FAIRCHILD SEMICONDUCTOR

MADE IN FAIRCHILD

DISCRETE PRODUCTS

DATABOOK

JULY 1973

DISCRETE PRODUCTS

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THE 1973 FAIRCHILD DISCRETE PRODUCTS DATA BOOK PROVIDES COMPREHENSIVE TECHNICAL DATA FOR DIODES □ SMALL SIGNAL TRANSISTORS □ MULTIPLE DIODES AND TRANSISTORS □ POWER TRANSISTORS AND UNENCAPSULATED COMPONENTS □□ DISCRETE OPTOELECTRONIC DEVICES □ RF POWER TRANSISTORS AND MICROWAVE DEVICES ARE EXCLUDED □□ THESE PRODUCTS ARE MANUFACTURED BY FAIRCHILD'S MICROWAVE AND OPTOELECTRONICS DIVISION □ AND INFORMATION REGARDING THEM MAY BE OBTAINED BY FILLING OUT ONE OF THE TEAR-OUT CARDS AT THE BACK OF THIS BOOK OR BY CONTACTING ANY FAIRCHILD FIELD SALES OFFICE □□ THE DATA BOOK IS DIVIDED INTO NINE SEPARATE SECTIONS □□ A BRIEF DESCRIPTION OF THE CONTENT AND USAGE NOTES PRECEDES THE INDIVIDUAL SECTIONS □□□

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SEMICONDUCTOR

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INTRODUCTION

INDEX AND DEVICE CROSS REFERENCE

The following numerical list of devices, which Fairchild supplies, was compiled on the basis of technology, cost, performance and availability. The content of each column is described below.

1. Industry Type Number

   A listing of the devices which Fairchild can supply directly, or for which a substitution can be recommended, is contained in the first column. The PRO-ELECTRON devices are in boldface type.

2. Recommended Fairchild Device

   a. If the Recommended Device and the Industry Device Type are the same, it indicates that Fairchild can supply the Industry Type in accordance with the official registered data or the original manufacturer's published data, as applicable.

   b. CF indicates Consult Factory. This notation is for devices which are useful in two or more applications, or where a Recommended Fairchild Device lends itself to special applications. It would also be used where a different device would be recommended as more suitable for certain applications.

   Please contact either the factory or the nearest Fairchild Field Sales Office to discuss your applications. (A complete listing of Sales Offices is contained at the back of this book.) Field Applications Engineers are located in many of the Sales Offices to provide on the spot technical assistance.

3. Data Sheet

   This column lists a type number identifying the detailed data sheet (Section 4) for the Recommended Fairchild Device. Some older device types do not have definitive specifications. Therefore, the Recommended Fairchild Device number may be shown but no data sheet has been included since it is not recommended that this type be used for new system design work. For example, the 2N697 has been a popular designer's choice as a general workhorse device. The leakage and collector saturation voltage specifications reflect the original nonepitaxial mesa manufacturing process that was used to make the device in 1960. Today almost all suppliers use a Planar* epitaxial product with significantly better characteristics.

An asterisk (*) indicates there is a complete data sheet included in Section 4.

4. Short Form Data

   This column refers to the page of the Selection Guide by Application and Short Form Data Listing (Section 3) which contains the abbreviated data listing for the Recommended Fairchild Device.

5. Family Characteristics

   This column refers to the subsection of Section 5 which contains the characterization data typical of the product family from which the Recommended Fairchild Device is supplied. Manufacturers may use different device processes to supply a given device type. This frequently occurs if the type is an older one with relaxed specifications. Where this option is desired, no reference has been made to the generic family source, and Fairchild reserves the right to make changes to line sources.

* Planar is a patented Fairchild process

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
BA100	BA100		3-7	
BA103	FDH900	FDH900		D6
BA104	FDH444	FD400		D4
BA108	FDH999	FDH900		D6
BA114	FDH999	FDH900		D6
BA115	FDH400	FD400		D4
BA116	FDH900	FDH900		D6
BA127	FDH444	FD400		D4
***BA128**	BA128	BA128	3-7	D6
***BA129**	BA129	BA129	3-7	D5
***BA130**	BA130	BA130	3-7	D5
BA136	BA136		3-7	
BA137	BAY72	BAY72		D4
BA147/25	FDH900	FDH900		D6
BA147/50	1N457	1N457		D5
BA147/100	FDH444	FD400		D4
BA147/150	FDH400	FD400		D4
BA151	FDH999	FDH900		D6
BA153	FDH900	FDH900		D6
BA155	BA155		3-7	
***BA164**	BA164	BA164	3-7	D6
BA168	1N4148	1N914		D6
BA170	FDH900	FDH900		D6
BA174	FDH900	FDH900		D6
BA175	1N4150	1N3600		D6
BA177	FDH900	FDH900		D6
BA179	FDH900	FDH900		D6
BA180	FDH999	FDH900		D6
BA181	FDH999	FDH900		D6
***BA216**	BA216	BA216	3-7	D6
***BA217**	BA217	BA217	3-7	D6
BA218	BA218		3-7	
BA219	BA219		3-7	
BAV10	1N4148	1N914		D6
BAW10	1N4150	1N3600		D6
BAW11	FDH444	FD400		D4
BAW12	FDH400	FD400		D4
BAW13	1N485B	1N482		D5
BAW16	FDH400	FD400		D4
BAW17	1N3595	1N3595		D5
BAW18	1N485B	1N482		D5
BAW24	FDH999	FDH900		D6
BAW25	FDH900	FDH900		D6
BAW26	FDH999	FDH900		D6
BAW27	FDH900	FDH900		D6
BAW33	FDH600	FD600		D6
BAW43	1N3595	1N3595		D5
BAW45	FDH999	FDH900		D6
BAW46	FDH600	FD600		D6
BAW47	1N4148	1N914		D6
BAW48	FDH666	FD600		D6
BAW49	FDH444	FD400		D4
BAW50	FDH400	FD400		D4

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
BAW51	BAY73	BAY73		D5
BAW52	FDH400	FD400		D4
BAW53	FDH999	FDH900		D6
BAW54	FDH666	FD600		D6
BAW55	FDH600	FD600		D6
BAX12	FDH400	FD400		D4
***BAX13**	BAX13	BAX13	3-3	D6
BAX16	BAX16		3-7	
BAX20	FDH900	FDH900		D6
BAX21	1N4448	1N914		D6
BAX22	FDH444	FD400		D4
BAX25	FD777	FD700		D7
BAX26	FD700	FD700		D7
BAX27	FD700	FD700		D7
BAX33	FA2311E	FA2310E		D6
BAX34	FA2313E	FA2310E		D6
BAX35	FA2313E	FA2310E		D6
BAX36	FA2321E	FA2310E		D4
BAX37	FA2323E	FA2310E		D4
BAX38	FA2323E	FA2310E		D4
BAX39	FA4311E	FA2310E		D6
BAX40	FA4313E	FA2310E		D6
BAX41	FA4313E	FA2310E		D6
BAX42	FA4321E	FA2310E		D4
BAX43	FA4323E	FA2310E		D4
BAX44	FA4323E	FA2310E		D4
BAX51	FSA2502M	FSA2500M		D11
BAX52	FSA2704M	FSA2702M		D11
BAX53	FSA2705M	FSA2702M		D11
BAX72	FSA1410M	FSA1410M		D11
BAX73	FSA1411M	FSA1410M		D11
BAX78	1N4150	1N3600		D6
BAX79	1N4150	1N3600		D6
BAX80	1N4148	1N914		D6
BAX81	1N4153	1N4151		D6
BAX82	1N4154	1N4151		D6
BAX83	1N4148	1N914		D6
BAX84	1N4151	1N4151		D6
BAX85	1N4151	1N4151		D6
BAX86A	1N4148	1N914		D6
BAX86B	1N4148	1N914		D6
BAX87	BAX13	BAX12		D6
BAX88	FDH999	FDH900		D6
BAX89A	FDH999	FDH900		D6
BAX89B	1N4151	1N4151		D6
BAX90A	1N4154	1N4151		D6
BAX90B	1N4151	1N4151		D6
BAX90C	1N4154	1N4151		D6
BAX91A	1N4151	1N4151		D6
BAX91B	1N4148	1N914		D6
BAX91C	1N4148	1N914		D6
BAX92	1N4151	1N4151		D6
BAX93	1N4151	1N4151		D6
BAX94	1N4151	1N4151		D6

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
BAX95	FDH600	FD600		D6
BAX96A	1N4446	1N914		D6
BAX96B	1N4446	1N914		D6
BAY17	1N4150	1N3600		D6
BAY18	BAY72	BAY72		D4
BAY19	FDH400	FD400		D4
BAY20	1N485B	1N482		D5
BAY31	1N4154	1N4151		D6
BAY32	1N485B	1N482		D5
BAY33	1N485B	1N482		D5
BAY36	1N4154	1N4151		D6
BAY38	1N4151	1N4151		D6
BAY41	1N4150	1N3600		D6
BAY42	1N4150	1N3600		D6
BAY43	1N4150	1N3600		D6
BAY44	1N4150	1N3600		D6
BAY45	FDH400	FD400		D4
BAY60	1N4154	1N4151		D6
BAY63	FDH600	FD600		D6
BAY64	FDH999	FDH900		D6
BAY67	FDH900	FDH900		D6
BAY68	FDH999	FDH900		D6
BAY69	FDH900	FDH900		D6
***BAY71**	BAY71	BAY71	3-3	D6
***BAY72**	BAY72	BAY72	3-5	D4
***BAY73**	BAY73	BAY73	3-8	D5
***BAY74**	BAY74	BAY74	3-3	D6
BAY80	FDH444	FD400		D4
***BAY82**	BAY82	BAY82	3-1	D7
BAY83	FDH900	FDH900		D6
BAY86	1N457	1N457		D5
BAY87	FDH400	FD400		D4
BAY93	FDH999	FDH900		D6
BAY94	1N4154	1N4151		D6
BAY95	1N4151	1N4151		D6
BAY97	1N4154	1N4151		D6
BAY98	FDH400	FD400		D4
BAY99	FDH900	FDH900		D6
BC107	BC317	BC317		SS18
BC107A	BC317A	BC317		SS18
BC107B	BC317B	BC317		SS18
BC108	BC318	BC317		SS18
BC108A	BC318A	BC317		SS18
BC108B	BC318B	BC317		SS18
BC108C	BC318C	BC317		SS18
BC109	BC319	BC317		SS18
BC109B	BC319B	BC317		SS18
BC109C	BC319C	BC317		SS18
BC110	2N3701	2N3700		SS17
***BC113**	BC113	BC113	3-29	SS18
***BC114**	BC114	BC113	3-29	SS18
***BC115**	BC115	BC115	3-29	SS15
BC116	BC116A	BC116A		SS15
***BC116A**	BC116A	BC116A	3-27	SS15
BC117	BC117		3-33	
BC118	BC118		3-24	
***BC119**	BC119	BC119	3-20	SS15
***BC125**	BC125	BC125	3-23	SS15
***BC126**	BC126	BC125	3-27	SS22
BC132	2N3565	2N3565		SS8
BC134	BC134		3-23	
BC135	BC118			
BC136	BC125	BC125		SS15
BC137	BC116A	BC116A		SS15
BC138	BC119	BC119		SS15
***BC139**	BC139	BC119	3-25	SS22
***BC140**	BC140	BC140	3-20	SS17
***BC140-6**	BC140-6	BC140	3-20	SS17
***BC140-10**	BC140-10	BC140	3-20	SS17
***BC140-16**	BC140-16	BC140	3-20	SS17
BC140-25	BC140-25	BC140	3-20	SS17
***BC141**	BC141	BC140	3-20	SS17
***BC141-6**	BC141-6	BC140	3-20	SS17
***BC141-10**	BC141-10	BC140	3-20	SS17
***BC141-16**	BC141-16	BC140	3-20	SS17
***BC141-25**	BC141-25	BC140	3-20	SS17
***BC142**	BC142	BC142	3-21	SS17
***BC143**	BC143	BC143	3-26	SS24
BC144	BC286	BC286		SS17
BC145	BC117			
BC147	BC317	BC317		SS18
BC147A	BC317A	BC317		SS18
BC147B	BC317B	BC317		SS18
BC148	BC318	BC317		SS18
BC148A	BC318A	BC317		SS18
BC148B	BC318B	BC317		SS18
BC148C	BC318C	BC317		SS18
BC149	BC319	BC317		SS18
BC149B	BC319B	BC317		SS18
BC149C	BC319C	BC317		SS18
***BC153**	BC153	BC153	3-32	SS33
***BC154**	BC154	BC153	3-32	SS33
BC157	BC320	BC320		SS33
BC157A	BC320A	BC320		SS33
BC157B	BC320B	BC320		SS33
BC158	BC321	BC320		SS33
BC158A	BC321A	BC320		SS33
BC158B	BC321B	BC320		SS33
BC159	BC322	BC320		SS33
BC159B	BC322B	BC320		SS33
***BC160**	BC160	BC140	3-25	SS24
***BC160-6**	BC160-6	BC140	3-25	SS24
***BC160-10**	BC160-10	BC140	3-25	SS24
***BC160-16**	BC160-16	BC140	3-25	SS24
***BC160-25**	BC160-25	BC140	3-25	SS24
***BC161**	BC161	BC140	3-25	SS24

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
*BC161-6	BC161-6	BC140	3-25	SS24
*BC161-10	BC161-10	BC140	3-25	SS24
*BC161-16	BC161-16	BC140	3-25	SS24
BC161-25	BC161-25	BC140	3-25	SS24
BC167	BC317	BC317		SS18
BC167A	BC317A	BC317		SS18
BC167B	BC317B	BC317		SS18
BC168	BC318	BC317		SS18
BC168A	BC318A	BC317		SS18
BC168B	BC318B	BC317		SS18
BC168C	BC318C	BC317		SS18
BC169	BC319	BC317		SS18
BC169B	BC319B	BC317		SS18
BC169C	BC319C	BC317		SS18
BC170	BC318	BC317		SS18
BC170A	BC318A	BC317		SS18
BC170B	BC318B	BC317		SS18
BC170C	BC318C	BC317		SS18
BC171	BC317	BC317		SS18
BC171A	BC317A	BC317		SS18
BC171B	BC317B	BC317		SS18
BC172	BC318	BC317		SS18
BC172A	BC318A	BC317		SS18
BC172B	BC318B	BC317		SS18
BC172C	BC318C	BC317		SS18
BC173	BC319	BC317		SS18
BC173B	BC319B	BC317		SS18
BC173C	BC319C	BC317		SS18
BC177	BC177		3-31	
BC177VI	BC177VI		3-31	
BC177A	BC177A		3-31	
BC177B	BC177B		3-31	
BC178	BC178		3-31	
BC178VI	BC178VI		3-31	
BC178A	BC178A		3-31	
BC178B	BC178B		3-31	
BC179	BC179		3-31	
BC179A	BC179A		3-31	
BC179B	BC179B		3-31	
BC182	BC317	BC317		SS18
BC182A	BC317A	BC317		SS18
BC182B	BC317B	BC317		SS18
BC183	BC318	BC317		SS18
BC183A	BC318A	BC317		SS18
BC183B	BC318B	BC317		SS18
BC183C	BC318C	BC317		SS18
BC184	BC319	BC317		SS18
BC184B	BC319B	BC317		SS18
BC184C	BC319C	BC317		SS18
BC197	BC317	BC317		SS18
BC197A	BC317A	BC317		SS18
BC197B	BC317B	BC317		SS18
BC198	BC318	BC317		SS18
BC198A	BC318A	BC317		SS18
BC198B	BC318B	BC317		SS18
BC198C	BC318C	BC317		SS18
BC199	BC319	BC317		SS18
BC199B	BC319B	BC317		SS18
BC199C	BC319C	BC317		SS18
BC200	BC322	BC320		SS33
*BC204	BC204	BC204	3-32	SS23
*BC204A	BC204A	BC204	3-32	SS23
BC204B	BC204B	BC204	3-32	SS23
*BC205	BC205	BC205	3-32	SS23
*BC205A	BC205A	BC205	3-32	SS23
*BC205B	BC205B	BC205	3-32	SS23
*BC205C	BC205C	BC205		SS23
*BC206	BC206	BC206	3-32	SS33
*BC206B	BC206B	BC206	3-32	SS33
*BC206C	BC206C	BC206		SS33
*BC207	BC207	BC207	3-30	SS18
*BC207A	BC207A	BC207	3-30	SS18
*BC207B	BC207B	BC207	3-30	SS18
*BC208	BC208	BC207	3-29	SS18
*BC208A	BC208A	BC207	3-29	SS18
*BC208B	BC208B	BC207	3-29	SS18
*BC208C	BC208C	BC207	3-29	SS18
*BC209	BC209	BC207	3-29	SS18
*BC209B	BC209B	BC207	3-29	SS18
*BC209C	BC209C	BC207	3-29	SS18
BC212	BC320	BC320		SS33
BC212A	BC320A	BC320		SS33
BC212B	BC320B	BC320		SS33
BC213	BC321	BC320		SS33
BC213A	BC321A	BC320		SS33
BC213B	BC321B	BC320		SS33
BC214	BC322	BC320		SS33
BC214B	BC322B	BC320		SS33
BC221	2N3638A	2N3638		SS22
BC222	BC125	BC125		SS15
*BC225	BC225	BC153	3-32	SS33
BC231	MPS6534M	MPS6533M		SS22
BC232	MPS6531	MPS6530		SS15
BC237	BC317	BC317		SS18
BC237A	BC317A	BC317		SS18
BC237B	BC317B	BC317		SS18
BC238	BC318	BC317		SS18
BC238A	BC318A	BC317		SS18
BC238B	BC318B	BC317		SS18
BC238C	BC318C	BC317		SS18
BC239	BC319	BC317		SS18
BC239B	BC319B	BC317		SS18
BC239C	BC319C	BC317		SS18
BC251	BC320	BC320		SS33
BC251A	BC320A	BC320		SS33
BC251B	BC320B	BC320		SS33

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
BC251C	BC526C	BC526		SS33
BC252	BC321	BC320		SS33
BC252A	BC321A	BC320		SS33
BC252B	BC321B	BC320		SS33
BC252C	BC321C	BC320		SS33
BC253	BC322	BC320		SS33
BC253B	BC322B	BC320		SS33
BC253C	BC322C	BC320		SS33
BC264	2N5485	2N5485		
BC267	BC317	BC317		SS18
BC268	BC318	BC317		SS18
BC269	BC319	BC317		SS18
BC270	BC283			
BC280	2N930	2N930		SS8
BC282	BC282		3-20	
BC283	BC283		3-25	
BC284	2N915			SS14
BC285	2N3114			SS16
***BC286**	BC286	BC286	3-21	SS17
***BC287**	BC287	BC286	3-26	SS24
BC288	BFX34	BFX34		PWR1
BC307	BC320	BC320		SS33
BC307A	BC320A	BC320		SS33
BC307B	BC320B	BC320		SS33
BC308	BC321	BC320		SS33
BC308A	BC321A	BC320		SS33
BC308B	BC321B	BC320		SS33
BC308C	BC321C	BC320		SS33
BC309	BC322	BC320		SS33
BC309B	BC322B	BC320		SS33
BC310	BC286	BC286		SS17
BC311	BC287	BC286		SS24
BC315	2N5087	2N5086		SS33
***BC317**	BC317	BC317	3-30	SS18
***BC317A**	BC317A	BC317	3-30	SS18
***BC317B**	BC317B	BC317	3-30	SS18
***BC318**	BC318	BC317	3-29	SS18
***BC318A**	BC318A	BC317	3-29	SS18
***BC318B**	BC318B	BC317	3-29	SS18
***BC318C**	BC318C	BC317	3-29	SS18
***BC319**	BC319	BC317	3-29	SS18
***BC319B**	BC319B	BC317	3-29	SS18
***BC319C**	BC319C	BC317	3-29	SS18
***BC320**	BC320	BC320	3-32	SS33
***BC320A**	BC320A	BC320	3-32	SS33
***BC320B**	BC320B	BC320	3-32	SS33
***BC321**	BC321	BC320	3-32	SS33
***BC321A**	BC321A	BC320	3-32	SS33
***BC321B**	BC321B	BC320	3-32	SS33
***BC321C**	BC321C	BC320	3-32	SS33
***BC322**	BC322	BC320	3-32	SS33
***BC322B**	BC322B	BC320	3-32	SS33
***BC322C**	BC322C	BC320		SS33

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
***BC323**	BC323	BC323	3-36	PWR1
BC327	BC527	BC527		SS24
BC328	BC528	BC527		SS24
BC337	BC537	BC527		SS17
BC338	BC538	BC527		SS17
BC407	BC207	BC207		SS18
BC407A	BC207A	BC207		SS18
BC408	BC208	BC207		SS18
BC408A	BC208A	BC207		SS18
BC408B	BC208B	BC207		SS18
BC408C	BC208C	BC207		SS18
BC409	BC209	BC207		SS18
BC409B	BC209B	BC207		SS18
BC409C	BC209C	BC207		SS18
BC477	BC177			
BC478	BC178			
BC479	BC179			
BC512	BC320	BC320		SS33
BC512A	BC320A	BC320		SS33
BC512B	BC320B	BC320		SS33
BC513	BC321	BC320		SS33
BC513A	BC321A	BC320		SS33
BC513B	BC321B	BC320		SS33
BC513C	BC321C	BC320		SS33
BC514	BC322	BC320		SS33
BC514B	BC322B	BC320		SS33
BC514C	BC322C	BC320		SS33
***BC520**	BC520	BC520	3-30	SS8
***BC521**	BC521	BC520	3-30	SS8
***BC522**	BC522	BC522		
***BC523**	BC523	BC523	3-30	SS8
***BC526**	BC526	BC526	3-32	SS33
***BC526A**	BC526A	BC526	3-32	SS33
***BC526B**	BC526B	BC526	3-32	SS33
***BC526C**	BC526C	BC526	3-32	SS33
***BC527**	BC527	BC527	3-28	SS24
***BC527-6**	BC527-6	BC527	3-28	SS24
***BC527-10**	BC527-10	BC527	3-28	SS24
***BC527-16**	BC527-16	BC527	3-28	SS24
***BC527-25**	BC527-25	BC527	3-28	SS24
***BC528**	BC528	BC527	3-28	SS24
***BC528-6**	BC528-6	BC527	3-28	SS24
***BC528-10**	BC528-10	BC527	3-28	SS24
***BC528-16**	BC528-16	BC527	3-28	SS24
***BC528-25**	BC528-25	BC527	3-28	SS24
***BC530**	BC530	BC530	3-34	SS25
***BC531**	BC531	BC530	3-34	SS25
***BC532**	BC532	BC532	3-33	
***BC533**	BC533	BC532	3-33	
***BC534**	BC534	BC534	3-28	SS24
***BC535**	BC535	BC534	3-24	SS17
***BC537**	BC537	BC527	3-24	SS17
***BC537-6**	BC537-6	BC527	3-24	SS17

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*BC537-10	BC537-10	BC527	3-24	SS17
*BC537-16	BC537-16	BC527	3-24	SS17
*BC537-25	BC537-25	BC527	3-24	SS17
*BC538	BC538	BC527	3-24	SS17
*BC538-6	BC538-6	BC527	3-24	SS17
*BC538-10	BC538-10	BC527	3-24	SS17
*BC538-16	BC528-16	BC527	3-24	SS17
*BC538-25	BC538-25	BC527	3-24	SS17
BC582	BC317	BC317		SS18
BC582A	BC317A	BC317		SS18
BC582B	BC317B	BC317		SS18
BC583	BC318	BC317		SS18
BC583A	BC318A	BC317		SS18
BC583B	BC318B	BC317		SS18
BC583C	BC318C	BC317		SS18
BC584	BC319	BC317		SS18
BC584B	BC319B	BC317		SS18
BC584C	BC319C	BC317		SS18
BCY42	2N2221	2N2218		SS15
BCY43	2N2222	2N2218		SS15
BCY58	2N3947	2N3946		SS14
BCY59	2N3947	2N3946		SS14
BCY65E	2N3947	2N3946		SS14
BCY70	BCY70		3-25	
BCY71	BCY71		3-25	
BCY72	BCY72		3-25	
BCY78	2N3962	2N3962		SS33
BCY78IX	2N3964	2N3962		SS33
BCY78VII	2N3962	2N3962		SS33
BCY78VIII	2N3964	2N3962		SS33
BCY78X	2N3964	2N3962		SS33
BCY79	2N3962	2N3962		SS33
BCY79IX	2N3964	2N3962		SS33
BCY79VII	2N3962	2N3962		SS33
BCY79VIII	2N3964	2N3962		SS33
*BD115	BD115	BD115	3-33	
BD124	2N3054	2N3054		PWR5
BD130	2N3055	2N3055		PWR6
BD135	CF			
BD136	CF			
BD137	CF			
BD138	CF			
BD139	CF			
BD140	CF			
BD142	2N3055	2N3055		PWR6
BD162	2N4910	2N4231		PWR5
BD163	2N4910	2N4231		PWR5
BD181	2N4913	2N4913		PWR6
BD182	2N3055	2N3055		PWR6
BD183	2N3716	2N3713		PWR6
*BD220	BD220	BD220	3-37	PWR5
*BD221	BD221	BD220	3-37	PWR5
*BD222	BD222	BD220	3-37	PWR5
*BD223	BD223	BD223	3-37	PWR14
*BD224	BD224	BD223	3-37	PWR14
*BD225	BD225	BD223	3-37	PWR14
BD239	2N6121	2N6121		PWR5
BD239A	2N6122	2N6121		PWR5
BD239B	2N6123	2N6121		PWR5
BD240	2N6124	2N6124		PWR14
BD240A	2N6125	2N6124		PWR14
BD240B	2N6126	2N6124		PWR14
BD241	2N6121	2N6121		PWR5
BD241A	2N6122	2N6121		PWR5
BD241B	2N6123	2N6121		PWR5
BD242	2N6124	2N6124		PWR14
BD242A	2N6125	2N6124		PWR14
BD242B	2N6126	2N6124		PWR14
BDX10	2N3055	2N3055		PWR6
BDX13	2N5301	2N5301		PWR7
BDX22	SE9051	2N6233		PWR9
BDX24	2N5878	2N5877		PWR6
BDX40	2N5302	2N5301		PWR7
BDX41	2N5301			PWR7
BDY10	2N4907	2N4901		PWR15
BDY11	2N4909	2N4901		PWR15
BDY12	2N4910	2N4231		PWR5
BDY13	2N3054	2N3054		PWR5
BDY17	2N5301	2N5301		PWR7
BDY18	2N5302	2N5302		PWR7
BDY23	2N4914	2N4913		PWR6
BDY24	2N4915	2N4913		PWR6
BDY25	2N3055	2N3055		PWR6
BDY38	2N4914	2N4913		PWR6
BDY39	2N3055	2N3055		PWR6
BDY55	2N3055	2N3055		PWR6
BDY56	2N3055	2N3055		PWR6
BDY71	2N3054	2N3054		PWR5
BDY73	2N3715	2N3713		PWR6
BDY76	2N5302	2N5301		PWR7
BDY78	2N3054	2N3054		PWR5
BF115	2N918	2N918		SS27
BF152	BF152		3-35	
BF153	2N3563	2N918		SS27
BF154	2N3564	2N3564		SS2
BF155	SE5023	SE5020		SS3
BF156	SE7002			SS16
BF157	BF257	BF257		
BF158	2N3563	2N918		SS27
BF159	BF159		3-35	
BF160	BF160		3-35	
BF161	SE5023	SE5020		SS3
BF162	BF162		3-35	
BF163	BF163		3-35	
BF165	2N3564	2N3564		SS2

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BF166	SE5023	SE5020		SS3
***BF167**	BF167	BF167	3-34	
BF173	SE5035	SE5035		SS12
BF174	BF257	BF257		
BF176	PE5025	PE5025		SS6
BF177	SE7002			SS16
BF178	BF257	BF257		
BF179	BF258	BF257		
BF180	SE5020	SE5020		SS3
BF181	SE5020	SE5020		SS3
BF182	SE5020	SE5020		SS3
BF183	SE5020	SE5020		SS3
BF184	2N3688	2N3688		SS1
BF185	2N3688	2N3688		SS1
BF194	PN3688	2N3688		SS1
BF195	PN3688	2N3688		SS1
BF196	BF167	BF167		
BF197	PE5030B	PE5029		SS12
BF198	BF167	BF167		
BF199	PE5030B	PE5029		SS12
BF200	BF222	BF222		
***BF222**	BF222	BF222	3-34	SS3
BF244	2N5484	2N5484		
BF245	2N5484	2N5484		
BF251	BF167	BF167		
BF254	PN3688	2N3688		SS1
BF255	PN3688	2N3688		SS1
BF256	2N5484	2N5484		
***BF257**	BF257	BF257	3-33	
***BF258**	BF258	BF257	3-33	
***BF259**	BF259	BF257	3-33	
BF270	BF167	BF167		
BF271	PE5030B	PE5029		SS12
BF273	PE5029	PE5029		SS12
BF274	PE5029	PE5029		SS12
BF311	PE5025	PE5025		SS6
BF314	PE5010	PE5010		SS19
BF334	PN3688	2N3688		SS1
BF335	PN3688	2N3688		SS1
***BF336**	BF336	BF336	3-33	
***BF337**	BF337	BF336	3-33	
***BF338**	BF338	BF336	3-33	
BF350	FT0601	FT0601		SS26
BF351	FT0601	FT0601		SS26
BF352	FT0601	FT0601		SS26
BF353	FT0601	FT0601		SS26
BF354	FT0601	FT0601		SS26
BF456	BF257	BF257		
BF457	BF257	BF257		
BF458	BF258	BF257		
BF459	BF259	BF257		
BFR10	2N2218A	2N2218A		SS15
BFR11	2N2221A	2N2218A		SS15

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BFR16	2N2484	2N2484		SS8
BFR17	2N3117	2N2484		SS8
BFR18	2N871			SS17
BFR19	2N3110	2N3107		SS17
BFR20	2N3109	2N3109		SS17
BFR21	2N3108	2N3107		SS17
BFR22	2N1893	2N1893		SS17
BFR23	2N4031	2N4030		SS24
BFR24	2N4032	2N4030		SS24
BFW19	2N3137	2N3137		SS2
BFW20	2N3962	2N3962		SS33
BFW22	2N3964	2N3962		SS33
BFW23	2N3965	2N3962		SS33
BFW29	2N2219A	2N2218A		SS15
BFW31	2N2907	2N2904		SS22
BFW32	2N2222	2N2218		SS15
BFW33	2N1893	2N1893		SS17
BFW36	2N3114			SS16
BFW37	2N3114			SS16
BFW39	2N2915	2N2915		SS8
BFW39A	2N2919A	2N2915		SS8
BFW40	2N2916	2N2916		SS8
BFW41	2N918	2N918		SS27
BFW45	SE7001			SS16
BFW51	2N2974	2N2915		SS8
BFW51A	2N2978	2N2915		SS8
BFW52	2N2978	2N2915		SS8
BFW52A	2N2979	2N2915		SS8
BFW57	PE6020	PE6020		SS17
BFW58	PE6020	PE6020		SS17
BFW59	PE6020	PE6020		SS17
BFW60	PE6020	PE6020		SS17
BFW66	2N2219A	2N2218A		SS15
BFW67	2N5058	2N5058		SS11
BFW68	2N2222A	2N2218A		SS15
BFX11	2N3726	2N3726		SS22
BFX12	2N2894	2N2894		SS30
BFX13	2N2894	2N2894		SS30
BFX17	2N3725	2N3724		SS13
BFX18	SE5023	SE5020		SS3
BFX19	SE5022	SE5020		SS3
BFX20	SE5021	SE5020		SS3
BFX21	SE5020	SE5020		SS3
BFX29	2N2905A	2N2904		SS22
BFX30	2N2905A	2N2904		SS22
BFX31	SE5023	SE5020		SS3
BFX33	2N3137	2N3137		SS2
***BFX34**	BFX34	BFX34	3-36	PWR1
BFX35	2N3504			SS22
BFX36	2N4024	2N4020		SS33
***BFX37**	BFX37	BFX37	3-31	SS33
***BFX38**	BFX38	BFX38	3-25	SS24
***BFX39**	BFX39	BFX38	3-25	SS24

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*BFX40	BFX40	BFX38	3-26	SS24
*BFX41	BFX41	BFX38	3-26	SS24
BFX43	2N2369	2N2369		SS28
BFX44	2N2368			SS28
BFX45	2N2222	2N2218		SS15
BFX48	BFX48		3-25	
BFX50	2N2222A	2N2218A		SS15
BFX51	2N2221A	2N2218A		SS15
BFX52	2N2222A	2N2218A		SS15
BFX62	2N918	2N918		SS27
BFX63	2N3962	2N3962		SS33
BFX66	2N998	2N998		
BFX67	2N997	2N997		
BFX68	2N1711	2N718A		SS15
BFX68A	2N1711	2N718A		SS15
BFX69	2N1613	2N718A		SS15
BFX69A	2N3110	2N3107		SS17
BFX73	2N918	2N918		SS27
BFX75	2N1132			SS22
BFX84	2N3108	2N3107		SS17
BFX85	2N3107	2N3107		SS17
BFX86	2N3109	2N3107		SS17
BFX87	2N2904A	2N2904		SS22
BFX88	2N2904	2N2904		SS22
BFX93	2N930	2N930		SS8
BFX93A	2N2484	2N2484		SS8
BFX94	2N2221	2N2218		SS15
BFX95	2N2222	2N2218		SS15
BFX96	2N2218	2N2218		SS15
BFX97	2N2219	2N2218		SS15
BFX98	2N3923	2N3923		SS16
*BFY50	BFY50	BFY50	3-20	SS17
*BFY51	BFY51	BFY50	3-20	SS17
*BFY52	BFY52	BFY50	3-20	SS17
*BFY56	BFY56	BFY56		SS17
BFY57	BFY57		3-33	
BFY63	2N3137	2N3137		SS2
*BFY64	BFY64	BFY64	3-25	SS22
BFY72	2N2218A	2N2218A	3-20	SS15
BFY74	2N915			SS14
BFY75	2N915			SS14
BFY77	2N930	2N930		SS8
BSS10	2N3013	2N3009		SS5
BSS11	2N2369A	2N2369		SS28
BSS12	2N3011			SS28
BSS30	2N1893	2N1893		SS17
BSS31	2N3019	2N3019		SS17
BSS32	2N1893	2N1893		SS17
BSV64	BFX34	BFX34		PWR1
BSV77	2N3725	2N3724		SS13
BSV89	2N2368			SS28
BSV90	2N2369	2N2369		SS28
BSV91	2N2369A	2N2369		SS28
BSV92	2N3011	2N3011		SS28
BSW11	2N3646	2N3646		SS5
BSW12	2N3646	2N3646		SS5
BSW19	2N3014	2N3009		SS5
BSW21	2N2906	2N2904		SS22
BSW22	2N2907	2N2904		SS22
BSW23	2N2904	2N2904		SS22
BSW24	2N2906	2N2904		SS22
BSW25	2N2894A	2N2894		SS32
BSW26	2N4047	2N3724		SS13
BSW27	2N4047	2N3724		SS13
BSW28	2N4047	2N3724		SS13
BSW29	2N4046	2N3724		SS13
BSW32	2N5830	2N5830		SS16
BSW41	2N2221	2N2218		SS15
BSW42	BC317	BC317		SS18
BSW43	BS318	BC317		SS18
BSW44	BC321	BC320		SS33
BSW45	BC322	BC320		SS33
BSW65	2N3019	2N3019		SS17
BSW66	2N3019	2N3019		SS17
BSW70	2N2222	2N2218		SS15
BSW72	2N2906	2N2904		SS22
BSW73	2N2907	2N2904		SS22
BSW74	2N2906	2N2904		SS22
BSW75	2N2907	2N2904		SS22
BSW82	2N2221	2N2218		SS15
BSW83	2N2222	2N2218		SS15
BSW84	2N2221	2N2218		SS15
BSW85	2N2222	2N2218		SS15
BSW88	2N3694	2N3693		
BSW89	2N3694	2N3693		
BSX20	BSX20		3-17	
BSX26	BSX26		3-17	
BSX27	BSX27			
BSX28	BSX28		3-17	
BSX29	BSX29		3-19	
*BSX32	BSX32	BSX32	3-17	SS13
BSX33	2N3701	2N3701		SS17
BSX36	2N2906	2N2904		SS22
BSX39	BSX39		3-17	
BSX44	2N709	2N709		SS29
BSX48	2N4013	2N3724		SS13
BSX49	2N4013	2N3724		SS13
BSX59	2N3725	2N3724		SS13
BSX60	2N3724	2N3724		SS13
BSX61	2N3725	2N3724		SS13
BSX62	BFX34	BFX34		PWR1
BSX63	BFX34	BFX34		PWR1
BSX66	2N2368			SS28
BSX67	2N744			SS28
BSX76	2N2369	2N2369		SS28
BSX77	2N2369	2N2369		SS28

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BSX78	2N2369	2N2369		SS28
BSX87	2N914			SS5
BSX87A	2N708			SS5
BSX88	2N708			SS5
BSX88A	2N914			SS5
BSX90	2N2368			SS28
BSX91	2N744			SS5
BSX92	2N2368			SS28
BSX93	2N2369	2N2369		SS28
BSY17	2N2368			SS28
BSY18	2N744			SS28
BSY19	2N708			SS5
BSY38	2N2368			SS28
BSY39	2N744			SS28
BSY40	2N2894	2N2894		SS30
BSY41	2N2894	2N2894		SS30
BSY51	2N697			
BSY52	2N1711	2N718A		
BSY53	2N1613	2N718A		
BSY54	2N1711	2N718A		
BSY55	2N1893	2N1893		SS17
BSY56	2N3019	2N3019		SS17
BSY78	2N2222	2N2218		SS15
BSY79	2N3114			
BSY95	2N2369	2N2369		SS28
BSY95A	2N2369	2N2369		SS28
BUY24	2N5069	2N5067		PWR6
BUY46	2N3054	2N3054		PWR5
BUY68	BFX34	BFX34		PWR1
BZX43	FCT1021	FCT1021		D3
BZX44	FCT1022	FCT1021		D3
BZX45	FCT1025	FCT1021		
BZX46C3V3	1N746A	1N746		D8
BZX46C3V6	1N747A	1N746		D8
BZX46D3V9	1N748A	1N746		D8
BZX46C4V3	1N749A	1N746		D8
BZX46C4V7	1N750A	1N746		D8
BZX46C5V1	1N751A	1N746		D8
BZX46C5V6	1N752A	1N746		D8
BZX46C6V2	1N753A	1N746		D8
BZX46C6V8	1N754A	1N746		D8
BZX46C7V5	1N755A	1N746		D8
BZX46C8V2	1N756A	1N746		D8
BZX46C9V1	1N757A	1N746		D8
BZX46C10	1N758A	1N746		D8
BZX46C11	1N962B	1N957		D8
BZX46C12	1N963B	1N957		D8
BZX46C13	1N964B	1N957		D8
BZX46C15	1N965B	1N957		D8
BZX46C16	1N966B	1N957		D8
BZX46C18	1N967B	1N957		D8
BZX46C20	1N968B	1N957		D8
BZX46C22	1N969B	1N957		D8
BZX46C24	1N970B	1N957		D8
BZX46C27	1N971B	1N957		D8
BZX46C30	1N972B	1N957		D8
BZX46C33	1N973B	1N957		D8
BZX63C6V8	1N957B	1N957		D8
BZX63C7V5	1N958B	1N957		D8
BZX63C8V2	1N959B	1N957		D8
BZX63C9V1	1N960B	1N957		D8
BZX63C10	1N961B	1N957		D8
BZX64C11	1N962B	1N957		D8
BZX64C12	1N963B	1N957		D8
BZX64C13	1N964B	1N957		D8
BZX64C15	1N965B	1N957		D8
BZX64C16	1N966B	1N957		D8
BZX64C18	1N967B	1N957		D8
BZX64C20	1N968B	1N957		D8
BZX64C22	1N969B	1N957		D8
BZX64C24	1N970B	1N957		D8
BZX64C27	1N971B	1N957		D8
BZX65C30	1N972B	1N957		D8
BZX65C33	1N973B	1N957		D8
BZX71C5V1	1N751A	1N746		D8
BZX71C5V6	1N752A	1N746		D8
BZX71C6V2	1N753A	1N746		D8
BZX71C6V8	1N957B	1N957		D8
BZX71C7V5	1N958B	1N957		D8
BZX71C8V2	1N959B	1N957		D8
BZX71C9V1	1N960B	1N957		D8
BZX71C10	1N961B	1N957		D8
BZX71C11	1N962B	1N957		D8
BZX71C12	1N963B	1N957		D8
BZX71C13	1N964B	1N957		D8
BZX71C15	1N965B	1N957		D8
BZX71C16	1N966B	1N957		D8
BZX71C18	1N967B	1N957		D8
BZX71C20	1N968B	1N957		D8
BZX71C22	1N969B	1N957		D8
BZX71C24	1N970B	1N957		D8
BZX79C4V7	1N750A	1N746		D8
BZX79C5V1	1N751A	1N746		D8
BZX79C5V6	1N752A	1N746		D8
BZX79C6V2	1N753A	1N746		D8
BZX79C6V8	1N957B	1N957		D8
BZX79C7V5	1N958B	1N957		D8
BZX79C8V2	1N959B	1N957		D8
BZX79C9V1	1N960B	1N957		D8
BZX79C10	1N961B	1N957		D8
BZX79C11	1N962B	1N957		D8
BZX79C12	1N963B	1N957		D8
BZX79C13	1N964B	1N957		D8
BZX79C15	1N965B	1N957		D8
BZX79C16	1N966B	1N957		D8
BZX79C18	1N967B	1N957		D8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
BZX79C20	1N968B	1N957		D8
BZX79C22	1N969B	1N957		D8
BZX79C24	1N970B	1N957		D8
BZX79C27	1N971B	1N957		D8
BZX79C30	1N972B	1N957		D8
BZX79C33	1N973B	1N957		D8
BZY85C4V3	1N749A	1N746		D8
BZY85C4V7	1N750A	1N746		D8
BZY85C5V1	1N751A	1N746		D8
BZY85C5V6	1N752A	1N746		D8
BZY85C6V2	1N753A	1N746		D8
BZY85C6V8	1N754A	1N746		D8
BZY85C7V5	1N755A	1N746		D8
BZY85C8V2	1N756A	1N746		D8
BZY85C9V1	1N757A	1N746		D8
BZY85C10	1N758A	1N746		D8
BZY85C11	1N962B	1N957		D8
BZY85C12	1N963B	1N957		D8
BZY85C13	1N964B	1N957		D8
BZY85C15	1N965B	1N957		D8
BZY85C16	1N966B	1N957		D8
BZY85C18	1N967B	1N957		D8
BZY85C20	1N968B	1N957		D8
BZY85C22	1N969B	1N957		D8
BZY85C24	1N970B	1N957		D8
BZY85C27	1N971B	1N957		D8
BZY85C30	1N972B	1N957		D8
BZY85C33	1N973B	1N957		D8
BZY85D4V7	1N750	1N746		D8
BZY85D5V6	1N752	1N746		D8
BZY85D6V8	1N754	1N746		D8
BZY85D8V2	1N756	1N746		D8
BZY85D10	1N758	1N746		D8
BZY85D12	1N759	1N746		D8
BZY85D15	1N965A	1N957		D8
BZY85D18	1N967A	1N957		D8
BZY85D22	1N969A	1N957		D8
BZY88C3V3	1N746A	1N746		D8
BZY88C3V6	1N747A	1N746		D8
BZY88C3V9	1N748A	1N746		D8
BZY88C4V3	1N749A	1N746		D8
BZY88C4V7	1N750A	1N746		D8
BZY88C5V1	1N751A	1N746		D8
BZY88C5V6	1N752A	1N746		D8
BZY88C6V2	1N753A	1N746		D8
BZY88C6V8	1N754A	1N746		D8
BZY88C7V5	1N755A	1N746		D8
BZY88C8V2	1N756A	1N746		D8
BZY88C9V1	1N757A	1N746		D8
BZY88C10	1N961B	1N957		D8
BZY88C11	1N962B	1N957		D8
BZY88C12	1N963B	1N957		D8
BZY88C13	1N964B	1N957		D8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
BZY88C15	1N965B	1N957		D8
BZY88C16	1N966B	1N957		D8
BZY88C18	1N967B	1N957		D8
BZY88C20	1N968B	1N957		D8
BZY88C22	1N969B	1N957		D8
BZY88C24	1N970B	1N957		D8
BZY88C27	1N971B	1N957		D8
BZY88C30	1N972B	1N957		D8
BZY88C33	1N973B	1N957		D8
D12A8	2N3728	2N3728		SS15
D12E026	2N3728	2N3728		SS15
D12E126	2N2976	2N2917		SS8
D16G6	2N5770	2N918		SS27
D16P1	MPSA13	MPSA13		SS20
D29E1	2N4402	2N4402		SS22
D29E1J1	2N4402	2N4402		SS22
D29E2	2N4403	2N4402		SS22
D29E2J1	2N4403	2N4402		SS22
D29E4	2N4402	2N4402		SS22
D29E4K1	2N4402	2N4402		SS22
D29E5	2N4403	2N4402		SS22
D29E5J1	2N4403	2N4402		SS22
D29E6	2N4403	2N4402		SS22
D29E6J1	2N4403	2N4402		SS22
D29E7	2N4403	2N4402		SS22
D29E7J1	2N4403	2N4402		SS22
D29E9	MPSA05	MPSA05		SS17
D29E9J1	MPSA05	MPSA05		SS17
D29E10	MPSA05	MPSA05		SS17
D29E10J1	MPSA05	MPSA05		SS17
D29F1	2N3905	2N3905		SS23
D29F2	2N3905	2N3905		SS23
D29F3	2N3906	2N3905		SS23
D29F4	2N5087	2N5086		SS33
D29F5	2N5086	2N5086		SS33
D29F6	2N5086	2N5086		SS33
D29F7	2N5087	2N5086		SS33
D32K1	2N5845	2N5845		SS13
D32K2	2N5845	2N5845		SS13
D32P1	PE5025	PE5025		SS6
D32P2	2N4123	2N4123		SS14
D32P3	2N4123	2N4123		SS14
D32P4	2N4124	2N4123		SS14
D33D21	2N4400	2N4400		SS15
D33D21J1	2N4400	2N4400		SS15
D33D22	2N4401	2N4400		SS15
D33D22J1	2N4401	2N4400		SS15
D33D24	2N4400	2N4400		SS15
D33D24J1	2N4400	2N4400		SS15
D33D25	2N4401	2N4400		SS15
D33D25J1	2N4401	2N4400		SS15
D33D26	2N4401	2N4400		SS15
D33D26J1	2N4401	2N4400		SS15

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
D33D27	2N4401	2N4400		SS15
D33D27J1	2N4401	2N4400		SS15
D33D29	MPSA55	MPSA55		SS24
D33D29J1	MPSA55	MPSA55		SS24
D33D30	MPSA55	MPSA55		SS24
D33D30J1	MPSA55	MPSA55		SS24
D40N1	SE7055	SE7055		SS11
D40N2	SE7055	SE7055		SS11
D40N3	SE7056	SE7055		SS11
D40N4	SE7056	SE7055		SS11
D42C1	2N6121	2N6121		PWR5
D42C2	2N6121	2N6121		PWR5
D42C3	2N6121	2N6121		PWR5
D42C4	2N6121	2N6121		PWR5
D42C5	2N6121	2N6121		PWR5
D42C6	2N6121	2N6121		PWR5
D42C7	2N6122	2N6121		PWR5
D42C8	2N6122	2N6121		PWR5
D42C9	2N6122	2N6121		PWR5
D42C10	2N6123	2N6121		PWR5
D42C11	2N6123	2N6121		PWR5
D43C1	2N6124	2N6124		PWR14
D43C2	2N6124	2N6124		PWR14
D43C3	2N6124	2N6124		PWR14
D43C4	2N6124	2N6124		PWR14
D43C5	2N6124	2N6124		PWR14
D43C6	2N6124	2N6124		PWR14
D43C7	2N6125	2N6124		PWR14
D43C8	2N6125	2N6124		PWR14
D43C9	2N6125	2N6124		PWR14
D43C10	2N6126	2N6124		PWR14
D43C11	2N6126	2N6124		PWR14
D44C1	2N6121	2N6121		PWR5
D44C2	2N6121	2N6121		PWR5
D44C3	2N6121	2N6121		PWR5
D44C4	2N6121	2N6121		PWR5
D44C5	2N6121	2N6121		PWR5
D44C6	2N6121	2N6121		PWR5
D44C7	2N6122	2N6121		PWR5
D44C8	2N6122	2N6121		PWR5
D44C9	2N6122	2N6121		PWR5
D44C10	2N6123	2N6121		PWR5
D44C11	2N6123	2N6121		PWR5
D44H1	2N6129	2N6129		PWR10
D44H2	2N6129	2N6129		PWR10
D44H4	2N6129	2N6129		PWR10
D44H5	2N6129	2N6129		PWR10
D44H7	2N6130	2N6129		PWR10
D44H8	2N6130	2N6129		PWR10
D44H10	2N6131	2N6129		PWR10
D45C1	2N6124	2N6124		PWR14
D45C2	2N6124	2N6124		PWR14
D45C3	2N6124	2N6124		PWR14
D45C4	2N6124	2N6124		PWR14
D45C5	2N6124	2N6124		PWR14
D45C6	2N6124	2N6124		PWR14
D45C7	2N6125	2N6124		PWR14
D45C8	2N6125	2N6124		PWR14
D45C9	2N6125	2N6124		PWR14
D45C10	2N6126	2N6124		PWR14
D45C11	2N6126	2N6124		PWR14
D45H1	2N6132	2N6132		PWR17
D45H2	2N6132	2N6132		PWR17
D45H4	2N6132	2N6132		PWR17
D45H5	2N6132	2N6132		PWR17
D45H7	2N6133	2N6132		PWR17
D45H8	2N6133	2N6132		PWR17
D45H10	2N6134	2N6132		PWR17
DA1701	1N4148	1N914		D6
DA1702	1N4148	1N914		D6
DA1703	1N4148	1N914		D6
DA1704	1N4148	1N914		D6
DN918**	DN918		3-36	SS27
DN2222A**	DN2222A		3-36	SS15
DN2369A**	DN2369A		3-36	SS28
DN2484**	DN2484		3-45	SS8
DN2894	DN2894			
DN2907**	DN2907		3-45	SS22
DN3014**	DN3014		3-45	SS5
DN3019**	DN3019		3-45	SS17
DN3250**	DN3250		3-45	
DN3468**	DN3468		3-45	SS7
DN3725**	DN3725		3-45	SS13
DN3742**	DN3742		3-45	
DN3904**	DN3904		3-45	SS14
DN3906**	DN3906		3-45	SS23
DN3923**	DN3923		3-45	SS16
DN3930**	DN3930		3-45	SS25
DN3962**	DN3962		3-45	SS33
DN4033**	DN4033		3-45	SS24
DN4209**	DN4209		3-45	SS31
DN5455**	DN5455		3-45	SS21
DT230A	FDH400	FD400		D4
DT230B	FDH400	FD400		D4
DT230F	FDH400	FD400		D4
DT230G	FDH400	FD400		D4
DT230HI	FDH400	FD400		D4
EN697	EN697		3-23	SS15
EN706	EN706		3-18	SS28
EN708	EN708		3-18	SS28
EN718A	EN718A		3-23	SS15
EN722	EN722		3-27	SS22
EN744	EN744		3-18	SS28
EN870	EN870		3-24	SS17
EN871	EN871		3-24	SS17
EN914	EN914		3-18	SS5

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EN915	EN915		3-24	SS14
EN916	EN916		3-22	SS14
EN918	EN918		3-35	SS27
EN930	EN930		3-30	SS8
EN956	EN956		3-23	SS15
EN1132	EN1132		3-27	SS22
EN1613	EN1613		3-23	SS15
EN1711	EN1711		3-23	SS15
EN2219	EN2219		3-23	SS15
EN2222	EN2222		3-23	SS15
EN2369A	EN2369A		3-18	SS28
EN2484	EN2484		3-30	SS8
EN2894A	EN2894A		3-19	SS32
EN2905	EN2905		3-28	SS22
EN2907	EN2907		3-28	SS22
EN3009	EN3009		3-18	SS5
EN3011	EN3011		3-18	SS28
EN3013	EN3013		3-18	SS5
EN3014	EN3014		3-18	SS5
EN3250	EN3250		3-27	SS23
EN3502	EN3502		3-28	SS22
EN3504	EN3504		3-28	SS22
EN3903	EN3903		3-23	SS14
EN3904	EN3904		3-23	SS14
EN3905	EN3905		3-27	SS23
EN3906	EN3906		3-27	SS23
EN3962	EN3962		3-32	SS33
EN4123	EN4123		3-22	SS14
EN4124	EN4124		3-22	SS14
EN4125	EN4125		3-27	SS23
EN4126	EN4126		3-27	SS23
EN5172	EN5172		3-22	SS8
*FA2310E	FA2310E	FA2310E		D6
*FA2310U	FA2310U	FA2310E		D6
*FA2311E	FA2311E	FA2310E		D6
*FA2311U	FA2311U	FA2310E		D6
*FA2312E	FA2312E	FA2310E		D6
*FA2312U	FA2312U	FA2310E		D6
*FA2313E	FA2313E	FA2310E		D6
*FA2313U	FA2313U	FA2310E		D6
*FA2320E	FA2320E	FA2310E		D4
*FA2320U	FA2320U	FA2310E		D4
*FA2321E	FA2321E	FA2310E		D4
*FA2321U	FA2321U	FA2310E		D4
*FA2322E	FA2322E	FA2310E		D4
*FA2322U	FA2322U	FA2310E		D4
*FA2323E	FA2323E	FA2310E		D4
*FA2323U	FA2323U	FA2310E		D4
*FA2324E	FA2324E	FA2310E		D4
*FA2324U	FA2324U	FA2310E		D4
*FA2325E	FA2325E	FA2310E		D4
*FA2325U	FA2325U	FA2310E		D4
*FA2330E	FA2330E	FA2310E		D5
*FA2330U	FA2330U	FA2310E		D5
*FA2331E	FA2331E	FA2310E		D5
*FA2331U	FA2331U	FA2310E		D5
*FA2332E	FA2332E	FA2310E		D5
*FA2332U	FA2332U	FA2310E		D5
*FA2333E	FA2333E	FA2310E		D5
*FA2333U	FA2333U	FA2310E		D5
*FA2334E	FA2334E	FA2310E		D5
*FA2334U	FA2334U	FA2310E		D5
*FA2335E	FA2335E	FA2310E		D5
*FA2335U	FA2335U	FA2310E		D5
*FA2360E	FA2360E	FA2310E		D6
*FA2360U	FA2360U	FA2310E		D6
*FA2361E	FA2361E	FA2310E		D6
*FA2361U	FA2361U	FA2310E		D6
*FA3310	FA3310	FA2310E		D6
*FA3311	FA3311	FA2310E		D6
*FA3312	FA3312	FA2310E		D6
*FA3313	FA3313	FA2310E		D6
*FA3320	FA3320	FA3210E		D4
*FA3321	FA3321	FA2310E		D4
*FA3322	FA3322	FA2310E		D4
*FA3323	FA3323	FA2310E		D4
*FA3324	FA3324	FA2310E		D4
*FA3325	FA3325	FA2310E		D4
*FA3330	FA3330	FA2310E		D5
*FA3331	FA3331	FA2310E		D5
*FA3332	FA3332	FA2310E		D5
*FA3333	FA3333	FA2310E		D5
*FA3334	FA3334	FA2310E		D5
*FA3335	FA3335	FA2310E		D5
*FA3360	FA3360	FA2310E		D6
*FA3361	FA3361	FA2310E		D6
*FA4310E	FA4310E	FA2310E		D6
*FA4310U	FA4310U	FA2310E		D6
*FA4311E	FA4311E	FA2310E		D6
*FA4311U	FA4311U	FA2310E		D6
*FA4312E	FA4312E	FA2310E		D6
*FA4312U	FA4312U	FA2310E		D6
*FA4313E	FA4313E	FA2310E		D6
*FA4313U	FA4313U	FA2310E		D6
*FA4320E	FA4320E	FA2310E		D4
*FA4320U	FA4320U	FA2310E		D4
*FA4321E	FA4321E	FA2310E		D4
*FA4321U	FA4321U	FA2310E		D4
*FA4322E	FA4322E	FA2310E		D4
*FA4322U	FA4322U	FA2310E		D4
*FA4323E	FA4323E	FA2310E		D4
*FA4323U	FA4323U	FA2310E		D4
*FA4324E	FA4324E	FA2310E		D4
*FA4324U	FA4324U	FA2310E		D4
*FA4325E	FA4325E	FA2310E		D4
*FA4325U	FA4325U	FA2310E		D4

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*FA4330E	FA4330E	FA2310E		D5
*FA4330U	FA4330U	FA2310E		D5
*FA4331E	FA4331E	FA2310E		D5
*FA4331U	FA4331U	FA2310E		D5
*FA4332E	FA4332E	FA2310E		D5
*FA4332U	FA4332U	FA2310E		D5
*FA4333E	FA4333E	FA2310E		D5
*FA4333U	FA4333U	FA2310E		D5
*FA4334E	FA4334E	FA2310E		D5
*FA4334U	FA4334U	FA2310E		D5
*FA4335E	FA4335E	FA2310E		D5
*FA4335U	FA4335U	FA2310E		D5
*FA4360E	FA4360E	FA2310E		D6
*FA4360U	FA4360U	FA2310E		D6
*FA4361E	FA4361E	FA2310E		D6
*FA4361U	FA4361U	FA2310E		D6
*FCT1021	FCT1021	FCT1021	3-12	D3
*FCT1022	FCT1022	FCT1021	3-12	D3
*FCT1025	FCT1025	FCT1021	3-12	
*FCT1121	FCT1121	FCT1021	3-12	D3
*FCT1122	FCT1122	FCT1021	3-12	D3
*FCT1125	FCT1125	FCT1021	3-12	D3
FD100	1N4153	1N4151		D6
*FD300	FD300	FD300	3-8	D5
*FD333	FD333	FD300	3-8	D5
*FD400	FD400	FD400	3-5	D4
*FD444	FD444	FD400	3-5	D4
*FD600	FD600	FD600	3-3	D6
*FD666	FD666	FD600	3-4	D6
*FD700	FD700	FD700	3-3	D7
*FD777	FD777	FD700	3-3	D7
FDC485B**	FDC485B			D5
FDC3070**	FDC3070		3-16	D4
FDC3600**	FDC3600		3-16	D6
FDC4376**	FDC4376		3-16	D7
*FDH300	FDH300	FD300	3-8	D5
*FDH333	FDH333	FD300	3-8	D5
*FDH400	FDH400	FD400	3-5	D4
*FDH444	FDH444	FD400	3-5	D4
*FDH600	FDH600	FD600	3-3	D6
*FDH666	FDH666	FD600	3-4	D6
*FDH900	FDH900	FDH900	3-7	D6
*FDH999	FDH999	FDH900	3-7	D6
FDN400	FDH400	FD400		D4
FDN444	FDH444	FD400		D4
*FDN600	FDN600	FD600	3-3	D6
FDN666	FDN666	FD600	3-4	D6
*FDN700	FDN700	FD700		D7
*FDN777	FDN777	FD700		D7
FDS100	FDS100			SS24
FDS200	FDS200			SS15
FE3819	2N5486	2N5485		
FE4302	2N5486	2N5484		
FE4303	2N5486	2N5484		
FE4304	2N5486	2N5484		
FE5245	2N5485	2N5484		
FE5246	2N5485	2N5484		
FE5247	2N5486	2N5484		
FE5457	2N5457			
FE5458	2N5458			
FE5459	2N5459			
FE5484	2N5484	2N5484		
FE5485	2N5485	2N5484		
FE5486	2N5486	2N5484		
*FH1100	FH1100	FH1100	3-9	D12
*FJT1100	FJT1100	FJT1100	3-8	D2
*FJT1101	FJT1101	FJT1100		D2
*FJT2000	FJT2000	FJT1100	3-8	D2
*FPQ3467	FPQ3467	FPQ3467	3-44	SS7
*FPQ3468	FPQ3468	FPQ3467	3-44	SS7
*FPQ3724	FPQ3724	FPQ3724	3-44	SS13
*FPQ3725	FPQ3725	FPQ3724	3-44	SS13
*FQ3467	FQ3467	FPQ3467	3-44	SS7
*FQ3468	FQ3468	FPQ3467	3-44	SS7
*FQ3724	FQ3724	FPQ3724	3-44	SS13
*FQ3725	FQ3725	FPQ3724	3-44	SS13
FSA1169	FSA2781M	FSA2702M		D11
FSA1171	FSA2782M	FSA2702M		D11
FSA1172	FSA2782M	FSA2702M		D11
FSA1173	FSA2783M	FSA2702M		D11
FSA1174	FSA2784M	FSA2702M		D11
FSA1175	FSA2786M	FSA2702M		D11
FSA1176	FSA1411M	FSA1410M		D11
FSA1177	FSA2775M	FSA2702M		D11
FSA1178	FSA2775M	FSA2702M		D11
FSA1179	FSA2776M	FSA2702M		D11
FSA1181	FSA2776M	FSA2702M		D11
FSA1182	FSA2777M	FSA2702M		D11
FSA1183	FSA2778M	FSA2702M		D11
FSA1184	FSA2787M	FSA2702M		D11
FSA1185	FSA2787M	FSA2702M		D11
FSA1186	FSA2704M	FSA2702M		D11
FSA1187	FSA2705M	FSA2702M		D11
FSA1188	FSA2788M	FSA2702M		D11
FSA1189	FSA2788M	FSA2702M		D11
FSA1191	FSA2702M	FSA2702M		D11
FSA1192	FSA2703M	FSA2702M		D11
FSA1193	FSA2702M	FSA2702M		D11
FSA1194	FSA2703M	FSA2702M		D11
FSA1195	FSA2773M	FSA2702M		D11
FSA1196	FSA2774M	FSA2702M		D11
FSA1197	FSA2704M	FSA2702M		D11
FSA1198	FSA2705M	FSA2702M		D11
FSA1199	FSA2770M	FSA2702M		D11
FSA1201	FSA2770M	FSA2702M		D11
FSA1202	FSA2781M	FSA2702M		D11

**See Dice Information, Section 9.

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
FSA1203	FSA2783M	FSA2702M		D11
FSA1204	FSA2785M	FSA2702M		D11
*FSA1410M	FSA1410M	FSA1410M	3-13	D11
*FSA1411M	FSA1411M	FSA1410M	3-13	D11
FSA1412M	FSA2502M	FSA2500M		D11
FSA1413M	FSA2788M	FSA2502M		D11
*FSA2002M	FSA2002M	FSA1410M	3-13	D11
*FSA2003M	FSA2003M	FSA1410M	3-13	D11
*FSA2500M	FSA2500M	FSA2500M	3-13	D11
*FSA2501M	FSA2501M	FSA2500M	3-13	D11
*FSA2502M	FSA2502M	FSA2500M	3-13	D11
*FSA2503M	FSA2503M	FSA2500M	3-13	D11
*FSA2504M	FSA2504M	FSA2500M	3-13	D11
*FSA2508M	FSA2508M	FSA2500M	3-13	D11
*FSA2509M	FSA2509M	FSA2500M	3-13	D11
*FSA2510M	FSA2510M	FSA2500M	3-13	D11
*FSA2563M	FSA2563M	FSA2563M	3-13	D11
*FSA2564M	FSA2564M	FSA2563M	3-13	D11
*FSA2565M	FSA2565M	FSA2563M	3-13	D11
*FSA2566M	FSA2566M	FSA2563M	3-13	D11
*FSA2619M	FSA2619M	FSA2619M	3-13	D11
*FSA2620M	FSA2620M	FSA2619M	3-13	D11
*FSA2621M	FSA2621M	FSA2619M	3-13	D11
*FSA2702M	FSA2702M	FSA2702M	3-14	D11
*FSA2703M	FSA2703M	FSA2702M	3-14	D11
*FSA2704M	FSA2704M	FSA2702M	3-14	D11
*FSA2705M	FSA2705M	FSA2702M	3-14	D11
*FSA2719M	FSA2719M	FSA2619M	3-13	D11
*FSA2720M	FSA2720M	FSA2619M	3-13	D11
*FSA2721M	FSA2721M	FSA2619M	3-13	D11
*FSA2770M	FSA2770M	FSA2702M	3-14	D11
*FSA2771M	FSA2771M	FSA2702M	3-15	D11
*FSA2772M	FSA2772M	FSA2702M	3-15	D11
*FSA2773M	FSA2773M	FSA2702M	3-15	D11
*FSA2774M	FSA2774M	FSA2702M	3-15	D11
*FSA2775M	FSA2775M	FSA2702M	3-15	D11
*FSA2776M	FSA2776M	FSA2702M	3-15	D11
*FSA2777M	FSA2777M	FSA2702M	3-15	D11
*FSA2778M	FSA2778M	FSA2702M	3-14	D11
*FSA2779M	FSA2779M	FSA2702M	3-14	D11
*FSA2780M	FSA2780M	FSA2702M	3-14	D11
*FSA2781M	FSA2781M	FSA2702M	3-15	D11
*FSA2782M	FSA2782M	FSA2702M	3-15	D11
*FSA2783M	FSA2783M	FSA2702M	3-15	D11
*FSA2784M	FSA2784M	FSA2702M	3-14	D11
*FSA2785M	FSA2785M	FSA2702M	3-14	D11
*FSA2786M	FSA2786M	FSA2702M	3-14	D11
*FSA2787M	FSA2787M	FSA2702M	3-15	D11
*FSA2788M	FSA2788M	FSA2702M	3-13	D11
*FT0601	FT0601	FT0601	3-40	SS26
*FT709	FT709	2N709	3-17	SS29
FT2974	2N2974	2N2915		SS8
FT2975	2N2975	2M2916		SS8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
FT2978	2N2978	2N2915		SS8
FT2979	2N2979	2N2915		SS8
*FT3723	FT3723	2N3722	3-17	SS9
FT3820	2N4360	2N4342		
FT3903	2N3946	2N3946		SS14
FT3904	2N3947	2N3946		SS14
FT3905	2N3250	2N3250		
FT3906	2N3251	2N3250		
FT3909	2N4360	2N4342		
GE-10	MPS2924	MPS2923		SS14
GE-11	2N5770	2N918		SS27
GE-17	MPSA05	MPSA05		SS17
GE-20	2N4400	2N4400		SS15
GE-26	2N6122	2N6121		PWR5
GE-27	SE7056	SE7055		SS11
GE-28	2N6122	2N6121		PWR5
GE-29	2N6125	2N6124		PWR14
GE-504A	1N4004	1N4001		
GEMR-6	2N6121	2N6121		PWR5
GER4001	1N4001	1N4001		D10
GER4002	1N4002	1N4001		D10
GER4003	1N4003	1N4001		D10
GER4004	1N4004	1N4001		D10
GER4005	1N4005	1N4001		D10
GET706	2N5772	2N3646		SS5
GET708	2N5772	2N3646		SS5
GET914	2N5772	2N3646		SS5
GET929	2N5209	2N5209		SS18
GET930	2N5209	2N5209		SS18
GET2221	PN2221	2N2218		SS15
GET2221A	PN2221A	2N2218A		SS15
GET2222	PN2222	2N2218		SS15
GET2222A	PN2222A	2N2218A		SS15
GET2369	2N5769	2N2369		SS28
GET2484	2N5961	2N5961		SS8
GET2904	PN2904	2N2904		SS22
GET2905	PN2905	2N2904		SS22
GET2906	PN2906	2N2904		SS22
GET2907	PN2907	2N2904		SS22
GET3013	2N5772	2N3646		SS5
GET3014	2N5772	2N3646		SS5
GET3563	2N3563	2N918		SS27
GET3638	2N3638	2N3638		SS22
GET3638A	2N3638A	2N3638		SS22
GET3646	2N3646	2N3646		SS5
GET5305	MPSA13	MPSA13		SS20
GET5306	MPSA14	MPSA13		SS20
GET5306A	MPSA14	MPSA13		SS20
GET5307	MPSA13	MPSA13		SS20
GET5308	MPSA14	MPSA13		SS20
GET5308A	MPSA14	MPSA13		SS20
KE4220	2N5486	2N5484		
KE4221	2N5486	2N5484		

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
KE4222	2N5486	2N5484		
KE4416	2N5486	2N5484		
MD708	2N3425			SS5
MD708A	2N3425			SS5
MD708B	2N3425			SS5
*MD918	MD918	MD918	3-43	SS27
*MD918A	MD918A	MD918	3-41	SS27
*MD918B	MD918B	MD918	3-41	SS27
MD984	MD3250	MD3250		SS23
MD1120	2N3410	2N3409		SS15
MD1121	2N3410	2N3409		SS15
MD1122	2N3411	2N3409		SS15
MD1129	2N2642	2N2639		SS8
MD1130	MD3251A	MD3250		SS23
MD1132	MD918A	MD918		SS27
*MD2218	MD2218	MD2218	3-43	SS15
*MD2218A	MD2218A	MD2218	3-43	SS15
*MD2219	MD2219	MD2218	3-43	SS15
*MD2219A	MD2219A	MD2218	3-43	SS15
*MD2369	MD2369	MD2369	3-43	SS28
*MD2369A	MD2369A	MD2369	3-41	SS28
*MD2369B	MD2369	MD2369	3-41	SS28
*MD2904	MD2904	MD2904	3-43	SS22
*MD2904A	MD2904A	MD2904	3-43	SS22
*MD2905	MD2905	MD2904	3-43	SS22
*MD2905A	MD2905A	MD2904	3-43	SS22
*MD3250	MD3250	MD3250	3-43	SS23
*MD3250A	MS3250	MD3250	3-42	SS23
*MD3251	MD3251	MD3250	3-43	SS23
*MD3251A	MD3251A	MD3250	3-42	SS23
MD8001	2N2916A	2N2916		SS8
MD8002	2N2920	2N2920		SS8
MD8003	2N2920	2N2920		SS8
MF3304	2N3304			SS31
MFE120	FT0601	FT0601		SS26
MFE121	FT0601	FT0601		SS26
MFE122	FT0601	FT0601		SS26
MFE2000	2N5485	2N5484		
MFE2001	2N5486	2N5484		
MFE3001	2N5486	2N5484		
MFE3004	FT0601	FT0601		SS26
MFE3005	FT0601	FT0601		SS26
MFE3006	FT0601	FT0601		SS26
MFE3007	FT0601	FT0601		SS26
MFE3008	FT0601	FT0601		SS26
MFE4011	2N4342	2N4342		SS34
MFE4012	2N4342	2N4342		SS34
MHQ3467	FPQ3467	FPQ3467		SS7
MJ400	CF			
MJ410	CF			
MJ411	CF			
MJ413	CF			
MJ420	2N3440	2N3439		PWR8
MF421	2N3439	2N3439		PWR8
MJ423	CF			
MJ424	CF			
MJ425	CF			
MJ431	CF			
MJ450	2N4398	2N4398		PWR16
MJ480	2N5067	2N5067		PWR6
MJ481	2N5068	2N5067		PWR6
MJ490	2N4901	2N4901		PWR15
MJ491	2N4902	2N4901		PWR15
MJ500	2N5003	2N5002		PWR11
MJ501	2N5003	2N5002		PWR11
MJ802	CF			
MJ900	CF			
MJ901	CF			
MJ1000	CF			
MJ1001	CF			
MJ1800	CF			
MJ2249	2N3766	2N3766		PWR18
MJ2250	2N3767	2N3766		PWR18
MJ2251	CF			
MJ2252	CF			
MJ2253	2N4899	2N3740		PWR14
MJ2254	2N4900	2N3740		PWR14
MJ2267	2N3791	2N3789		PWR15
MJ2268	2N3791	2N3789		PWR15
MJ2500	CF			
MJ2501	CF			
MJ2801	CF			
MJ2840	2N3715	2N3713		PWR6
MJ2841	2N3716	2N3713		PWR6
MJ2901	CF			
MJ2940	2N3791	2N3789		PWR15
MJ2941	2N3792	2N3789		PWR15
MJ2955	2N3791	2N3789		PWR15
MJ3000	CF			
MJ3001	CF			
MJ3040	CF			
MJ3041	CF			
MJ3042	CF			
MJ3101	CF			
MJ3201	CF			
MJ3202	CF			
MJ3430	CF			
MJ3701	2N4898	2N3740		PWR14
MJ3771	CF			
MJ3772	CF			
MJ4000	CF			
MJ4001	CF			
MJ4010	CF			
MJ4011	CF			
MJ4030	CF			
MJ4031	CF			

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
MJ4032	CF			
MJ4033	CF			
MJ4034	CF			
MJ4035	CF			
MJ4502	CF			
MJ6257	CF			
MJ6302	CF			
MJ6700	2N5002	2N5002		PWR19
MJ6701	2N5002	2N5002		PWR19
MJE105	2N6133	2N6132		PWR17
MJE105K	2N6133	2N6132		PWR17
MJE170	2N5323	2N5320		PWR12
MJE171	2N5323	2N5320		PWR12
MJE172	2N5322	2N5320		PWR12
MJE180	2N5321	2N5320		PWR2
MJE181	2N5321	2N5320		PWR2
MJE182	2N5320	2N5320		PWR2
MJE200	2N4895	2N4895		PWR1
MJE205	2N6130	2N6129		PWR10
MJE205K	2N6130	2N6129		PWR10
MJE220	2N5321	2N5320		PWR2
MJE221	2N5320	2N5320		PWR2
MJE222	2N5321	2N5320		PWR2
MJE223	2N5321	2N5320		PWR2
MJE224	2N5320	2N5320		PWR2
MJE225	2N5321	2N5320		PWR2
MJE230	2N5323	2N5320		PWR12
MJE231	2N5322	2N5320		PWR12
MJE232	2N5323	2N5320		PWR12
MJE233	2N5323	2N5320		PWR12
MJE234	2N5322	2N5320		PWR12
MJE235	2N5323	2N5320		PWR12
MJE240	2N5320	2N5320		PWR2
MJE242	2N5320	2N5320		PWR2
MJE243	2N5681	2N5679		PWR3
MJE244	2N5682	2N5679		PWR3
MJE250	2N5322	2N5320		PWR12
MJE251	2N5322	2N5320		PWR12
MJE252	2N5322	2N5320		PWR12
MJE253	2N5679	2N5679		PWR13
MJE254	2N5679	2N5679		PWR13
MJE340	CF			
MJE340K	CF			
MJE341	CF			
MJE341K	CF			
MJE344	CF			
MJE344K	CF			
MJE370	2N6124	2N6124		PWR14
MJE370K	2N6124	2N6124		PWR14
MJE371	2N6124	2N6124		PWR14
MJE371K	2N6124	2N6124		PWR14
MJE520	2N6121	2N6121		PWR5
MJE520K	2N6121	2N6121		PWR5
MJE521	2N6121	2N6121		PWR5
MJE521K	2N6121	2N6121		PWR5
MJE700	CF			
MJE701	CF			
MJE702	CF			
MJE703	CF			
MJE710	2N5323	2N5320		PWR12
MJE711	2N5323	2N5320		PWR12
MJE712	2N5322	2N5320		PWR12
MJE720	2N5321	2N5320		PWR2
MJE721	2N5321	2N5320		PWR2
MJE722	2N5320	2N5320		PWR2
MJE800	CF			
MJE801	CF			
MJE802	CF			
MJE803	CF			
MJE1090	CF			
MJE1091	CF			
MJE1092	CF			
MJE1093	CF			
MJE1100	CF			
MJE1101	CF			
MJE1102	CF			
MJE1103	CF			
MJE2010	2N6124	2N6124		PWR14
MJE2011	2N6125	2N6124		PWR14
MJE2020	2N6121	2N6121		PWR5
MJE2021	2N6122	2N6121		PWR5
MJE2360	CF			
MJE2361	CF			
MJE2370	2N5323	2N5320		PWR12
MJE2371	2N5323	2N5320		PWR12
MJE2480	2N6121	2N6121		PWR5
MJE2481	2N6121	2N6121		PWR5
MJE2482	2N6129	2N6129		PWR10
MJE2483	2N6130	2N6129		PWR10
MJE2490	2N6124	2N6124		PWR14
MJE2491	2N6125	2N6124		PWR14
MJE2520	2N5321	2N5320		PWR2
MJE2521	2N5321	2N5320		PWR2
MJE2522	2N6121	2N6121		PWR5
MJE2523	2N6122	2N6121		PWR5
MJE2801	CF			
MJE2801K	CF			
MJE2901	2N3789	2N3789		PWR15
MJE2901K	2N3789	2N3789		PWR15
MJE2955	2N3791	2N3789		PWR15
MJE2955K	2N3791	2N3789		PWR15
MJE3054	2N6122	2N6121		PWR5
MJE3055	CF			
MJE3055K	CF			
MJE3370	2N6124	2N6124		PWR14
MJE3371	2N6124	2N6124		PWR14

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
MJE3439	2N3439	2N3439		PWR8
MJE3440	2N3440	2N3439		PWR8
MJE3520	2N6121	2N6121		PWR5
MJE3521	2N6121	2N6121		PWR5
MJE3738	CF			
MJE3739	CF			
MJE3740	2N6125	2N6124		PWR14
MJE3741	2N6126	2N6124		PWR14
MJE4918	2N6124	2N6124		PWR14
MJE4919	2N6125	2N6124		PWR14
MJE4920	2N6126	2N6124		PWR14
MJE4921	2N6121	2N6121		PWR5
MJE4922	2N6122	2N6121		PWR5
MJE4923	2N6123	2N6121		PWR5
MJE5190	2N6121	2N6121		PWR5
MJE5191	2N6122	2N6121		PWR5
MJE5192	2N6123	2N6121		PWR5
MJE5193	2N6124	2N6124		PWR14
MJE5194	2N6125	2N6124		PWR14
MJE5195	2N6126	2N6124		PWR14
MJE5655	CF			
MJE5656	CF			
MJE5657	CF			
MJE5974	2N6132	2N6132		PWR17
MJE5975	2N6133	2N6132		PWR17
MJE5976	2N6134	2N6132		PWR17
MJE5977	2N6129	2N6129		PWR10
MJE5978	2N6130	2N6129		PWR10
MJE5980	2N6131	2N6129		PWR10
MJE5980	CF			
MJE5981	CF			
MJE5982	CF			
MJE5983	CF			
MJE5984	CF			
MJE5985	CF			
MJE6040	CF			
MJE6041	CF			
MJE6042	CF			
MJE6043	CF			
MJE6044	CF			
MJE6045	CF			
MM1748	2N2894A	2N2894		SS32
MM1803	2N3137	2N3137		SS2
MM1812	2N3440	2N3439		PWR8
MM1941	2N918	2N918		SS27
MM2193A	2N2218A	2N2218A		SS15
MM2258	SE7055	SE7055		SS11
MM2259	SE7055	SE7055		SS11
MM2260	SE7055	SE7055		SS11
MM2270	2N2270			SS15
MM2483	2N2483	2N2483		SS8
MM2894A	2N2894A	2N2894		SS32
MM3000	SE7002			SS16
MM3001	SE7001			SS16
MM3003	SE7055	SE7055		SS11
MM3005	2N5681	2N5679		PWR3
MM3306	2N5681	2N5679		PWR3
MM3007	2N5681	2N5679		PWR3
MM3008	SE7055	SE7055		SS11
MM3009	SE7055	SE7055		SS11
MM3019	2N3019	2N3019		SS17
MM3020	2N3020	2N3019		SS17
MM3053	2N3053	2N3053		SS17
MM3726	2N3468	2N3467		SS7
MM3903	2N3946	2N3946		SS14
MM3904	2N3947	2N3946		SS14
MM3905	2N3250	2N3250		
MM3906	2N3251	2N3250		
MM4208	2N4208	2N4208		SS31
MM4208A	2N4208	2N4208		SS31
MM4209	2N4209	2N4208		SS31
MM4209A	2N4209	2N4208		SS31
MM5005	2N5679	2N5679		PWR13
MM5006	2N5679	2N5679		PWR13
MM5007	2N5679	2N5679		PWR13
MM8006	2N918	2N918		SS27
MM8007	2N918	2N918		SS27
*MPF102	MPF102	MPF102	3-40	SS34
*MPF108	MPF108	MPF102	3-40	SS34
*MPF109	MPF109	MPF102	3-40	SS34
*MPF111	MPF111	MPF111	3-40	
*MPF112	MPF112	MPF111	3-40	
MPF120	FT0601	FT0601		SS26
MPF121	FT0601	FT0601		SS26
MPF122	FT0601	FT0601		SS26
MPF161	2N4360	2N4342		SS34
MPF256	2N5486	2N5484		
MPF820	2N5486	2N5484		
MPQ3725	FPQ3725	FPQ3724		SS13
*MPS706	MPS706	2N706	3-18	SS5
*MPS706A	MPS706A	2N706	3-18	SS5
*MPS834	MPS834	2N834	3-18	SS28
*MPS918	MPS918	2N918	3-35	SS27
*MPS2369	MPS2369	2N2369	3-18	SS28
*MPS2711	MPS2711	MPS2711	3-22	SS14
*MPS2712	MPS2712	MPS2711	3-22	SS14
MPS2713	MPS2713		3-18	SS15
MPS2714	MPS2714		3-18	SS15
*MPS2923	2N2923	MPS2923	3-22	
*MPS2924	MPS2924	MPS2923	3-22	
*MPS2925	MPS2925	MPS2923	3-22	
*MPS2926	MPS2926	MPS2926	3-22	
*MPS3392	MPS3392	MPS3392	3-22	
*MPS3393	MPS3393	MPS3392	3-22	
*MPS3394	MPS3394	MPS3392	3-22	
*MPS3395	MPS3395	MPS3392	3-22	

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
*MPS3563	MPS3563	2N918	3-35	
*MPS3638	MPS3638	2N3638	3-27	
*MPS3638A	MPS3638A	2N3638	3-27	
*MPS3639	MPS3639	2N3639	3-19	
*MPS3640	MPS3640	2N3639	3-19	
*MPS3646	MPS3646	2N3646	3-10	
*MPS3693	MPS3693	2N3693	3-24	
*MPS3694	MPS3694	2N3693	3-23	
*MPS3702	MPS3702	MPS3702	3-27	
*MPS3703	MPS3703	MPS3702	3-27	
*MPS3704	MPS3704	MPS3704	3-23	
*MPS3705	MPS3705	MPS3704	3-23	
*MPS3706	MPS3706	MPS3704	3-22	
*MPS3707	MPS3707	MPS3707	3-29	
*MPS3708	MPS3708	MPS3707	3-30	
*MPS3709	MPS3709	MPS3707	3-30	
*MPS3710	MPS3710	MPS3707	3-30	
*MPS3711	MPS3711	MPS3707	3-29	
*MPS3721	MPS3721	MPS2926	3-22	
MPS3725	2N5845	2N5845		SS13
*MPS4354	MPS4354	2N4354	3-28	
*MPS4355	MPS4355	2N4354	3-28	
*MPS4356	MPS4356	2N4354	3-28	
*MPS5172	MPS5172	MPS5172	3-22	
*MPS5551M	MPS5551M	2N5550	3-33	
MPS6507	PE5031	PE5029		SS12
MPS6511	PE5025	PE5025		SS6
*MPS6512	MPS6512	MPS6512	3-22	SS14
*MPS6513	MPS6513	MPS6512	3-22	SS14
*MPS6514	MPS6514	MPS6512	3-22	SS14
*MPS6515	MPS6515	MPS6512	3-22	SS14
*MPS6516	MPS6516	MPS6516	3-27	SS23
*MPS6517	MPS6517	MPS6516	3-27	SS23
*MPS6518	MPS6518	MPS6516	3-27	SS23
*MPS6519	MPS6519	MPS6516	3-27	SS23
*MPS6520	MPS6520	MPS6520	3-29	SS14
*MPS6521	MPS6521	MPS6520	3-29	SS14
*MPS6522	MPS6522	MPS6522	3-32	SS23
*MPS6523	MPS6523	MPS6522	3-32	SS23
*MPS6530	MPS6530	MPS6530	3-23	SS15
*MPS6531	MPS6531	MPS6530	3-23	SS15
*MPS6532	MPS6532	MPS6530	3-23	SS15
MPS6533	MPS6533M	MPS6533M		SS22
*MPS6533M	MPS6533M	MPS6533M	3-27	SS22
MPS6534	MPS6534M	MPS6533M		SS22
*MPS6534M	MPS6534M	MPS6533M	3-27	SS22
MPS6535	MPS6535M	MPS6533M		SS22
*MPS6535M	MPS6535M	MPS6533M	3-27	SS22
MPS6539	PE5031	PE5029		SS12
MPS6540	PE5031	PE5029		SS12
MPS6542	PE5029	PE5029		SS12
MPS6543	2N5770	2N918		SS27
MPS6544	PE5030B	PE5029		SS12
MPS6545	PE5030B	PE5029		SS12
MPS6546	PE5031	PE5029		SS12
MPS6547	PE5031	PE5029		SS12
MPS6548	2N5770	2N918		SS27
*MPS6560	MPS6560	MPS6560	3-22	SS15
*MPS6561	MPS6561	MPS6560	3-22	SS15
*MPS6562	MPS6562	MPS6560	3-27	SS24
*MPS6563	MPS6563	MPS6560	3-27	SS22
*MPS6565	MPS6565	MPS6565	3-23	
*MPS6566	MPS6566	MPS6566	3-23	
MPS6567	PE5029	PE5029		SS12
MPS6568	PE5010	PE5010		SS19
MPS6568A	PE5010	PE5010		SS19
MPS6569	PE5010	PE5010		SS19
MPS6570	PE5010	PE5010		SS19
*MPS6571	MPS6571	MPS6571	3-29	
*MPSA05	MPSA05	MPSA05	3-24	SS17
*MPSA06	MPSA06	MPSA05	3-24	SS17
*MPSA09	MPSA09	MPSA09	3-30	
*MPSA10	MPSA10	MPSA10	3-23	
*MPSA12	MPSA12	MPSA12	3-43	SS20
*MPSA13	MPSA13	MPSA13	3-43	SS20
*MPSA14	MPSA14	MPSA13	3-43	SS20
MPSA18	2N5962	2N5961		SS8
*MPSA20	MPSA20	MPSA20	3-23	
*MPSA42	MPSA42	MPSA42	3-33	
*MPSA43	MPSA43	MPSA42	3-33	
*MPSA55	MPSA55	MPSA55	3-28	SS24
*MPSA56	MPSA56	MPSA55	3-28	SS24
*MPSA70	MPSA70	MPSA20		
*MPSA92	MPSA92	MPSA92	3-34	SS4
*MPSA93	MPSA93	MPSA92	3-34	SS4
MPSH02	PE5010	PE5010		SS19
MPSH07	PE5010	PE5010		SS19
MPSH08	PE5010	PE5010		SS19
MPSH10	PE3100	PE3100		SS12
MPSH11	PE3100	PE3100		SS12
MPSH19	PE5031	PE5029		SS12
MPSH20	PE5031	PE5029		SS12
MPSH24	PE5031	PE5029		SS12
MPSH30	PE5010	PE5010		SS19
MPSH31	PE5010	PE5010		SS19
MPSH32	PE5010	PE5010		SS19
MPSH34	PE5030B	PE5029		SS12
MPSH37	PE5029	PE5029		SS12
*MPSL01	MPSL01	MPSL01	3-33	SS16
*MPSL07	MPSL07	MPSL07	3-19	SS31
*MPSL08	MPSL08	MPSL07	3-19	SS31
*MPSL51	MPSL51	MPSL01	3-34	SS25
MPSU03	SE7055	SE7055		SS11
MPSU04	SE7055	SE7055		SS11
MPSU10	SE7056	SE7055		SS11
MPSU55	2N6125	2N6124		PWR14

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MPSU56	2N6126	2N6124		PWR14
MPSU57	2N6126	2N6124		PWR14
MZ70-3.3	1N746	1N746		D8
MZ70-3.3A	1N746	1N746		D8
MZ70-3.3B	1N746B	1N746		D8
MZ70-3.6	1N747	1N746		D8
MZ70-3.6A	1N747	1N746		D8
MZ70-3.6B	1N747B	1N746		D8
MZ70-3.9	1N748	1N746		D8
MZ70-3.9A	1N748	1N746		D8
MZ70-3.9B	1N748B	1N746		D8
MZ70-4.3	1N749	1N746		D8
MZ70-4.3A	1N749	1N746		D8
MZ70-4.3B	1N749B	1N746		D8
MZ70-4.7	1N750	1N746		D8
MZ70-4.7A	1N750	1N746		D8
MZ70-4.7B	1N750B	1N746		D8
MZ70-5.1	1N751	1N746		D8
MZ70-5.1A	1N751	1N746		D8
MZ70-5.1B	1N751B	1N746		D8
MZ70-5.6	1N752	1N746		D8
MZ70-5.6A	1N752	1N746		D8
MZ70-5.6B	1N752B	1N746		D8
MZ70-6.2	1N753	1N746		D8
MZ70-6.2A	1N753	1N746		D8
MZ70-6.2B	1N753B	1N746		D8
MZ70-6.8	1N754	1N746		D8
MZ70-6.8A	1N754	1N746		D8
MZ70-6.8B	1N754B	1N746		D8
MZ70-7.5	1N755	1N746		D8
MZ70-7.5A	1N755	1N746		D8
MZ70-7.5B	1N755B	1N746		D8
MZ70-8.2	1N756	1N746		D8
MZ70-8.2A	1N756	1N746		D8
MZ70-8.2B	1N756B	1N746		D8
MZ70-9.1	1N757	1N746		D8
MZ70-9.1A	1N757	1N746		D8
MZ70-9.1B	1N757B	1N746		D8
MZ70-10	1N758	1N746		D8
MZ70-10A	1N758	1N746		D8
MZ70-10B	1N758B	1N746		D8
MZ70-11	1N962A	1N957		D8
MZ70-11A	1N962A	1N957		D8
MZ70-11B	1N962B	1N957		D8
MZ70-12	1N759	1N957		D8
MZ70-12A	1N759	1N957		D8
MZ70-12B	1N759B	1N957		D8
MZ70-13	1N964A	1N957		D8
MZ70-13A	1N964A	1N957		D8
MZ70-13B	1N964B	1N957		D8
MZ70-15	1N965A	1N957		D8
MZ70-15A	1N965A	1N957		D8
MZ70-15B	1N965B	1N957		D8
MZ70-16	1N966A	1N957		D8
MZ70-16A	1N966A	1N957		D8
MZ70-16B	1N966B	1N957		D8
MZ70-18	1N967A	1N957		D8
MZ70-18A	1N967A	1N957		D8
MZ70-18B	1N967B	1N957		D8
MZ70-20	1N968A	1N957		D8
MZ70-20A	1N968A	1N957		D8
MZ70-20B	1N968B	1N957		D8
MZ70-22	1N969A	1N957		D8
MZ70-22A	1N969A	1N957		D8
MZ70-22B	1N969B	1N957		D8
MZ70-24	1N970A	1N957		D8
MZ70-24A	1N970A	1N957		D8
MZ70-24B	1N970B	1N957		D8
MZ70-27	1N971A	1N957		D8
MZ70-27A	1N971A	1N957		D8
MZ70-27B	1N971B	1N957		D8
MZ70-30	1N972A	1N957		D8
MZ70-30A	1N972A	1N957		D8
MZ70-30B	1N972B	1N957		D8
MZ70-33	1N973A	1N957		D8
MZ70-33A	1N973A	1N957		D8
MZ70-33B	1N973B	1N957		D8
MZ92-3.3	1N746	1N746		D8
MZ92-3.6	1N747	1N746		D8
MZ92-3.9	1N748	1N746		D8
MZ92-4.3	1N749	1N746		D8
MZ92-4.7	1N750	1N746		D8
MZ92-5.1	1N751	1N746		D8
MZ92-5.6	1N752	1N746		D8
MZ92-6.2	1N753	1N746		D8
MZ92-6.8	1N957	1N957		D8
MZ92-7.5	1N958	1N957		D8
MZ92-8.2	1N959	1N957		D8
MZ92-9.1	1N960	1N957		D8
MZ92-10	1N961	1N957		D8
MZ92-11	1N962	1N957		D8
MZ92-12	1N963	1N957		D8
MZ92-13	1N964	1N957		D8
MZ92-15	1N965	1N957		D8
MZ92-16	1N966	1N957		D8
MZ92-18	1N967	1N957		D8
MZ92-20	1N968	1N957		D8
MZ92-22	1N969	1N957		D8
MZ92-24	1N970	1N957		D8
MZ92-27	1N971	1N957		D8
MZ92-30	1N972	1N957		D8
MZ92-33	1N973	1N957		D8
MZ500-4	1N746	1N746		D8
MZ500-5	1N747	1N746		D8
MZ500-6	1N748	1N746		D8
MZ500-7	1N749	1N746		D8

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MZ500-8	1N750	1N746		D8
MZ500-9	1N751	1N746		D8
MZ500-10	1N752	1N746		D8
MZ500-11	1N753	1N746		D8
MZ500-12	1N957A	1N957		D8
MZ500-13	1N958A	1N957		D8
MZ500-14	1N959A	1N957		D8
MZ500-15	1N960A	1N957		D8
MZ500-16	1N961A	1N957		D8
MZ500-17	1N962A	1N957		D8
MZ500-18	1N963A	1N957		D8
MZ500-19	1N964A	1N957		D8
MZ500-20	1N965A	1N957		D8
MZ500-21	1N966A	1N957		D8
MZ500-22	1N967A	1N957		D8
MZ500-23	1N968A	1N957		D8
MZ500-24	1N969A	1N957		D8
MZ500-25	1N970A	1N957		D8
MZ500-26	1N971A	1N957		D8
MZ500-27	1N972A	1N957		D8
MZ500-28	1N973A	1N957		D8
NF500	2N5486	2N5484		
NF501	2N5486	2N5484		
NF506	2N5486	2N5484		
NF520	2N5486	2N5484		
NF521	2N5485	2N5484		
NF522	2N5485	2N5484		
NF523	2N5485	1N5484		
NF530	2N5485	2N5484		
NF531	2N5485	2N5484		
NF532	2N5485	2N5484		
NF533	2N5485	2N5484		
NF5457	2N5485	2N5484		
NF5458	2N5485	2N5484		
NF5459	2N5486	2N5484		
NF5485	2N5485	2N5484		
NF5486	2N5486	2N5484		
P1086E	2N4360	2N4342		SS34
P1087E	2N4360	2N4342		SS34
*PE3100	PE3100	PE3100	3-35	SS12
*PE5010	PE5010	PE5010	3-35	SS19
*PE5013	PE5013	PE5010	3-35	SS19
*PE5015	PE5015	PE5010	3-35	SS19
*PE5025	PE5025	PE5025	3-35	SS6
*PE5029	PE5029	PE5029	3-35	SS12
*PE5030B	PE5030B	PE5029	3-35	SS12
*PE5031	PE5031	PE5029	3-35	SS12
*PE6020	PE6020	PE6020	3-22	SS17
*PE6021	PE6021	PE6020	3-22	SS17
PF510	2N4360	2N4342		SS34
PF511	2N4360	2N4342		SS34
*PN1613	PN1613	2N718A	3-23	
*PN1711	PN1711	2N718A	3-23	
*PN1893	PN1893	2N1893	3-24	SS17
*PN2218	PN2218	2N2218	3-23	SS15
*PN2218A	PN2218A	2N2218A	3-23	SS15
*PN2219	PN2219	2N2218	3-23	SS15
*PN2219A	PN2219A	2N2218A	3-23	SS15
*PN2221	PN2221	2N2218		SS15
*PN2221A	PN2221A	2N2218A	3-23	SS15
*PN2222	PN2222	2N2218	3-23	SS15
*PN2222A	PN2222A	2N2218A	3-23	SS15
*PN2484	PN2484	2N2484	3-30	SS8
*PN2904	PN2904	2N2904	3-28	SS22
*PN2904A	PN2904A	2N2904	3-28	SS12
*PN2905	PN2905	2N2904	3-28	SS12
*PN2905A	PN2905A	2N2904	3-28	SS12
*PN2906	PN2906	2N2904	3-28	SS12
*PN2906A	PN2906A	2N2904	3-28	SS12
*PN2907	PN2907	2N2904	3-28	SS12
*PN2907A	PN2907A	2N2904	3-28	SS12
*PN3250	PN3250	2N3250	3-28	
*PN3250A	PN3250A	2N3250	3-28	
*PN3251	PN3251	2N3250	3-27	
*PN3251A	PN3251A	2N3250	3-28	
*PN3565	PN3565	2N3565	3-29	SS8
*PN3566	PN3566	2N3565	3-23	SS15
*PN3567	PN3567	2N3567	3-23	
*PN3568	PN3568	2N3567	3-24	
*PN3569	PN3569	2N3567	3-23	
*PN3641	PN3641	2N3641	3-23	SS15
*PN3642	PN3642	2N3641	3-24	SS15
*PN3643	PN3643	2N3641	3-23	SS15
*PN3644	PN3644	2N3644	3-28	SS22
*PN3645	PN3645	2N3644	3-28	SS22
*PN3688	PN3688	2N3688	3-35	SS1
*PN3689	PN3689	2N3688	3-35	SS1
*PN3690	PN3690	2N3688	3-35	SS1
*PN3691	PN3691	2N3691		
*PN3692	PN3692	2N3691		
*PN4248	PN4248	2N4248	3-32	SS33
*PN4249	PN4249	2N4248	3-32	SS33
*PN4250	PN4250	2N4248	3-32	SS33
*PN4250A	PN4250A	2N4248	3-32	SS33
PN4257	PN4258	2N4258		SS31
PN4257A	PN4258A	2N4258		SS31
*PN4258	PN4258	2N4258	3-19	SS31
*PN4258A	PN4258A	2N4258	3-19	SS31
*PN4357	PN4357	PN4357	3-34	SS4
*PN4888	PN4888	2N4888	3-34	
*PN4889	PN4889	2N4888	3-34	
*PN4916	PN4916	2N4916	3-27	SS23
*PN4917	PN4917	2N4916	3-27	SS23
*PN5126	PN5126	2N5126	3-35	SS1
*PN5128	PN5128	2N5128	3-22	SS15
*PN5129	PN5128	2N5128	3-22	SS15

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*PN5130	PN5130	2N5130	3-35	SS27
*PN5131	PN5131	2N5131	3-22	
*PN5132	PN5132	2N5131	3-22	
*PN5133	PN5133	2N5133	3-29	SS8
*PN5134	PN5134	2N5134	3-18	SS28
*PN5135	PN5135	2N5135	3-22	SS15
*PN5136	PN5136	2N5135	3-22	SS15
*PN5137	PN5137	2N5135	3-22	SS15
*PN5138	PN5138	2N5138	3-22	SS33
*PN5139	PN5139	2N5139	3-27	
*PN5142	PN5142	2N5142	3-27	SS22
*PN5143	PN5143	2N5142	3-27	SS22
*PN5855	PN5855	2N5855		SS24
*PN5856	PN5856	2N5855		SS17
*PN5857	PN5857	2N5855		SS24
*PN5858	PN5858	2N5855		SS17
*PN5910	PN5910	2N5771	3-19	SS31
*PN5964	PN5964	PN5964	3-33	SS16
*PN5965	PN5965	PN5964	3-33	SS16
*RF400	RF400	RF400	3-9	D1
*RF401	RF401	RF400	3-9	D1
SD345	2N6123	2N6121		PWR5
SD445	2N6126	2N6124		PWR14
SDA345	2N6122	2N6121		PWR5
SDA445	2N6125	2N6124		PWR14
SDB345	2N6123	2N6121		PWR5
SDB445	2N6126	2N6124		PWR14
SE1001	SE1001		3-24	SS14
SE1002	SE1002			SS14
SE1010	SE1010		3-35	SS2
SE2001	SE2001		3-22	SS14
SE2002	SE2002		3-22	SS14
SE3001	SE3001		3-35	SS27
SE3002	SE3002		3-35	SS27
SE3646	2N3646	2N3646		SS22
SE4001	SE4001		3-29	SS8
SE4002	SE4002		3-29	SS8
SE4010	SE4010		3-29	SS8
SE4020	SE4020		3-30	SS8
SE4021	SE4021		3-30	SS8
SE4022	SE4022			SS8
SE5001	2N3688	2N3688		SS1
SE5002	2N3689	2N3688		SS1
SE5003	2N3690	2N3688		SS1
SE5006	SE5006	2N3688	3-35	SS1
*SE5020	SE5020	SE5020	3-34	SS3
*SE5021	SE5021	SE5020	3-34	SS3
*SE5022	SE5022	SE5020	3-34	SS3
*SE5023	SE5023	SE5020	3-34	SS3
*SE5024	SE5024	SE5020	3-34	SS3
SE5025	PE5025	PE5025		SS6
SE5030B	PE5030B	PE5029		SS12
*SE5035	SE5035	SE5035	3-34	SS12
*SE5036	SE5036	SE5035	3-34	SS12
SE5040	SE5040	BF167	3-34	
*SE5050	SE5050	SE5050	3-34	SS3
*SE5051	SE5051	SE5050	3-34	SS3
SE5052	SE5052		3-34	SS3
*SE5055	SE5055	SE5055	3-34	SS10
*SE5315	SE5315	FT0601		SS26
SE6001	2N3567	2N3567		SS15
SE6002	2N3566	2N3566		SS15
*SE6020	SE6020	PE6020	3-24	SS17
*SE6021	SE6021	PE6020	3-24	SS17
SE6022	PE6020	PE6020		SS17
SE6023	PE6021	PE6020		SS17
SE7001	SE7001		3-33	SS16
SE7002	SE7002		3-33	SS16
SE7010	SE7010		3-33	SS16
*SE7055	SE7055	SE7055	3-33	SS11
*SE7056	SE7056	SE7055	3-33	SS11
*SE7057	SE7057	SE7055	3-33	SS11
SE7066	CF			
SE8010	2N3722	2N3722		SS9
*SE9051	SE9051	2N6233	3-36	PWR9
*SE9052	SE9052	2N6233	3-36	PWR9
*SE9331	SE9331	SE9331	3-36	PWR8
TIP29	2N6121	2N6121		PWR5
TIP29A	2N6122	2N6121		PWR5
TIP29B	2N6123	2N6121		PWR5
TIP29C	2N6123	2N6121		PWR5
TIP30	2N6124	2N6124		PWR14
TIP30A	2N6125	2N6124		PWR14
TIP30B	2N6126	2N6124		PWR14
TIP30C	2N6126	2N6124		PWR14
TIP31	2N6121	2N6121		PWR5
TIP31A	2N6122	2N6121		PWR5
TIP31B	2N6123	2N6121		PWR5
TIP31C	2N6123	2N6121		PWR5
TIP32	2N6124	2N6124		PWR14
TIP32A	2N6125	2N6124		PWR14
TIP32B	2N6126	2N6124		PWR14
TIP32C	2N6126	2N6124		PWR14
TIP33	2N6129	2N6129		PWR10
TIP33A	2N6130	2N6129		PWR10
TIP33B	2N6131	2N6129		PWR10
TIP33C	2N6131	2N6129		PWR10
TIP34	2N6132	2N6132		PWR17
TIP34A	2N6133	2N6132		PWR17
TIP34B	2N6134	2N6132		PWR17
TIP34C	2N6134	2N6132		PWR17
TIP41	2N6129	2N6129		PWR10
TIP41A	2N6130	2N6129		PWR10
TIP41B	2N6131	2N6129		PWR10
TIP41C	2N6131	2N6129		PWR10
TIP42	2N6132	2N6132		PWR17

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TIP42A	2N6133	2N6132		PWR17
TIP42B	2N6134	2N6132		PWR17
TIP42C	2N6134	2N6132		PWR17
TIP501	2N5321	2N5320		PWR2
TIP502	2N5320	2N5320		PWR2
TIP530	SE9052	2N6233		PWR9
TIP3055	2N6131	2N6129		PWR10
TIS37	2N3905	2N3905		SS23
TIS38	2N3905	2N3905		SS23
TIS44	2N5772	2N3646		SS5
TIS45	2N5772	2N3646		SS5
TIS46	2N5772	2N3646		SS5
TIS47	2N5769	2N2369		SS28
TIS48	2N5769	2N2369		SS28
TIS49	2N5769	2N2369		SS28
TIS50	2N5771	2N5771		SS31
TIS51	2N5769	2N2369		SS28
TIS52	2N5772	2N3646		SS5
TIS53	MPS3640	2N3639		SS5
TIS54	MPS3640	2N3639		SS5
TIS55	2N5772	2N3646		SS5
TIS56	SE5055	SE5055		SS10
TIS57	SE5055	SE5055		SS10
TIS62	2N5770	2N918		SS27
TIS63	2N5770	2N918		SS27
TIS64	2N5770	2N918		SS27
TIS84	PE5031	PE5029		SS12
TIS85	PE5030B	PE5029		SS12
TIS86	PE5031	PE5029		SS12
TIS87	PE5031	PE5029		SS12
TIS88	2N5484	2N5484		
TIS90	2N4401	2N4400		SS15
TIS90M	2N4401	2N4400		SS15
TIS91	2N4403	2N4402		SS22
TIS91M	2N4403	2N4402		SS22
TIS92	2N4401	2N4400		SS15
TIS92M	2N4401	2N4400		SS15
TIS93	2N4403	2N4402		SS22
TIS93M	2N4403	2N4402		SS22
TIS97	2N5210	2N5209		
TIS98	2N5961	2N5961		SS8
TIS99	MPSA06	MPSA05		SS17
TIS100	2N5833	2N5830		SS16
TIS101	2N5831	2N5830		SS16
TIS104	PE5030B	PE5029		SS12
TP3638	2N3638	2N3638		SS22
TP3638A	2N3638A	2N3638		SS22
TP4123	2N4123	2N4123		SS14
TP4124	2N4124	2N4123		SS14
TP4125	2N4125	2N4125		SS23
TP4126	2N4126	2N4125		SS23
TP4257	2N4258	2N4258		SS31
TP4258	2N4258	2N4258		SS31

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TP4274	2N4274	2N4274		SS31
TP4275	2N4275	2N4274		SS31
TPS6512	MPS6512	MPS6512		SS14
TPS6513	MPS6513	MPS6512		SS14
TPS6514	MPS6514	MPS6512		SS14
TPS6515	MPS6515	MPS6512		SS14
TPS6516	MPS6516	MPS6516		SS23
TPS6517	MPS6517	MPS6516		SS23
TPS6518	MPS6518	MPS6516		SS23
TPS6519	MPS6519	MPS6516		SS23
TPS6522	MPS6522	MPS6522		SS23
TPS6523	MPS6523	MPS6522		SS23
1N193	FDH666	FD600		
1N194	FDH666	FD600		
1N194A	FDH666	FD600		
1N195	FDH666	FD600		
1N196	FDH666	FD600		
1N300	1N482	1N482		D5
1N300A	1N482	1N482		D5
1N300B	1N482	1N482		D5
1N301	1N483	1N482		D5
1N301A	1N483	1N482		D5
1N301B	1N483	1N482		D5
1N316	1N4001	1N4001		D10
1N317	1N4002	1N4001		D10
1N318	1N4003	1N4001		D10
1N319	1N4004	1N4001		D10
1N320	1N4005	1N4001		D10
1N323	1N4001	1N4001		D10
1N324	1N4002	1N4001		D10
1N325	1N4003	1N4001		D10
1N326	1N4004	1N4001		D10
1N327	1N4005	1N4001		D10
1N330	1N456	1N456		D5
1N331	1N456	1N456		D5
1N350	1N457	1N457		D5
1N351	1N484	1N482		D5
1N352	1N485	1N482		D5
1N353	1N661	1N659		D4
1N359	1N4001	1N4001		D10
1N360	1N4002	1N4001		D10
1N361	1N4003	1N4001		D10
1N362	1N4004	1N4001		D10
1N363	1N4005	1N4001		D10
1N373	1N747	1N746		D8
1N374	1N749	1N746		D8
1N375	1N750	1N746		D8
1N376	1N752	1N746		D8
1N377	1N754	1N746		D8
1N378	1N757	1N746		D8
1N379	1N758	1N746		D8
1N380	1N964A	1N957		D8
1N381	1N966A	1N957		D8

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1N382	1N968A	1N957		D8
1N383	1N970A	1N957		D8
1N384	1N972A	1N957		D8
1N385	1N973A	1N957		D8
1N432	1N482	1N482		D5
1N432A	1N482	1N482		D5
1N433	1N485	1N482		D5
1N433A	1N485	1N482		D5
1N434	1N485	1N482		D5
1N434A	1N485	1N482		D5
1N440	1N4002	1N4001		D10
1N440B	1N4002	1N4001		D10
1N441	1N4003	1N4001		D10
1N441B	1N4003	1N4001		D10
1N442	1N4004	1N4001		D10
1N442B	1N4004	1N4001		D10
1N443	1N4004	1N4001		D10
1N443B	1N4004	1N4001		D10
1N444	1N4005	1N4001		D10
1N444B	1N4005	1N4001		D10
1N445	1N4005	1N4001		D10
1N445B	1N4005	1N4001		D10
*1N456	1N456	1N456	3-8	D5
*1N456A	1N456A	1N456	3-8	D5
*1N457	1N457	1N457	3-8	D5
*1N457A	1N457A	1N457	3-8	D5
*1N458	1N458	1N458	3-8	D5
*1N458A	1N458A	1N458	3-8	D5
*1N459	1N459	1N459	3-8	D5
*1N459A	1N459A	1N459	3-8	D5
1N460	1N484	1N482		D5
1N460A	1N484	1N482		D5
*1N461	1N461	1N461	3-7	D5
*1N461A	1N461A	1N461	3-7	D5
*1N462	1N462	1N462	3-7	D5
*1N462A	1N462A	1N462	3-7	D5
*1N463	1N463	1N463	3-7	D5
*1N463A	1N463A	1N463	3-7	D5
*1N464	1N464	1N464	3-7	D5
*1N464A	1N464A	1N464	3-7	D5
1N466	1N747	1N746		D8
1N466A	1N746A	1N746		D8
1N467	1N749	1N746		D8
1N467A	1N749A	1N746		D8
1N468	1N750	1N746		D8
1N468A	1N750A	1N746		D8
1N469	1N753	1N746		D8
1N469A	1N753A	1N746		D8
1N470	1N754	1N746		D8
1N470A	1N754A	1N746		D8
*1N482	1N482	1N482	3-7	D5
*1N482A	1N482A	1N482	3-8	D5
*1N482B	1N482B	1N482	3-8	D5
*1N483	1N483	1N482	3-7	D5
*1N483A	1N483A	1N482	3-8	D5
*1N483B	1N483B	1N482	3-8	D5
*1N484	1N484	1N482	3-7	D5
*1N484A	1N484A	1N482	3-8	D5
*1N484B	1N484B	1N482	3-8	D5
*1N485	1N485	1N482	3-7	D5
*1N485A	1N485A	1N482	3-8	D5
*1N485B	1N485B	1N482	3-8	D5
*1N486	1N486	1N482	3-8	D5
*1N486A	1N486A	1N482	3-8	D5
*1N486B	1N486B	1N482	3-8	D5
1N530	1N4002	1N4001		D10
1N531	1N4003	1N4001		D10
1N532	1N4004	1N4001		D10
1N533	1N4004	1N4001		D10
1N534	1N4005	1N4001		D10
1N535	1N4005	1N4001		D10
1N536	1N4001	1N4001		D10
1N537	1N4002	1N4001		D10
1N538	1N4003	1N4001		D10
1N539	1N4004	1N4001		D10
1N540	1N4004	1N4001		D10
1N547	1N4005	1N4001		D10
1N596	1N4005	1N4001		D10
1N599	1N4001	1N4001		D10
1N599A	1N4001	1N4001		D10
1N600	1N4002	1N4001		D10
1N600A	1N4002	1N4001		D10
1N601	1N4003	1N4001		D10
1N601A	1N4003	1N4001		D10
1N602	1N4003	1N4001		D10
1N602A	1N4003	1N4001		D10
1N603	1N4004	1N4001		D10
1N603A	1N4004	1N4001		D10
1N604	1N4004	1N4001		D10
1N604A	1N4004	1N4001		D10
1N605	1N4005	1N4001		D10
1N605A	1N4005	1N4001		D10
1N606	1N4005	1N4001		D10
1N606A	1N4005	1N4001		D10
1N607	1N4001	1N4001		D10
1N607A	1N4001	1N4001		D10
1N608	1N4002	1N4001		D10
1N608A	1N4002	1N4001		D10
1N609	1N4003	1N4001		D10
1N609A	1N4003	1N4001		D10
1N610	1N4003	1N4001		D10
1N610A	1N4003	1N4001		D10
1N611	1N4004	1N4001		D10
1N611A	1N4004	1N4001		D10
1N612	1N4004	1N4001		D10
1N612A	1N4004	1N4001		D10

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1N613	1N4005	1N4001		D10
1N613A	1N4005	1N4001		D10
1N614	1N4005	1N4001		D10
1N614A	1N4005	1N4001		D10
1N619	FDH666	FD600		D6
1N622	FDH444	FD400		D4
*1N625	1N625	1N625	3-6	D6
*1N626	1N626	1N625	3-5	D4
*1N627	1N627	1N625	3-5	D4
*1N628	1N628	1N625	3-5	D4
*1N629	1N629	1N625	3-5	D4
*1N643	1N643	1N643	3-5	D4
*1N643A	1N643A	1N643		D4
1N645	1N4003	1N4001		D10
1N645A	1N4003	1N4001		D10
1N646	1N4004	1N4001		D10
1N647	1N4004	1N4001		D10
1N648	1N4005	1N4001		D10
1N649	1N4005	1N4001		D10
*1N658	1N658	1N658	3-5	D4
1N658A	1N658A			D4
*1N659	1N659	1N659	3-4	D6
1N659A	1N659	1N659		D6
*1N660	1N660	1N659	3-5	D4
1N660A	1N660	1N659		D4
*1N661	1N661	1N659	3-7	D4
1N661A	1N661	1N659		D4
*1N662	1N662	1N662	3-5	D4
*1N662A	1N662A	1N662	3-5	D4
*1N663	1N663	1N662	3-5	D4
*1N663A	1N663A	1N662	3-5	D4
1N664	1N756A	1N746		D8
1N665	1N759A	1N746		D8
1N666	1N965B	1N957		D8
1N667	1N967B	1N957		D8
1N668	1N969B	1N957		D8
1N669	1N971B	1N957		D8
1N674	1N750A	1N746		D8
1N675	1N753A	1N746		D8
1N676	1N4002	1N4001		D10
1N677	1N4002	1N4001		D10
1N678	1N4003	1N4001		D10
1N679	1N4003	1N4001		D10
1N681	1N4004	1N4001		D10
1N682	1N4004	1N4001		D10
1N683	1N4004	1N4001		D10
1N684	1N4004	1N4001		D10
1N685	1N4005	1N4001		D10
1N686	1N4005	1N4001		D10
1N687	1N4005	1N4001		D10
1N689	1N5005	1N4001		D10
1N690	FDH400	FD400		D4
1N691	FDH400	FD400		D4
1N692	FDH400	FD400		D4
1N693	FDH400	FD400		D4
1N696	FDH666	FD600		D6
1N697	FDH666	FD600		D6
1N701	1N758A	1N746		D8
1N703	1N747	1N746		D8
1N703A	1N747A	1N746		D8
1N704	1N749	1N746		D8
1N704A	1N749A	1N746		D8
1N705	1N750	1N746		D8
1N705A	1N750A	1N746		D8
1N706	1N752	1N746		D8
1N706A	1N752A	1N746		D8
1N707	1N754	1N746		D8
1N707A	1N754A	1N746		D8
1N708	1N752	1N746		D8
1N708A	1N752A	1N746		D8
1N709	1N753	1N746		D8
1N709A	1N753A	1N746		D8
1N710	1N754	1N746		D8
1N710A	1N754A	1N746		D8
1N711	1N755	1N746		D8
1N711A	1N755A	1N746		D8
1N712	1N756	1N746		D8
1N712A	1N756A	1N746		D8
1N713	1N757	1N746		D8
1N713A	1N757A	1B746		D8
1N714	1N758	1N746		D8
1N714A	1N758A	1N746		D8
1N715	1N962A	1N957		D8
1N715A	1N962B	1N957		D8
1N716	1N963A	1N957		D8
1N716A	1N963B	1N957		D8
1N717	1N964A	1N957		D8
1N717A	1N964B	1N957		D8
1N718	1N965A	1N957		D8
1N718A	1N965B	1N957		D8
1N719	1N966A	1N957		D8
1N719A	1N966B	1N957		D8
1N720	1N967A	1N957		D8
1N720A	1N967B	1N957		D8
1N721	1N968A	1N957		D8
1N721A	1N968B	1N957		D8
1N722	1N969A	1N957		D8
1N722A	1N969B	1N957		D8
1N723	1N970A	1N957		D8
1N723A	1N970B	1N957		D8
1N724	1N971A	1N957		D8
1N724A	1N971B	1N957		D8
1N725	1N972B	1N957		D8
1N725A	1N972B	1N957		D8
1N726	1N973A	1N957		D8

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1N726A	1N973B	1N957		D8
*1N746	1N746	1N746	3-10	D8
*1N746A	1N746A	1N746	3-10	D8
*1N747	1N747	1N746	3-10	D8
*1N747A	1N747A	1N746		D8
*1N748	1N748	1N746	3-10	D8
*1N748A	1N748A	1N746	3-10	D8
*1N749	1N749	1N746	3-10	D8
*1N749A	1N749A	1N746	3-10	D8
*1N750	1N750	1N746	3-10	D8
*1N750A	1N750A	1N746	3-10	D8
*1N751	1N751	1N746	3-10	D8
*1N751A	1N751A	1N746	3-10	D8
*1N752	1N752	1N746	3-10	D8
*1N752A	1N752A	1N746	3-10	D8
*1N753	1N753	1N746	3-10	D8
*1N753A	1N753A	1N746	3-10	D8
*1N754	1N754	1N746	3-10	D8
*1N754A	1N754A	1N746	3-10	D8
*1N755	1N755	1N746	3-10	D8
*1N755A	1N755A	1N746	3-10	D8
*1N756	1N756	1N746	3-10	D8
*1N756A	1N756A	1N746	3-10	D8
*1N757	1N757	1N746	3-10	D8
*1N757A	1N757A	1N746	3-10	D8
*1N758	1N758	1N746	3-10	D8
*1N758A	1N758A	1N746	3-10	D8
*1N759	1N759	1N746	3-10	D8
*1N759A	1N759A	1N746	3-11	D8
1N761	1N750	1N746		D8
1N762	1N752	1N746		D8
1N763	1N754	1N746		D8
1N764	1N757	1N746		D8
1N765	1N758	1N746		D8
1N766	1N964A	1N957		D8
1N767	1N966A	1N957		D8
1N768	1N968A	1N957		D8
1N769	1N970A	1N957		D8
1N778	1N778		3-5	D4
1N779	1N779		3-7	D4
1N789	1N789		3-6	D6
1N790	1N790		3-6	D6
1N791	1N791		3-6	D4
1N792	1N792		3-6	D4
1N793	1N793		3-5	D6
1N794	1N794		3-5	D4
1N795	1N795		3-7	D4
1N796	1N796		3-5	D4
1N797	1N797		3-5	D6
1N798	1N660	1N659		D4
1N799	1N799		3-7	D4
1N800	1N3070	1N3070		D4
1N801	1N801		3-5	D4
1N802	1N3070	1N3070		D4
1N803	1N3070	1N3070		D4
1N804	1N804		3-5	D4
1N806	1N806		3-5	D4
1N807	1N807		3-5	D4
1N808	1N808		3-5	D4
1N809	1N809		3-5	D4
1N810	FDH600	FD600		D6
1N811	1N811		3-6	D6
1N812	1N812		3-5	D6
1N813	1N813		3-6	D6
1N814	1N814		3-4	D6
1N815	1N815		3-6	D6
1N816	1N816		3-7	D5
1N817	1N3070	1N3070		D4
1N818	1N818		3-5	D4
1N837	1N837		3-5	D4
1N837A	1N837A		3-5	D4
1N838	1N838		3-5	D4
1N839	1N839		3-5	D4
1N840	1N840		3-5	D4
1N841	1N841		3-5	D4
1N842	1N842		3-5	D4
1N843	1N843		3-5	D4
1N844	1N844		3-7	D4
1N845	1N845		3-5	D4
1N846	1N4001	1N4001		D10
1N847	1N4002	1N4001		D10
1N848	1N4003	1N4001		D10
1N849	1N4004	1N4001		D10
1N850	1N4004	1N4001		D10
1N851	1N4005	1N4001		D10
1N852	1N4005	1N4001		D10
1N857	1N4001	1N4001		D10
1N858	1N4002	1N4001		D10
1N859	1N4003	1N4001		D10
1N860	1N4004	1N4001		D10
1N861	1N4004	1N4001		D10
1N862	1N4005	1N4001		D10
1N863	1N4005	1N4001		D10
1N868	1N4001	1N4001		D10
1N869	1N4002	1N4001		D10
1N870	1N4003	1N4001		D10
1N871	1N4004	1N4001		D10
1N872	1N4004	1N4001		D10
1N873	1N4005	1N4001		D10
1N874	1N4005	1N4001		D10
1N879	1N4001	1N4001		D10
1N880	1N4002	1N4001		D10
1N881	1N4003	1N4001		D10
1N882	1N4004	1N4001		D10
1N883	1N4004	1N4001		D10
1N884	1N4005	1N4001		D10

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
1N885	1N4005	1N4001		D10
1N890	1N890		3-8	D5
1N891	1N891		3-5	D4
1N892	1N4148	1N914		D6
1N893	1N3070	1N3070		D4
1N897	1N4148	1N914		D6
1N898	1N914B	1N914		D6
1N899	1N4148	1N914		D6
1N900	1N4148	1N914		D6
1N901	1N4148	1N914		D6
1N902	1N3070	1N3070		D4
1N903	1N903		3-4	D6
1N903A	1N903A		3-4	D6
1N904	1N904		3-4	D6
1N904A	1N904A		3-4	D6
1N905	1N905		3-4	D6
1N905A	1N905A		3-4	D6
1N906	1N906		3-4	D6
1N906A	1N906A		3-4	D6
1N907	1N907		3-4	D6
1N907A	1N907A		3-4	D6
1N908	1N908		3-4	D6
1N908A	1N908A		3-4	D6
*1N914	1N914	1N914	3-3/3-12	D6
*1N914A	1N914A	1N914	3-3	D6
*1N914B	1N914B	1N914	3-3	D6
1N915	1N914B	1N914		D6
*1N916	1N916	1N914	3-3	D6
*1N916A	1N916A	1N914	3-3	D6
*1N916B	1N916B	1N914	3-3	D6
1N917	1N914	1N914		D6
1N919	1N3070	1N3070		D4
1N920	1N3069			D6
1N921	1N662	1N662		D4
1N922	1N662	1N662		D4
1N923	FDH444	FD400		D4
1N925	1N925		3-7	D6
1N926	1N926		3-7	D4
1N927	1N927		3-5	D4
1N928	1N928		3-5	D6
1N929	1N914B	1N914		D6
1N930	FDH666	FD600		D6
1N931	1N4148	1N914		D6
1N932	1N3070	1N3070		D4
1N934	1N3064	1N3062		D6
1N947	1N4005	1N4001		D10
1N948	1N662A	1N662		D4
*1N957	1N957	1N957	3-10	D8
*1N957A	1N957A	1N957	3-10	D8
*1N957B	1N957B	1N957	3-10	D8
*1N958	1N958	1N957	3-10	D8
*1N958A	1N958A	1N957	3-10	D8
*1N958B	1N958B	1N957	3-10	D8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
*1N959	1N959	1N957	3-10	D8
*1N959A	1N959A	1N957	3-10	D8
*1N959B	1N959B	1N957	3-10	D8
*1N960	1N960	1N957	3-10	D8
*1N960A	1N960A	1N957	3-10	D8
*1N960B	1N960B	1N957	3-10	D8
*1N961	1N961	1N957	3-10	D8
*1N961A	1N961A	1N957	3-10	D8
*1N961B	1N961B	1N957	3-10	D8
*1N962	1N962	1N957	3-10	D8
*1N962A	1N962A	1N957	3-10	D8
*1N962B	1N962B	1N957	3-10	D8
*1N963	1N963	1N957	3-10	D8
*1N963A	1N963A	1N957	3-11	D8
*1N963B	1N963B	1N957	3-11	D8
*1N964	1N964	1N957	3-11	D8
*1N964A	1N964A	1N957	3-11	D8
*1N964B	1N964B	1N957	3-11	D8
*1N965	1N965	1N957	3-11	D8
*1N965A	1N965A	1N957	3-11	D8
*1N965B	1N965B	1N957	3-11	D8
*1N966	1N966	1N957	3-11	D8
*1N966A	1N966A	1N957	3-11	D8
*1N966B	1N966B	1N957	3-11	D8
*1N967	1N967	1N957	3-11	D8
*1N967A	1N967A	1N957	3-11	D8
*1N967B	1N967B	1N957	3-11	D8
*1N968	1N968	1N957	3-11	D8
*1N968A	1N968A	1N957	3-11	D8
*1N968B	1N968B	1N957	3-11	D8
*1N969	1N969	1N957	3-11	D8
*1N969A	1N969A	1N957	3-11	D8
*1N969B	1N969B	1N957	3-11	D8
*1N970	1N970	1N957	3-11	D8
*1N970A	1N970A	1N957	3-11	D8
*1N970B	1N970B	1N957	3-11	D8
*1N971	1N971	1N957	3-11	D8
*1N971A	1N971A	1N957	3-11	D8
*1N971B	1N971B	1N957	3-11	D8
*1N972	1N972	1N957	3-11	D8
*1N972A	1N972A	1N957	3-11	D8
*1N972B	1N972B	1N957	3-11	D8
*1N973	1N973	1N957	3-11	D8
*1N973A	1N973A	1N957	3-11	D8
*1N973B	1N973B	1N957	3-11	D8
1N997	1N914	1N914		D6
1N998	FD444	FD400		D4
1N999	1N914	1N914		D6
1N1008	1N4004	1N4001		D10
1N1028	1N4001	1N4001		D10
1N1029	1N4002	1N4001		D10
1N1030	1N4003	1N4001		D10
1N1031	1N4003	1N4001		D10

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
1N1032	1N4004	1N4001		D10
1N1033	1N4004	1N4001		D10
1N1169	1N4004	1N4001		D10
1N1169A	1N4004	1N4001		D10
1N1486	1N4005	1N4001		D10
1N1487	1N4002	1N4001		D10
1N1488	1N4003	1N4001		D10
1N1489	1N4004	1N4001		D10
1N1490	1N4004	1N4001		D10
1N1491	1N4005	1N4001		D10
1N1492	1N4005	1N4001		D10
1N1927	1N748	1N746		D8
1N1928	1N750	1N746		D8
1N1929	1N752	1N746		D8
1N1930	1N754	1N746		D8
1N1931	1N756	1N746		D8
1N1932	1N758	1N746		D8
1N1933	1N759	1N746		D8
1N1934	1N965A	1N957		D8
1N1935	1N967A	1N957		D8
1N1936	1N969A	1N957		D8
1N1937	1N971A	1N957		D8
1N1938	1N973A	1N957		D8
1N1954	1N748	1N746		D8
1N1955	1N750	1N746		D8
1N1956	1N752	1N746		D8
1N1957	1N754	1N746		D8
1N1958	1N756	1N746		D8
1N1959	1N758	1N746		D8
1N1960	1N759	1N746		D8
1N1961	1N965A	1N957		D8
1N1962	1N967A	1N957		D8
1N1963	1N1969A	1N957		D8
1N1964	1N971A	1N957		D8
1N1965	1N973A	1N957		D8
1N1981	1N748	1N746		D8
1N1982	1N750	1N746		D8
1N1983	1N752	1N746		D8
1N1984	1N754	1N746		D8
1N1985	1N756	1N746		D8
1N1986	1N758	1N746		D8
1N1987	1N759	1N746		D8
1N1988	1N965A	1N957		D8
1N1989	1N967A	1N957		D8
1N1990	1N969A	1N957		D8
1N1991	1N971A	1N957		D8
1N1992	1N973A	1N957		D8
1N2069	1N4003	1N4001		D10
1N2069A	1N4003	1N4001		D10
1N2070	1N4004	1N4001		D10
1N2070A	1N4004	1N4001		D10
1N2071	1N4005	1N4001		D10
1N2071A	1N4005	1N4001		D10
1N2072	1N4001	1N4001		D10
1N2073	1N4002	1N4001		D10
1N2074	1N4003	1N4001		D10
1N2075	1N4003	1N4001		D10
1N2076	1N4004	1N4001		D10
1N2077	1N4004	1N4001		D10
1N2078	1N4004	1N4001		D10
1N2079	1N4005	1N4001		D10
1N2080	1N4001	1N4001		D10
1N2081	1N4002	1N4001		D10
1N2082	1N4003	1N4001		D10
1N2083	1N4004	1N4001		D10
1N2084	1N4004	1N4001		D10
1N2085	1N4005	1N4001		D10
1N2086	1N4005	1N4001		D10
1N2088	1N4005	1N4001		D10
1N2089	1N4005	1N4001		D10
1N2090	1N4001	1N4001		D10
1N2091	1N4002	1N4001		D10
1N2092	1N4003	1N4001		D10
1N2093	1N4004	1N4001		D10
1N2094	1N4004	1N4001		D10
1N2095	1N4005	1N4001		D10
1N2096	1N4005	1N4001		D10
1N2103	1N4001	1N4001		D10
1N2104	1N4002	1N4001		D10
1N2105	1N4003	1N4001		D10
1N2106	1N4004	1N4001		D10
1N2107	1N4004	1N4001		D10
1N2108	1N4005	1N4001		D10
1N2110	1N4002	1N4001		D10
1N2111	1N4003	1N4001		D10
1N2112	1N4004	1N4001		D10
1N2113	1N4004	1N4001		D10
1N2114	1N4005	1N4001		D10
1N2115	1N4004	1N4001		D10
1N2116	1N4004	1N4001		D10
1N2482	1N4003	1N4001		D10
1N2483	1N4004	1N4001		D10
1N2484	1N4005	1N4001		D10
1N2485	1N4003	1N4001		D10
1N2486	1N4004	1N4001		D10
1N2487	1N4004	1N4001		D10
1N2488	1N4005	1N4001		D10
1N2489	1N4005	1N4001		D10
1N2609	1N4001	1N4001		D10
1N2610	1N4002	1N4001		D10
1N2611	1N4003	1N4001		D10
1N2612	1N4004	1N4001		D10
1N2613	1N4004	1N4001		D10
1N2614	1N4005	1N4001		D10
1N2615	1N4005	1N4001		D10
1N2765	FCT1125	FCT1021		D3

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
1N2765A	FCT1122	FCT1021		D3
*1N3062	1N3062	1N3062	3-3	D6
*1N3063	1N3063	1N3062	3-3	D6
*1N3064	1N3064	1N3062	3-3	D6
1N3065	1N3065		3-3	D6
1N3066	1N3066		3-3	D6
*1N3067	1N3067		3-4	D6
1N3068	1N3068		3-6	D4
*1N3069	1N3069		3-5	D6
*1N3070	1N3070	1N3070	3-5/3-12	D4
*1N3071	1N3071	1N3070	3-5	D4
1N3072	1N4001	1N4001		D10
1N3073	1N4002	1N4001		D10
1N3074	1N4003	1N4001		D10
1N3075	1N4003	1N4001		D10
1N3076	1N4004	1N4001		D10
1N3077	1N4004	1N4001		D10
1N3078	1N4004	1N4001		D10
1N3079	1N4004	1N4001		D10
1N3080	1N4005	1N4001		D10
1N3081	1N4005	1N4001		D10
1N3082	1N4003	1N4001		D10
1N3083	1N4004	1N4001		D10
1N3084	1N4005	1N4001		D10
1N3147	1N662A	1N662		D4
1N3189	1N4003	1N4001		D10
1N3190	1N4004	1N4001		D10
1N3191	1N4005	1N4001		D10
1N3192	1N3070	1N3070		D4
1N3193	1N4003	1N4001		D10
1N3194	1N4004	1N4001		D10
1N3195	1N4005	1N4001		D10
1N3206	1N662	1N662		D4
1N3207	1N662A	1N662		D4
1N3215	1N662	1N662		D4
1N3223	1N628	1N625		D4
1N3253	1N4003	1N4001		D10
1N3254	1N4004	1N4001		D10
1N3255	1N4005	1N4001		D10
1N3257	1N662A	1N662		D4
1N3258	1N662A	1N662		D4
1N3277	1N4003	1N4001		D10
1N3278	1N4004	1N4001		D10
1N3279	1N4005	1N4001		D10
1N3411	1N753	1N746		D8
1N3412	1N754	1N746		D8
1N3413	1N755	1N746		D8
1N3414	1N756	1N746		D8
1N3415	1N758	1N746		D8
1N3416	1N759	1N746		D8
1N3417	1N965A	1N957		D8
1N3418	1N967A	1N957		D8
1N3419	1N969A	1N957		D8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
1N3420	1N971A	1N957		D8
1N3421	1N972A	1N957		D8
1N3422	1N973A	1N957		D8
1N3471	1N482A	1N482		D8
1N3485	1N485B	1N482		D8
1N3506	1N746A	1N746		D8
1N3507	1N747A	1N746		D8
1N3508	1N748A	1N746		D8
1N3509	1N749A	1N746		D8
1N3510	1N750A	1N746		D8
1N3511	1N751A	1N746		D8
1N3512	1N752A	1N746		D8
1N3513	1N753A	1N746		D8
1N3514	1N754A	1N746		D8
1N3515	1N755A	1N746		D8
1N3516	1N756A	1N746		D8
1N3517	1N757A	1N746		D8
1N3518	1N758A	1N746		D8
1N3519	1N962B	1N957		D8
1N3520	1N963B	1N957		D8
1N3521	1N964B	1N957		D8
1N3522	1N965B	1N957		D8
1N3523	1N966B	1N957		D8
1N3524	1N967B	1N957		D8
1N3525	1N968B	1N957		D8
1N3526	1N969B	1N957		D8
1N3527	1N970B	1N957		D8
1N3528	1N971B	1N957		D8
1N3529	1N972B	1N957		D8
1N3530	1N973B	1N957		D8
1N3544	1N4002	1N4001		D10
1N3545	1N4003	1N4001		D10
1N3546	1N4004	1N4001		D10
1N3547	1N4004	1N4001		D10
1N3548	1N4005	1N4001		D10
1N3549	1N4005	1N4001		D10
1N3550	1N3070	1N3070		D4
1N3567	1N483A	1N482		D5
1N3568	1N483A	1N482		D5
1N3593	1N4531	1N4531		D6
1N3594	1N4531	1N4531		D6
*1N3595	1N3595	1N3595	3-8/3-12	D5
1N3596	1N3596		3-4	D6
*1N3597	1N3597	1N3597	3-5	D4
1N3598	1N914	1N914		D6
1N3599	1N3070	1N3070		D4
*1N3600	1N3600	1N3600	3-3	D6
1N3601	1N3070	1N3070		D4
1N3602	1N3602		3-4	D6
1N3603	1N3603		3-4	D6
1N3604	1N3604		3-3	D6
1N3605	1N3605		3-3	D6
1N3606	1N3606		3-3	D6

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
1N3607	1N4448	1N914		D6
1N3611	1N4003	1N4001		D10
1N3612	1N4004	1N4001		D10
1N3613	1N4005	1N4001		D10
1N3625	1N486	1N482		D10
1N3722	1N914B	1N914		D6
1N3731	1N914B	1N914		D6
1N3748	1N4003	1N4001		D10
1N3749	1N4004	1N4001		D10
1N3750	1N4005	1N4001		D10
1N3754	1N4002	1N4001		D10
1N3755	1N4003	1N4001		D10
1N3756	1N4004	1N4001		D10
1N3757	1N4003	1N4001		D10
1N3758	1N4004	1N4001		D10
1N3759	1N4005	1N4001		D10
1N3872	1N662A	1N662		D4
1N3873	1N662A	1N662		D4
1N3952	1N3595	1N3595		D5
1N3954	FDH400	FD400		D4
1N3956	1N914B	1N914		D6
*1N4001	1N4001	1N4001	3-16	D10
*1N4002	1N4002	1N4001	3-16	D10
*1N4003	1N4003	1N4001	3-16	D10
*1N4004	1N4004	1N4001	3-16	D10
*1N4005	1N4005	1N4005	3-16	D10
*1N4009	1N4009	1N4009	3-4	D10
1N4043	1N914B	1N914		D6
*1N4086	1N4086	1N4086	3-3	D6
1N4087	1N4087		3-3	D6
1N4092	1N4454	1N3062		D6
1N4093	1N4454	1N3062		D6
1N4095	1N751	1N746		D8
1N4099	1N957B	1N957		D8
1N4100	1N958B	1N957		D8
1N4101	1N959B	1N957		D8
1N4102	1N960B	1N957		D8
1N4103	1N960B	1N957		D8
1N4104	1N961B	1N957		D8
1N4105	1N962B	1N957		D8
1N4106	1N963B	1N957		D8
1N4107	1N964B	1N957		D8
1N4108	1N965B	1N957		D8
1N4109	1N965B	1N957		D8
1N4110	1N966B	1N957		D8
1N4111	1N967B	1N957		D8
1N4112	1N967B	1N957		D8
1N4113	1N968B	1N957		D8
1N4114	1N968B	1N957		D8
1N4115	1N969B	1N957		D8
1N4116	1N970B	1N957		D8
1N4117	1N970B	1N957		D8
1N4118	1N971B	1N957		D8
1N4119	1N971B	1N957		D8
1N4120	1N972B	1N957		D8
1N4121	1N972B	1N957		D8
1N4147	1N914	1N914		D6
*1N4148	1N4148	1N914	3-3	D6
*1N4149	1N4149	1N914	3-3	D6
*1N4150	1N4150	1N3600	3-3	D6
*1N4151	1N4151	1N4151	3-3	D6
*1N4152	1N4152	1N4151	3-3	D6
*1N4153	1N4153	1N4151	3-3	D6
*1N4154	1N4154	1N4151	3-4	D6
*1N4244	1N4244	1N4244	3-3	D7
1N4245	1N4003	1N4001		D10
1N4246	1N4004	1N4001		D10
1N4247	1N4005	1N4001		D10
*1N4305	1N4305	1N3062	3-3	D6
*1N4306	1N4306	1N4306	3-12	D6
*1N4307	1N4307	1N4306	3-12	D6
1N4322	1N4322		3-4	D6
1N4363	1N4363		3-5	
1N4364	1N4002	1N4001		D10
1N4365	1N4003	1N4001		D10
1N4366	1N4004	1N4001		D10
1N4367	1N4004	1N4001		D10
1N4368	1N4005	1N4001		D10
1N4369	1N4005	1N4001		D10
1N4375	1N914B	1N914		D6
*1N4376	1N4376	1N4376	3-3	D7
1N4389	FDH666	FD600		D6
1N4390	FDH666	FD600		D6
1N4391	FDH666	FD600		D6
1N4392	FDH666	FD600		D6
1N4444	1N4148	1N914		D6
1N4445	1N4148	1N914		D6
*1N4446	1N4446	1N914	3-3	D6
*1N4447	1N4447	1N914	3-3	D6
*1N4448	1N4448	1N914	3-3	D6
*1N4449	1N4449	1N914	3-3	D6
*1N4450	1N4450	1N3600	3-4	D6
1N4451	1N914B	1N914		D6
1N4453	1N4448	1N914		D6
*1N4454	1N4454	1N3062	3-4	D6
*1N4531	1N4531	1N4531	3-3	D6
*1N4532	1N4532	1N4531	3-4	D6
*1N4533	1N4533	1N4533	3-3	D6
*1N4534	1N4534	1N4533	3-3	D6
*1N4536	1N4536	1N4009	3-4	D6
*1N4607	1N4607	1N4607		D6
*1N4610	1N4610	1N3600	3-3	D6
1N4620	1N746A	1N746		D8
1N4621	1N747A	1N746		D8
1N4622	1N748A	1N746		D8
1N4623	1N749A	1N746		D8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
1N4624	1N750A	1N746		D8
1N4625	1N751A	1N746		D8
1N4626	1N752A	1N746		D8
1N4627	1N753A	1N746		D8
1N4726	1N4727	1N4727		D6
*1N4727	1N4727	1N4727	3-4	D6
1N4816	1N4001	1N4001		D10
1N4817	1N4002	1N4001		D10
1N4818	1N4003	1N4001		D10
1N4819	1N4004	1N4001		D10
1N4820	1N4004	1N4001		D10
1N4821	1N4005	1N4001		D10
1N4822	1N4005	1N4001		D10
1N4861	1N483	1N482		D5
1N4862	1N483	1N482		D5
1N4863	1N914B	1N914		D6
1N4864	1N914B	1N914		D6
1N4938	1N3070	1N3070		D6
*1N4950	1N4950	1N4950	3-4	D6
1N5004	1N4002	1N4001		D10
1N5005	1N4003	1N4001		D10
1N5006	1N4004	1N4001		D10
1N5007	1N4005	1N4001		D10
1N5219	1N4454	1N3062		D6
1N5220	1N4454	1N3062		D6
1N5234	1N753	1N746		D8
1N5234A	1N753	1N746		D8
1N5234B	1N753A	1N746		D8
1N5235	1N754	1N746		D8
1N5235A	1N754	1N746		D8
1N5235B	1N754A	1N746		D8
1N5236	1N755	1N746		D8
1N5236A	1N755	1N746		D8
1N5236B	1N755A	1N746		D8
1N5237	1N756	1N746		D8
1N5237A	1N756	1N746		D8
1N5237B	1N756A	1N746		D8
1N5238	1N757	1N746		D8
1N5238A	1N757	1N746		D8
1N5238B	1N757A	1N746		D8
1N5239	1N757	1N746		D8
1N5239A	1N757	1N746		D8
1N5239B	1N957A	1N746		D8
1N5240	1N758	1N746		D8
1N5240A	1N758	1N746		D8
1N5240B	1N758A	1N746		D8
1N5241	1N759	1N746		D8
1N5241A	1N759	1N746		D8
1N5241B	1N759A	1N746		D8
1N5242	1N759	1N746		D8
1N5242A	1N759	1N746		D8
1N5242B	1N759A	1N746		D8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
1N5243	1N964A	1N957		D8
1N5243A	1N964A	1N957		D8
1N5243B	1N964B	1N957		D8
1N5244	1N965A	1N957		D8
1N5244A	1N965A	1N957		D8
1N5244B	1N965B	1N957		D8
1N5245	1N965A	1N957		D8
1N5245A	1N965A	1N957		D8
1N5245B	1N965B	1N957		D8
1N5246	1N966A	1N957		D8
1N5246A	1N966A	1N957		D8
1N5246B	1N966B	1N957		D8
1N5247	1N967A	1N957		D8
1N5247A	1N967A	1N957		D8
1N5247B	1N967B	1N957		D8
1N5248	1N967A	1N957		D8
1N5248A	1N967A	1N957		D8
1N5248B	1N967B	1N957		D8
1N5249	1N968A	1N957		D8
1N5249A	1N968A	1N957		D8
1N5249B	1N968B	1N957		D8
1N5250	1N968A	1N957		D8
1N5250A	1N968A	1N957		D8
1N5250B	1N968B	1N957		D8
1N5251	1N969A	1N957		D8
1N5251A	1N969A	1N957		D8
1N5251B	1N969B	1N957		D8
1N5252	1N970A	1N957		D8
1N5252A	1N970A	1N957		D8
1N5252B	1N970B	1N957		D8
1N5253	1N970A	1N957		D8
1N5253A	1N970A	1N957		D8
1N5253B	1N970B	1N957		D8
1N5254	1N971A	1N957		D8
1N5254A	1N971A	1N957		D8
1N5254B	1N971B	1N957		D8
1N5255	1N971A	1N957		D8
1N5255A	1N971A	1N957		D8
1N5255B	1N971B	1N957		D8
1N5256	1N972A	1N957		D8
1N5256A	1N972A	1N957		D8
1N5256B	1N972B	1N957		D8
1N5257	1N973A	1N957		D8
1N5257A	1N973A	1N957		D8
1N5257B	1N973B	1N957		D8
*1N5282	1N5282	1N5282	3-3	D6
*1N5317	1N5317	1N5317	3-3	D6
*1N5318	1N5318	1N5317	3-4	D6
*1N5319	1N5319	1N5317	3-4	D6
*1N5390	1N5390	FH1100	3-9	D12
1N5412	1N4450	1N3600		D6
1N5413	1N4607	1N4607		D6
1N5414	1N4607	1N4607		D6

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
1N5518	1N746	1N746		D8
1N5518A	1N746	1N746		D8
1N5518B	1N746A	1N746		D8
1N5519	1N747	1N746		D8
1N5519A	1N747	1N746		D8
1N5519B	1N747A	1N746		D8
1N5520	1N748	1N746		D8
1N5520A	1N748	1N746		D8
1N5520B	1N748A	1N746		D8
1N5521	1N749	1N746		D8
1N5521A	1N749	1N746		D8
1N5521B	1N749B	1N746		D8
1N5522	1N750	1N746		D8
1N5522A	1N750	1N746		D8
1N5522B	1N750	1N746		D8
1N5523	1N751	1N746		D8
1N5523A	1N751	1N746		D8
1N5523B	1N751A	1N746		D8
1N5524	1N752	1N746		D8
1N5524A	1N752	1N746		D8
1N5524B	1N752A	1N746		D8
1N5525	1N753	1N746		D8
1N5525A	1N753	1N746		D8
1N5525B	1N753A	1N746		D8
1N5526	1N957	1N957		D8
1N5526A	1N957A	1N957		D8
1N5526B	1N957B	1N957		D8
1N5527	1N958	1N957		D8
1N5527A	1N958A	1N957		D8
1N5527B	1N958B	1N957		D8
1N5528	1N959	1N957		D8
1N5528A	1N959A	1N957		D8
1N5528B	1N959B	1N957		D8
1N5529	1N960	1N957		D8
1N5529A	1N960A	1N957		D8
1N5529B	1N960B	1N957		D8
1N5530	1N961	1N957		D8
1N5530A	1N961A	1N957		D8
1N5530B	1N961B	1N957		D8
1N5531	1N962	1N957		D8
1N5531A	1n962A	1N957		D8
1N5531B	1N962B	1N957		D8
1N5532	1N963	1N957		D8
1N5532A	1N963A	1N957		D8
1N5532B	1N963B	1N957		D8
1N5533	1N964	1N957		D8
1N5533A	1N964A	1N957		D8
1N5533B	1N964B	1N957		D8
1N5534	1N965	1N957		D8
1N5534A	1N965A	1N957		D8
1N5534B	1N965B	1N957		D8
1N5535	1N965	1N957		D8
1N5535A	1N965A	1N957		D8
1N5535B	1N965B	1N957		D8
1N5536	1N966	1N957		D8
1N5536A	1N966A	1N957		D8
1N5536B	1N966B	1N957		D8
1N5537	1N967	1N957		D8
1N5537A	1N967A	1N957		D8
1N5537B	1N967B	1N957		D8
1N5538	1N967	1N957		D8
1N5538A	1N967A	1N957		D8
1N5538B	1N967B	1N957		D8
1N5539	1N968	1N957		D8
1N5539A	1N968A	1N957		D8
1N5539B	1N968B	1N957		D8
1N5540	1N968	1N957		D8
1N5540A	1N968A	1N957		D8
1N5540B	1N968B	1N957		D8
1N5541	1N969	1N957		D8
1N5541A	1N969A	1N957		D8
1N5541B	1N969B	1N957		D8
1N5542	1N970	1N957		D8
1N5542A	1N970A	1N957		D8
1N5542B	1N970B	1N957		D8
1N5543	1N971	1N957		D8
1N5543A	1N971A	1N957		D8
1N5543B	1N971B	1N957		D8
1N5544	1N971	1N957		D8
1N5544A	1N971A	1N957		D8
1N5544B	1N971B	1N957		D8
1N5545	1N972	1N957		D8
1N5545A	1N972A	1N957		D8
1N5545B	1N972B	1N957		D8
1N5546	1N973	1N957		D8
1N5546A	1N973A	1N957		D8
1N5546B	1N973B	1N957		D8
1N5605	FDH333	FD300		D5
1N5606	FDH300	FD300		D5
1N5607	FDH300	FD300		D5
1N5608	FDH444	FD400		D4
1N5609	FDG444	FD400		D4
*1N5794	1N5794	1N5794	3-16	D10
*1N5795	1N5795	1N5794	3-16	D10
*1N5796	1N5796	1N5794	3-16	D10
*1N5797	1N5797	1N5794	3-16	D10
*1N5798	1N5798	1N5794	3-16	D10
*1S44	1S44	1S44	3-7	D6
*1S920	1S920	1S920	3-7	D4
2N160	2N2218	2N2218		SS15
2N160A	2N2218	2N2218		SS15
2N161	2N2218	2N2218		SS15
2N161A	2N2218	2N2218		SS15
2N162	2N2221	2N2218		SS15
2N162A	2N2221	2N2218		SS15
2N163	2N2221	2N2218		SS15
2N163A	2N2221	2N2218		SS15

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N258	2N2906	2N2904		SS22
2N259	2N2906	2N2904		SS22
2N260	2N2906	2N2904		SS22
2N260A	2N2906	2N2904		SS22
2N261	2N2906	2N2904		SS22
2N262	2N2906	2N2904		SS22
2N262A	2N2906	2N2904		SS22
2N263	2N2907	2N2904		SS22
2N264	2N2906	2N2904		SS22
2N327	2N2906	2N2904		SS22
2N327A	2N2906	2N2904		SS22
2N327B	2N2906	2N2904		SS22
2N328	2N2906	2N2904		SS22
2N328A	2N2906	2N2904		SS22
2N328B	2N2906	2N2904		SS22
2N329	2N2906	2N2904		SS22
2N329A	2N2906	2N2904		SS22
2N329B	2N2906	2N2904		SS22
2N330	2N2906	2N2904		SS22
2N330A	2N2906	2N2904		SS22
2N332	2N2221	2N2218		SS15
2N332A	2N2218	2N2218		SS15
2N333	2N2221	2N2218		SS15
2N333A	2N2218	2N2218		SS15
2N334	2N2221	2N2218		SS15
2N334A	2N2218	2N2218		SS15
2N334B	2N2218	2N2218		SS15
2N335	2N2221	2N2218		SS15
2N335A	2N2218	2N2218		SS15
2N335B	2N2218	2N2218		SS15
2N336	2N2221	2N2218		SS15
2N336A	2N2218	2N2218		SS15
2N337	2N2221	2N2218		SS15
2N337A	2N2218	2N2218		SS15
2N338	2N2221	2N2218		SS15
2N338A	2N2218	2N2218		SS15
2N354	2N2906	2N2904		SS22
2N355	2N2906	2N2904		SS22
2N389	2N5068	2N5067		PWR6
2N389A	2N5068	2N5067		PWR6
2N424	2N5069	2N5067		PWR6
2N424A	2N5069	2N5067		PWR6
2N470	2N2221	2N2218		SS15
2N471	2N2221	2N2218		SS15
2N471A	2N2221	2N2218		SS15
2N472	2N2221	2N2218		SS15
2N472A	2N2221	2N2218		SS15
2N473	2N2221	2N2218		SS15
2N474	2N2221	2N2218		SS15
2N474A	2N2221	2N2218		SS15
2N475	2N2221	2N2218		SS15
2N475A	2N2221	2N2218		SS15
2N476	2N2221	2N2218		SS15
2N477	2N2221	2N2218		SS15
2N478	2N2221	2N2218		SS15
2N479	2N2221	2N2218		SS15
2N479A	2N2221	2N2218		SS15
2N480	2N2221	2N2218		SS15
2N480A	2N2221	2N2218		SS15
2N497	2N1893	2N1893		SS17
2N497A	2N1893	2N1895		SS17
2N498	2N5681	2N5681		PWR3
2N498A	2N5681	2N5681		PWR3
2N541	2N2221	2N2218		SS15
2N541A	2N2221	2N2218		SS15
2N542	2N2221	2N2218		SS15
2N542A	2N2221	2N2218		SS15
2N543	2N2221	2N2218		SS15
2N543A	2N2221	2N2218		SS15
2N545	2N4238	2N4237		PWR5
2N546	2N4237	2N4237		PWR5
2N547	2N4238	2N4237		PWR5
2N548	2N4237	2N4237		PWR5
2N549	2N4238	2N4237		PWR5
2N550	2N4237	2N4237		PWR5
2N551	2N1893	2N1893		SS17
2N552	2N2218	2N2218		SS15
2N619	2N2221A	2N2218A		SS15
2N620	2N2221	2N2218		SS15
2N621	2N2221	2N2218		SS15
2N656	2N1893	2N1893		SS17
2N656A	2N1893	2N1893		SS17
2N657	2N657		3-33	SS17
2N657A	2N5681	2N5679		PWR13
2N696	2N2218	2N2218		SS15
2N696A	2N2218	2N2218		SS15
2N697	2N697		3-20	SS15
2N697A	2N2218	2N2218		SS15
2N698	2N1893	2N1893		SS17
2N699	2N699		3-21	SS17
2N699A	2N1893	2N1893		SS17
2N699B	2N1893	2N1893		SS17
2N702	2N3946	2N3946		SS14
2N703	2N3946	2N3946		SS14
*2N706	2N706	2N706	3-17	SS5
*2N706A	2N706A	2N706	3-17	SS28
2N706B	2N706B		3-17	SS28
2N706C	2N2368			SS28
2N707	CF			
2N707A	CF			
2N708	2N708		3-17	SS5
*2N709	2N709	2N709	3-17	SS29
2N709A	FT709	2N709		SS29
2N715	2N2221	2N2218		SS15
2N716	2N2221	2N2218		SS15
2N717	2N2221	2N2218		SS15

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N718	2N718		3-20	SS15
*2N718A	2N718A	2N718A	3-20	SS15
2N719	2N719		3-21	SS17
2N719A	2N719A		3-21	SS17
2N720	2N720		3-21	SS17
2N720A	2N720A		3-21	SS17
2N721	2N2906	2N2904		SS22
2N721A	2N2906	2N2904		SS22
2N722	2N722		3-25	SS22
2N722A	2N2906	2N2904		SS22
2N726	2N3250	2N3250		
2N727	2N3250	2N3250		
2N730	2N2218	2N2218		SS15
2N731	2N2221	2N2218		SS15
2N734	2N2484	2N2484		SS8
2N734A	2N2484	2N2484		SS8
2N735	2N2484	2N2484		SS8
2N735A	2N2484	2N2484		SS8
2N736	2N2484	2N2484		SS8
2N736A	2N2484	2N2484		SS8
2N736B	2N2484	2N2484		SS8
2N742	2N2484	2N2484		SS8
2N742A	2N2484	2N2484		SS8
2N743	2N2368			SS28
2N743A	2N2368			SS28
2N744	2N744		3-17	SS28
2N744A	2N2369A	2N2369		SS28
2N745	2N2221	2N2218		SS15
2N746	2N2221	2N2218		SS15
2N747	2N2221	2N2218		SS15
2N748	2N2221	2N2218		SS15
2N749	2N2221	2N2218		SS15
2N751	2N2221	2N2218		SS15
2N752	2N2221A	2N2218A		SS15
2N753	2N2369A	2N2369	3-17	SS28
2N754	2N720A			SS17
2N755	2N720A			SS17
2N756	2N930	2N930		SS8
2N756A	2N2484	2N2484		SS8
2N757	2N930	2N930		SS8
2N757A	2N2484	2N2484		SS8
2N758	2N930	2N930		SS8
2N758A	2N2484	2N2484		SS8
2N758B	2N2484	2N2484		SS8
2N759	2N930	2N930		SS8
2N759A	2N2484	2N2484		SS8
2N759B	2N2484	2N2484		SS8
2N760	2N930	2N930		SS8
2N760A	2N2484	2N2484		SS8
2N760B	2N2484	2N2484		SS8
2N761	2N930	2N930		SS8
2N762	2N930	2N930		SS8
2N770	2N3013	2N3009		SS5
2N771	2N3013	2N3009		SS5
2N772	2N3013	2N3009		SS5
2N773	2N3013	2N3009		SS5
2N774	2N3013	2N3009		SS5
2N775	2N3013	2N3009		SS5
2N776	2N3013	2N3009		SS5
2N777	2N3013	2N3009		SS5
2N778	2N3013	2N3009		SS5
2N780	2N930	2N930		SS8
2N783	2N834	2N834		SS28
2N784	2N834	2N834		SS28
2N784A	2N834	2N834		SS28
2N789	2N3946	2N3946		SS14
2N790	2N3946	2N3946		SS14
2N791	2N3946	2N3946		SS14
2N792	2N3946	2N3946		SS14
2N793	2N3946	2N3946		SS14
*2N834	2N834	2N834	3-17	SS28
2N834A	2N4137			SS28
2N835	2N4137			SS28
2N839	2N3946	2N3946		SS14
2N840	2N3946	2N3946		SS14
2N841	2N3947	2N3946		SS14
2N842	2N3946	2N3946		SS14
2N843	2N3946	2N3946		SS14
2N844	2N720A			SS17
2N845	2N720A			SS17
2N847	2N2369A	2N2369		SS28
2N849	2N2368			SS28
2N850	2N2369A	2N2369		SS28
2N851	2N2368			SS28
2N852	2N2369A	2N2369		SS28
2N858	2N2906	2N2904		SS22
2N859	2N2906	2N2904		SS22
2N860	2N2906	2N2904		SS22
2N861	2N2906	2N2904		SS22
2N862	2N2906	2N2904		SS22
2N863	2N2906	2N2904		SS22
2N864	2N2906	2N2904		SS22
2N864A	2N2906	2N2904		SS22
2N865	2N2906	2N2904		SS22
2N865A	2N2906	2N2904		SS22
2N866	2N2906	2N2904		SS22
2N867	2N2906	2N2904		SS22
2N869	2N869		3-25	SS30
2N869A	2N869A		3-25	SS30
2N870	2N871			SS17
2N871	2N871		3-20	SS17
2N902	2N2221	2N2218		SS15
2N903	2N2221	2N2218		SS15
2N904	2N2221	2N2218		SS15
2N905	2N2221	2N2218		SS15
2N906	2N2221	2N2218		SS15

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2N907	2N2221	2N2218		SS15
2N908	2N2221	2N2218		SS15
2N909	2N2222	2N2218		SS15
2N910	2N2484	2N930		SS8
2N911	2N2484	2N930		SS8
2N912	2N2484	2N930		SS8
2N914	2N914		3-17	SS5
2N914A	2N2369A	2N2369		SS28
2N915	2N915		3-20	SS14
2N915A	2N3946	2N3946		SS14
2N916	2N916		3-20	SS14
2N916A	2N3946	2N3946		SS14
2N916B	2N3946	2N3946		SS14
2N917	2N918	2N918		SS27
2N917A	2N918	2N918		SS27
*2N918	2N918	2N918	3-34	SS27
2N919	2N834	2N834		SS28
2N920	2N834	2N834		SS28
2N921	2N834	2N834		SS28
2N922	2N834	2N834		SS28
2N923	2N2906	2N2904		SS22
2N924	2N2906	2N2904		SS22
2N925	2N2906	2N2904		SS22
2N926	2N2906	2N2904		SS22
2N927	2N2906	2N2904		SS22
2N928	2N2906	2N2904		SS22
2N929	2N930	2N930		SS8
2N929A	2N2484	2N2484		SS8
*2N930	2N930	2N930	3-29	SS8
2N930A	2N2484	2N2484		SS8
2N930B	2N2484	2N2484		SS8
2N935	2N2906	2N2904		SS22
2N936	2N2906	2N2904		SS22
2N937	2N2906	2N2904		SS22
2N938	2N2906	2N2904		SS22
2N939	2N2906	2N2904		SS22
2N940	2N2906	2N2904		SS22
2N941	2N2906	2N2904		SS22
2N942	2N2906	2N2904		SS22
2N943	2N2906	2N2904		SS22
2N944	2N2906	2N2904		SS22
2N945	2N2906	2N2904		SS22
2N946	2N2906	2N2904		SS22
2N947	2N834	2N834		SS28
*2N956	2N956	2N718A	3-20	
2N957	2N3014	2N3009		SS5
2N958	2N2369A	2N2369		SS28
2N959	2N2369A	2N2369		SS28
2N978	2N2906	2N2904		SS22
2N981	2N720A			SS17
2N988	2N2221	2N2218		SS15
2N989	2N2221	2N2218		SS15
2N995	2N3250	2N3250		

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N955A	2N3250	2N3250		
2N996	2N3251	2N3250		
*2N997	2N997	2N997	3-44	
*2N988	2N998	2N998	3-44	
*2N999	2N999	2N999	3-44	
2N1005	2N3013	2N3009		SS5
2N1006	2N3013	2N3009		SS5
2N1047	2N4912	2N4910		PWR5
2N1047A	2N4912	2N4910		PWR5
2N1047B	2N4912	2N4910		PWR5
2N1047C	2N4912	2N4910		PWR5
2N1049	2N4912	2N4910		PWR5
2N1049A	2N4912	2N4910		PWR5
2N1049B	2N4912	2N4910		PWR5
2N1049C	2N4912	2N4910		PWR5
2N1051	2N2218	2N2218		SS15
2N1054	2N3923	2N3923		SS16
2N1055	2N3923	2N3923		SS16
2N1067	2N4237	2N4237		PWR5
2N1068	2N4237	2N4237		PWR5
2N1069	2N5067	2N5067		PWR6
2N1070	2N5067	2N5067		PWR6
2N1072	2N3766	2N3766		PWR18
2N1074	2N2218	2N2218		SS15
2N1075	2N2218	2N2218		SS15
2N1076	2N2218	2N2218		SS15
2N1077	2N2218	2N2218		SS15
2N1079	2N5068	2N5067		PWR6
2N1080	2N4914	2N4913		PWR6
2N1081	2N2221	2N2218		SS15
2N1082	2N2221	2N2218		SS15
2N1092	2N4237	2N4237		PWR5
2N1105	2N1893	2N1893		SS17
2N1106	2N5681	2N5679		PWR13
2N1116	2N3020	2N3019		SS17
2N1117	2N1893	2N1893		SS17
2N1118	2N3250	2N3250		
2N1118A	2N3250	2N3250		
2N1131	2N1132			SS22
2N1131A	2N2904	2N2904		SS22
2N1132	2N1132		3-25	SS22
2N1132A	2N2904	2N2904		SS22
2N1132B	2N2904	2N2904		SS22
2N1135	2N2369A	2N2369		SS28
2N1135A	2N2369A	2N2369		SS28
2N1139	2N3946	2N3946		SS14
2N1149	2N2221A	2N2218A		SS15
2N1150	2N2221A	2N2218A		SS15
2N1151	2N2221A	2N2218A		SS15
2N1152	2N2221A	2N2218A		SS15
2N1153	2N2221A	2N2218A		SS15
2N1199	2N2368			SS28
2N1199A	2N2368			SS28

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2N1206	2N3020	2N3019		SS17
2N1210	2N4232	2N4231		PWR5
2N1211	2N4233	2N4231		PWR5
2N1212	2N5477			PWR4
2N1219	2N3250	2N3250		
2N1220	2N3250	2N3250		
2N1221	2N3250	2N3250		
2N1222	2N3250	2N3250		
2N1223	2N3250	2N3250		
2N1228	2N2904	2N2904		SS22
2N1229	2N2904	2N2904		SS22
2N1230	2N2904	2N2904		SS22
2N1231	2N2904	2N2904		SS22
2N1232	2N2904A	2N2904		SS22
2N1233	2N2904A	2N2904		SS22
2N1234	CF			
2N1235	CF			
2N1238	2N3467	2N3467		SS7
2N1239	2N3467	2N3467		SS7
2N1240	2N3467	2N3467		SS7
2N1241	2N3467	2N3467		SS7
2N1250	2N4914	2N4913		PWR6
2N1252	2N3724	2N3724		SS13
2N1252A	2N3724	2N3724		SS13
2N1253	2N3724	2N3724		SS13
2N1253A	2N3724	2N3724		SS13
2N1260	CF			
2N1267	2N2369A	2N2369		SS28
2N1268	2N2369A	2N2369		SS28
2N1269	2N2369A	2N2369		SS28
2N1270	2N2369A	2N2369		SS28
2N1271	2N2369A	2N2369		SS28
2N1272	2N2369A	2N2369		SS28
2N1335	2N2218A	2N2218A		SS15
2N1336	2N2218A	2N2218A		SS15
2N1337	2N2218A	2N2218A		SS15
2N1338	2N2218A	2N2218A		SS15
2N1339	2N1893	2N1893		SS17
2N1340	2N1893	2N1893		SS17
2N1341	2N1893	2N1893		SS17
2N1342	2N1893	2N1893		SS17
2N1386	2N2222	2N2218		SS15
2N1387	2N2222	2N2218		SS15
2N1388	2N2222	2N2218		SS15
2N1389	2N2222A	2N2218A		SS15
2N1390	2N2222	2N2218		SS15
2N1420	2N2219	2N2218		SS15
2N1420A	2N2219	2N2218		SS15
2N1439	2N2906A	2N2904		SS22
2N1440	2N2906A	2N2904		SS22
2N1441	2N2906	2N2904		SS22
2N1442	2N2906	2N2904		SS22
2N1443	2N2906	2N2904		SS22
2N1444	2N3724	2N3724		SS13
2N1445	2N5682	2N5679		PWR13
2N1469	2N2906	2N2904		SS22
2N1470	2N5068	2N5067		PWR6
2N1474	2N2906A	2N2904		SS22
2N1474A	2N2906A	2N2904		SS22
2N1475	2N2906A	2N2904		SS22
2N1476	CF			
2N1477	CF			
2N1479	2N4237	2N4237		PWR5
2N1480	2N4238	2N4237		PWR5
2N1481	2N4237	2N4237		PWR5
2N1482	2N4238	2N4237		PWR5
2N1483	2N4231	2N4231		PWR5
2N1484	2N4232	2N4231		PWR5
2N1485	2N4231	2N4231		PWR5
2N1486	2N4232	2N4231		PWR5
2N1487	2N4913	2N4913		PWR6
2N1488	2N4914	2N4913		PWR6
2N1489	2N4913	2N4913		PWR6
2N1490	2N4914	2N4913		PWR6
2N1491	2N2218	2N2218		SS15
2N1492	2N2218A	2N2218A		SS15
2N1493	2N3923	2N3923		SS16
2N1505	2N2218	2N2218		SS15
2N1506	2N2218	2N2218		SS15
2N1506A	2N2218A	2N2218A		SS15
2N1507	2N2219	2N2218		SS15
2N1508	2N3020	2N3019		SS17
2N1509	2N3020	2N3019		SS17
2N1511	2N4913	2N4913		PWR6
2N1512	2N4914	2N4913		PWR6
2N1513	2N4913	2N4913		PWR6
2N1514	2N4914	2N4913		PWR6
2N1528	2N2218	2N2218		SS15
2N1564	2N1893	2N1893		SS17
2N1565	2N1893	2N1893		SS17
2N1566	2N1893	2N1893		SS17
2N1566A	2N1893	2N1893		SS17
2N1572	2N1893	2N1893		SS17
2N1573	2N1893	2N1893		SS17
2N1574	2N1893	2N1893		SS17
2N1586	2N3946	2N3946		SS14
2N1587	2N3946	2N3946		SS14
2N1588	2N3946	2N3946		SS14
2N1589	2N3946	2N3946		SS14
2N1590	2N3946	2N3946		SS14
2N1591	2N3946	2N3946		SS14
2N1592	2N3946	2N3946		SS14
2N1593	2N3946	2N3946		SS14
2N1594	2N3946	2N3946		SS14
*2N1613	2N1613	2N718A	3-18	
2N1613A	2N2218	2N2218		SS15

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2N1613B	2N3020	2N3019		SS17
2N1615	2N3923	2N3923		SS16
2N1623	2N2906	2N2904		SS22
2N1647	2N5477			PWR4
2N1648	2N5479			PWR4
2N1649	2N5477			PWR4
2N1650	2N5477			PWR4
2N1654	2N3923	2N3923		SS16
2N1655	2N3923	2N3923		SS16
2N1656	2N2923	2N3923		SS16
2N1657	2N5320	2N5320		PWR2
2N1679	2N5335	2N4895		PWR1
2N1680	2N5334	2N4895		PWR1
2N1690	2N4912	2N4231		PWR5
2N1691	CF			
2N1700	2N4237	2N4237		PWR5
2N1701	2N4910	2N4231		PWR5
2N1702	2N5067	2N5067		PWR6
2N1703	2N5067	2N5067		PWR6
2N1704	2N2218	2N2218		SS15
2N1708	2N3013	2N3009		SS5
2N1708A	2N3013	2N3009		SS5
*2N1711	2N1711	2N718A	3-20	
2N1711A	2N2219A	2N2218A		SS15
2N1711B	2N2219A	2N2218A		SS15
2N1714	2N4237	2N4237		PWR5
2N1715	2N5681	2N5679		PWR13
2N1716	2N4237	2N4237		PWR5
2N1717	2N5681	2N5679		PWR13
2N1718	2N3766	2N3766		PWR18
2N1719	2N3767	2N3766		PWR18
2N1720	2N3766	2N3766		PWR18
2N1721	2N3767	2N3766		PWR18
2N1722	CF			
2N1722A	CF			
2N1723	CF			
2N1764	2N2369A	2N2369		SS28
2N1768	2N4231	2N4231		PWR5
2N1769	2N4232	2N4231		PWR5
2N1837	2N2218	2N2218		SS15
2N1837A	2N2218	2N2218		SS15
2N1837B	2N2218	2N2218		SS15
2N1838	2N2218	2N2218		SS15
2N1839	2N2218	2N2218		SS15
2N1840	2N2218	2N2218		SS15
2N1841	2N5320	2N5320		PWR2
2N1886	2N4911	2N4231		PWR5
2N1889	2N1893	2N1893		SS17
2N1890	2N3019	2N3019		SS17
*2N1893	2N1893	2N1893	3-21	SS17
2N1894	2N4238	2N4237		PWR5
2N1895	2N4239	2N4237		PWR5
2N1896	2N5336	2N5336		PWR4
2N1897	2N5336	2N5336		PWR4
2N1898	2N5338	2N5336		PWR4
2N1923	2N1893	2N1893		SS17
2N1941	2N2218	2N2218		SS15
2N1943	2N3020	2N3019		SS17
2N1944	2N2219	2N2218		SS15
2N1945	2N2219	2N2218		SS15
2N1946	2N2219A	2N2218A		SS15
2N1947	CF			
2N1948	CF			
2N1949	CF			
2N1950	CF			
2N1951	CF			
2N1952	CF			
2N1953	2N2218	2N2218		SS15
2N1958	2N3724	2N3724		SS13
2N1958A	2N3724	2N3724		SS13
2N1959	2N3724	2N3724		SS13
2N1959A	2N3724	2N3724		SS13
2N1972	2N2219	2N2218		SS15
2N1973	2N3019	2N3019		SS17
2N1974	2N1893	2N1893		SS17
2N1975	2N1893	2N1893		SS17
2N1983	2N2219	2N2218		SS15
2N1984	2N2218	2N2218		SS15
2N1985	2N2218	2N2218		SS15
2N1986	2N2218	2N2218		SS15
2N1987	2N2218	2N2218		SS15
2N1988	2N2218A	2N2218A		SS15
2N1989	2N2218A	2N2218A		SS15
2N1990	2N4410	2N4409		SS16
2N1991	2N2904	2N2904		SS15
2N1992	2N2221	2N2218		SS15
2N2008	2N3923	2N3923		SS16
2N2015	2N5881	2N5881		PWR7
2N2016	2N5882	2N5881		PWR7
2N2017	2N1893	2N1893		SS17
2N2018	CF			
2N2019	CF			
2N2020	CF			
2N2021	CF			
2N2032	2N4232	2N4231		PWR5
2N2033	2N3020	2N3019		SS17
2N2034	2N4238	2N4237		PWR5
2N2035	2N4232	2N4231		PWR5
2N2036	2N4232	2N4231		PWR5
2N2038	2N3053	2N3053		
2N2039	2N1893	2N1893		SS17
2N2040	2N3053	2N3053		
2N2041	2N1893	2N1893		SS17
2N2049	2N2219A	2N2218A		SS15
2N2086	2N3020	2N3019		SS17
2N2087	2N3020	2N3019		SS17
2N2106	2N1893	2N1893		SS17

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2N2107	2N1893	2N1893		SS17
2N2108	2N1893	2N1893		SS17
2N2192	2N2219A	2N2218A		SS15
2N2192A	2N2219A	2N2218A		SS15
2N2192B	2N2219A	2N2219A		SS15
2N2193	2N2218A	2N2218A		SS15
2N2193A	2N2218A	2N2218A		SS15
2N2193B	2N2218A	2N2218A		SS15
2N2194	2N2218A	2N2218A		SS15
2N2194A	2N2218A	2N2218A		SS15
2N2194B	2N2218A	2N2218A		SS15
2N2195	2N2218	2N2218		SS15
2N2195A	2N2218	2N2218		SS15
2N2195B	2N2218	2N2218		SS15
2N2196	2N3766	2N3766		PWR18
2N2197	2N3766	2N3766		PWR18
2N2198	2N1893	2N1893		SS17
2N2201	2N5681	2N5679		PWR3
2N2202	2N5681	2N5679		PWR3
2N2203	2N5681	2N5679		PWR3
2N2204	2N5681	2N5679		PWR3
2N2205	2N2368			SS28
2N2206	2N2369A	2N2369		SS28
2N2214	2N2368			SS28
2N2216	2N3923	2N3923		SS16
2N2217	2N2218	2N2218		SS15
*2N2218	2N2218	2N2218	3-20	SS15
*2N2218A	2N2218A	2N2218A	3-20	SS15
*2N2219	2N2219	2N2218	3-20	SS15
*2N2219A	2N2219A	2N2218A	3-20	SS15
2N2220	2N2221	2N2218		SS15
*2N2221	2N2221	2N2218	3-20	SS15
*2N2221A	2N2221A	2N2218A	3-20	SS15
*2N2222	2N2222	2N2218	3-20	SS15
*2N2222A	2N2222A	2N2218A	3-20	SS15
2N2222B	2N2222A	2N2218A		SS15
2N2236	2N2218	2N2218		SS15
2N2237	2N2218	2N2218		SS15
2N2239	2N4232	2N4231		PWR5
2N2240	2N2218	2N2218		SS15
2N2241	2N2219	2N2218		SS15
2N2242	2N3013	2N3009		SS5
2N2243	2N3020	2N3019		SS17
2N2243A	2N3020	2N3019		SS17
2N2270	2N2270		3-20	
2N2272	2N2222	2N2218		SS15
2N2297	2N3020	2N3019		SS17
2N2303	2N2905	2N2904		SS22
2N2304	2N4910	2N4231		PWR5
2N2305	2N5068	2N5067		PWR6
2N2308	2N4912	2N4231		PWR5
2N2309	2N2218	2N2218		SS15
2N2310	2N1893	2N1893		SS17
2N2311	2N5681	2N5679		PWR3
2N2312	2N1893	2N1893		SS17
2N2313	2N5681	2N5679		PWR3
2N2314	2N2221A	2N2218A		SS15
2N2315	2N2221A	2N2218A		SS15
2N2316	2N1893	2N1893		SS17
2N2317	2N1613	2N1613		
2N2318	2N930	2N930		SS8
2N2319	2N930	2N930		SS8
2N2320	2N930	2N930		SS8
2N2339	2N4910	2N4231		PWR5
2N2340	2N5320	2N5320		PWR2
2N2341	2N5320	2N5320		PWR2
2N2342	2N5320	2N5320		PWR2
2N2343	2N5320	2N5320		PWR2
2N2349	2N930	2N930		SS8
2N2350	2N2222A	2N2218A		SS15
2N2350A	2N2222A	2N2218A		SS15
2N2351	2N2221A	2N2218A		SS15
2N2351A	2N2221A	2N2218A		SS15
2N2352	2N2221A	2N2218A		SS15
2N2352A	2N2221A	2N2218A		SS15
2N2353	2N2221	2N2218		SS15
2N2353A	2N2221	2N2218		SS15
2N2364	2N3020	2N3019		SS17
2N2364A	2N3020	2N3019		SS17
2N2368	2N2368		3-17	SS28
*2N2369	2N2369	2N2369	3-17	SS28
*2N2369A	2N2369A	2N2369	3-17	SS28
2N2377	2N3250	2N3250		
2N2378	2N3250	2N3250		
2N2380	2N2218A	2N2218A		SS15
2N2380A	2N2218A	2N2218A		SS15
2N2383	2N4914	2N4913		PWR6
2N2384	2N4914	2N4913		PWR6
2N2389	2N1613	2N718A		
2N2390	2N1711	2N718A		
2N2391	2N3250	2N3250		
2N2392	2N3250	2N3250		
2N2393	2N2904	2N2904		SS22
2N2394	2N2904	2N2904		SS22
2N2395	2N2218	2N2218		SS15
2N2396	2N2218	2N2218		SS15
2N2397	2N2369A	2N2369		SS28
2N2405	2N2405		3-20	SS13
2N2410	2N3724	2N3724		
2N2411	2N2894	2N2894		
2N2412	2N2894	2N2894		SS30
2N2413	2N2221	2N2218		SS15
2N2424	2N3250	2N3250		
2N2425	2N3250	2N3250		
2N2433	2N1613	2N1613		
2N2434	2N1711	2N718A		

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2N2435	2N3020	2N3019		SS17
2N2436	2N3019	2N3019		SS17
2N2437	2N3020	2N3019		SS17
2N2438	2N3020	2N3019		SS17
2N2439	2N3019	2N3019		SS17
2N2440	2N3019	2N3019		SS17
2N2443	2N3923	2N3923		SS16
2N2475	2N709	2N709		SS29
2N2476	2N3724	2N3724		SS13
2N2477	2N3724	2N3724		SS13
2N2478	2N2218A	2N2218		SS15
2N2479	2N2218A	2N2218		SS15
2N2481	2N2481		3-17	SS28
2N2483	2N2484	2N2484		
*2N2484	2N2484	2N2484	3-29	SS8
2N2501	2N3014	2N3009		SS8
2N2509	2N2484	2N2484		SS8
2N2510	2N2484	2N2484		SS8
2N2511	2N2484	2N2484		SS8
2N2529	2N930	2N930		SS8
2N2530	2N930	2N930		SS8
2N2531	2N930	2N930		SS8
2N2532	2N930	2N930		SS8
2N2533	2N930	2N930		SS8
2N2534	2N930	2N930		SS8
2N2537	2N3724	2N3724		SS13
2N2538	2N3724	2N3724		SS13
2N2539	2N3724	2N3724		SS13
2N2540	2N3724	2N3724		SS13
2N2551	CF			
2N2585	2N3117	2N2484		SS8
2N2594	2N5321	2N5320		PWR2
2N2595	2N2906A	2N2904		SS22
2N2596	2N2906A	2N2904		SS22
2N2597	2N2906A	2N2904		SS22
2N2598	CF			
2N2599	CF			
2N2599A	CF			
2N2600	CF			
2N2600A	CF			
2N2601	2N2906A	2N2904		SS22
2N2602	2N2906A	2N2904		SS22
2N2603	2N2906A	2N2904		SS22
2N2604	2N3962	2N3962		SS33
2N2605	2N3962	2N3962		SS33
2N2605A	2N3962	2N3962		SS33
2N2610	2N930	2N930		SS8
2N2611	2N3766	2N3766		PWR18
2N2615	2N918	2N918		SS27
2N2616	2N918	2N918		SS27
2N2617	2N3250	2N3250		
2N2618	2N2218	2N2218		SS15
*2N2639	2N2639	2N2639	3-41	SS8
*2N2640	2N2640	2N2639	3-41	SS8
*2N2641	2N2641	2N2639	3-43	SS8
*2N2642	2N2642	2N2639	3-41	SS8
*2N2643	2N2643	2N2639	3-41	SS8
*2N2644	2N2644	2N2639	3-43	SS8
2N2645	2N956	2N718A		SS15
2N2651	2N3014	2N3009		SS5
2N2655	2N5681	2N5679		PWR3
2N2656	2N930	2N930		SS8
2N2657	2N5336	2N5336		PWR4
2N2658	2N5336	2N5336		PWR4
2N2673	2N930	2N930		SS8
2N2674	2N930	2N930		SS8
2N2675	2N930	2N930		SS8
2N2676	2N930	2N930		SS8
2N2677	2N930	2N930		SS8
2N2678	2N930	2N930		SS8
2N2692	2N930	2N930		SS8
2N2693	2N930	2N930		SS8
2N2694	2N930	2N930		SS8
2N2695	2N2906	2N2904		SS22
2N2696	2N2906	2N2904		SS22
2N2709	2N2906	2N2904		SS22
2N2710	2N3014	2N3009		SS5
2N2711	MPS2711	MPS2711		SS14
2N2712	MPS2712	MPS2711		SS14
2N2713	MPS2713			SS15
2N2714	MPS2714			SS15
*2N2723	2N2723	2N2723	3-44	
*2N2724	2N2724	2N2723	3-44	
*2N2725	2N2725	2N2723	3-44	
2N2726	2N3440	2N3439		PWR8
2N2729	2N918	2N918		SS27
2N2785	2N999	2N999		
2N2787	2N2218A	2N2218A		SS15
2N2788	2N2218A	2N2218A		SS15
2N2789	2N2219A	2N2218A		SS15
2N2790	2N2221A	2N2218A		SS15
2N2791	2N2221A	2N2218A		SS15
2N2792	2N2222A	2N2218A		SS15
2N2800	2N2904A	2N2904		SS22
2N2801	2N2905A	2N2904		SS22
2N2811	2N5002	2N5002		PWR19
2N2812	2N5002	2N5002		PWR19
2N2813	2N5002	2N5002		PWR19
2N2814	2N5002	2N5002		PWR19
2N2829	2N5002	2N5002		PWR19
2N2831	2N2221	2N2218		SS15
2N2837	2N2906A	2N2904		SS22
2N2838	2N2907A	2N2904		SS22
2N2849	2N5337	2N5336		PWR4
2N2850	2N5336	2N5336		PWR4
2N2851	2N5336	2N5336		PWR4
2N2852	2N5335	2N5336		PWR4

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2N2853	2N5336	2N5336		PWR4
2N2854	2N5337	2N5336		PWR4
2N2855	2N5336	2N5336		PWR4
2N2856	2N5334	2N4895		PWR1
2N2858	2N5335	2N4895		PWR1
2N2859	2N5338	2N5336		PWR4
2N2861	2N3962	2N3962		SS33
2N2862	2N3962	2N3962		SS33
2N2863	2N2218	2N2218		SS15
2N2864	2N2218	2N2218		SS15
2N2866	2N5002	2N5002		PWR19
2N2867	2N5002	2N5002		PWR19
2N2868	2N2868		3-20	
2N2875	2N5003	2N5002		PWR11
2N2877	2N5002	2N5002		PWR19
2N2878	2N5002	2N5002		PWR19
2N2879	2N5002	2N5002		PWR19
2N2880	2N5002	2N5002		PWR19
2N2881	2N4235	2N4234		PWR14
2N2882	2N4236	2N4234		PWR14
2N2886	2N2218A	2N2218A		SS15
2N2890	2N5335	2N4895		PWR4
2N2891	2N5335	2N4895		PWR4
2N2892	2N5002	2N5002		PWR19
2N2893	2N5002	2N5002		PWR19
*2N2894	2N2894	2N2894	3-19	SS30
*2N2894A	2N2894A	2N2894	3-19	SS32
2N2895	CF			
2N2896	CF			
2N2897	CF			
2N2902	CF			
2N2903	2N2920	2N2920		SS8
2N2903A	2N2920	2N2920		SS8
*2N2904	2N2904	2N2904		SS22
*2N2904A	2N2904A	2N2904	3-25	SS22
*2N2905	2N2905	2N2904	3-25	SS22
*2N2905A	2N2905A	2N2904	3-25	SS22
*2N2906	2N2906	2N2904	3-25	SS22
*2N2906A	2N2906A	2N2904	3-26	SS22
*2N2907	2N2907	2N2904	3-25	SS22
*2N2907A	2N2907A	2N2904	3-25	SS22
2N2908	2N5069	2N5067		
2N2909	2N2221A	2N2218A		SS15
2N2911	2N3766	2N3766		
*2N2913	2N2913	2N2913	3-43	SS8
*2N2914	2N2914	2N2913	3-43	SS8
*2N2915	2N2915	2N2915	3-41	SS8
*2N2915A	2N2915A	2N2915	3-41	SS8
*2N2916	2N2916	2N2916	3-41	SS8
*2N2916A	2N2916A	2N2916	3-41	SS8
*2N2917	2N2917	2N2917	3-41	SS8
*2N2918	2N2918	2N2917	3-41	SS8
*2N2919	2N2919	2N2915	3-41	SS8
*2N2919A	2N2919A	2N2915	3-41	SS8
*2N2920	2N2920	2N2916	3-41	SS8
*2N2920A	2N2920A	2N2916	3-41	SS8
2N2922	MPS6512	MPS6512		SS14
2N2923	MPS2923	MPS2923		
2N2924	MPS2924	MPS2923		
2N2925	MPS2925	MPS2923		
2N2926	MPS2926	MPS2926		
2N2927	2N2904	2N2904		SS22
2N2936	2N2919	2N2915		SS8
2N2937	2N2919	2N2915		SS8
2N2938	2N2369A	2N2369		SS28
2N2939	2N3020	2N3019		SS17
2N2940	2N3019	2N3019		SS17
2N2941	CF			
2N2954	2N3014	2N3009		SS5
2N2960	2N2219	2N2218		SS15
2N2961	2N2219	2N2218		SS15
2N2968	2N3250	2N3250		
2N2969	2N3250	2N3250		
2N2970	2N3250	2N3250		
2N2971	2N3250	2N3250		
*2N2972	2N2972	2N2913	3-43	SS8
*2N2973	2N2973	2N2913	3-43	SS8
*2N2974	2N2974	2N2915	3-41	SS8
*2N2975	2N2975	2N2916	3-41	SS8
*2N2976	2N2976	2N2917	3-41	SS8
*2N2977	2N2977	2N2917	3-41	SS8
*2N2978	2N2978	2N2915	3-41	SS8
*2N2979	2N2979	2N2915	3-41	SS8
2N2983	2N5335	2N4895		PWR1
2N2984	2N5682	2N5679		
2N2985	2N5338	2N5336		PWR4
2N2986	2N5682	2N5679		PWR3
2N2987	2N5335	2N4895		PWR1
2N2988	2N5681	2N5679		PWR3
2N2989	2N5681	2N5679		
2N2990	2N5681	2N5679		PWR3
*2N3009	2N3009	2N3009	3-17	SS5
*2N3010	2N3010	2N709	3-17	SS29
*2N3011	2N3011	2N3011	3-17	SS28
*2N3012	2N3012	2N2894	3-19	SS30
*2N3013	2N3013	2N3009	3-17	SS5
*2N3014	2N3014	2N3009	3-17	SS5
2N3015	2N3015		3-17	
*2N3019	2N3019	2N3019	3-21	SS17
*2N3020	2N3020	2N3019	3-21	SS17
*2N3053	2N3053	2N3053	3-20	
2N3053A	2N3020	2N3019		SS17
*2N3054	2N3054	2N3054	3-36	PWR5
*2N3055	2N3055	2N3055	3-39	PWR6
2N3056	2N3020	2N3019		SS17
2N3056A	2N3020	2N3019		SS17

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2N3057	2N3019	2N3019		SS17
2N3057A	2N3019	2N3019		SS17
2N3072	2N3072		3-25	SS22
2N3073	2N3073		3-25	SS22
2N3077	2N2484	2N2484		SS8
2N3078	2N2483			SS8
2N3081	2N3020	2N3019		SS17
*2N3107	2N3107	2N3107	3-21	SS17
*2N3108	2N3108	2N3107	3-21	SS17
*2N3109	2N3109	2N3107	3-20	SS17
*2N3110	2N3110	2N3107	3-20	SS17
2N3114	2N3114		3-33	
2N3115	2N2221	2N2218		SS15
2N3116	2N2222	2N2218		SS15
*2N3117	2N3117	2N2484	3-29	SS8
2N3119	2N3020	2N3019		SS17
2N3120	2N2904	2N2904		SS22
2N3121	2N2906	2N2904		SS22
2N3122	2N2219	2N2218		SS15
2N3123	2N2219	2N2218		SS15
2N3133	2N2904	2N2904		SS22
2N3134	2N3134		3-25	SS22
2N3135	2N2906	2N2904		SS22
2N3136	2N2907	2N2904		SS22
*2N3137	2N3137	2N3137	3-34	SS2
2N3138	2N5002	2N5002		PWR19
2N3140	2N5002	2N5002		PWR19
2N3142	2N5002	2N5002		PWR19
2N3144	2N5002	2N5002		PWR19
2N3162	2N3411			SS15
2N3171	2N4901	2N4901		PWR15
2N3172	2N4902	2N4901		PWR15
2N3173	2N4903	2N4901		PWR15
2N3175	2N5003	2N5002		PWR11
2N3176	2N5003	2N5002		PWR11
2N3177	2N5003	2N5002		PWR11
2N3183	2N4904	2N4901		PWR15
2N3184	2N4905	2N4901		PWR15
2N3185	2N4906	2N4901		PWR15
2N3195	2N4904	2N4901		PWR15
2N3196	2N4905	2N4901		PWR15
2N3197	2N4906	2N4901		PWR15
2N3199	2N5003	2N5002		PWR11
2N3200	2N5003	2N5002		PWR11
2N3201	2N5003	2N5002		PWR11
2N3202	2N4234	2N4234		PWR14
2N3203	2N4235	2N4235		PWR14
2N3204	2N4236	2N4234		PWR14
2N3205	2N5003	2N5002		PWR11
2N3206	2N5003	2N5002		PWR11
2N3207	2N5003	2N5002		PWR11
2N3208	2N4234	2N4234		PWR14
*2N3209	2N3209	2N2894	3-19	SS30

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2N3210	2N3013	2N3009		SS5
2N3211	2N3013	2N3009		SS5
2N3220	2N5002	2N5002		PWR19
2N3221	2N5002	2N5002		PWR19
2N3222	2N5002	2N5002		PWR19
2N3223	2N5002	2N5002		PWR19
2N3224	2N3923	2N3923		SS16
2N3225	2N3923	2N3923		SS16
2N3226	2N4913	2N4913		PWR6
2N3227	2N4137			SS28
2N3232	2N4914	2N4913		PWR6
2N3235	2N3055	2N3055		PWR7
2N3237	2N5882	2N5881		PWR7
2N3238	2N5882	2N5881		PWR7
2N3239	2N5882	2N5881		PWR7
2N3241	2N2222	2N2218		SS15
2N3241A	2N2222	2N2218		SS15
2N3242	2N2222	2N2218		SS15
2N3242A	2N2222	2N2218		SS15
2N3244	2N3467	2N3467		SS7
2N3245	2N3468	2N3467		SS7
2N3246	2N2484	2N2484		SS8
2N3247	2N2484	2N2484		SS8
2N3248	2N2894	2N2894		SS30
2N3249	2N2894	2N2894		SS30
*2N3250	2N3250	2N3250	3-25	
*2N3250A	2N3250A	2N3250	3-25	
*2N3251	2N3251	2N3250	3-25	
*2N3251A	2N3251A	2N3250	3-25	
2N3252	2N3252		3-17	SS13
2N3253	2N3253		3-17	SS13
2N3299	2N3299		3-20	SS15
2N3300	2N3300		3-20	SS15
2N3301	2N3301		3-20	SS15
2N3302	2N3302		3-20	SS15
2N3304	2N3304		3-19	SS31
2N3326	2N2218A	2N2218A		SS15
2N3337	CF			
2N3338	CF			
2N3339	CF			
2N3347	2N4024	2N4020		SS33
2N3348	2N4024	2N4020		SS33
2N3349	2N4021	2N4020		SS33
2N3350	2N4025	2N4020		SS33
2N3351	2N4022	2N4020		SS33
2N3352	2N4019	2N4017		SS33
2N3374	2N3020	2N3020		SS17
2N3390	MPS6521	MPS2520		SS14
2N3391	MPS6515	MPS6512		SS14
2N3391A	MPS6520	MPS6520		SS14
2N3392	MPS3392	MPS3392		
2N3393	MPS3393	MPS3392		
2N3394	MPS3394	MPS3392		
2N3395	MPS3395	MPS3392		

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N3396	MPS3393	MPS3392		
2N3397	MPS3395	MPS3392		
2N3398	MPS3395	MPS3392		
2N3402	MPS6513	MPS6512		SS14
2N3403	MPS6515	MPS6512		SS14
2N3404	MPS6565	MPS6565		
2N3405	MPS6566	MPS6565		
*2N3409	2N3409	2N3409	3-41	SS15
*2N3410	2N3410	2N3409	3-41	SS15
*2N3411	2N3411	2N3409	3-41	SS15
2N3413	CF			
2N3414	MPS6513	MPS6512		
2N3415	MPS6515	MPS6512		
2N3416	MPS6565	MPS6565		
2N3417	MPS6566	MPS6565		
2N3418	2N5334	2N4895		PWR1
2N3419	2N5335	2N4895		PWR1
2N3420	2N5336	2N5336		PWR4
2N3421	2N5336	2N5336		PWR4
*2N3423	2N3423	2N3423	3-41	SS27
*2N3424	2N3424	2N3424	3-41	SS27
2N3425	2N3425		3-43	
*2N3439	2N3439	2N3439	3-36	PWR8
*2N3440	2N3440	2N3440	3-36	PWR8
2N3444	2N3444		3-17	SS13
2N3451	2N4208	2N4208		SS31
2N3464	2N2219A	2N2218A		SS15
*2N3467	2N3467	2N3467	3-19	SS7
*2N3468	2N3468	2N3467	3-19	SS7
2N3469	2N5337	2N5337		PWR4
2N3485	2N2906	2N2904		SS22
2N3485A	2N2906A	2N2904		SS22
2N3486	2N2907	2N2904		SS22
2N3486A	2N2907A	2N2904		SS22
2N3494	CF			
2N3495	CF			
2N3496	CF			
2N3497	CF			
2N3498	CF			
2N3499	CF			
2N3500	CF			
2N3501	CF			
2N3502	2N3502		3-25	SS22
2N3503	2N3503		3-25	SS22
2N3504	2N3504		3-25	SS22
2N3505	2N3505		3-25	SS22
2N3508	2N2369A	2N2369		SS28
2N3509	2N2369A	2N2369		SS28
2N3510	2N3510		3-17	SS5
2N3511	2N3511		3-17	SS5
2N3512	2N3724	2N3724		SS13
2N3521	2N2919	2N2915		SS8
2N3522	2N2978	2N2915		SS8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N3526	2N3114			
2N3545	2N3209	2N2894		
2N3546	2N3546		3-19	
2N3547	2N3962	2N3962		SS33
2N3548	2N3962	2N3962		SS33
2N3549	2N3962	2N3962		SS33
2N3550	2N3962	2N3962		SS33
2N3554	2N3724	2N3724		SS13
*2N3563	2N3563	2N918	3-35	SS27
*2N3564	2N3564	2N3564	3-35	SS2
*2N3565	2N3565	2N3565	3-29	SS8
*2N3566	2N3566	2N3566	3-22	SS15
*2N3567	2N3567	2N3567	3-23	
*2N3568	2N3568	2N3567	3-24	
*2N3569	2N3569	2N3567	3-23	
2N3576	2N4209	2N4208		SS31
2N3579	2N3962	2N3962		SS33
2N3580	2N3962	2N3962		SS33
2N3581	2N3962	2N3962		SS33
2N3582	2N3962	2N3962		SS33
2N3583	CF			
2N3584	CF			
2N3585	CF			
2N3587	2N2917	2N2917		SS8
2N3605	2N5769	2N2369		SS28
2N3605A	2N5769	2N2369		SS28
2N3606	2N5769	2N2369		SS28
2N3606A	2N5769	2N2369		SS28
2N3607	2N5769	2N2369		SS28
2N3634	CF			
2N3635	CF			
2N3636	CF			
2N3637	CF			
*2N3638	2N3638	2N3638	3-27	SS22
*2N3638A	2N3638A	2N3638	3-27	SS22
*2N3639	2N3639	2N3639	3-19	SS31
*2N3640	2N3640	2N3639	3-19	SS31
*2N3641	2N3641	2N3641	3-23	SS15
*2N3642	2N3642	2N3641	3-24	SS15
*2N3643	2N3643	2N3641	3-23	SS15
*2N3644	2N3644	2N3644	3-28	SS22
*2N3645	2N3645	2N3644	3-28	SS22
*2N3646	2N3646	2N3646	3-18	SS5
2N3647	2N3013	2N3009		SS5
2N3648	2N3013	2N3009		SS5
2N3660	2N5023	2N3467		
2N3661	2N5022	2N3467		
2N3662	2N5770	2N918		SS27
2N3663	2N5770	2N918		SS27
2N3665	2N3665		3-21	
2N3666	2N3666		3-21	
2N3667	2N5881	2N5881		PWR7
2N3671	2N2905A	2N2904		SS22

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N3672	2N2907A	2N2904		SS22
2N3673	2N2907A	2N2904		SS22
2N3675	2N4238	2N4237		PWR5
2N3676	2N4239	2N4237		PWR5
2N3678	2N3020	2N3019		SS17
2N3680	2N2920	2N2920		SS8
*2N3688	2N3688	2N3688	3-35	SS1
*2N3689	2N3689	2N3688	3-35	SS1
*2N3690	2N3690	2N3688	3-35	SS1
2N3691	2N3693	2N3693		
2N3692	2N3694	2N3693		
*2N3693	2N3693	2N3693	3-24	
*2N3694	2N3694	2N3693	3-23	
*2N3700	2N3700	2N3700	3-21	SS17
*2N3701	2N3701	2N3701	3-21	SS17
2N3702	MPS3702	MPS3702		
2N3703	MPS3703	MPS3702		
2N3704	MPS3704	MPS3704		
2N3705	MPS3705	MPS3704		
2N3706	MPS3706	MPS3704		
2N3707	MPS3707	MPS3707		
2N3708	MPS3708	MPS3708		
2N3709	MPS3709	MPS3709		
2N3710	MPS3710	MPS3710		
2N3711	MPS3711	MPS3711		
2N3712	2N3923	2N3923		SS16
*2N3713	2N3713	2N3713	3-39	PWR6
*2N3714	2N3714	2N3713	3-39	PWR6
*2N3715	2N3715	2N3713	3-39	PWR6
*2N3716	2N3716	2N3713	3-39	PWR6
2N3719	2N5679	2N5679		PWR13
2N3720	2N5679	2N5679		PWR13
*2N3722	2N3722	2N3722	3-17	SS9
2N3723	FT3723	2N3722		SS9
*2N3724	2N3724	2N3724	3-17	SS13
2N3724A	CF			
*2N3725	2N3725	2N3724	3-17	SS13
2N3725A	CF			
*2N3726	2N3726	2N3726	3-42	SS22
*2N3727	2N3727	2N3726	3-42	SS22
*2N3728	2N3728	2N3728	3-41	SS15
*2N3729	2N3729	2N3728	3-41	SS15
2N3734	2N3734		3-17	
2N3735	2N3725	2N3724		SS13
2N3736	2N4014	2N3724		
2N3737	2N4014	2N3724		
2N3738	CF			
2N3739	CF			
*2N3740	2N3740	2N3740	3-37	PWR14
2N3740A	2N3740A			PWR14
*2N3741	2N3741	2N3740	3-37	PWR14
2N3741A	2N3741A			PWR14
2N3742	SE7056	SE7055		SS11

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N3743	CF			
2N3744	2N5002	2N5002		PWR19
2N3745	2N5002	2N5002		PWR19
2N3746	2N5002	2N5002		PWR19
2N3747	2N5002	2N5002		PWR19
2N3748	2N5002	2N5002		PWR19
2N3749	2N5002	2N5002		PWR19
2N3750	2N5004	2N5002		PWR19
2N3751	2N5004	2N5002		PWR19
2N3752	2N5004	2N5002		PWR19
2N3762	2N5023	2N3467		SS7
2N3763	2N5022	2N3467		SS7
2N3764	2N5023	2N3467		SS7
2N3765	2N5022	2N3467		SS7
*2N3766	2N3766	2N3766		PWR18
*2N3767	2N3767	2N3766		PWR18
2N3771	2N3771			PWR7
2N3772	2N3772			PWR7
2N3774	2N4234	2N4234		PWR14
2N3775	2N4235	2N4235		PWR14
2N3776	2N4236	2N4234		PWR14
2N3777	2N5679	2N5679		PWR13
2N3778	2N4234	2N4234		PWR14
2N3779	2N4235	2N4234		PWR14
2N3780	2N4236	2N4234		PWR14
2N3781	2N5679	2N5679		PWR13
2N3782	2N4234	2N4234		PWR14
*2N3789	2N3789	2N3789	3-39	PWR15
*2N3790	2N3790	2N3789	3-39	PWR15
*2N3791	2N3791	2N3789	3-39	PWR15
*2N3792	2N3792	2N3789	3-39	PWR15
2N3793	MPS6530	MPS6530		SS15
2N3794	MPS6531	MPS6530		SS15
2N3798	2N3962	2N3962		SS33
2N3798A	2N3962	2N3962		SS33
2N3799	2N3965	2N3962		SS33
2N3799A	2N3965	2N3962		SS33
*2N3800	2N3800	2N3800	3-43	SS33
*2N3801	2N3801	2N3800	3-43	SS33
*2N3802	2N3802	2N3800	3-42	SS33
*2N3803	2N3803	2N3800	3-42	SS33
*2N3804	2N3804	2N3804	3-42	SS33
*2N3804A	2N3804A	2N3804	3-42	SS33
*2N3805	2N3805	2N3804	3-42	SS33
*2N3805A	2N3805A	2N3804	3-42	SS33
*2N3806	2N3806	2N3800	3-43	SS33
*2N3807	2N3807	2N3800	3-43	SS33
*2N3808	2N3808	2N3800	3-42	SS33
*2N3809	2N3809	2N3800	3-42	SS33
*2N3810	2N3810	2N3804	3-42	SS33
*2N3810A	2N3810A	2N3804	3-42	SS33
*2N3811	2N3811	2N3804	3-42	SS33
*2N3811A	2N3811A	2N3804	4-42	SS33

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N3819	2N5486	2N5484		
2N3825	2N5220	2N5220		SS15
2N3826	MPS6565	MPS6565		
2N3827	MPS6566	MPS6565		
2N3828	MPS6565	MPS6565		
2N3829	2N3250	2N3250		
2N3830	2N2218A	2N2218A		SS15
2N3831	2N2218A	2N2218A		SS15
2N3843	MPS6512	MPS6512		SS14
2N3843A	MPS6512	MPS6512		SS14
2N3844	MPS6512	MPS6512		SS14
2N3844A	MPS6512	MPS6512		SS14
2N3845	MPS6512	MPS6512		SS14
2N3845A	MPS6513	MPS6512		SS14
2N3850	2N5002	2N5002		PWR19
2N3851	2N5002	2N5002		PWR19
2N3852	2N5002	2N5002		PWR19
2N3853	2N5002	2N5002		PWR19
2N3854	MPS6512	MPS6512		SS14
2N3854A	MPS6512	MPS6512		SS14
2N3855	MPS6512	MPS6512		SS14
2N3855A	MPS6512	MPS6512		SS14
2N3856	MPS6513	MPS6512		SS14
2N3856A	MPS6513	MPS6512		SS14
2N3858	MPS6512	MPS6512		SS14
2N3858A	2N4409	2N4409		PWR15
2N3859	MPS6513	MPS6512		SS14
2N3859A	2N4409	2N4409		SS16
2N3860	MPS6514	MPS6512		SS14
2N3862	2N3946	2N3946		SS14
2N3863	2N3715	2N3713		PWR6
2N3877	2N4410	2N4409		SS16
2N3877A	2N4410	2N4409		SS16
2N3878	CF			
2N3879	CF			
2N3880	2N5770	2N918		SS27
2N3900	2N5210	2N5209		
2N3900A	2N5210	2N5209		
2N3901	2N5088	2N5088		
2N3902	CF			
*2N3903	2N3903	2N3903	3-23	SS14
*2N3904	2N3904	2N3903	3-23	SS14
*2N3905	2N3905	2N3905	3-27	SS23
*2N3906	2N3906	2N3905	3-27	SS23
2N3907	2N2915	2N2915		SS8
2N3908	2N2916	2N2916		SS8
2N3916	CF			
*2N3923	2N3923	2N3923	3-33	SS16
2N3930	CF			
2N3931	CF			
2N3932	2N5770	2N918		SS27
2N3933	2N5770	2N918		SS27
2N3941	2N2916	2N2916		SS8
2N3942	2N2918	2N2917		SS8
2N3943	2N2975	2N2916		SS8
2N3944	2N2977	2N2917		SS8
2N3945	2N2218A	2N2218A		SS15
*2N3946	2N3946	2N3946	3-20	SS14
*2N3947	2N3947	2N3946	3-20	SS14
2N3953	2N5770	2N918		SS27
*2N3962	2N3962	2N3962	3-31	SS33
2N3963	2N3962	2N3962		SS33
*2N3964	2N3964	2N3962	3-31	SS33
*2N3965	2N3965	2N3962	3-31	SS33
2N3973	2N4400	2N4400		SS15
2N3974	2N4401	2N4400		SS15
2N3975	2N4400	2N4400		SS15
2N3976	2N4401	2N4400		SS15
2N3981	2N2218	2N2218		SS15
2N3982	2N2218	2N2218		SS15
2N3983	2N5770	2N918		SS27
2N3984	2N5770	2N918		SS27
2N3985	2N5770	2N918		SS27
2N3996	2N5002	2N5002		PWR19
2N3997	2N5004	2N5002		PWR19
2N3998	2N5002	2N5002		PWR19
2N3999	2N5004	2N5002		PWR19
2N4000	2N3019	2N3019		SS17
2N4001	2N5681	2N5679		PWR3
*2N4013	2N4013	2N3724	3-17	SS13
*2N4014	2N4014	2N3724	3-17	SS13
*2N4015	2N4015	2N3726	3-42	SS22
*2N4016	2N4016	2N3726	3-42	SS22
*2N4017	2N4017	2N4017	3-43	SS33
*2N4018	2N4018	2N4017	3-43	SS33
*2N4019	2N4019	2N4017	3-43	SS33
*2N4020	2N4020	2N4020	3-42	SS33
*2N4021	2N4021	2N4020	3-42	SS33
*2N4022	2N4022	2N4020	3-42	SS33
*2N4023	2N4023	2N4020	3-42	SS33
*2N4024	2N4024	2N4020	3-42	SS33
*2N4025	2N4025	2N4020	3-42	SS33
2N4026	CF			
2N4027	CF			
2N4028	CF			
2N4029	CF			
*2N4030	2N4030	2N4030	3-25	SS24
*2N4031	2N4031	2N4030	3-26	SS24
*2N4032	2N4032	2N4030	3-25	SS24
*2N4033	2N4033	2N4030	3-26	SS24
*2N4034	2N4034	2N4034	3-25	
*2N4035	2N4035	2N4034	3-25	
2N4036	2N4036		3-26	
2N4037	2N4037		3-25	
2N4042	2N2920	2N2920		
2N4043	2N2916	2N2916		SS8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N4044	2N2920	2N2920		SS8
2N4045	2N2916	2N2916		SS8
2N4046	2N4046	2N3724	3-17	
2N4047	2N4047	2N3724	3-17	
2N4054	CF			
2N4056	CF			
2N4057	CF			
2N4058	MPS6522	MPS6522		SS23
2N4059	MPS6516	MPS6516		SS23
2N4060	MPS6516	MPS6516		SS23
2N4061	MPS6517	MPS6516		SS23
2N4062	MPS6518	MPS6516		SS23
2N4063	2N3439	2N3439		PWR8
2N4064	2N3440	2N3439		PWR8
2N4068	CF			
2N4069	CF			
2N4086	MPS6514	MPS6512		SS14
2N4087	MPS6515	MPS6512		SS14
2N4087A	MPS6515	MPS6512		SS14
2N4099	2N2918	2N2917		SS8
2N4100	2N2920	2N2920		SS8
2N4115	2N4115		3-38	PWR19
2N4116	2N4116		3-38	PWR19
*2N4121	2N4121	2N4121	3-27	SS23
*2N4122	2N4122	2N4121	3-27	SS23
*2N4123	2N4123	2N4123	3-22	SS14
*2N4124	2N4124	2N4123	3-22	SS14
*2N4125	2N4125	2N4125	3-27	SS23
*2N4126	2N4126	2N4125	3-27	SS23
2N4134	SE5020	SE5020		SS3
2N4135	SE5020	SE5020		SS3
2N4137	2N4137		3-17	
2N4140	2N4400	2N4400		SS15
2N4141	2N4401	2N4400		SS15
2N4142	2N4402	2N4402		SS22
2N4143	2N4403	2N4402		SS22
2N4150	2N5337	2N5336		PWR4
*2N4208	2N4208	2N4208	3-19	SS31
*2N4209	2N4209	2N4208	3-19	SS31
2N4225	2N5334	2N4895		PWR1
2N4226	2N5334	2N4895		PWR1
2N4227	2N4400	2N4400		SS15
2N4228	2N4402	2N4402		SS22
*2N4231	2N4231	2N4910	3-36	PWR5
*2N4232	2N4232	2N4910	3-36	PWR5
*2N4233	2N4233	2N4910	3-36	PWR5
*2N4234	2N4234	2N4234	3-36	PWR14
*2N4235	2N4235	2N4234	3-36	PWR14
*2N4236	2N4236	2N4234	3-36	PWR14
*2N4237	2N4237	2N4237	3-36	PWR5
*2N4238	2N4238	2N4237	3-36	PWR5
*2N4239	2N4239	2N4237	3-36	PWR5
2N4240	CF			

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
*2N4248	2N4248	2N4248	3-32	SS33
*2N4249	2N4249	2N4248	3-32	SS33
*2N4250	2N4250	2N4248	3-32	SS33
*2N4250A	2N4250A	2N4248	3-32	SS33
2N4252	2N918	2N918		SS27
2N4253	2N918	2N918		SS27
2N4254	2N918	2N918		SS27
2N4255	2N918	2N918		SS27
2N4256	2N3904	2N3903		SS14
2N4257	2N4258	2N4258		SS31
2N4257A	2N4258A	2N4258		SS31
*2N4258	2N4258	2N4258	3-19	SS31
*2N4258A	2N4258A	2N4258	3-19	SS31
*2N4264	2N4264	2N4264	3-18	SS5
*2N4265	2N4265	2N4264	3-18	SS5
2N4269	CF			
2N4270	2N3923	2N3923		SS16
2N4271	CF			
2N4272	CF			
*2N4274	2N4274	2N4274	3-18	SS28
*2N4275	2N4275	2N4274	3-18	SS28
2N4284	2N5086	2N5086		SS33
2N4285	2N5086	2N5086		SS33
2N4286	MPS6515	MPS6512		SS14
2N4287	MPS6566	MPS6565		
2N4288	MPS6518	MPS6516		SS23
2N4289	2N5086	2N5086		SS33
2N4290	MPS6533M	MPS6533M		SS22
2N4291	MPS6534M	MPS6533M		SS22
2N4292	2N5770	2N918		SS27
2N4293	2N5770	2N918		SS27
2N4294	2N5769	2N2369		SS28
2N4295	2N5769	2N2369		SS28
2N4296	CF			
2N4297	CF			
2N4298	CF			
2N4299	CF			
2N4300	2N5336	2N5336		PWR4
2N4302	2N5486	2N5484		
2N4303	2N5486	2N5484		
2N4304	2N5486	2N5484		
2N4305	2N4895	2N4895		PWR1
2N4307	2N4895	2N4895		PWR1
2N4309	2N4897	2N4895		PWR1
2N4311	2N4895	2N4895	3-19	PWR1
2N4313	2N4313			
*2N4342	2N4342	2N4342	3-40	SS34
*2N4343	2N4343	2N4342	3-40	SS34
2N4347	CF			
2N4348	CF			
*2N4354	2N4354	2N4354	3-28	SS24
*2N4355	2N4355	2N4354	3-28	SS24
*2N4356	2N4356	2N4354	3-28	SS24

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N4357	CF			
2N4358	CF			
2N4359	2N3964	2N3962		SS33
*2N4360	2N4360	2N4342	3-40	SS34
2N4387	2N4898	2N3740		
2N4388	2N4899	2N3740		
2N4389	2N4258	2N4258		SS31
2N4395	2N3715	2N3713		PWR6
2N4396	2N3715	2N3713		PWR6
*2N4398	2N4398	2N4398	3-39	
*2N4399	2N4399	2N4398	3-39	
*2N4400	2N4400	2N4400	3-23	SS15
*2N4401	2N4401	2N4400	3-23	SS15
*2N4402	2N4402	2N4402	3-28	SS22
*2N4403	2N4403	2N4402	3-28	SS22
2N4404	2N4031	2N4030		SS24
2N4405	2N4033	2N4030		SS24
2N4406	2N4031	2N4030		SS24
2N4407	2N4033	2N4030		SS24
*2N4409	2N4409	2N4409	3-24	SS16
*2N4410	2N4410	2N4409	3-24	SS16
2N4412	2N3962	2N3962		SS33
2N4412A	2N3962	2N3962		SS33
2N4413	2N3962	2N3962		SS33
2N4413A	2N3962	2N3962		SS33
2N4414	2N3962	2N3962		SS33
2N4414A	2N3962	2N3962		SS33
2N4415	2N3962	2N3962		SS33
2N4415A	2N3962	2N3962		SS33
2N4418	2N5772	2N3646		SS5
2N4419	2N5772	2N3646		SS5
2N4420	2N5772	2N3646		SS5
2N4421	2N5772	2N3646		SS5
2N4422	2N5772	2N3646		SS5
2N4423	2N5772	2N3646		SS5
2N4424	MPS3711	MPS3707		
2N4425	MPS3711	MPS3707		
2N4436	2N4400	2N4400		SS15
2N4437	2N4401	2N4400		SS15
2N4438	CF			
2N4439	CF			
2N4440	CF			
2N4449	2N2369A	2N2369		SS28
2N4450	2N2222	2N2218		SS15
2N4451	2N2894	2N2894		SS30
2N4452	2N2907	2N2904		SS22
2N4453	2N3209	2N2894		SS30
2N4872	2N4208	2N4208		SS31
2N4873	2N2369A	2N2369		SS28
2N4878	2N2979	2N2915		SS8
2N4879	2N2979	2N2975		SS8
2N4880	2N2979	2N2915		SS8
*2N4888	2N4888	2N4888	3-34	
*2N4889	2N4889	2N4888	3-34	
2N4890	2N2904	2N2904		SS22
*2N4895	2N4895	2N4895	3-36	PWR1
*2N4896	2N4896	2N4895	3-36	PWR1
*2N4897	2N4897	2N4895	3-36	PWR1
*2N4898	2N4898	2N3740	3-37	
*2N4899	2N4899	2N3740	3-37	
*2N4900	2N4900	2N3740	3-37	
*2N4901	2N4901	2N4901	3-39	PWR15
*2N4902	2N4902	2N4901	3-39	PWR15
*2N4903	2N4903	2N4901	3-39	PWR15
*2N4904	2N4904	2N4901	3-39	PWR15
*2N4905	2N4905	2N4901	3-39	PWR15
*2N4906	2N4906	2N4901	3-39	PWR15
*2N4907	2N4907	2N4901	3-39	PWR15
*2N4908	2N4908	2N4901	3-39	PWR15
*2N4909	2N4909	2N4901	3-39	PWR15
*2N4910	2N4910	2N4231	3-36	PWR5
*2N4911	2N4911	2N4231	3-36	PWR5
*2N4912	2N4912	2N4231	3-36	PWR5
*2N4913	2N4913	2N4913	3-39	PWR6
*2N4914	2N4914	2N4913	3-39	PWR6
*2N4915	2N4915	2N4913	3-39	PWR6
*2N4916	2N4916	2N4916	3-27	
*2N4917	2N4917	2N4916	3-27	
2N4918	2N6124	2N6124		PWR14
2N4919	2N6125	2N6124		PWR14
2N4920	2N6126	2N6124		PWR14
2N4921	2N6121	2N6121		PWR5
2N4922	2N6122	2N6121		PWR5
2N4923	2N6123	2N6121		PWR5
2N4924	CF			
2N4925	CF			
2N4926	2N4926		3-33	
2N4927	2N4927		3-33	
2N4928	CF			
2N4929	CF			
2N4930	CF			
2N4931	CF			
2N4937	MD3250A	MD3250		
2N4938	MD3250A	MF3250		
2N4939	MF3250	MF3250		
2N4940	MD3250A	MF3250		
2N4941	MF3250A	MD3250		
2N4942	MF3250	MF3250		
2N4943	2N3019	2N3019		SS17
2N4944	PN3567	2N3567		SS15
2N4945	PN3568	2N3567		SS17
2N4946	PN3569	2N3567		SS17
2N4951	2N2221	2N2218		SS15
2N4952	2N2222	2N2218		SS15
2N4953	2N2222	2N2218		SS15
2N4954	2N2221	2N2218		SS15

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N4955	2N2913	2N2913		SS8
2N4956	2N2918	2N2917		SS8
*2N4960	2N4960	2N4960	3-20	SS17
*2N4961	2N4961	2N4960	3-21	SS17
*2N4962	2N4962	2N4960	3-21	SS17
*2N4963	2N4963	2N4960	3-21	SS17
2N4964	2N4248	2N4248		SS33
2N4965	2N4249	2N4248		SS33
2N4966	SE4001			
2N4967	2N3565	2N3565		SS8
2N4968	SE4001			
2N4969	2N4400	2N4400		SS15
2N4970	2N4401	2N4400		SS15
2N4971	2N4402	2N4402		SS22
2N4972	2N4403	2N4402		SS22
2N4994	MPS3693	2N3693		
2N4995	MPS3694	2N3693		
2N4996	CF			
2N4997	CF			
2N4998	2N5002	2N5002		PWR19
2N4999	2N5003	2N5002		PWR11
2N5000	2N5004	2N5002		PWR19
2N5001	2N5005	2N5002		PWR11
*2N5002	2N5002	2N5002	3-38	PWR19
*2N5003	2N5003	2N5002		PWR11
*2N5004	2N5004	2N5002	3-38	PWR19
*2N5005	2N5005	2N5002	3-38	PWR11
2N5006	CF			
2N5007	CF			
2N5008	CF			
2N5009	CF			
*2N5022	2N5022	2N5022	3-19	SS7
*2N5023	2N5023	2N5022	3-19	SS7
2N5033	2N5033		3-40	
2N5034	2N5877	2N5877		PWR6
2N5035	2N5877	2N5877		PWR6
2N5036	2N5877	2N5877		PWR6
2N5037	2N5877	2N5877		PWR6
2N5040	2N4354	2N4354		SS24
2N5041	2N4354	2N4354		SS24
2N5042	2N4030	2N4030		SS24
2N5050	CF			
2N5051	CF			
2N5052	CF			
2N5055	2N4258	2N4258		SS31
2N5056	2N5056		3-19	SS32
2N5057	2N5057		3-19	SS32
*2N5058	2N5058	2N5058	3-33	SS11
2N5059	2N5059	2N5058	3-33	SS11
*2N5067	2N5067	2N5067	3-39	PWR6
*2N5068	2N5068	2N5067	3-39	PWR6
*2N5069	2N5069	2N5067	3-39	PWR6
2N5073	2N5682	2N5679		PWR3

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N5083	CF			
2N5084	CF			
2N5085	CF			
*2N5086	2N5086	2N5086	3-32	SS33
*2N5087	2N5087	2N5086	3-32	SS33
*2N5088	2N5088	2N5088	3-29	
*2N5089	2N5089	2N5088	3-29	
2N5092	2N3449	2N3439		PWR8
2N5106	2N2219	2N2218		SS15
2N5107	2N2222	2N2218		SS15
2N5110	2N4234	2N4234		PWR14
2N5111	2N4236	2N4234		PWR14
2N5112	2N4234	2N4234		PWR14
2N5113	2N4236	2N4234		PWR14
*2N5126	2N5126	2N5126	3-35	SS1
2N5127	2N5127	2N3564	3-35	
*2N5128	2N5128	2N5128	3-22	SS15
*2N5129	2N5129	2N5128	3-22	SS15
*2N5130	2N5130	2N5130	3-35	SS27
*2N5131	2N5131	2N5131	3-22	
*2N5132	2N5132	2N5131	3-22	
*2N5133	2N5133	2N5133	3-29	SS8
*2N5134	2N5134	2N5134	3-18	SS28
*2N5135	2N5135	2N5135	3-22	SS15
*2N5136	2N5136	2N5135	3-22	SS15
*2N5137	2N5137	2N5135		SS15
*2N5138	2N5138	2N5138	3-32	SS33
*2N5139	2N5139	2N5139	3-27	
2N5140	2N3639	2N3639		SS31
2N5141	2N3639	2N3639		SS31
*2N5142	2N5142	2N5142	3-27	SS22
*2N5143	2N5143	2N5142	3-27	SS22
2N5144	2N4013	2N3724		SS13
2N5145	2N3724	2N3724		SS13
2N5146	FQ3467	FQ3467		SS7
2N5147	2N5679	2N5679		PWR13
2N5148	2N5681	2N5679		PWR3
2N5149	2N5679	2N5679		PWR13
2N5150	2N5681	2N5679		PWR3
2N5151	CF			
2N5152	2N5336	2N5336		PWR4
2N5153	CF			
2N5154	2N5337	2N5336		PWR4
2N5172	MPS5172	MPS5172		
2N5174	2N4410	2N4409		SS16
2N5175	2N5830	2N5830		SS16
2N5176	2N5832	2N5830		SS16
2N5190	2N6121	2N6121		PWR5
2N5191	2N6122	2N6121		PWR5
2N5192	2N6123	2N6121		PWR5
2N5193	2N6124	2N6124		PWR14
2N5194	2N6125	2N6124		PWR14
2N5195	2N6126	2N6124		PWR14

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N5200	CF			
2N5201	CF			
2N5202	CF			
2N5208	PE5030B	PE5029		SS12
*2N5209	2N5209	2N5209	3-30	
*2N5210	2N5210	2N5209	3-30	
*2N5219	2N5219	2N5219	3-22	
*2N5220	2N5220	2N5220	3-22	SS15
*2N5221	2N5221	2N5220	3-27	SS8
2N5222	CF			
*2N5223	2N5223	2N5219	3-22	
*2N5224	2N5224	2N5224	3-18	SS5
*2N5225	2N5225	2N5225	3-22	SS15
*2N5226	2N5226	2N5225	3-27	SS22
*2N5227	2N5227	2N5227	3-27	
*2N5228	2N5228	2N5228	3-19	SS31
2N5232	2N5210	2N5209		
2N5232A	2N5210	2N5209		
2N5233	2N5961	2N5961		SS8
2N5234	2N5210	2N5209		
2N5235	2N5962	2N5961		SS8
2N5236	2N3137	2N3137		SS2
2N5237	2N5337	2N5336		PWR4
2N5239	CF			
2N5240	CF			
2N5241	CF			
2N5244	2N4035	2N4034		
2N5245	2N5485	2N5484		
2N5246	2N5485	2N5484		
2N5247	2N5486	2N5484		
2N5249	2N5962	2N5961		SS8
2N5249A	2N5962	2N5961		SS8
2N5252	CF			
2N5253	CF			
2N5254	2N4019	2N4017		SS33
2N5255	2N4020	2N4020		SS33
2N5256	2N4034	2N4020		SS33
2N5279	2N3439	2N3439		PWR8
2N5280	CF			
2N5292	2N2894A	2N2894		SS32
2N5293	2N6122	2N6121		PWR5
2N5294	2N6122	2N6121		PWR5
2N5295	2N6122	2N6121		PWR5
2N5296	2N6122	2N6121		PWR5
2N5297	2N6123	2N6121		PWR5
2N5298	2N6123	2N6121		PWR5
*2N5301	2N5301	2N5301	3-39	PWR7
*2N5302	2N5302	2N5301	3-39	PWR7
*2N5303	2N5303	2N5301	3-39	PWR7
2N5305	MPSA13	MPSA13		
2N5306	MPSA14	MPSA13		
2N5306A	MPSA14	MPSA13		
2N5307	MPSA13	MPSA13		
2N5308	MPSA14	MPSA13		
2N5308A	MPSA14	MPSA13		
2N5309	2N5209	2N5209		
2N5310	2N5209	2N5209		
2N5311	2N5210	2N5209		
*2N5320	2N5320	2N5320		PWR2
*2N5321	2N5322	2N5320		PWR12
*2N5322	2N5322	2N5320		PWR12
*2N5323	2N5323	2N5320		PWR12
2N5333	CF			
*2N5334	2N5335	2N4895		PWR1
*2N5335	2N5335	2N4895		PWR1
*2N5336	2N5336	2N5336		PWR4
*2N5337	2N5337	2N5336		PWR4
*2N5338	2N5338	2N5336		PWR4
*2N5339	2N5339	2N5336		PWR4
2N5346	2N5002	2N5002		PWR19
2N5347	2N5002	2N5002		PWR19
2N5354	MPS3638	2N3638		SS22
2N5355	MPS3638A	2N3638		SS22
2N5356	CF			
2N5365	PN3644	2N3644		SS22
2N5366	PN3644	2N3644		SS22
2N5367	CF			
2N5368	2N4400	2N4400		SS15
2N5369	2N4401	2N4401		SS15
2N5370	PN3566	2N3566		SS15
2N5371	2N4400	2N4400		SS15
2N5372	2N4402	2N4402		SS22
2N5373	2N4403	2N4402		SS22
2N5374	CF			
2N5375	2N4402	2N4402		SS22
2N5376	2N5961	2N5961		SS8
2N5377	2N5961	2N5961		SS8
2N5378	PN4249	2N4248		SS33
2N5379	PN4248	2N4248		SS33
2N5380	2N3903	2N3903		SS14
2N5381	2N3904	2N3903		SS14
2N5382	2N3905	2N3905		SS23
2N5383	2N3906	2N3905		SS23
2N5384	2N5003	2N5002		PWR11
2N5385	2N5003	2N5002		PWR11
2N5390	CF			
*2N5400	2N5400	2N5400	3-34	SS25
*2N5401	2N5401	2N5400	3-34	SS25
2N5404	CF			
2N5405	CF			
2N5406	CF			
2N5407	CF			
2N5408	2N5003	2N5002		PWR11
2N5409	2N5003	2N5002		PWR11
2N5410	2N5003	2N5002		PWR11
2N5411	2N5003	2N5002		PWR11

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N5414	CF			
2N5418	2N4400	2N4400		SS15
2N5419	2N4401	2N4400		SS15
2N5420	PN3566	2N3566		SS15
2N5425	CF			
2N5426	CF			
2N5427	CF			
2N5428	CF			
2N5429	CF			
2N5430	CF			
2N5447	MPS3702	MPS3702		
2N5448	MPS3703	MPS3702		
2N5449	MPS3704	MPS3704		
2N5450	MPS3705	MPS3704		
2N5451	MPS3706	MPS3704		
*2N5455	2N5455	2N5455	3-19	SS21
*2N5456	2N5456	2N5455	3-19	SS21
*2N5457	2N5457	2N5457	3-40	
*2N5458	2N5458	2N5457	3-40	
*2N5459	2N5459	2N5457	3-40	
2N5460	CF			
2N5461	CF			
2N5462	CF			
2N5463	CF			
2N5464	CF			
2N5465	CF			
2N5466	CF			
2N5467	CF			
2N5468	SE9052	2N6233		PWR9
2N5469	SE9052	2N6233		PWR9
2N5477	2N5002	2N5002		PWR19
2N5478	2N5004	2N5002		PWR19
*2N5484	2N5484	2N5484	3-40	
*2N5485	2N5485	2N5484	3-40	
*2N5486	2N5486	2N5484	3-40	
2N5490	2N6122	2N6121		PWR5
2N5491	2N6122	2N6121		PWR5
2N5492	2N6130	2N6129		PWR10
2N5493	2N6130	2N6129		PWR10
2N5494	2N6129	2N6129		PWR10
2N5495	2N6129	2N6129		PWR10
2N5496	2N6131	2N6129		PWR10
2N5497	2N6131	2N6129		PWR10
*2N5550	2N5550	2N5550		SS16
2N5551	MPS5551M	2N5550		SS16
2N5629	CF			
2N5630	CF			
2N5631	CF			
2N5632	CF			
2N5633	CF			
2N5634	CF			
2N5655	CF			
2N5656	CF			
2N5657	CF			
2N5658	2N5004	2N5002		PWR19
2N5660	2N6233	2N6233		PWR9
2N5661	2N6234	2N6233		PWR9
2N5664	2N6233	2N6233		PWR9
2N5665	2N6234	2N6233		PWR9
*2N5668	2N5668	2N5668		
*2N5669	2N5669	2N5668		
*2N5670	2N5670	2N5668		
2N5675	2N5679	2N5679	PWR13	
*2N5679	2N5679	2N5679		PWR13
*2N5680	2N5680	2N5679		PWR13
*2N5681	2N5681	2N5679		PWR3
*2N5682	2N5682	2N5679		PWR3
2N5729	2N5336	2N5336		PWR4
2N5730	2N5002	2N5002		PWR19
2N5737	2N3791	2N3789		PWR15
2N5738	2N3792	2N3789		PWR15
2N5741	2N4399	2N4398		PWR16
2N5745	CF			
2N5758	CF			
2N5759	CF			
2N5760	CF			
2N5763	2N2907A	2N2904		SS22
2N5769	2N5769	2N2369	3-18	SS28
*2N5770	2N5770	2N918	3-35	SS27
*2N5771	2N5771	2N5771	3-19	SS31
*2N5772	2N5772	2N3646	3-18	SS5
2N5781	2N4234	2N4234		PWR14
2N5782	2N4235	2N4235		PWR14
2N5783	2N4236	2N4234		PWR14
2N5784	2N4237	2N4237		PWR5
2N5785	2N4238	2N4237		PWR5
2N5786	2N4239	2N4237		PWR5
2N5793	MD2218A	MD2218		
2N5794	MD2219A	MD2218		
2N5795	MD2904A	MD2904		
2N5796	MD2905A	MD2904		
2N5804	CF			
2N5805	CF			
2N5810	MPS6561	MPS6560		SS15
2N5811	MPS6563	MPS6560		SS22
2N5812	CF			
2N5813	CF			
2N5814	CF			
2N5815	CF			
2N5816	CF			
2N5817	CF			
2N5818	CF			
2N5819	CF			
2N5820	PN5856	2N5855		SS17
2N5821	PN5855	2N5855		SS24
2N5822	PE6020	PE6020		SS17

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N5823	MPS4355	2N4354		SS24
2N5824	MPS6512	MPS6512		SS14
2N5825	MPS6513	MPS6512		SS14
2N5826	MPS6514	MPS6512		SS14
2N5827	MPS6515	MPS6512		SS14
2N5828	2N5962	2N5961		SS8
*2N5830	2N5830	2N5830	3-37	SS16
*2N5831	2N5831	2N5830	3-33	SS16
*2N5832	2N5832	2N5830	3-33	SS16
*2N5833	2N5833	2N5830	3-33	SS16
2N5838	CF			
2N5839	CF			
2N5840	CF			
*2N5845	2N5845	2N5845	3-18	SS13
*2N5845A	2N5845A	2N5845	3-18	SS13
*2N5855	2N5855	2N5855	3-28	SS24
*2N5856	2N5856	2N5855	3-24	SS17
*2N5857	2N5857	2N5855	3-28	SS24
*2N5858	2N5858	2N5855	3-24	SS17
2N5859	2N3724	2N3724		SS13
2N5860	2N3724	2N3724		SS13
2N5861	2N3725	2N3724		SS13
2N5864	2N4031	2N4030		SS24
2N5865	2N4030	2N4030		SS24
2N5867	2N4908	2N4901		PWR15
2N5868	2N4909	2N4901		PWR15
2N5869	2N4914	2N4913		PWR6
2N5870	2N4915	2N4913		PWR6
*2N5871	2N5871	2N5871		PWR15
*2N5872	2N5872	2N5871		PWR15
*2N5873	2N5873	2N5873		PWR6
*2N5874	2N5874	2N5873		PWR6
*2N5875	2N5875	2N5875		PWR15
*2N5876	2N5876	2N5875		PWR15
*2N5877	2N5877	2N5877		PWR6
*2N5878	2N5878	2N5877		PWR6
*2N5879	2N5879	2N5879		PWR16
*2N5880	2N5880	2N5879		PWR16
*2N5881	2N5881	2N5881		PWR7
*2N5882	2N5882	2N5881		PWR7
*2N5883	2N5883	2N5883		PWR16
*2N5884	2N5884	2N5883		PWR16
*2N5885	2N5885	2N5885		PWR7
*2N5886	2N5886	2N5885		PWR7
*2N5910	2N5910	2N5771	3-19	SS31
2N5939	2N5004	2N5002		PWR19
2N5940	2N5004	2N5002		PWR19
2N5954	2N4900	2N3740		PWR14
2N5955	2N4899	2N3740		PWR14
2N5956	2N4898	2N3740		PWR14
*2N5961	2N5961	2N5961	3-30	SS8
*2N5962	2N5962	2N5961	3-30	SS8
*2N5963	2N5963	2N5961	3-29	SS8

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N5964	PN5964	PN5964		SS16
2N5965	PN5965	PN5965		SS16
2N5970	2N5302	2N5301		PWR7
2N5971	2N5302	2N5301		PWR7
2N5972	2N5302	2N5301		PWR7
2N5973	2N3714	2N3713		PWR6
2N5975	2N6132	2N6132		PWR17
2N5976	2N6132	2N6132		PWR17
2N5977	2N6129	2N6129		PWR10
2N5978	2N6129	2N6129		PWR10
2N5979	2N6129	2N6129		PWR10
2N5980	CF			
2N5981	CF			
2N5982	CF			
2N5983	CF			
2N5984	CF			
2N5985	CF			
2N5986	CF			
2N5987	CF			
2N5988	CF			
2N5989	CF			
2N5990	CF			
2N5991	CF			
2N5998	2N5961	2N5961		SS8
2N5999	2N5087	2N5086		SS33
2N6000	2N4401	2N4400		SS15
2N6001	2N4402	2N4402		SS22
2N6002	CF			
2N6003	CF			
2N6004	2N4401	2N4400		SS15
2N6005	2N4402	2N4402		SS22
2N6006	CF			
2N6007	CF			
2N6008	2N5961	2N5961		SS8
2N6009	2N5087	2N5086		SS33
2N6010	2N4401	2N4400		SS15
2N6011	2N4402	2N4402		SS22
2N6012	CF			
2N6013	CF			
2N6014	CF			
2N6015	CF			
2N6016	CF			
2N6017	CF			
2N6049	2N4899	2N3740		PWR14
2N6050	CF			
2N6051	CF			
2N6052	CF			
2N6053	CF			
2N6054	CF			
2N6055	CF			
2N6056	CF			
2N6057	CF			
2N6058	CF			

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N6059	CF			
2N6067	CF			
2N6076	MPS5172	MPS5172		
2N6077	SE9051	2N6233		PWR9
2N6078	SE9051	2N5133		PWR9
2N6079	SE9052	2N6233		PWR9
2N6098	CF			
2N6099	CF			
2N6100	CF			
2N6101	CF			
2N6102	CF			
2N6103	CF			
2N6106	2N6126	2N6124		PWR14
2N6107	2N6126	2N6124		PWR14
2N6108	2N6132	2N6132		PWR17
2N6109	2N6132	2N6132		PWR17
2N6110	2N6132	2N6132		PWR17
2N6111	2N6132	2N6132		PWR17
*2N6121	2N6121	2N6121	3-37	PWR5
*2N6122	2N6122	2N6121	3-37	PWR5
*2N6123	2N6123	2N6121	3-37	PWR5
*2N6124	2N6124	2N6124	3-37	PWR14
*2N6125	2N6125	2N6124	3-37	PWR14
*2N6126	2N6126	2N6124	3-37	PWR14
*2N6129	2N6129	2N6129	3-37	PWR10
*2N6130	2N6130	2N6130	3-37	PWR10
*2N6131	2N6131	2N6131	3-37	PWR10
*2N6132	2N6132	2N6132	3-37	PWR17
*2N6133	2N6133	2N6133	3-37	PWR17
*2N6134	2N6134	2N6134	3-37	PWR17
2N6175	2N3440	2N3439		PWR8
2N6176	2N3439	2N3439		PWR8
2N6177	2N3439	2N3439		PWR8
2N6182	2N5003	2N5002		PWR11
2N6183	2N5005	2N5002		PWR11
2N6184	2N5003	2N5002		PWR11
2N6185	2N5005	2N5002		PWR11
2N6218	CF			
2N6219	CF			
2N6220	CF			
2N6221	2N5831	2N5830		SS16
2N6222	PE6020	PE6020		SS17
2N6223	PN3645	2N3645		SS22
2N6224	2N5962	2N5961		SS8
2N6225	PN4250A	2N4248		SS33
*2N6233	2N6233	2N6233	3-36	PWR9
*2N6234	2N6234	2N6233	3-36	PWR9
*2N6235	2N6235	2N6233	3-36	PWR9

Industry Type Number	Recommended Fairchild Device	Data Sheet	Short Form Data	Family Characteristics
2N6246	2N3791	2N3789		PWR15
2N6247	2N3792	2N3789		PWR15
2N6249	CF			
2N6250	CF			
2N6251	CF			
2N6253	CF			
2N6254	2N5882	2N5881		PWR7
2N6257	2N5882	2N5881		PWR7
2N6258	2N5303	2N5301		PWR7
2N6260	2N4231	2N4231		
2N6261	2N4233	2N4231		
2N6263	2N6233	2N6233		PWR9
2N6264	2N6233	2N6233		PWR9
2N6282	CF			
2N6283	CF			
2N6284	CF			
2N6285	CF			
2N6286	CF			
2N6287	CF			
2N6294	CF			
2N6295	CF			
2N6296	CF			
2N6297	CF			
2N6298	CF			
2N6299	CF			
2N6300	CF			
2N6301	CF			
2N6303	CF			
2N6306	CF			
2N6307	CF			
2N6308	CF			
2N6312	CF			
2N6313	CF			
2N6314	CF			
2N6315	CF			
2N6316	CF			
2N6317	CF			
2N6318	CF			
2N6326	2N5881	2N5881		PWR7
2N6327	2N5882	2N5881		PWR7
2N6328	CF			
2N6329	2N3791	2N3789		PWR15
2N6330	2N3792	2N3789		PWR15
2N6331	CF			
2N6338	CF			
2N6339	CF			
2N6340	CF			
2N6341	CF			

DISCRETE PRODUCTS

CONTENTS AND SECTION SELECTOR

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INTRODUCTION

SELECTION GUIDE BY APPLICATION AND SHORT FORM DATA LISTING

The arrangement of this section makes it more than a simple short form listing of Fairchild's Discrete semiconductor product line. Each major division is an application category and each subdivision is a secondary categorization of a key parametric value. In some instances, the crossover from one subdivision to another is somewhat arbitrary since definition varies with manufacturer. To aid the user in locating the desired device type, a short definition of each grouping is shown below and a cross reference statement has been included in some of the subsections.

There are two major groups of registered devices, those which have been registered in the U.S. with JEDEC, and those which have been registered in Europe with Association International PRO-ELECTRON. The JEDEC devices included are all devices which are prefixed 1N or 2N. The PRO-ELECTRON devices are all preceded by a two or three character alpha prefix. Since many of the device types contained in the data listing have multiple letter prefixes, the PRO-ELECTRON devices have been included in boldface type.

1. Diodes (Pages 3 through 16)

   All single and multiple diodes including assemblies, monolithic diode arrays, unencapsulated diodes (dice) and rectifiers.

2. Small Signal Transistors

   a. High Speed Saturated Switches (Pages 17 through 19)

      Logic Switches and Core Driver Transistors manufactured with specific diffusion processes to control majority carrier lifetimes. Storage times are generally less than 100 ns.

   b. General Purpose Amplifiers and Switches (Pages 20 through 28)

      Suitable for a wide variety of switching and amplifier applications. Collector to emitter voltages are less than 100 V, switching times are generally less than 1.0 μs and specification currents range from 100 μA to 1.0 A.

   c. Low Level, Low Noise Amplifiers (Pages 29 through 32)

      Designed to be used as front end Audio Amplifiers with operation in the 10 μA to 2.0 mA current range.

   d. High Voltage Amplifiers (Pages 33 and 34)

      Collector to emitter voltages greater than 100 V, current handling capabilities in the 10 mA area. There is a definite overlap between this section and the TO5 Power section.

   e. RF Amplifiers and Oscillators (Pages 34 and 35)

      Power gain, oscillator power out and/or noise figure specifications at frequencies above 25 MHz.

3. Power Transistors (Pages 36 through 39)

   Normal operating current ranges above 1.0 A and/or power dissipation capability of 1.0 W or more. There is a definite overlap with small signal transistors at 1.0 A and 1.0 W (see small Signal General Purpose Amplifiers and High Voltage sections).

4. Field Effect Transistors (Page 40)

   Junction and MOS Field Effect Transistors.

5. Multiple Transistors (Pages 41 through 44)

   Matched and unmatched dual transistors, including complementary duals, quad core driver transistors and Darlington transistors.

6. Unencapsulated Transistors (Page 45)

   Transistor dice.

NOTE:

Use of well specified devices, while normally somewhat higher in cost, can virtually eliminate the multiple sourcing technique, not only by Fairchild, but any manufacturer, since the more stringent the specifications, the less latitude permitted in the manufacturing process.

COMPUTER DIODES (BY ASCENDING t_{rr})
GLASS PACKAGE

TYPE	t_{rr} ns MAX	B_V VOLTS MIN	nA MAX	I_R @ @	V_R VOLTS	VOLTS MAX	V_F @ @	I_F mA	C pF MAX	Package	Package Equivalent DO7/DO35
FD700	0.70	30	50	@	15	1.1	@	50	75	DO7	
BAY82	0.75	12	100	@	12	1.0	@	20	1.3	DO7	
1N4244	0.75	20	100	@	10	1.0	@	20	0.8	DO7	
1N4376	0.75	20	100	@	10	1.1	@	50	1.0	DO7	
FD777	0.75	15	100	@	8.0	1.0	@	20	1.3	DO7	
1N5282	2.0	80	100	@	55	1.3	@	500	2.5	DO35	
1N5317	2.0	80	100	@	55	0.90	@	100	2.5	DO34	1N5282
1N3606	2.0	75	50	@	50	0.88	@	20	2.0	DO7	1N4153
1N4153	2.0	75	50	@	50	0.88	@	20	2.0	DO35	1N3606
1N4534	2.0	75	50	@	50	0.88	@	20	2.0	DO34	1N4153
1N3062	2.0	75	100	@	50	1.0	@	20	1.0	DO7	
1N3066	2.0	75	100	@	50	1.0	@	10	1.0	DO7	
1N3605	2.0	40	50	@	30	0.88	@	20	2.0	DO7	1N4152
1N4152	2.0	40	50	@	30	0.88	@	20	2.0	DO35	1N3605
1N4533	2.0	40	50	@	30	0.88	@	20	2.0	DO34	1N4152
1N4087	2.5	50	90	@	50	0.975	@	30	1.8	DO35	
1N3600	3.0	75	100	@	50	1.0	@	200	2.5	DO7	1N4150
BAX13	4.0	50	200	@	50	1.0	@	20	3.0	DO35	
BAY71	4.0	50	100	@	35	1.0	@	20	2.0	DO35	1N3603
BAY74	4.0	50	100	@	35	1.1	@	300	3.0	DO35	1N3600
1N914	4.0	100	25	@	20	1.0	@	10	4.0	DO7	1N4148
1N914A	4.0	100	25	@	20	1.0	@	20	4.0	DO7	1N4446
1N914B	4.0	100	25	@	20	1.0	@	100	4.0	DO7	1N4448
1N916	4.0	100	25	@	20	1.0	@	10	2.0	DO7	1N4149
1N916A	4.0	100	25	@	20	1.0	@	20	2.0	DO7	1N4447
1N916B	4.0	100	25	@	20	1.0	@	30	2.0	DO7	1N4449
1N4148	4.0	100	25	@	20	1.0	@	10	4.0	DO35	1N914
1N4149	4.0	100	25	@	20	1.0	@	10	2.0	DO35	1N916
1N4446	4.0	100	25	@	20	1.0	@	20	4.0	DO35	1N914A
1N4447	4.0	100	25	@	20	1.0	@	20	2.0	DO35	1N916A
1N4448	4.0	100	25	@	20	1.0	@	100	4.0	DO35	1N914B
1N4449	4.0	100	25	@	20	1.0	@	30	2.0	DO35	1N916B
1N4531	4.0	100	25	@	20	1.0	@	10	4.0	DO34	1N4148
1N4606	4.0	85	250	@	70	1.10	@	250	2.5	DO35	
1N4610	4.0	80	100	@	55	1.0	@	200	2.0	DO7	
1N3604	4.0	75	50	@	50	1.0	@	50	2.0	DO7	1N4151
1N4151	4.0	75	50	@	50	1.0	@	50	2.0	DO35	1N3604
FD600	4.0	75	100	@	50	1.0	@	200	2.5	DO7	FDH600
FDH600	4.0	75	100	@	50	1.0	@	200	2.5	DO35	FD600
FDN600	4.0	75	100	@	50	1.0	@	200	2.5	DO34	FDH600
1N3063	4.0	75	100	@	50	0.85	@	10	2.0	DO7	1N4305
1N3064	4.0	75	100	@	50	1.0	@	10	2.0	DO7	1N4454
1N3065	4.0	75	100	@	50	1.0	@	20	1.5	DO7	
1N4086	4.0		250	@	70	1.0	@	200	10	DO7	
1N4150	4.0	75	100	@	50	1.0	@	200	2.5	DO35	1N3600
1N4305	4.0	75	100	@	50	0.85	@	10	2.0	DO35	1N3063

DIODES

COMPUTER DIODES (BY ASCENDING t_{rr})
GLASS PACKAGE (Cont'd)

TYPE	t_{rr} ns MAX	B_V VOLTS MIN	nA MAX	I_R @	V_R VOLTS	VOLTS MAX	V_F @	I_F mA	C pF MAX	Package	Package Equivalent DO7/DO35
1N4322	4.0	75	100	@	50	1.0	@	200	1.5	DO7	
1N4454	4.0	75	100	@	50	1.0	@	10	2.0	DO35	1N3064
1N4532	4.0	75	100	@	50	1.0	@	10	2.0	DO34	1N4454
1N5318	4.0	75	100	@	50	1.0	@	200	2.5	DO34	FDH600
1N903	4.0	60	100	@	40	1.0	@	10	1.0	DO7	
1N908	4.0	60	100	@	40	1.0	@	10	2.5	DO7	
1N903A	4.0	50	100	@	40	1.0	@	20	1.0	DO7	
1N904	4.0	50	100	@	30	1.0	@	10	1.0	DO7	
1N907	4.0	50	100	@	30	1.0	@	10	2.5	DO7	
1N907A	4.0	50	100	@	30	1.0	@	20	2.5	DO7	
1N908A	4.0	50	100	@	40	1.0	@	20	2.5	DO7	
FDH666	4.0	40	100	@	25	1.0	@	100	3.5	DO35	
FDN666	4.0	40	100	@	25	1.0	@	100	3.5	DO34	FDH666
1N905	4.0	40	100	@	20	1.0	@	10	1.0	DO7	
1N906	4.0	40	100	@	20	1.0	@	10	2.5	DO7	
1N4450	4.0	40	50	@	30	1.0	@	200	4.0	DO35	
1N5319	4.0	40	100	@	25	1.0	@	100	3.5	DO34	FDH666
1N904A	4.0	35	100	@	30	1.0	@	20	1.0	DO7	
1N4009	4.0	35	100	@	25	1.0	@	30	4.0	DO7	1N4154
1N4154	4.0	35	100	@	25	1.0	@	30	4.0	DO35	1N4009
1N4536	4.0	35	100	@	25	1.0	@	30	4.0	DO34	1N4154
1N905A	4.0	30	100	@	20	1.0	@	20	1.0	DO7	
1N906A	4.0	30	100	@	20	1.0	@	20	2.5	DO7	
1N3067	4.0	30	100	@	20	1.0	@	5	4.0	DO7	
1N4727	4.0	30	100	@	20	0.85	@	10	4.0	DO35	
1N4950	4.0	30	100	@	25	1.0	@	300	3.5	DO7	
1N3596	4.0	20	100	@	20	1.0	@	30	1.0	DO7	
FD666	5.0	40	100	@	25	1.0	@	100	3.5	DO7	
1N3602	5.0	75	100	@	50	1.0	@	20	3.0	DO7	
1N3603	5.0	45	100	@	35	1.0	@	30	3.0	DO7	
1N659	6.0	60	5	@	50	1.0	@	6		DO7	
1N814	25	50	100	@	20	1.0	@	5	1.0	DO7	

HIGH VOLTAGE SWITCHING DIODES (BY DESCENDING BV)
GLASS PACKAGE

TYPE	B_V VOLTS MIN	nA MAX	I_R @	V_R VOLTS	VOLTS MAX	V_F @	I_F mA	C pF MAX	t_{rr} ns MAX	Package
1N843	250	100	@	200	1.0	@	150		300	DO7
1N809	220	1000	@	200	1.0	@	100		300	DO7
FD400	200	100	@	150	1.0	@	400	2.0	50	DO7
FDH400	200	100	@	150	1.0	@	400	2.0	50	DO35
1N629	200	1000	@	175	1.5	@	4.0		50	DO7
1N643	200	25	@	10	1.0	@	10	3.0	50	DO7
1N804	200	1000	@	40	1.0	@	50		50	DO7
1N807	200	500	@	175	1.0	@	4.0		300	DO7
1N839	200	100	@	175	1.0	@	150	5.0	500	DO7
1N842	200	100	@	160	1.0	@	150		300	DO7
1N845	200	100	@	160	1.0	@	200		500	DO7
1N3070	200	100	@	175	1.0	@	100	5.0	40	DO7
1N3071	200	100	@	150	1.0	@	100	5.0	40	DO7
1N3597	200	100	@	150	1.2	@	400	5.0	30	DO7
FD444	150	50	@	100	1.0	@	300	2.5	60	DO7
FDH444	150	50	@	100	1.0	@	300	2.5	60	DO35
1N628	150	1000	@	125	1.5	@	4.0		50	DO7
1N801	150	100	@	125	1.0	@	10		500	DO7
1N838	150	100	@	125	1.0	@	150		500	DO7
1N841	150	100	@	120	1.0	@	150		300	DO7
1N4363	150	100	@	120	1.0	@	200	3.0	40	DO7
BAY72	125	100	@	100	1.0	@	100	5.0	50	DO35
1N806	125	500	@	100	1.0	@	4.0		50	DO7
1N658	120	50	@	50	1.0	@	100		300	DO7
1N660	120	5000	@	100	1.0	@	7.0		300	DO7
1N928	120	100	@	10	1.0	@	10	4.0	150	DO7
1N797	115	1000	@	100	1.0	@	10		500	DO7
1N808	110	1000	@	100	1.0	@	100		300	DO7
1N627	100	1000	@	75	1.5	@	4.0		50	DO7
1N662	100	100	@	50	1.0	@	10	3.0	50	DO7
1N662A	100	1000	@	10	1.0	@	100		300	DO7
1N663	100	5000	@	75	1.0	@	100		500	DO7
1N663A	100	100	@	75	1.0	@	100		300	DO7
1N778	100	500	@	100	1.0	@	10		300	DO7
1N837	100	100	@	75	1.0	@	150		500	DO7
1N837A	100	100	@	80	1.0	@	150		300	DO7
1N794	75	5000	@	50	1.0	@	10		50	DO7
1N818	75	200	@	55	1.5	@	30	5.0	50	DO7
1N927	65	100	@	10	1.0	@	10	4.0	150	DO7
1N3069	65	100	@	60	1.0	@	50	6.0	50	DO7
1N793	60	1000	@	50	1.0	@	10		50	DO7
1N796	60	5000	@	50	1.0	@	100		500	DO7
1N891	60	100	@	40	1.0	@	50		50	DO7
1N626	50	1000	@	35	1.5	@	4.0		50	DO7
1N840	50	100	@	40	1.0	@	150		300	DO7
1N812	40	20	@	10	1.0	@	5.0		250	DO7

DIODES

HIGH VOLTAGE SWITCHING DIODES (BY DESCENDING BV)
GLASS PACKAGE (Cont'd)

TYPE	B_V VOLTS MIN	nA MAX	I_R @ @	V_R VOLTS	VOLTS MAX	V_F @ @	I_F mA	C pF MAX	t_{rr} ns MAX	Package
1N625	30	1000	@	20	1.5	@	4.0		4	DO7
1N789	30	100	@	20	1.0	@	10		500	DO7
1N790	30	5000	@	20	1.0	@	10		250	DO7
1N791	30	5000	@	20	1.0	@	50		500	DO7
1N792	30	13	@	20	1.0	@	100		500	DO7
1N811	30	1000	@	10	1.0	@	1.0		250	DO7
1N3068	30	100	@	20	1.0	@	20	6.0	50	DO7
1N815	25	500	@	5.0	1.0	@	30		250	DO7
1N813	20	500	@	5.0	1.0	@	5.0		250	DO7

TYPE	B_V VOLTS MIN	nA MAX	I_R @	V_R VOLTS	V_F VOLTS MAX	@	I_F mA	C pF MAX	t_{rr} ns MAX	Package
1N461	30	500	@	25	1.0	@	15	10		DO7
1N461A	30	500	@	25	1.0	@	100			DO7
1N462	70	500	@	60	1.0	@	5.0	8.0		DO7
1N462A	70	500	@	60	1.0	@	100			DO7
1N463	200	500	@	175	1.0	@	1.0			DO7
1N463A	200	500	@	175	1.0	@	100			DO7
1N464	150	500	@	125	1.0	@	3.0	6.0		DO7
1N464A	150	500	@	125	1.0	@	100			DO7
1N482	40	100	@	30	1.1	@	100			DO7
1N483	80	250	@	60	1.1	@	100			DO7
1N484	150	250	@	125	1.1	@	100			DO7
1N485	200	250	@	175	1.0	@	100			DO7
1N661	240	350	@	200	1.0	@	7.0			DO7
1N779	200	500	@	175	1.0	@	10			DO7
1N795	75	5000	@	50	1.0	@	50			DO7
1N799	150	5000	@	100	1.0	@	50			DO7
1N816	6	100	@	4	1.0	@	100			DO7
1N844	100	100	@	80	1.0	@	200		500	DO7
1N925	40	1000	@	10	1.0	@	5.0		150	DO7
1N926	40	100	@	10	1.0	@	5.0		50	DO7
1S44	40	50	@	10	1.15	@	10	6.0		DO35
1S920	50	100	@	50	1.2	@	200			DO35
1S921	100	100	@	100	1.2	@	200			DO35
1S922	150	100	@	150	1.2	@	200			DO35
1S923	200	100	@	200	1.2	@	200			DO35
BA100	60	1000	@	60	1.0	@	50			DO35
BA128	75	100	@	50	1.0	@	50	5.0		DO35
BA129	200	10	@	180	1.0	@	10	6.0		DO35
BA130	30	500	@	25	1.0	@	15	2.0		DO35
BA136	50	100	@	30	1.0	@	100	2.0		DO35
BA155	150	1500	@	100	1.2	@	10	10		DO35
BA164	20	2000	@	15	1.0	@	10			DO35
BA216	10	1500	@	10	1.0	@	15			DO35
BA217	30	50	@	10	1.0	@	10	5.0		DO35
BA218	50	50	@	25	1.0	@	10	5.0		DO35
BA219	100	200	@	50	0.85	@	10	5.0		DO35
BAX16	150	100	@	150	1.0	@	1.0	10	120	DO35
FDH900	50	100	@	30	1.0	@	100	3.0	4.0	DO35
FDH999	30	1000	@	20	1.0	@	10	5.0	10	DO35

DIODES

LOW LEAKAGE DIODES (BY DESCENDING BV)
GLASS PACKAGE

TYPE	B_V VOLTS MIN	nA MAX	I_R @	V_R VOLTS	VOLTS MAX	V_F @	I_F mA	C pF MAX	t_{rr} ns MAX	Package
1N486	250	50	@	225	1.1	@	100			DO7
1N486A	250	25	@	225	1.0	@	100			DO7
1N486B	250	50	@	225	1.0	@	100			DO7
1N459	200	25	@	175	1.0	@	3.0			DO7
1N459A	200	25	@	175	1.0	@	100			DO7
1N485A	200	25	@	175	1.0	@	100			DO7
1N485B	200	25	@	175	1.0	@	100			DO7
FD300	150	1.0	@	125	1.0	@	200	6.0		DO7
FD333	150	3.0	@	125	1.0	@	200	10		DO7
FDH300	150	1.0	@	125	1.0	@	200	6.0		DO35
FDH333	150	3.0	@	125	1.0	@	200	10		DO35
1N458	150	25	@	125	1.0	@	7.0			DO7
1N458A	150	5.0	@	125	1.0	@	100			DO7
1N484A	150	25	@	125	1.0	@	100			DO7
1N484B	150	25	@	125	1.0	@	100			DO7
1N3595	150	1.0	@	125	1.0	@	200	8.0		DO7
BAY73	125	5.0	@	100	1.0	@	200	8.0		DO7
1N483A	80	25	@	60	1.0	@	100			DO7
1N483B	80	25	@	60	1.0	@	100			DO7
1N890	80	25	@	60	1.0	@	20			DO7
1N457	70	25	@	60	1.0	@	20	8.0		DO7
1N457A	70	25	@	60	1.0	@	100	5.0		DO7
1N482A	40	25	@	30	1.0	@	100			DO7
1N482B	40	25	@	30	1.0	@	100			DO7
FJT1000	35	0.01	@	20	1.0	@	10	1.3		TO18-6
FJT1100	35	0.01	@	15	1.0	@	10	1.3		DO7
FJT2000	35	0.01	@	20	1.0	@	10	1.3		TO18-3
1N456	30	25	@	25	1.0	@	40	6.0		DO7
1N456A	30	25	@	25	1.0	@	100	5.0		DO7

HOT CARRIER DIODES
GLASS PACKAGE

TYPE	B_V VOLTS MIN	nA MAX	I_R @ @	V_R VOLTS	VOLTS MAX	V_F @ @	I_F mA	C pF MAX	NF dB MAX	Package
FH1100	5.0	50	@	1.0	0.55	@	10	1.0	1.6	DO7
1N5390	5.0	50	@	1.0	0.55	@	10	1.0	1.6	DO7

VOLTAGE VARIABLE CAPACITOR DIODES
GLASS PACKAGE

TYPE	B_V VOLTS MIN	nA MAX	I_R @ @	V_R VOLTS	C pF MAX	Figure Of Merit (Q) MIN	C_1/C_4 V_{R1}=0.1V V_{R2}=4.0V	C_3/C_{20} V_{R3}=3V V_{R20}=20V	Package
RF400	35	30	@	30	10	350	2.0	2.0	DO34
RF401	35	30	@	30	7.0	350	2.0	2.0	DO34

DIODES

ZENER DIODES (BY ASCENDING V_Z)
GLASS PACKAGE

TYPE	V_Z @ I_Z VOLTS NOMINAL	TOL $\pm V_Z$ %	I_Z TEST CURRENT mA	Z_Z @ I_Z Ω MAX	I_R @ μA MAX	@	V_R VOLTS	T C %/°C	Package
1N746	3.3	10	20	28	10	@	1.0	-.070	DO7
1N746A	3.3	5.0	20	28	10	@	1.0	-.070	DO7
1N747	3.6	10	20	24	10	@	1.0	-.065	DO7
1N747A	3.6	5.0	20	24	10	@	1.0	-.065	DO7
1N748	3.9	10	20	23	10	@	1.0	-.060	DO7
1N748A	3.9	5.0	20	23	10	@	1.0	-.060	DO7
1N749	4.3	10	20	22	2.0	@	1.0	-.055	DO7
1N749A	4.3	5.0	20	22	2.0	@	1.0	-.055	DO7
1N750	4.7	10	20	19	2.0	@	1.0	-.043	DO7
1N750A	4.7	5.0	20	19	2.0	@	1.0	-.043	DO7
1N751	5.1	10	20	17	1.0	@	1.0	±.030	DO7
1N751A	5.1	5.0	20	17	1.0	@	1.0	±.030	DO7
1N752	5.6	10	20	11	1.0	@	1.0	±.028	DO7
1N752A	5.6	5.0	20	11	1.0	@	1.0	±.028	DO7
1N753	6.2	10	20	7.0	0.1	@	1.0	+.045	DO7
1N753A	6.2	5.0	20	7.0	0.1	@	1.0	+.045	DO7
1N957	6.8	20	18.5	4.5	10	@	4.6	+.050	DO7
1N754	6.8	10	20	5.0	0.1	@	1.0	+.050	DO7
1N957A	6.8	10	18.5	4.5	10	@	4.9	+.050	DO7
1N754A	6.8	5.0	20	5.0	0.1	@	1.0	+.050	DO7
1N957B	6.8	5.0	18.5	4.5	10	@	5.2	+.050	DO7
1N958	7.5	20	16.5	5.5	10	@	5.1	+.058	DO7
1N755	7.5	10	20	6.0	0.1	@	1.0	+.058	DO7
1N958A	7.5	10	16.5	5.5	10	@	5.4	+.058	DO7
1N755A	7.5	5.0	20	6.0	0.1	@	1.0	+.058	DO7
1N958B	7.5	5.0	16.5	5.5	10	@	5.7	+.058	DO7
1N959	8.2	20	15	6.5	5.0	@	5.6	+.062	DO7
1N756	8.2	10	20	8.0	0.1	@	1.0	+.062	DO7
1N959A	8.2	10	15	6.5	5.0	@	5.9	+.062	DO7
1N756A	8.2	5.0	20	8.0	0.1	@	1.0	+.068	DO7
1N959B	8.2	5.0	15	6.5	5.0	@	6.2	+.062	DO7
1N960	9.1	20	14	7.5	1.0	@	6.3	+.068	DO7
1N757	9.1	10	20	16	0.1	@	1.0	+.068	DO7
1N960A	9.1	10	14	7.5	1.0	@	6.6	+.068	DO7
1N757A	9.1	5.0	20	16	0.1	@	1.0	+.068	DO7
1N960B	9.1	5.0	14	7.5	1.0	@	6.9	+.068	DO7
1N961	10	20	12.5	8.5	1.0	@	6.8	+.072	DO7
1N758	10	10	20	17	0.1	@	1.0	+.075	DO7
1N961A	10	10	12.5	8.5	1.0	@	7.2	+.072	DO7
1N961B	10	5.0	12.5	8.5	1.0	@	7.6	+.072	DO7
1N758A	10	5.0	20	17	0.1	@	1.0	+.075	DO7
1N962	11	20	11.5	9.5	1.0	@	7.6	+.073	DO7
1N962A	11	10	11.5	9.5	1.0	@	8.0	+.073	DO7
1N962B	11	5.0	11.5	9.5	1.0	@	8.4	+.073	DO7
1N963	12	20	10.5	11.5	1.0	@	8.0	+.076	DO7
1N759	12	10	20	50	0.1	@	1.0	+.077	DO7

ZENER DIODES (BY ASCENDING V_Z)
(Cont'd) GLASS PACKAGE

TYPE	V_Z @ I_Z VOLTS NOMINAL	TOL $\pm V_Z$ %	I_Z TEST CURRENT mA	Z_Z @ I_Z Ω MAX	I_R @ μA MAX	I_R @ @	V_R VOLTS	T C %/°C	Package
1N963A	12	10	10.5	11.5	1.0	@	8.6	+.076	DO7
1N759A	12	5.0	20	50	.10	@	1.0	+.077	DO7
1N963B	12	5.0	10.5	11.5	1.0	@	9.1	+.076	DO7
1N964	13	20	9.5	13	.10	@	8.9	+.079	DO7
1N964A	13	10	9.5	13	.10	@	9.4	+.079	DO7
1N964B	13	5.0	9.5	13	.10	@	9.9	+.079	DO7
1N965	15	20	8.5	16	.10	@	10	+.082	DO7
1N965A	15	10	8.5	16	.10	@	10.8	+.082	DO7
1N965B	15	5.0	8.5	16	.10	@	11.4	+.082	DO7
1N966	16	20	7.8	17	.10	@	10.8	+.083	DO7
1N966A	16	10	7.8	17	.10	@	11.5	+.083	DO7
1N966B	16	5.0	7.8	17	.10	@	12.2	+.083	DO7
1N967	18	20	7.0	21	.10	@	12.3	+.085	DO7
1N967A	18	10	7.0	21	.10	@	13	+.085	DO7
1N967B	18	5.0	7.0	21	.10	@	13.7	+.085	DO7
1N968	20	20	6.2	25	.10	@	13.6	+.086	DO7
1N968A	20	10	6.2	25	.10	@	14.4	+.086	DO7
1N968B	20	5.0	6.2	25	.10	@	15.2	+.086	DO7
1N969	22	20	5.6	29	.10	@	14.9	+.087	DO7
1N969A	22	10	5.6	29	.10	@	15.8	+.087	DO7
1N969B	22	5.0	5.6	29	.10	@	16.7	+.087	DO7
1N970	24	20	5.2	33	.10	@	16.4	+.088	DO7
1N970A	24	10	5.2	33	.10	@	17.3	+.088	DO7
1N970B	24	5.0	5.2	33	.10	@	18.2	+.088	DO7
1N971	27	20	4.6	41	.10	@	18.2	+.090	DO7
1N971A	27	10	4.6	41	.10	@	19.4	+.090	DO7
1N971B	27	5.0	4.6	41	.10	@	20.6	+.090	DO7
1N972	30	20	4.2	49	.10	@	20.4	+.091	DO7
1N972A	30	10	4.2	49	.10	@	21.6	+.091	DO7
1N972B	30	5.0	4.2	49	.10	@	22.8	+.091	DO7
1N973	33	20	3.8	58	.05	@	22.5	+.092	DO7
1N973A	33	10	3.8	58	.05	@	23.8	+.092	DO7
1N973B	33	5.0	3.8	58	.05	@	25.1	+.092	DO7

DIODES

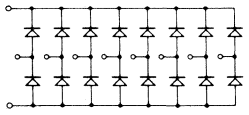
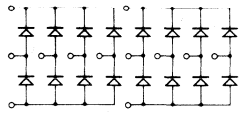
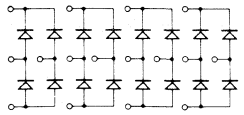
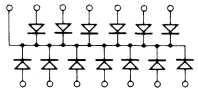
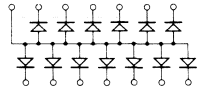
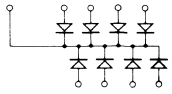
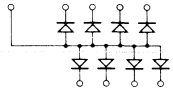
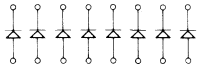
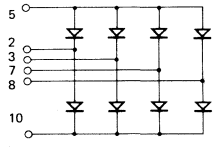
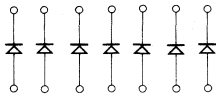
VOLTAGE REFERENCE ZENER DIODES (NUMERIC LISTING) METAL PACKAGE

TYPE	V_Z @ I_Z VOLTS ±5%	I_Z mA (TEST)	TEMPERATURE COEFFICIENT TEMP. RANGE °C	T C %/°C	Z_Z @ I_Z Ω MAX	Package
FCT1021	6.7	0.1	0 to +100	±.001	750	TO18
FCT1022	6.7	0.1	0 to +100	±.002	750	TO18
FCT1025	6.7	0.1	0 to +100	±.005	750	TO18
FCT1121	6.7	0.1	-55 to +100	±.001	750	TO18
FCT1122	6.7	0.1	-55 to +100	±.002	750	TO18
FCT1125	6.7	0.1	-55 to +100	±.005	750	TO18

MATCHED DIODE ASSEMBLIES (NUMERIC LISTING) GLASS AND PLASTIC

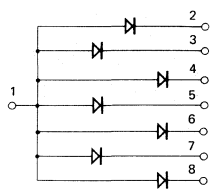
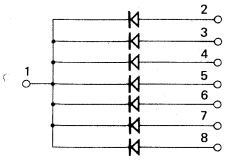
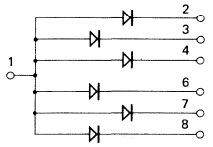
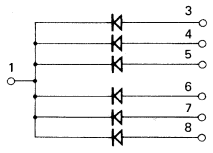
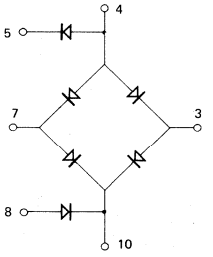
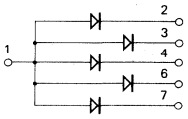
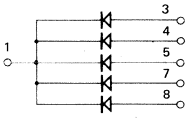
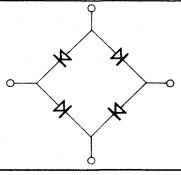
NUMBER OF DIODES			2	2	4	4	4
CONFIGURATION			PAIR	PAIR	QUAD	QUAD	BRIDGE
PACKAGE			(308)	DO7 or DO35	(310)	DO7 or DO35	(309)
	V_F MATCHING (-55°C to +100°C)						
BASIC DIODE SPECIFICATION	I_F RANGE mA	ΔV_F mV	TYPE	TYPE	TYPE	TYPE	TYPE
1N914	0.01 – 1.0	3.0	FA2310 E	FA2310 U	FA4310 E	FA4310 U	FA3310
1N914	0.01 – 1.0	10	FA2311 E	FA2311 U	FA4311 E	FA4311 U	FA3311
1N914	1.0 – 10	5.0	FA2312 E	FA2312 U	FA4312 E	FA4312 U	FA3312
1N914	1.0 – 10	15	FA2313 E	FA2313 U	FA4313 E	FA4313 U	FA3313
1N3070	0.01 – 1.0	3.0	FA2320 E	FA2320 U	FA4320 E	FA4320 U	FA3320
1N3070	0.01 – 1.0	10	FA2321 E	FA2321 U	FA4321 E	FA4321 U	FA3321
1N3070	1.0 – 10	5.0	FA2322 E	FA2322 U	FA4322 E	FA4322 U	FA3322
1N3070	1.0 – 10	15	FA2323 E	FA2323 U	FA4323 E	FA4323 U	FA3323
1N3070	10 – 100	10	FA2324 E	FA2324 U	FA4324 E	FA4324 U	FA3324
1N3070	10 – 100	20	FA2325 E	FA2325 U	FA5325 E	FA4325 U	FA3325
1N3070	10 – 100	10	FA2360 E	FA2360 U	FA4360 E	FA4360 U	FA3360
1N3070	10 – 100	20	FA2361 E	FA2361 U	FA4361 E	FA4361 U	FA3361
1N3595	0.01 – 1.0	10	FA2330 E	FA2330 U	FA4330 E	FA4330 U	FA3330
1N3595	1.0 – 10	15	FA2331 E	FA2331 U	FA4331 E	FA4331 U	FA3331
1N3595	10 – 100	20	FA2332 E	FA2332 U	FA4332 E	FA4332 U	FA3332
1N3595	0.01 – 1.0	10	FA2333 E	FA2333 U	FA4333 E	FA4333 U	FA3333
1N3595	1.0 – 10	15	FA2334 E	FA2334 U	FA4334 E	FA4334 U	FA3334
1N3595	10 – 100	20	FA2335 E	FA2335 U	FA4335 E	FA4335 U	FA3335
1N4306	0.1 – 10	10	1N4306				
1N4307	0.1 – 10	10			1N4307		

MONOLITHIC DIODE ARRAYS (BY DESCENDING NUMBER OF JUNCTIONS)
PLASTIC–METAL–CERAMIC PACKAGES

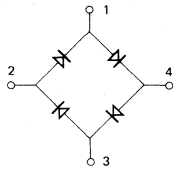
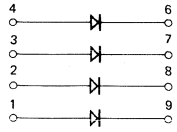
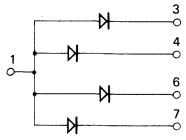
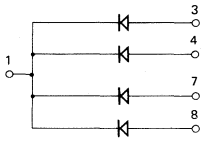
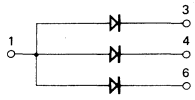
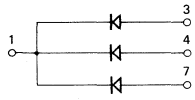
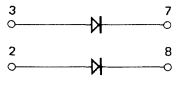
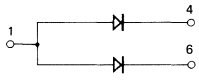
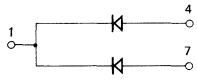
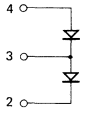
CIRCUIT	TYPE	B_V VOLTS MIN	I_R nA @ V_R MAX VOLTS	V_F VOLTS @ I_F MAX mA	C pF MAX	t_{rr} ns MAX	PACKAGE OUTLINE	PACKAGE DESCRIPTION
	FSA2500M	60	100 @ 50	1.5 @ 500	7.0	50	TO85-1	Ceramic FP–10L
	FSA2501M	60	100 @ 50	1.5 @ 500	7.0	50	TO116-2	Ceramic Dip–14L
	FSA2502M	60	100 @ 50	1.5 @ 500	7.0	50	TO5-11	Metal Can–10L
	FSA2510M	60	100 @ 40	1.3 @ 500	5.0	50	TO116-1	Plastic Dip–14L
	FSA2503M	60	100 @ 50	1.5 @ 500	7.0	50	TO116-2	Ceramic Dip–14L
	FSA2504M	60	100 @ 50	1.5 @ 500	7.0	50	TO86-1	Ceramic FP–14L
	FSA2509M	60	100 @ 40	1.3 @ 500	5.0	50	TO116-1	Plastic Dip–14L
	FSA2508M	60	100 @ 40	1.3 @ 500	5.0	50	TO116-3	Plastic Dip–16L
	FSA2565M	60	100 @ 40	1.3 @ 500	3.0	50	TO116-1	Plastic Dip–14L
	FSA2566M	60	100 @ 40	1.3 @ 500	3.0	50	TO116-1	Plastic Dip–14L
	FSA1411M	60	100 @ 40	1.5 @ 500	3.0	50	TO5-11	Metal Can–10L
	FSA2002M	60	100 @ 40	1.5 @ 500	3.0	50	TO85-1	Ceramic FP–10L
	FSA2563M	60	100 @ 40	1.3 @ 500	3.0	50	TO116-1	Plastic Dip–14L
	FSA1410M	60	100 @ 40	1.5 @ 500	3.0	50	TO5-11	Metal Can–10L
	FSA2003M	60	100 @ 40	1.5 @ 500	3.0	50	TO85-1	Ceramic FP–10L
	FSA2564M	60	100 @ 40	1.3 @ 500	3.0	50	TO116-1	Plastic Dip–14L
	FSA2619M	100	5.0 μA @ 75	1.0 @ 10	4.0	50	TO116-3	Plastic Dip–16L
	FSA2719M	75	100 @ 50	1.0 @ 10	3.0	40	TO116-3	Plastic Dip–16L
	FSA2788M	60	100 @ 50	1.1 @ 200	7.0	10	TO5-11	Metal Can–10L
	FSA2620M	100	5.0 μA @ 75	1.0 @ 10	4.0	5.0	TO116-1	Plastic Dip–14L
	FSA2720M	75	100 @ 50	1.0 @ 10	3.0	4.0	TO116-1	Plastic Dip–14L
	FSA2621M	100	5.0 μA @ 75	1.0 @ 10	4.0	4.0	TO86-1	Ceramic FP–14L
	FSA2721M	75	100 @ 50	1.0 @ 10	3.0	4.0	TO86-1	Ceramic FP–14L

DIODES

MONOLITHIC DIODE ARRAYS (BY DESCENDING NUMBER OF JUNCTIONS)
PLASTIC–METAL–CERAMIC PACKAGES (Cont'd)

CIRCUIT	TYPE	B_V VOLTS MIN	I_R nA @ V_R VOLTS MAX	V_F VOLTS @ I_F mA MAX	C pF MAX	t_{rr} ns MAX	PACKAGE OUTLINE	PACKAGE DESCRIPTION
	FSA2780M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2786M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2779M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2785M	60	100 @ 40	1.0 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2770M	60	100 @ 40	1.0 @ 200	4.0	6	TO5-11	Metal Can–10L
	FSA2778M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2784M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2702M	60	100 @ 40	1.0 @ 200	3.0	8.0	TO5-12	Metal Can–4L
	FSA2703M	60	100 @ 40	1.0 @ 200	3.0	8.0	TO18-3	Metal Can–4L
	FSA2704M	60	100 @ 40	1.0 @ 200	3.0	8.0	TO5-12	Metal Can–4L
	FSA2705M	60	100 @ 40	1.0 @ 200	3.0	8.0	TO18-3	Metal Can–4L

MONOLITHIC DIODE ARRAYS (BY DESCENDING NUMBER OF JUNCTIONS)
(Cont'd) PLASTIC–METAL–CERAMIC PACKAGES

CIRCUIT	TYPE	B_V VOLTS MIN	I_R nA @ V_R VOLTS MAX	V_F VOLTS @ I_F mA MAX	C pF MAX	t_{rr} ns MAX	PACKAGE OUTLINE	PACKAGE DESCRIPTION
	FSA2773M	60	100 @ 40	1.0 @ 100	3.0	6	TO5-12	Metal Can–4L
	FSA2774M	60	100 @ 40	1.0 @ 100	3.0	6	TO18-3	Metal Can–4L
	FSA2772M	60	100 @ 40	1.0 @ 100	3.0	6	TO5-11	Metal Can–10L
	FSA2777M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2783M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2776M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2782M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2771M	60	100 @ 40	1.0 @ 100	3.0	6	TO5-11	Metal Can–10L
	FSA2775M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2781M	60	100 @ 40	1.1 @ 200	3.0	10	TO5-11	Metal Can–10L
	FSA2787M	60	100 @ 50	1.1 @ 200	7.0	10	TO18-3	Metal Can–4L

DIODES/RECTIFIERS

DIODE DICE
(BY DESCENDING BV)

TYPE	BASIC STANDARD DEVICE	B_V VOLTS MIN	I_R nA @ MAX	V_R VOLTS	V_F VOLTS @ MAX	I_F mA	t_{rr} ns @ MAX	$I_f=I_r$ MAX	C pF MAX	CHIP SIZE MILS	BASIC APPLICATION
FDC3070	1N3070	200	100 @	175	1.0 @	100	50 @	10	2.5	17.5 x 17.5	High Voltage Switching
FDC485B	1N485B	200	25 @	175	1.0 @	100	500 @	10	5.0	17.5 x 17.5	High Voltage Low Leakage
FDC3600	1N3600	75	100 @	50	1.0 @	100	4.0@	10	2.5	17.5 x 17.5	General Purpose Switching
FDC4376	1N4376	20	100 @	10	1.1 @	50	0.8@	10	1.2	17.5 x 17.5	Ultra High Speed Switching

RECTIFIERS

GENERAL PURPOSE RECTIFIERS (BY ASCENDING V_R)
GLASS PACKAGE

TYPE	V_R VOLTS MIN	I_R @ V_R μA MAX	V_F VOLTS @ MAX	I_F AMPS	V_{FM} VOLTS @ MAX	I_O AMPS	Package
1N4001	50	10	1.1 @	1.0	1.6 @	1.0	DO41
1N5794	50	200	0.98 @	1.0			DO41
1N4002	100	10	1.1 @	1.0	1.6 @	1.0	DO41
1N5795	100	200	0.98 @	1.0			DO41
1N4003	200	10	1.1 @	1.0	1.6 @	1.0	DO41
1N5796	200	200	0.98 @	1.0			DO41
1N4004	400	10	1.1 @	1.0	1.6 @	1.0	DO41
1N5797	400	200	0.98 @	1.0			DO41
1N4005	600	10	1.1 @	1.0	1.6 @	1.0	DO41
1N5798	600	200	0.98 @	1.0			DO41

NPN HIGH SPEED SATURATED SWITCHING TRANSISTORS (BY ASCENDING V_{CEO})

METAL PACKAGE

(FOR MEDIUM SPEED – SEE GENERAL PURPOSE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	τ_s (t_{off}) ns @ I_C MAX mA	h_{FE} @ I_C MIN - MAX mA	$V_{CE(sat)}$ VOLTS @ I_C MAX mA	f_T MHz MIN	C_{ob} pF MAX	P_D T_A 25°C mW	P_D T_C 25°C W	Package	PNP Complement
2N834	6	25 @ 10	25 @ 10	0.25 @ 10	350	4.0	300	1.0	TO18-1	2N2894A
2N709	6	6 @ 5	20 - 120 @ 10	0.30 @ 3	600	3.0	300	0.5	TO18-1	2N4208
FT709	6	6 @ 5	30 - 125 @ 10	0.25 @ 10	600	3.0	300	0.5	TO18-1	2N4208
2N3010	6	6 @ 5	25 - 125 @ 10	0.25 @ 10	600	3.0	300		TO18-1	2N4208
2N3510	10	(25) @ 150	25 - 150 @ 150	0.40 @ 150	350	4.0	360	1.2	TO18-2	2N5455
BSX28	12	13 @ 10	30 - 120 @ 10	0.2 @ 10	400	4.0	360	1.2	TO18-1	2N2894A
2N3011	12	13 @ 10	30 - 120 @ 10	0.20 @ 10	400	4.0	360	1.2	TO18-1	2N4208
2N744	12	18 @ 10	40 - 120 @ 10	0.35 @ 10	280	5.0	300	1.0	TO18-1	2N2894A
2N2368	15	10 @ 10	20 - 60 @ 10	0.25 @ 10	400	4.0	360	1.2	TO18-1	2N5056
2N2369	15	13 @ 10	40 - 120 @ 10	0.25 @ 10	500	4.0	360	1.2	TO18-1	2N5057
2N2369A	15	13 @ 10	40 - 120 @ 10	0.20 @ 10	500	4.0	360	1.2	TO18-1	2N5057
2N3009	15	18 @ 10	30 - 120 @ 30	0.18 @ 30	350	5.0	360	1.2	TO18-2	2N5455
2N3013	15	18 @ 10	30 - 120 @ 30	0.18 @ 30	350	5.0	360	1.2	TO18-2	2N5455
2N3511	15	(18) @ 150	30 - 120 @ 150	0.40 @ 150	450	4.0	360	1.2	TO18-2	2N5455
2N914	15	20 @ 20	30 - 120 @ 10	0.25 @ 20	300	6.0	360	1.2	TO18-1	2N5455
2N2481	15	20 @ 10	40 - 120 @ 10	0.25 @ 10	300	5.0	360	1.2	TO18-1	2N5057
2N706A	15	25 @ 10	20 - 60 @ 10	0.60 @ 10	200	5.0	300	1.0	TO18-1	2N5056
2N706B	15	25 @ 10	20 - 60 @ 10	0.60 @ 10	200	5.0	300	1.0	TO18-1	2N5056
2N708	15	25 @ 10	30 - 120 @ 10	0.40 @ 10	300	6.0	360	1.2	TO18-1	2N5056
2N753	15	35 @ 10	40 - 120 @ 10	0.60 @ 10	200	5.0	300	1.0	TO18-1	2N5057
BSX20	15	18 @ 10	30 - 120 @ 30	0.18 @ 30	350	5.0	360	1.2	TO18-1	BSX29
BSX26	15	13 @ 10	40 - 120 @ 10	0.25 @ 10	500	4.0	360	1.2	TO18-1	
2N4137	20	13 @ 10	40 - 120 @ 10	0.30 @ 10	500	4.0	360	1.2	TO18-1	2N3209
BSX39	20	18 @ 10	40 - 120 @ 30	0.18 @ 30	350	5.0	360	1.2	TO18-1	2N3209
2N3014	20	18 @ 10	30 - 120 @ 30	0.18 @ 30	350	5.0	360	1.2	TO18-2	2N5456
2N706	(20)	60 @ 10	20 @ 10	0.60 @ 10	200	6.0	300	1.0	TO18-1	2N2894
2N3015	30	(60) @ 300	30 - 120 @ 150	0.40 @ 150	250	8.0	800	3.0	TO5-1	
2N4046	30	(60) @ 500	40 - 150 @ 100	0.20 @ 100	250	12	800	3.5	TO5-1	2N5023
2N3724	30	(60) @ 500	60 - 150 @ 100	0.20 @ 100	300	12	800	3.5	TO5-1	2N5023
2N4013	30	(60) @ 500	60 - 150 @ 100	0.20 @ 100	300	12	360	1.2	TO18-1	
2N3734	30	(60) @1000	30 - 120 @1000	0.90 @1000	300	9.0	1000	4.0	TO5-1	2N5023
2N3252	30	(70) @ 500	30 - 90 @ 500	0.50 @ 500	200	12	1000	5.0	TO5-1	2N5023
BSX32	40	(60) @ 500	60 - 150 @ 100	0.25 @ 100	300	10	800	3.5	TO5-1	2N5022
2N3253	40	(70) @ 500	25 @ 150	0.35 @ 150	175	12	1000	5.0	TO5-1	2N5022
2N4047	50	(60) @ 500	40 - 150 @ 100	0.26 @ 100	250	10	800	3.5	TO5-1	2N5022
2N3725	50	(60) @ 500	60 - 150 @ 100	0.26 @ 100	300	10	800	3.5	TO5-1	2N5022
2N4014	50	(60) @ 500	60 - 150 @ 100	0.26 @ 100	300	10	360	1.2	TO18-1	
2N3444	50	(70) @ 500	20 - 60 @ 500	0.60 @ 500	150	12	1000	5.0	TO5-1	2N5022
2N3722	60	(100) @ 500	40 - 150 @ 100	0.22 @ 100	300	10	800	4.0	TO5-1	
FT3723	70	(130) @ 500	40 - 150 @ 100	0.28 @ 100	300	9.0	800	4.0	TO5-1	

TRANSISTORS—SMALL SIGNAL

NPN HIGH SPEED SATURATED SWITCHING TRANSISTORS (BY ASCENDING V_{CEO})

PLASTIC PACKAGE (Cont'd)

(FOR MEDIUM SPEED – SEE GENERAL PURPOSE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	τ_s (t_{off}) ns @ I_C MAX mA	h_{FE} @ I_C MIN - MAX mA	$V_{CE(sat)}$ VOLTS@ I_C MAX mA	f_T MHz MIN	C_{ob} pF MAX	P_D T_A 25°C mW	T_C 25°C W	Package	PNP Complement
MPS834		25 @ 10	25 @ 10	0.25 @ 10	350	4.0	625	1.0	TO92-1	MPSL08
2N5134	10	18 @ 10	20 - 150 @ 10	0.25 @ 10	250	4.0	200	0.5	TO18-4	2N3639
PN5134	10	18 @ 10	20 - 150 @ 10	0.25 @ 10	250	4.0	625	1.0	TO92-1	
EN3011	12	13 @ 10	30 - 120 @ 10	0.20 @ 10	400	4.0	200	0.5	TO18-4	EN2894A
2N4274	12	13 @ 10	35 - 120 @ 10	0.20 @ 10	400	4.0	280	0.83	TO18-4	2N2894A
EN744	12	18 @ 10	40 - 120 @ 10	0.30 @ 10	280	5.0	200	0.5	TO18-4	EN2984A
2N4265	12	20 @ 10	100 - 400 @ 10	0.22 @ 10	300	4.0	625	1.0	TO92-1	MPSL08
2N5224	12	(60) @ 10	40 - 400 @ 10	0.35 @ 10	250	4.0	625	1.0	TO92-1	MPSL08
2N4275	15	13 @ 10	35 - 120 @ 10	0.20 @ 10	400	4.0	280	0.83	TO18-4	2N5910
EN2369A	15	13 @ 10	40 @ 10	0.20 @ 10	500	4.0	200	0.5	TO18-4	2N5910
MPS2369	15	13 @ 10	40 - 120 @ 10	0.25 @ 10	500	4.0	625	1.0	TO92-1	2N5771
2N5769	15	13 @ 10	40 - 120 @ 10	0.20 @ 10	500	4.0	625	1.0	TO92-1	2N5771
EN3009	15	18 @ 10	30 - 120 @ 30	0.18 @ 30	350	5.0	200	0.5	TO18-4	
EN3013	15	20 @ 20	30 - 120 @ 10	0.40 @ 10	300	6.0	200	0.5	TO18-4	
MPS3646	15	18 @ 10	30 - 120 @ 30	0.20 @ 30	350	5.0	625	1.0	TO92-1	2N5771
2N3646	15	18 @ 10	30 - 120 @ 30	0.20 @ 30	350	5.0	200	0.5	TO18-4	2N4258A
2N5772	15	18 @ 10	30 - 120 @ 30	0.20 @ 30	350	5.0	625	1.0	TO92-1	2N5771
EN708	15	20 @ 20	30 - 120 @ 10	0.40 @ 10	300	6.0	200	0.5	TO18-4	2N5910
EN914	15	20 @ 20	30 - 120 @ 10	0.25 @ 20	300	6.0	200	0.5	TO18-4	EN2894A
2N4264	15	20 @ 10	40 - 160 @ 10	0.22 @ 10	300	4.0	625	1.0	TO92-1	2N5771
EN706	15	60 @ 10	20 @ 10	0.60 @ 10	200	6.0	200	0.5	TO18-4	2N5910
MPS2713	18		30 - 90 @ 2.0	0.30 @ 2.0	250	2.5	625	1.0	TO92-1	
MPS2714	18		75 - 225 @ 2.0	0.30 @ 2.0	250	2.5	625	1.0	TO92-1	
EN3014	20	18 @ 10	30 - 120 @ 30	0.18 @ 30	350	5.0	200	0.5	TO18-4	2N5910
MPS706A	(20)	25 @ 10	20 - 60 @ 10	0.60 @ 10	200	6.0	625	1.0	TO92-1	MPS3640
MPS706	(20)	60 @ 10	20 @ 10	0.60 @ 10	200	6.0	625	1.0	TO92-1	MPS3640
2N5845A	40	(50) @ 500	35 - 150 @ 500	0.50 @ 500	250	9.0	625	1.5	TO92-1	
2N5845	40	(60) @ 500	25 - 150 @ 500	0.60 @ 500	200	9.0	625	1.5	TO92-1	

PNP HIGH SPEED SATURATED SWITCHING TRANSISTORS (BY ASCENDING V_{CEO})
METAL PACKAGE

(FOR MEDIUM SPEED – SEE GENERAL PURPOSE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	τ_s (t_{off}) ns @ I_C MAX mA	h_{FE} h_{FE} @ I_C MIN - MAX mA	$V_{CE(sat)}$ VOLTS @ I_C MAX mA	f_T MHz MIN	C_{ob} (C_{cb}) pF MAX	P_D T_A 25°C mW	T_C 25°C W	Package	NPN Complement
2N3304	6	30 @ 10	30 - 120 @ 10	0.16 @ 10	500	3.5	300	0.5	TO18-1	2N709
BSX29	12	(90) @ 30	30 - 120 @ 30	0.20 @ 30	400	6.0	360	1.2	TO18-1	BSX20
2N4208	12	20 @ 10	30 - 120 @ 10	0.15 @ 10	700	3.0	350	0.7	TO18-1	2N2369A
2N2894A	12	20 @ 10	40 - 120 @ 30	0.19 @ 30	800	4.5	360	1.2	TO18-1	2N2369A
2N3546	12	(30) @ 50	30 - 120 @ 10	0.15 @ 10	700	6.0	360	1.2	TO18-1	2N914
2N3012	12	(75) @ 30	30 - 120 @ 30	0.20 @ 30	400	6.0	360	1.2	TO18-1	2N2369A
2N2894	12	(90) @ 30	30 - 150 @ 30	0.20 @ 30	400	6.0	360	1.2	TO18-1	2N2369A
2N4209	15	20 @ 10	50 - 120 @ 10	0.18 @ 10	850	3.0	350	0.7	TO18-1	2N2369A
2N5056	15	30 @ 10	30 - 100 @ 30	0.13 @ 30	600	4.5	360	1.2	TO18-1	2N2369A
2N5057	15	30 @ 10	40 - 100 @ 30	0.19 @ 30	800	4.5	360	1.2	TO18-1	2N2369A
2N5455	15	35 @ 10	30 - 120 @ 30	0.15 @ 30	450	(6.0)	340	1.0	TO18-2	2N3013
2N3209	20	(90) @ 30	30 - 120 @ 30	0.20 @ 30	400	5.0	360	1.2	TO18-1	2N4137
2N5456	25	35 @ 10	30 - 120 @ 30	0.15 @ 30	450	(6.0)	340	1.0	TO18-2	2N3014
2N5023	30	(90) @ 500	40 - 100 @ 500	0.35 @ 500	200	25.0	1000	4.0	TO5-1	2N3724
2N3467	40	(90) @ 500	40 - 120 @ 500	0.50 @ 500	175	25.0	1000	5.0	TO5-1	2N3725
2N5022	50	(90) @ 500	25 - 100 @ 500	0.40 @ 500	170	25.0	1000	4.0	TO5-1	2N3725
2N3468	50	(90) @ 500	25 - 75 @ 500	0.60 @ 500	150	25.0	1000	5.0	TO5-1	2N3725

PNP HIGH SPEED SATURATED SWITCHING TRANSISTORS (BY ASCENDING V_{CEO})
PLASTIC PACKAGE

(FOR MEDIUM SPEED – SEE GENERAL PURPOSE SECTION)

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TYPE	V_{CEO} (V_{CER}) VOLTS MIN	t_S (t_{off}) ns @ I_C MAX mA	h_{FE} h_{FE} @ I_C MIN - MAX mA	$V_{CE(sat)}$ VOLTS @ I_C MAX mA	f_T MHz MIN	C_{ob} pF MAX	P_D T_A 25°C mW	T_C 25°C W	Package	NPN Complement
2N5228	5	(140) @ 10	30 @ 10	0.40 @ 10	300	5.0	625	1.0	TO92-1	2N5224
MPSL07	6	15 @ 10	30 - 120 @ 10	0.15 @ 10	500	3.0	625	1.0	TO92-1	MPS2369
MPS3639	6	(25) @ 50	30 - 120 @ 10	0.16 @ 10	500	3.5	625	1.0	TO92-1	MPS2369
2N3639	6	30 @ 10	30 - 120 @ 10	0.16 @ 10	500	3.5	200	0.5	TO18-4	2N4274
2N4258A	12	15 @ 10	30 - 120 @ 10	0.15 @ 10	700	3.0	200	0.5	TO18-4	2N4274
PN4258A	12	50 @ 10	30 - 120 @ 10	0.15 @ 10	700	3.0	625	1.0	TO92-1	2N5769
2N4258	12	20 @ 10	30 - 120 @ 10	0.15 @ 10	700	3.0	200	0.5	TO18-4	2N4274
PN4258	12	20 @ 10	30 - 120 @ 10	0.15 @ 10	700	3.0	625	1.0	TO92-1	2N5769
MPSL08	12	20 @ 10	30 - 120 @ 10	0.15 @ 10	700	3.0	625	1.0	TO92-1	MPS2369
2N4313	12	20 @ 10	30 - 120 @ 30	0.19 @ 30	700	4.5	200	0.5	TO18-4	2N4274
EN2894A	12	20 @ 10	40 - 120 @ 30	0.19 @ 30	800	4.5	200	0.5	TO18-4	EN2369A
MPS3640	12	(35) @ 50	30 - 120 @ 10	0.20 @ 10	500	3.5	625	1.0	TO92-1	2N5772
2N3640	12	50 @ 10	30 - 120 @ 10	0.20 @ 10	500	3.5	200	0.5	TO18-4	2N4274
2N5771	15	20 @ 10	50 - 120 @ 10	0.15 @ 10	850	3.0	625	1.0	TO92-1	2N5772
2N5910	20	20 @ 10	30 - 120 @ 10	0.15 @ 10	700	3.0	200	0.5	TO18-4	EN3014
PN5910	20	20 @ 10	30 - 120 @ 10	0.15 @ 10	700	3.0	625	1.0	TO92-1	2N5769

TRANSISTORS—SMALL SIGNAL

NPN GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO}) METAL PACKAGE

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} h_{FE} MIN - MAX	@ I_C mA	$V_{CE(sat)}$ VOLTS MAX	@ I_C mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	T_C 25°C W	Package	PNP Complement
BFY52	20	60	@ 150	0.35	@ 150	12	200		800	2.86	TO5-1	
2N916	25	50 - 200	@ 10	0.50	@ 10	6.0	300		360	1.2	TO18-1	2N3250
2N718	28	40 - 120	@ 150	1.50	@ 150	35	50		400	1.5	TO18	2N2907
BC282	30	50 - 300	@ 50	0.50	@ 50	5.5(Typ)			400	1.30	TO18-1	
2N2219	30	100 - 300	@ 150	0.40	@ 150	8.0	250		800	3.0	TO5-1	2N2905
2N2222	30	100 - 300	@ 150	0.40	@ 150	8.0	250		500	1.8	TO18-1	2N2907
2N3300	30	100 - 300	@ 150	0.22	@ 150	8.0	250	150	800	3.0	TO5-1	2N2905
2N3302	30	100 - 300	@ 150	0.22	@ 150	8.0	250	150	360	1.8	TO18-1	2N2907
2N2218	30	40 - 120	@ 150	0.40	@ 150	8.0	250		800	3.0	TO5-1	2N2904
2N2221	30	40 - 120	@ 150	0.40	@ 150	8.0	250		500	1.8	TO18-1	2N2906
2N3299	30	40 - 120	@ 150	0.22	@ 150	8.0	250	150	800	3.0	TO5-1	2N2904
2N3301	30	40 - 120	@ 150	0.22	@ 150	8.0	250	150	360	1.8	TO18-1	2N2906
BC119	30	40 - 120	@ 150	0.35	@ 150	25	40		800	5.0	TO5-1	BC139
BFY51	30	40	@ 150	0.35	@ 150	12	50		800	2.86	TO5-1	
2N2405	30	30 - 120	@ 150	0.45	@ 150	11	200		800	2.4	TO5-1	2N2904
BFY50	35	30	@ 150	0.20	@ 150	12	60		800	2.86	TO5	
2N3947	40	100 - 300	@ 10	0.20	@ 10	4.0	300	450	360	1.2	TO18	2N3250
2N3946	40	50 - 150	@ 10	0.20	@ 10	4.0	250	375	360	1.2	TO18	FT3905
BC140	40	40 - 400	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC160
BC140-6	40	40 - 100	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC160-6
BC140-10	40	63 - 160	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC160-10
BC140-16	40	100 - 250	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC160-16
BC140-25	40	160 - 400	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC160-25
2N2219A	40	100 - 300	@ 150	0.30	@ 150	8.0	300	285	800	3.0	TO5-1	2N2905A
2N2222A	40	100 - 300	@ 150	0.30	@ 150	8.0	300	285	500	1.8	TO18-1	2N2907A
2N3109	40	100 - 300	@ 150	0.25	@ 150	25	70		800	5.0	TO5-1	2N2905
2N2218A	40	40 - 120	@ 150	0.30	@ 150	8.0	250	285	800	3.0	TO5-1	2N2904
2N2221A	40	40 - 120	@ 150	0.30	@ 150	8.0	250	285	500	1.8	TO18-1	2N2906
2N2868	40	40 - 120	@ 150	0.25	@ 150	20	50		800	2.8	TO5-1	2N2905
2N3110	40	40 - 120	@ 150	0.25	@ 150	25	60		800	5.0	TO5-1	2N2904
2N697	(40)	40 - 120	@ 150	1.50	@ 150	35	50		600	2.0	TO5-1	2N2904
2N2270	45	50 - 200	@ 150	0.90	@ 150	15	100		1000	5.0	TO5-1	2N2904A
BFY56	45	30 - 150	@ 150	0.30	@ 150	2.5	40	625	800	5.0	TO5-1	BFX39
2N915	50	50 - 200	@ 10	1.00	@ 10	3.5	250		360	1.2	TO18-1	2N3250A
2N956	(50)	100 - 300	@ 150	1.50	@ 150	25	70		500	1.8	TO18-1	2N2907
2N1711	(50)	100 - 300	@ 150	1.50	@ 150	25	70		800	3.0	TO5-1	2N2905
2N3053	(50)	50 - 250	@ 150	1.40	@ 150	15	100			5.0	TO5-1	2N2905
2N718A	(50)	40 - 120	@ 150	1.50	@ 150	25	60		500	1.8	TO18-1	2N2907
2N1613	(50)	40 - 120	@ 150	1.50	@ 150	25	80		800	3.0	TO5-1	2N2905A
BC141	60	40 - 400	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC161
BC141-6	60	40 - 100	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC161-6
BC141-10	60	63 - 160	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC161-10
BC141-16	60	100 - 250	@ 100	1.4	@1000	25	50		800	5.0	TO5-1	BC161-16
BC141-25	60	160 - 400	@ 150	1.4	@1000	25	50		800	5.0	TO5-1	BC161-25
2N871	60	100 - 300	@ 150	5.00	@ 150	15	60		500	1.8	TO18-1	2N2907A
2N4960	60	100 - 300	@ 150	0.18	@ 150	15	250	1000	800	3.5	TO5-1	2N2905A

NPN GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (Cont'd) (BY ASCENDING V_{CEO}) METAL PACKAGE

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} h_{FE} @ I_C MIN - MAX mA	$V_{CE(sat)}$ VOLTS@ I_C MAX mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	P_D T_C 25°C W	Package	PNP Complement
2N4962	60	100 - 300 @ 150	0.18 @ 150	15	250	1000	500	1.5	TO18-1	2N2907A
2N3107	60	100 - 300 @ 150	0.25 @ 150	20	70		800	5.0	TO18-1	2N4032
2N720	60	40 - 120 @ 150	5.00 @ 150	20	50		500	1.8	TO18-1	2N2906A
2N3108	60	40 - 120 @ 150	0.25 @ 150	20	60		800	5.0	TO5-1	2N4030
2N719A	60	20 - 60 @ 150	5.00 @ 150	15	40		500	1.8	TO18-1	2N2906A
2N719	60	20 - 60 @ 150	5.00 @ 150	20	60		500	1.8	TO18-1	2N2906A
BC142	60	20 @ 200	0.4 @ 200				800	5.0	TO5-1	BC143
BC286	60	20 - 180 @ 500	0.40 @ 500	12 (Typ)	100 (Typ)		800	4.0	TO5-1	BC287
2N3666	80	100 - 300 @ 150	1.20 @ 150	12	60			5.0	TO5-1	2N4033
2N3019	80	100 - 300 @ 150	0.20 @ 150	12	100		800	5.0	TO5-1	2N4033
2N3700	80	100 - 300 @ 150	0.20 @ 150	12	100		500	1.8	TO18-1	
2N4961	80	100 - 300 @ 150	0.18 @ 150	15	250	1000	800	3.5	TO5-1	2N4033
2N4963	80	100 - 300 @ 150	0.18 @ 150	15	250	1000	500	1.5	TO18-1	
2N3665	80	40 - 120 @ 150	1.20 @ 150	12	60			5.0	TO5-1	2N4031
2N3020	80	40 - 120 @ 150	0.20 @ 150	12	80		800	5.0	TO5-1	2N4031
2N3701	80	40 - 120 @ 150	0.20 @ 150	12	80		500	1.8	TO18-1	
2N720A	80	40 - 120 @ 150	5.00 @ 150	15	50		500	1.8	TO18-1	
2N1893	80	40 - 120 @ 150	5.00 @ 150	15	50		800	3.0	TO5-1	2N4031
2N699	(80)	40 - 120 @ 150	5.00 @ 150	20	50		600	2.0	TO5-1	2N4030

TRANSISTORS—SMALL SIGNAL

NPN GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO}) PLASTIC PACKAGE

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} (h_{fe}) h_{FE} @ MIN - MAX	I_C mA	$V_{CE(sat)}$ VOLTS @ MAX	I_C mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	T_C 25°C W	Package	PNP Complement
2N5128	12	35 - 350 @	50	0.25 @	150	10	200		300	0.7	TO5-4	2N5142
PN5128	12	35 - 350 @	50	0.25 @	150	10	200		625	1.0	TO92-1	PN5142
2N5129	12	35 - 350 @	50	0.25 @	150	10	200		200	0.5	TO18-4	2N5143
PN5129	12	35 - 350 @	50	0.25 @	150	10	200		625	1.0	TO92-1	PN5143
2N5219	15	35 - 500 @	2.0	0.40 @	2.0	4.0	150		625		TO92-1	2N3221
2N5131	15	30 - 500 @	10	1.00 @	10	6.0	100		200	0.5	TO18-4	2N5139
PN5131	15	30 - 500 @	10	1.00 @	10	6.0	100		625	1.0	TO92-1	PN5139
2N5220	15	30 - 600 @	50	0.50 @	50	10	100		625		TO92-1	2N5226
MPS2712	18	75 - 225 @	2.0			4.0			625	1.0	TO92-1	2N4126
MPS2711	18	30 - 90 @	2.0			4.0			625	1.0	TO92-1	2N4125
2N5223	20	50 - 800 @	2.0	0.70 @	2.0	4.0	150		625		TO92-1	2N5227
SE2002	20	100 - 400 @	10	0.70 @	10	6.0	200		200	0.5	TO18-4	2N4122
SE2001	20	40 - 160 @	10	0.70 @	10	6.0	200		200	0.5	TO18-4	2N4121
2N5132	20	30 - 400 @	10	2.00 @	10	3.5	200		200	0.5	TO18-4	2N4121
PN5132	20	30 - 400 @	10	2.00 @	10	3.5	200		625	1.0	TO92-1	PN4125
MPS3706	20	30 - 600 @	50	1.00 @	50	12	100		625	1.0	TO92-1	MPS3702
2N5136	20	20 - 400 @	150	0.25 @	150	35	40		220	0.6	TO5-4	2N5142
PN5136	20	20 - 400 @	150	0.25 @	150	35	40		625	1.0	TO92-1	2N5142
2N5137	20	20 - 400 @	150	0.25 @	150	35	40		220	0.6	TO18-4	2N5143
PN5137	20	20 - 400 @	150	0.25 @	150	35	40		625	1.0	TO92-1	2N5143
MPS6561	20	50 - 200 @	350	0.50 @	150	30	60		625	1.0	TO92-1	MPS6563
MPS6515	25	250 - 500 @	2.0	0.50 @	2.0	3.5			625	1.0	TO92-1	MPS6519
MPS2925	25	(235 - 470) @	2.0			12			625	1.0	TO92-1	2N4126
MPS3392	25	150 - 300 @	2.0			3.5			625	1.0	TO92-1	2N4126
MPS6514	25	150 - 300 @	2.0	0.50 @	2.0	3.5			625	1.0	TO92-1	MPS6518
MPS2924	25	(150 - 300) @	2.0			12			625	1.0	TO92-1	2N4126
MPS3395	25	150 - 500 @	2.0			3.5			625	1.0	TO92-1	2N4126
2N4124	25	120 - 360 @	2.0	0.30 @	2.0	4.0	300		625		TO92-1	2N4126
EN4124	25	120 - 360 @	2.0	0.30 @	2.0	4.0	300		200		TO18-4	EN4126
MPS3393	25	90 - 180 @	2.0			3.5			625	1.0	TO92-1	2N4126
MPS2923	25	(90 - 180) @	2.0			12			625	1.0	TO92-1	2N4126
MPS3721	25	60 - 660 @	2.0			3.5			625	1.0	TO92-1	2N4125
MPS3394	25	55 - 110 @	2.0			3.5			625	1.0	TO92-1	2N4125
MPS2926	25	(35 - 470) @	2.0			3.5			625	1.0	TO92-1	2N4125
EN5172	25	100 - 500 @	10	0.25 @	10	12			200	0.5	TO18-4	2N4122
MPS5172	25	100 - 500 @	10	0.25 @	10	12			625	1.0	TO92-1	2N4126
EN916	25	50 - 200 @	10	0.50 @	10	6.0	300		200	0.5	TO18-4	2N4121
2N5135	25	50 - 600 @	10	1.00 @	100	25	40		300	0.8	TO5-4	2N5142
PN5135	25	50 - 600 @	10	1.00 @	100	25	40		625	1.0	TO92-1	PN5142
2N5225	25	30 - 600 @	50	0.80 @	50	20	50		625		TO92-1	2N5226
MPS6560	25	50 - 200 @	500	0.50 @	500	30	60		625	1.0	TO92-1	MPS6562
MPS6513	30	90 - 180 @	2.0	0.50 @	2.0	3.5			625	1.0	TO92-1	MPS6517
MPS6512	30	50 - 100 @	2.0	0.50 @	2.0	3.5			625	1.0	TO92-1	MPS6516
2N4123	30	50 - 150 @	2.0	0.30 @	2.0	4.0	250		625		TO92-1	2N4125
EN4123	30	50 - 150 @	2.0	0.30 @	2.0	4.0	250		200		TO18-4	EN4125
2N3566	30	50 - 160 @	10	1.00 @	100	25	40		300	0.8	TO5-4	2N3638A

NPN GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO}) PLASTIC PACKAGE

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} (h_{fe}) h_{FE} MIN - MAX	@ I_C mA	$V_{CE(sat)}$ VOLTS@ MAX	I_C mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	T_C 25°C W	Package	PNP Complement
PN3566	30	50 - 160	@ 10	1.00	@ 100	25	40		625	1.0	TO92-1	2N3638A
MPS3704	30	100 - 300	@ 50	0.60	@ 50	12	100		625	1.0	TO92-1	2N4403
MPS3705	30	50 - 150	@ 50	0.80	@ 50	12	100		625	1.0	TO92-1	2N4402
MPS6532	30	30	@ 100	0.50	@ 100	5.0			625	1.0	TO92-1	MPS6535M
BC125	30	30	@ 150	25	@ 150	25	40		300	0.8	TO5-4	BC126
2N3643	30	100 - 300	@ 150	0.22	@ 150	8.0	250		350	0.7	TO5-4	2N3638A
PN3643	30	100 - 300	@ 150	0.22	@ 150	8.0	250		625	1.0	TO92-1	MPS3638A
EN2219	30	100 - 300	@ 150	0.40	@ 150	8.0	250		200	0.5	TO5-4	EN2905
PN2219	30	100 - 300	@ 150	0.40	@ 150	8.0	250		625	1.0	TO92-1	PN2905
EN2222	30	100 - 300	@ 150	0.40	@ 150	8.0	250		200	0.5	TO18-4	EN2907
PN2222	30	100 - 300	@ 150	0.40	@ 150	8.0	250		625	1.0	TO92-1	PN2907
2N3641	30	40 - 120	@ 150	0.22	@ 150	8.0	250		350	0.7	TO5-4	2N3638
PN3641	30	40 - 120	@ 150	0.22	@ 150	8.0	250		625	1.0	TO92-1	MPS3638
PN2218	30	40 - 120	@ 150	0.40	@ 150	8.0	250		625	1.0	TO92-1	PN2904
EN697	30	40 - 120	@ 150	1.50	@ 150	35	50		300	0.8	TO5-4	2N3638
MPSA10	40	40 - 400	@ 5.0			4.0	50		625	1.0	TO92-1	2N3905
MPSA20	40	40 - 400	@ 5.0	0.25	@ 5.0	4.0	125		625	1.0	TO92-1	2N3905
2N3904	40	100 - 300	@ 10	0.20	@ 10	4.0	300	225	625		TO92-1	2N3906
EN3904	40	100 - 300	@ 10	0.30	@ 10	4.0	300	225	200	0.5	TO18-4	EN3906
2N3903	40	50 - 150	@ 10	0.20	@ 10	4.0	250	225	625		TO92-1	2N3905
EN3903	40	50 - 150	@ 10	0.20	@ 10	4.0	250	225	200	0.5	TO18-4	EN3905
MPS6531	40	90 - 270	@ 100	0.30	@ 100	5.0			625	1.0	TO92-1	MPS6534M
MPS6530	40	40 - 120	@ 100	0.50	@ 100	5.0			625	1.0	TO92-1	MPS6535M
2N4401	40	100 - 300	@ 150	0.40	@ 150	6.5	250	225	625		TO92-1	2N4403
2N3569	40	100 - 300	@ 150	0.25	@ 150	20	60		300	0.8	TO5-4	2N4355
PN3569	40	100 - 300	@ 150	0.25	@ 150	20	60		625	1.0	TO92-1	MPS4355
PN2219A	40	100 - 300	@ 150	0.30	@ 150	8.0	300	285	625	1.0	TO92-1	PN2905A
PN2222A	40	100 - 300	@ 150	0.30	@ 150	8.0	300	285	625	1.0	TO92-1	PN2907A
EN1711	40	100 - 300	@ 150	1.50	@ 150	25	70		300	0.8	TO5-4	EN2905
PN1711	40	100 - 300	@ 150	1.50	@ 150	25	70		625	1.0	TO92-1	PN2905
EN956	40	100 - 300	@ 150	1.50	@ 150	25	70		220	0.6	TO18-4	EN2907
2N4400	40	50 - 150	@ 150	0.40	@ 150	6.5	200	255	625		TO92-1	2N4402
2N3567	40	40 - 120	@ 150	0.25	@ 150	20	60		300	0.8	TO5-4	2N4354
PN3567	40	40 - 120	@ 150	0.25	@ 150	20	60		625	1.0	TO92-1	MPS4354
PN2218A	40	40 - 120	@ 150	0.30	@ 150	8.0	250	285	625	1.0	TO92-1	PN2904A
PN2221A	40	40 - 120	@ 150	0.30	@ 150	8.0	250	285	625	1.0	TO92-1	PN2906A
EN718A	40	40 - 120	@ 150	1.50	@ 150	25	60		220	0.6	TO18-4	EN2907
EN1613	40	40 - 120	@ 150	1.50	@ 150	25	60		300	0.8	TO5-4	EN2905
PN1613	40	40 - 120	@ 150	1.50	@ 150	25	60		625	1.0	TO92-1	PN2905
2N3694	45	100 - 400	@ 10			3.5	200		200	0.5	TO18-4	2N4122
MPS3694	45	100 - 400	@ 10			3.5	200		625	1.0	TO92-1	2N3906
SE1002	45	100 - 400	@ 10	2.00	@ 10	3.5	200		200	0.5	TO18-4	2N4122
MPS6566	45	100 - 400	@ 10	0.40	@ 10	3.5	200		625	1.0	TO92-1	2N3906
BC134	45	150 - 400	@ 10			3.5	200		300	0.8	TO18-4	
MPS6565	45	40 - 160	@ 10	0.40	@ 10	3.5	200		625	1.0	TO92-1	2N3905

TRANSISTORS—SMALL SIGNAL

NPN GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO}) PLASTIC PACKAGE (Cont'd)

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} (h_{fe}) h_{FE} MIN - MAX	@ I_C mA	$V_{CE(sat)}$ VOLTS MAX	@ I_C mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	T_C 25°C W	Package	PNP Complement
BC118	45	40 - 160	@ 10			3.5	200		310	0.8	TO18-4	
2N3693	45	40 - 160	@ 10			3.5	200		200	0.5	TO18-4	2N4121
MPS3693	45	40 - 160	@ 10			3.5	200		625	1.0	TO92-1	2N3905
SE1001	45	40 - 160	@ 10	2.0	@ 10	3.5	200		200	0.5	TO18-4	2N4121
2N3642	45	40 - 120	@ 150	0.22	@ 150	8.0	250		350	0.7	TO5-4	2N3644
PN3642	45	40 - 120	@ 150	0.22	@ 150	8.0	250		625	1.0	TO92-1	PN3644
2N4409	50	60 - 400	@ 1.0	0.2	@ 1.0	12	60		625		TO92-1	MPSA55
EN915	50	50 - 200	@ 10	1.0	@ 10	3.5	250		200	0.5	TO18-4	2N4122
MPSA05	60	50	@ 100	0.25	@ 100		50		625	1.0	TO92-1	MPSA55
BC537	60	40 - 400	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC527
BC537-6	60	40 - 100	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC527-6
BC537-10	60	63 - 160	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC527-10
BC537-16	60	100 - 250	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC527-16
BC537-25	60	160 - 400	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC527-25
PE6020	60	100 - 300	@ 150	0.18	@ 150	15	250		625	1.0	TO92-1	PN3645
SE6020	60	100 - 300	@ 150	0.18	@ 150	15	250	1000	300	0.8	TO5-4	2N3645
EN871	60	100 - 300	@ 150	5.0	@ 150	20	60		220	0.6	TO18-4	
2N5856	60	50 - 300	@ 150	0.4	@ 150	12	12	200	750		TO5-4	2N5855
EN870	60	40 - 120	@ 150	5.0	@ 150	20	50		220	0.6	TO18-4	
2N3568	60	40 - 120	@ 150	0.25	@ 150	20	60		300	0.8	TO5-4	2N4354
PN3568	60	40 - 120	@ 150	0.25	@ 150	20	60		625	1.0	TO92-1	MPS4354
2N4410	80	60 - 400	@ 10	0.2	@ 1.0	12	60		625		TO92-1	MPSA56
BC535	80	50	@ 100	0.25	@ 100		50		625	1.0	TO92-1	BC534
MPSA06	80	50	@ 100	0.25	@ 100		50		625	1.0	TO92-1	MPSA56
PE6021	80	100 - 300	@ 150	0.18	@ 150	15	250	1000	625	1.0	TO92-1	
SE6021	80	100 - 300	@ 150	0.18	@ 150	15	250	1000	300	0.8	TO5-4	2N4356
BC538	80	40 - 400	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC528
BC538-6	80	40 - 100	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC528-6
BC538-10	80	63 - 160	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC528-10
BC538-16	80	100 - 250	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC528-16
BC538-25	80	160 - 400	@ 100	0.5	@1000	15	100		625	1.0	TO92-1	BC528-25
2N5858	80	50 - 300	@ 150	0.4	@ 150	12	200		750		TO105	2N5857
PN1893	80	40 - 120	@ 150	5.0	@ 150	15	50		625	1.0	TO92-1	MPSA56

PNP GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO})

METAL PACKAGE

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} h_{FE} @ I_C MIN - MAX mA	$V_{CE(sat)}$ VOLTS @ I_C MAX mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	P_D T_C 25°C W	Package	NPN Complement
2N869	18	20 @ 10	1.0 @ 10	9.0	100		360	1.2	TO18-1	2N916
2N869A	18	40 - 120 @ 30	0.2 @ 30	6.0	400	80	360	1.2	TO18-1	2N914
BCY72	25	50 @ 10	0.25 @ 10	6.0	200		360	1.2	TO18-1	
BFX48	30	90 @ 10	0.3 @ 50	3.5	400		360	1.0	TO18-1	
BC283	30	40 - 270 @ 50	0.3 @ 50	7.0 (Typ)	200 (Typ)		400	1.3	TO18-1	
2N3134	35	100 - 300 @ 150	0.6 @ 150	10	200	150	600	3.0	TO5-1	2N2219
2N722	35	30 - 90 @ 150	1.5 @ 150	45	60		400	1.5	TO18-1	2N718
2N1132	35	30 - 90 @ 150	1.5 @ 150	45	60		600	2.0	TO5-1	2N1613
2N4035	40	150 - 300 @ 10	0.14 @ 10	3.5	450	150	360	1.0	TO18-1	2N3947
2N3251	40	100 - 300 @ 10	0.25 @ 10	6.0	300	250	360	1.2	TO18-1	2N3947
BFY64	40	80 @ 10	0.3 @ 50	10	200	120	700	3.0	TO5-1	
2N4034	40	70 - 200 @ 10	0.14 @ 10	3.5	400	150	360	1.0	TO18-1	2N3946
BCY70	40	50 - @ 10	0.25 @ 10	6.0	200		360	1.2	TO18-1	
2N3250	40	50 - 150 @ 10	0.25 @ 10	6.0	250	225	360	1.2	TO18-1	2N3946
BC139	40	40 @ 50	1.2 @ 500	10	40		700	3.0	TO5-1	BC119
BC160	40	40 - 400 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC140
BC160-6	40	40 - 100 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC140-6
BC160-10	40	63 - 160 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC140-10
BC160-16	40	100 - 250 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC140-16
BC160-25	40	160 - 400 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC140-25
2N2905	40	100 - 300 @ 150	0.4 @ 150	8.0	200	110	600	3.0	TO5-1	2N2218A
2N2907	40	100 - 300 @ 150	0.4 @ 150	8.0	200	110	400	1.8	TO18-1	2N2222A
2N4037	40	50 - 250 @ 150	1.4 @ 150		60		1000		TO5-2	2N3110
2N2904	40	40 - 120 @ 150	0.4 @ 150	8.0	200	110	600	3.0	TO5-1	2N2218A
2N2906	40	40 - 120 @ 150	0.4 @ 150	8.0	200	110	400	1.8	TO18-1	2N2221A
BCY71	45	100 - 600 @ 10	0.25 @ 10	6.0	200		360	1.2	TO18-1	
2N3502	45	115 - 300 @ 50	0.25 @ 50	8.0	200	100	700	3.0	TO5-1	2N2219A
2N3504	45	115 - 300 @ 50	0.25 @ 50	8.0	200	100	400	1.3	TO18-1	2N2222A
BFX38	55	85 @ 100	0.5 @ 500	20	100	400	800	4.0	TO5-1	
BFX39	55	40 @ 100	0.5 @ 500	20	100	400	800	4.0	TO5-1	BFY56
2N3251A	60	100 - 300 @ 10	0.25 @ 10	6.0	300	250	360	1.2	TO18-1	2N871
2N3250A	60	50 - 150 @ 10	0.25 @ 10	6.0	250	225	360	1.2	TO18-1	
2N3503	60	115 - 300 @ 50	0.25 @ 50	8.0	200	100	700	3.0	TO5-1	2N3107
2N3505	60	115 - 300 @ 50	0.25 @ 50	8.0	200	100	400	1.3	TO18-1	2N871
2N3072	60	30 - 130 @ 50	0.25 @ 50	10	130	100	800	3.0	TO5-1	2N3108
2N3073	60	30 - 130 @ 50	0.25 @ 50	10	130	100	360	1.2	TO18-1	
BC161	60	40 - 400 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC141
BC161-6	60	40 - 100 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC141-6
BC161-10	60	63 - 160 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC141-10
BC161-16	60	100 - 250 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC141-16
BC161-25	60	150 - 400 @ 100	1.4 @1000	25	50		800	5.0	TO5-1	BC141-25
2N4032	60	100 - 300 @ 100	0.15 @ 150	20	150		800	4.0	TO5	2N3107
2N4030	60	40 - 120 @ 100	0.15 @ 150	20	100		800	4.0	TO5-1	2N3108
2N2905A	60	100 - 300 @ 150	0.4 @ 150	8.0	200	110	600	3.0	TO5-1	2N3107
2N2907A	60	100 - 300 @ 150	0.4 @ 150	8.0	200	110	400	1.8	TO18-1	2N871
2N2904A	60	40 - 120 @ 150	0.4 @ 150	8.0	200	110	600	3.0	TO5-1	2N3108

TRANSISTORS—SMALL SIGNAL

PNP GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO}) METAL PACKAGE (Cont'd)

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} h_{FE} MIN - MAX	@ I_C mA	$V_{CE(sat)}$ VOLTS MAX	@ I_C mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	T_C 25°C W	Package	NPN Complement
2N2906A	60	40 - 120	@ 150	0.4	@ 150	8.0	200	110	400	1.8	TO18-1	
BC143	60	20	@ 200	0.6	@ 200				700	3.0	TO5-1	BC142
BC287	60	20 - 200	@ 500	0.45	@ 500	13(Typ)	200(Typ)		800	4.0	TO5-1	BC286
2N4036	65	20 - 200	@ 150	0.65	@ 150		60	700		7.0	TO5-1	2N3108
BFX40	75	60	@ 500	0.5	@ 500	20	150		800	4.0	TO5-1	
BFX41	75	40	@ 100	0.5	@ 500	20	100	400	800	4.0	TO5-1	
2N4033	80	100 - 300	@ 100	0.15	@ 150	20	150		800	4.0	TO5-1	2N3020
2N4031	80	40 - 120	@ 100	0.15	@ 150	20	100		800	4.0	TO5-1	2N3019

PNP GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO}) PLASTIC PACKAGE

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} h_{FE} @ I_C MIN - MAX mA	$V_{CE(sat)}$ VOLTS @ I_C MAX mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	T_C 25°C W	Package	NPN Complement
2N5221	15	30 - 600 @ 50	0.50 @ 50	15	100		625		TO92-1	2N5227
2N5139	20	30 @ 10	0.20 @ 10	5.0	300		200	0.5	TO18-4	2N5137
PN5139	20	30 @ 10	0.20 @ 10	5.0	300		625	1.0	TO92-1	PN5137
2N5142	20	30 @ 50	0.50 @ 50	30	100	200	300	0.7	TO5-4	2N5136
PN5142	20	30 @ 50	0.50 @ 50	30	100	200	625	1.0	TO92-1	PN5136
2N5143	20	30 @ 50	0.50 @ 50	30	100	200	200	0.5	TO18-4	2N5137
PN5143	20	30 @ 50	0.50 @ 50	30	100	200	625	1.0	TO92-1	PN5137
MPS6563	20	50 - 200 @ 350	0.50 @ 350	30	60		625	1.0	TO92-1	MPS6561
MPS6519	25	250 - 500 @ 2.0	0.50 @ 2.0	4.0			625	1.0	TO92-1	MPS6515
2N4126	25	120 - 360 @ 2.0	0.40 @ 2.0	4.5	250		625		TO92-1	2N4124
EN4126	25	120 - 360 @ 2.0	0.40 @ 2.0	4.5	250		200	0.5	TO18-4	EN4124
2N3638A	25	100 @ 50	0.25 @ 50	10	150	170	300	0.7	TO5-4	2N3643
MPS3638A	25	100 @ 50	0.25 @ 50	10	150	170	625	1.0	TO92-1	2N4401
MPS3702	25	60 - 300 @ 50	0.25 @ 50	12	100		625	1.0	TO92-1	MPS3706
2N3638	25	30 @ 50	0.25 @ 50	20	100	170	300	0.7	TO5-4	2N3641
MPS3638	25	30 @ 50	0.25 @ 50	20	100	170	625	1.0	TO92-1	PN3641
2N5226	25	30 - 600 @ 50	0.80 @ 50	20	50		625		TO92-1	2N5225
MPS6562	25	50 - 200 @ 500	0.50 @ 500	30	60		625	1.0	TO92-1	MPS6560
2N4125	30	50 - 150 @ 2.0	0.40 @ 2.0	4.5	200		625		TO92-1	2N4123
EN4125	30	50 - 150 @ 2.0	0.40 @ 2.0	4.5	200		200	0.5	TO18-4	EN4123
2N5227	30	50 - 700 @ 2.0	0.40 @ 2.0	5.0	100		625		TO92-1	2N4123
2N4917	30	150 - 300 @ 10	0.14 @ 10	4.5	450	150	200	0.5	TO18-4	2N3694
PN4917	30	150 - 300 @ 10	0.14 @ 10	4.5	200	150	625	1.0	TO92-1	
2N4916	30	70 - 200 @ 10	0.14 @ 10	4.5	400	150	200	0.5	TO18-4	2N3693
PN4916	30	70 - 200 @ 10	0.14 @ 10	4.5	400	150	625	1.0	TO92-1	
MPS3703	30	30 - 150 @ 50	0.25 @ 50	12	100		625	1.0	TO92-1	2N4123
MPS6535M	30	30 @ 100	0.50 @ 100	8.0			625	1.0	TO92-1	MPS6533
BC126	30	30 - 120 @ 150	0.50 @ 150				300	0.8	TO5-4	BC125
EN722	35	30 - 90 @ 150	1.50 @ 150	45	60		200	0.5	TO18-4	EN718
EN1132	35	30 - 90 @ 150	1.50 @ 150	45	60		200	0.5	TO5-4	EN1613
MPS6518	40	150 - 300 @ 2.0	0.50 @ 2.0	4.0			625	1.0	TO92-1	MPS6514
MPS6517	40	90 - 180 @ 2.0	0.50 @ 2.0	4.0			625	1.0	TO92-1	MPS6513
MPS6516	40	50 - 100 @ 2.0	0.50 @ 2.0	4.0			625	1.0	TO92-1	MPS6512
MPSA70	40	40 - 400 @ 5.0	0.25 @ 5.0	4.0	125		625	1.0	TO92-1	MPSA20
2N4122	40	150 - 300 @ 10	0.14 @ 10	4.5	450	150	200	0.5	TO18-4	
2N3906	40	100 - 300 @ 10	0.25 @ 10	4.5	250	300	625		TO92-1	2N3904
EN3906	40	100 - 300 @ 10	0.25 @ 10	4.5	250	300	200	0.5	TO18-4	EN3904
PN3251	40	50 - 150 @ 10	0.25 @ 10	6.0	250	225	625	1.0	TO92-1	2N3903
2N4121	40	70 - 200 @ 10	0.14 @ 10	4.5	400	150	200	0.5	TO18-4	
2N3905	40	50 - 150 @ 10	0.25 @ 10	4.5	200	260	625		TO92-1	2N3903
EN3905	40	50 - 150 @ 10	0.25 @ 10	4.5	200	260	200	0.5	TO18-4	EN3903
EN3250	40	50 - 150 @ 10	0.25 @ 10	6.0	250	225	200	0.5	TO18-4	EN3903
PN3250	40	50 - 150 @ 10	0.25 @ 10	6.0	250	225	625	1.0	TO92-1	
MPS6534M	40	90 - 270 @ 100	0.30 @ 100	8.0			625	1.0	TO92-1	MPS6532
MPS6533M	40	40 - 120 @ 100	0.50 @ 100	8.0			625	1.0	TO92-1	MPS6531
BC116A	40	80 - 240 @ 150	0.40 @ 150	8.0	130		300	0.8	TO5-4	2N3569

PNP GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO}) PLASTIC PACKAGE (Cont'd)

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

TYPE	V_{CEO} (V_{CER}) VOLTS MIN	h_{FE} h_{FE} MIN - MAX	@ I_C mA	$V_{CE(sat)}$ VOLTS MAX	@ I_C mA	C_{ob} pF MAX	f_T MHz MIN	t_{off} ns MAX	P_D T_A 25°C mW	T_C 25°C W	Package	NPN Complement
EN2905	40	100 - 300	@ 150	0.40	@ 150	8.0	150	110	300	0.7	TO5-4	EN2219
PN2905	40	100 - 300	@ 150	0.40	@ 150	8.0	150	110	625	1.0	TO92-1	PN2219
EN2907	40	100 - 300	@ 150	0.40	@ 150	8.0	150	110	200	0.5	TO18-4	EN2222
PN2907	40	100 - 300	@ 150	0.40	@ 150	8.0	150	110	625	1.0	TO92-1	PN2222
2N4403	40	100 - 300	@ 150	0.40	@ 150	8.5	200	255	625		TO92-1	2N4401
2N4402	40	50 - 150	@ 150	0.40	@ 150	8.5	150	255	625		TO92-1	2N4400
PN2904	40	40 - 120	@ 150	0.40	@ 150	8.0	200	110	625	1.0	TO92-1	PN2218
PN2906	40	40 - 120	@ 150	0.40	@ 150	8.0	200	110	625	1.0	TO92-1	PN2221
2N3644	45	115 - 300	@ 50	0.25	@ 50	8.0	200	100	300	0.7	TO5-4	2N3569
PN3644	45	115 - 300	@ 50	0.25	@ 50	8.0	200	100	625	1.0	TO92-1	PN3569
EN3502	45	100 - 300	@ 150	0.40	@ 150	8.0	150	100	300	0.7	TO5-4	EN2219
EN3504	45	100 - 300	@ 150	0.40	@ 150	8.0	150	100	200	0.5	TO18-4	EN2222
2N4355	60	100 - 400	@ 10	0.15	@ 150	30	100		350	0.8	TO5-4	2N3568
MPS4355	60	100 - 400	@ 10	0.15	@ 150	30	100		625	1.0	TO92-1	PN3568
PN3251A	60	100 - 300	@ 10	0.25	@ 10	6.0	300	250	625	1.0	TO92-1	
PN3250A	60	50 - 150	@ 10	0.25	@ 10	6.0	250	225	625	1.0	TO92-1	
2N4354	60	50 - 500	@ 10	0.15	@ 150	30	100		350	0.8	TO5-4	SE6020
MPS4354	60	50 - 500	@ 10	0.15	@ 150	30	100		625	1.0	TO92-1	SE6020
2N3645	60	115 - 300	@ 50	0.25	@ 50	8.0	200	100	300	0.7	TO5-4	SE6020
PN3645	60	115 - 300	@ 50	0.25	@ 50	8.0	200	100	300	0.7	TO5-4	SE6020
MPSA55	60	50	@ 100	0.25	@ 100		50		625	1.0	TO92-1	MPSA05
PN2905A	60	100 - 300	@ 150	0.40	@ 150	8.0	150	110	625	1.0	TO92-1	PN2219A
PN2907A	60	100 - 300	@ 150	0.40	@ 150	8.0	150	110	625	1.0	TO92-1	PN2222A
BC527	60	40 - 400	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC537
BC527-6	60	40 - 100	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC537-6
BC527-10	60	63 - 160	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC537-10
BC527-16	60	100 - 250	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC537-16
BC527-25	60	160 - 400	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC537-25
2N5855	60	50 - 300	@ 150	0.40	@ 150		15		750		TO5-4	2N5856
PN2904A	60	40 - 120	@ 150	0.40	@ 150	8.0	150	110	625	1.0	TO92-1	PN2218A
PN2906A	60	40 - 120	@ 150	0.40	@ 150	8.0	150	110	625	1.0	TO92-1	PN2221A
BC534	80	50	@ 10	0.25	@ 100		50		625	1.0	TO92-1	BC535
2N4356	80	50 - 250	@ 10	0.15	@ 150	30	100		350	0.8	TO5-4	SE6021
MPS4356	80	50 - 250	@ 10	0.15	@ 150	30	100		625	1.0	TO92-1	SE6021
MPSA56	80	50	@ 100	0.25	@ 100		50		625	1.0	TO92-1	MPSA06
BC528	80	40 - 400	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC538
BC528-6	80	40 - 100	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC538-6
BC528-10	80	63 - 160	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC538-10
BC528-16	80	100 - 250	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC538-16
BC528-25	80	160 - 400	@ 100	0.50	@1000	15	100		625	1.0	TO92-1	BC538-25
2N5857	80	50 - 300	@ 150	0.40	@ 150		15		750		TO5-1	2N5858

TRANSISTORS—SMALL SIGNAL

NPN LOW LEVEL, LOW NOISE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO})
METAL PACKAGE

TYPE	V_{CEO} VOLTS MIN	h_{FE} h_{FE} MIN - MAX @	I_C mA	h_{FE} (h_{fe}) MIN - MAX @	I_C mA	NF dB @ MAX	f kHz	NF dB @ MAX	f kHz	Package
2N930	45	100 - 300 @	0.01	600 @	10			3.0 @	WIDEBAND	TO18
2N3117	60	250 - 500 @	0.01	400 @	1.0	1.0 @	1.0	1.0 @	10	TO18
2N2484	60	100 - 500 @	0.01	250 @	1.0	2.0 @	10	3.0 @	WIDEBAND	TO18

TRANSISTORS—SMALL SIGNAL

NPN LOW LEVEL, LOW NOISE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO})
PLASTIC PACKAGE

TYPE	V_{CEO} VOLTS MIN	h_{FE} h_{FE} MIN - MAX @	I_C mA	h_{FE} h_{FE} MIN - MAX @	I_C mA	NF dB @ MAX	f kHz	NF dB @ MAX	f kHz	Package
2N5133	18	60 - 1000 @	1.0							TO18-4
PN5133	18	60 - 1000 @	1.0							TO92-1
BC208	20	90 (Typ) @	0.01	110 - 800 @	2.0	10 @	1.0			TO18-4
BC208A	20	90 (Typ) @	0.01	110 - 220 @	2.0	10 @	1.0			TO18-4
BC208B	20	150 (Typ) @	0.01	200 - 450 @	2.0	10 @	1.0			TO18-4
BC208C	20	270 (Typ) @	0.01	420 - 800 @	2.0	10 @	1.0			TO18-4
BC209	20	150 (Typ) @	0.01	200 - 800 @	2.0	4.0 @	1.0	4.0 @	WIDE BAND	TO18-4
BC209B	20	150 (Typ) @	0.01	200 - 450 @	2.0	4.0 @	1.0	4.0 @	WIDE BAND	TO18-4
BC209C	20	270 (Typ) @	0.01	420 - 450 @	2.0	4.0 @	1.0	4.0 @	WIDE BAND	TO18-4
BC319	20	150 (Typ) @	0.01	200 - 800 @	2.0	4.0 @	1.0	4.0 @	WIDE BAND	TO92-1
BC319B	20	150 (Typ) @	0.01	200 - 450 @	2.0	4.0 @	1.0	4.0 @	WIDE BAND	TO92-1
BC319C	20	270 (Typ) @	0.01	420 - 800 @	2.0	4.0 @	1.0	4.0 @	WIDE BAND	TO92-1
MPS6571	20	250 - 1000 @	0.1							TO92-1
BC113	20	120 @	0.1	200 @	1.0	2.5 (Typ) @	1.0			TO18-4
BC114	25	120 @	0.1	200 @	10	3.0 @	1.0			TO18-4
2N5089	25	400 - 1200 @	0.1	400 @	10.0			2.0 @	WIDE BAND	TO92-1
MPS6521	25	150 @	0.1	300 - 600 @	2.0			3.0 @	WIDE BAND	TO92-1
MPS6520	25	100 @	0.1	200 - 400 @	2.0			3.0 @	WIDE BAND	TO92-1
2N3565	25	.70 @	0.1	150 - 600 @	1.0					TO18-4
PN3565	25	.70 @	0.1	150 - 600 @	1.0					TO92-1
SE4010	25	200 - 1000 @	1.0			3.0 @	1.0			TO18-4
SE4002	25	200 - 1000 @	1.0							TO18-4
SE4001	25	60 - 300 @	1.0							TO18-4
BC115	30	50 @	1.0	50 @	100					TO5-4
BC318	30	90 (Typ) @	0.01	110 - 800 @	2.0	6.0 @	1.0			TO92-1
BC318A	30	90 (Typ) @	0.01	110 - 220 @	2.0	6.0 @	1.0			TO92-1
BC318B	30	150 (Typ) @	0.01	200 - 450 @	2.0	6.0 @	1.0			TO92-1
BC318C	30	270 (Typ) @	0.01	420 - 800 @	2.0	6.0 @	1.0			TO92-1
2N5963	30	900 @	0.01	1200 - 2200 @	10	3.0 @	1.0	8.0 @	0.01	TO92-1
SE4023	30	900 @	0.01	1200 - 2200 @	10	3.0 @	1.0	8.0 @	0.01	TO18-4
2N5088	30	300 - 900 @	0.1	300 @	10			3.0 @	WIDE BAND	TO92-1
MPS3707	30	100 - 400 @	0.1					5.0 @	WIDE BAND	TO92-1
MPS3711	30	180 - 660 @	1.0							TO92-1

TRANSISTORS—SMALL SIGNAL

NPN LOW LEVEL, LOW NOISE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO})
PLASTIC PACKAGE

TYPE	V_{CEO} VOLTS MIN	h_{FE} MIN - MAX	@ I_C mA	h_{FE} MIN - MAX	@ I_C mA	NF dB MAX	@ f kHz	NF dB MAX	@ f kHz	Package
MPS3710	30	30 - 330	@ 1.0							TO92-1
MPS3709	30	45 - 165	@ 1.0							TO92-1
MPS3708	30	45 - 660	@ 1.0							TO92-1
BC207	45	90 (Typ)	@ 0.01	110 - 450	@ 2.0	10	@ 1.0			TO18-4
BC207A	45	90 (Typ)	@ 0.01	110 - 220	@ 2.0	10	@ 1.0			TO18-4
BC207B	45	150 (Typ)	@ 0.01	200 - 450	@ 2.0	10	@ 1.0			TO18-4
BC317	45	90 (Typ)	@ 0.01	110 - 450	@ 2.0	6.0	@ 1.0			TO92-1
BC317A	45	90 (Typ)	@ 0.01	110 - 220	@ 2.0	6.0	@ 1.0			TO92-1
BC317B	45	150 (Typ)	@ 0.01	200 - 450	@ 2.0	6.0	@ 1.0			TO92-1
2N5962	45	450	@ 0.01	600 - 1400	@ 10	3.0	@ 1.0	3.0	@ WIDE BAND	TO92-1
SE4021	45	450	@ 0.01	600 - 1400	@ 10	3.0	@ 1.0	3.0	@ WIDE BAND	TO18-4
EN930	45	100 - 300	@ 0.01	600	@ 10			3.0	@ WIDE BAND	TO18-4
BC521	45	600 - 1400	@10	350	@ 0.01	3.0	@ 1.0			TO92-1
2N5210	50	200 - 650	@ 0.1	250	@ 10	3.0	@ 1.0	2.0	@ WIDE BAND	TO92-1
2N5209	50	100 - 300	@ 0.1	150	@ 10	4.0	@ 1.0	3.0	@ WIDE BAND	TO92-1
MPSA09	50	100 - 600	@ 0.1							TO92-1
2N5961	60	100	@ 0.01	150 - 950	@ 10	6.0	@ 1.0			TO92-1
SE4020	60	100	@ 0.01	150 - 950	@ 10	6.0	@ 1.0			TO18-4
EN2484	60	100 - 300	@ 0.01	250	@ 1.0	2.0	@ 10	3.0	@ WIDE BAND	TO18-4
PN2484	60	100 - 500	@ 0.01	250	@ 1.0	2.0	@ 10	3.0	@ WIDE BAND	TO92-1
BC520	60	150 - 700	@ 10	100	@ 0.01	3.0	@ 1.0	3.0	@ WIDE BAND	TO92-1
BC523	60	150 - 700	@ 10	100	@ 0.01					TO92-1

PNP LOW LEVEL, LOW NOISE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO})
METAL PACKAGE

TYPE	V_{CEO} VOLTS MIN	h_{FE} h_{FE} MIN - MAX	@	I_C mA	h_{FE} h_{FE} MIN - MAX	@	I_C mA	NF dB MAX	@	f kHz	NF dB MAX	@	f kHz	Package
BC179	20	120 - 460	@	2.0				4.0	@	1.0	4.0	@	WIDE BAND	TO18-1
BC179A	20	120 - 220	@	2.0				4.0	@	1.0	4.0	@	WIDE BAND	TO18-1
BC179B	20	180 - 460	@	2.0				4.0	@	1.0	4.0	@	WIDE BAND	TO18-1
BC178	25	70 - 460	@	2.0				10	@	1.0				TO18-1
BC178VI	25	70 - 140	@	2.0				10	@	1.0				TO18-1
BC178A	25	120 - 220	@	2.0				10	@	1.0				TO18-1
BC178B	25	180 - 460	@	2.0				10	@	1.0				TO18-1
BC177	45	70 - 220	@	2.0				10	@	1.0				TO18-1
BC177VI	45	70 - 140	@	2.0				10	@	1.0				TO18-1
BC177A	45	120 - 220	@	2.0				10	@	1.0				TO18-1
BC177B	45	180 - 460	@	2.0				10	@	1.0				TO18-1
2N3964	45	180	@	0.001	250 - 500	@	0.01	2.0	@	1.0	4.0	@	0.1	TO18-1
2N3965	60	180	@	0.001	250 - 500	@	0.01	2.0	@	1.0	4.0	@	0.1	TO18-1
BFX37	60	70 - 300	@	0.01	100	@	1.0	3.0	@	1.0	3.0	@	WIDE BAND	TO18-1
2N3962	60	60	@	0.001	100 - 300	@	0.01	3.0	@	1.0	10	@	0.1	TO18-1

TRANSISTORS—SMALL SIGNAL

PNP LOW LEVEL, LOW NOISE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO}) PLASTIC PACKAGE

TYPE	V_{CEO} VOLTS MIN	$h_{FE}(h_{fe})$ MIN - MAX	@	I_C mA	$h_{FE}(h_{fe})$ MIN - MAX	@	I_C mA	NF dB MAX	@	f kHz	NF dB MAX	@	f kHz	Package
BC206	20	150 (Typ)	@	0.01	200 - 800	@	2.0	4.0	@	1.0	4.0	@	WIDE BAND	TO18-4
BC206B	20	150 (Typ)	@	0.01	200 - 450	@	2.0	4.0	@	1.0	4.0	@	WIDE BAND	TO18-4
BC206C	20	250 (Typ)	@	0.01	400 - 800	@	2.0	4.0	@	1.0	4.0	@	WIDE BAND	TO18-4
BC322	20	150 (Typ)	@	0.01	200 - 800	@	2.0	4.0	@	1.0	4.0	@	WIDE BAND	TO92-1
BC322B	20	150 (Typ)	@	0.01	200 - 450	@	2.0	4.0	@	1.0	4.0	@	WIDE BAND	TO92-1
MPS6523	25	150	@	0.10	300 - 600	@	2.0				3.0	@	WIDE BAND	TO92-1
MPS6522	25	100	@	0.10	200 - 400	@	2.0				3.0	@	WIDE BAND	TO92-1
BC205	20	80 (Typ)	@	0.01	110 - 500	@	2.0	10	@	1.0				TO18-4
BC205A	20	80 (Typ)	@	0.01	110 - 220	@	2.0	10	@	1.0				TO18-4
BC205B	20	150 (Typ)	@	0.01	200 - 450	@	2.0	10	@	1.0				TO18-4
BC321	30	80 (Typ)	@	0.01	110 - 800	@	2.0	6.0	@	1.0				TO92-1
BC321A	30	80 (Typ)	@	0.01	110 - 220	@	2.0	6.0	@	1.0				TO92-1
BC321B	30	150 (Typ)	@	0.01	200 - 450	@	2.0	6.0	@	1.0				TO92-1
2N5138	30	50 - 800	@	0.10	50	@	1.0							TO18-4
PN5138	30	50 - 800	@	0.10	50	@	1.0							TO92-1
BC225	40	130 (Typ)	@	0.01	90	@	1.0	1.0 (Typ)	@	1.0				TO18-4
BC153	40	50	@	0.10	50	@	10	1.0	@	1.0				TO18-4
BC154	40	160	@	0.10	160	@	10	2.5	@	1.0				TO18-4
2N4250	40	250 - 700	@	0.10	250	@	1.0	2.0	@	1.0	2.0	@	WIDE BAND	TO18-4
PN4250	40	250 - 700	@	0.10	250	@	1.0	2.0	@	1.0	2.0	@	WIDE BAND	TO92-1
2N4248	40	50	@	0.10	50	@	1.0							TO18-4
PN4248	40	50	@	0.10	50	@	1.0							TO92-1
BC204	45	80 (Typ)	@	0.01	50 - 450	@	2.0	10	@	1.0				TO18-4
BC204A	45	80 (Typ)	@	0.01	110 - 220	@	2.0	10	@	1.0				TO18-4
BC204B	45	150 (Typ)	@	0.01	200 - 450	@	2.0	10	@	1.0				TO18-4
BC320	45	80 (Typ)	@	0.01	110 - 450	@	2.0	6.0	@	1.0				TO92-1
BC320A	45	80 (Typ)	@	0.01	110 - 220	@	2.0	6.0	@	1.0				TO92-1
BC320B	45	150 (Typ)	@	0.01	200 - 450	@	2.0	6.0	@	1.0				TO92-1
2N5087	50	250 - 800	@	0.10	250	@	10	2.0	@	1.0	2.0	@	WIDE BAND	TO92-1
2N5086	50	150 - 500	@	0.10	150	@	10	3.0	@	1.0	3.0	@	WIDE BAND	TO92-1
BC526	50	40	@	0.01	(100 - 600)	@	2.0							TO92-1
BC526A	50	40	@	0.01	(100 - 300)	@	2.0				10		WIDE BAND	TO92-1
BC526B	50	40	@	0.01	(200 - 400)	@	2.0	4.0	@	1.0	4.0	@	WIDE BAND	TO92-1
BC526C	50	40	@	0.01	(350 - 600)	@	2.0	4.0	@	1.0	4.0	@	WIDE BAND	TO92-1
EN3962	60	60	@	0.001	100 - 300	@	0.01	3.0	@	1.0	10.0	@	0.1	TO18-4
2N4250A	60	250 - 700	@	0.10	250	@	1.0	2.0	@	1.0	2.0	@	WIDE BAND	TO18-4
PN4250A	60	250 - 700	@	0.10	250	@	1.0	2.0	@	1.0	2.0	@	WIDE BAND	TO92-1
2N4249	60	100 - 300	@	0.10	100	@	1.0	3.0	@	1.0	3.0	@	WIDE BAND	TO18-4
PN4249	60	100 - 300	@	0.10	100	@	1.0	3.0	@	1.0	3.0	@	WIDE BAND	TO92-1

NPN HIGH VOLTAGE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO})
METAL PACKAGE
(ALSO SEE TO5 POWER SECTION)

TYPE	V_{CEO} VOLTS MIN	h_{FE} h_{FE} MIN - MAX	@	I_C mA	f_T MHz MIN	C_{ob} (C_{cb}) pF MAX	P_D T_A 25°C mW	T_C 25°C W	Package
2N657	100	30 - 90	@	200	70		800	4.0	TO5-1
SE7002	120	30	@	30	40	3.5	800	5.0	TO5-1
BFY57	125	30 - 150	@	30	40	12	800	5.0	TO5-1
SE7010	150	30	@	25	40	3.5	800	3.0	TO5-1
2N3923	150	30 - 120	@	25	40	3.5	800	3.0	TO5-1
SE7001	150	30	@	30	40	9.0	800	5.0	TO5-1
2N3114	150	30 - 120	@	30	40	9.0	800	5.0	TO5-1
BF257	160	40 - 150	@	10	40	3.5	1000	7.0	TO5-2
BD115	180	22	@	50		3.5		6.0	TO5-1
BF336	180	20	@	30	80	(3.5)	800		TO5-1
2N4926	200	20 - 200	@	30	30	(6.0)	1000	7.0	TO5-2
BF337	200	20	@	30	80	(3.5)	800		TO5-1
SE7055	220	40 - 150	@	10	40	(3.5)	1000	7.0	TO5-2
BF338	225	20	@	30	80	(3.5)	800		TO5-1
BF258	250	40 - 150	@	10	40	3.5	1000	7.0	TO5-2
2N4927	250	20 - 200	@	30	30	(6.0)	1000	7.0	TO5-2
2N5059	250	30 - 150	@	30	30	10	1000	5.0	TO5-2
2N5058	300	35 - 150	@	30	30	10	1000	5.0	TO5-2
SE7056	300	40 - 100	@	10	40	(3.0)	1000	7.0	TO5-2
BF259	300	25	@	30	90 (Typ)	4.2	1000	7.0	TO5-2
SE7057	450	30 - 70	@	10	40	(2.5)	1000	7.0	TO5-2

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NPN HIGH VOLTAGE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO})
PLASTIC PACKAGE

TYPE	V_{CEO} VOLTS MIN	h_{FE} h_{FE} MIN - MAX	@	I_C mA	f_T MHz MIN	C_{ob} pF MAX	P_D T_A 25°C mW	T_C 25°C W	Package	PNP Complement
MPSL01	120	50 - 300	@	10	60	8.0	625	1.0	TO92-1	MPSL51
2N5830	120	80 - 500	@	25	100	40	625		TO92-1	
BC117	120	30	@	30	40		300	0.8	TO5-4	
BC532	140	60 - 250	@	10	100	6.0	625	1.0	TO92-1	BC530
2N5550	140	60 - 250	@	10	100	6.0	625		TO92-1	2N5400
PN5964	150	50 - 250	@	10	100	4.0	700	2.0	TO5-4	
BC533	160	80 - 250	@	10	100	6.0	625	1.0	TO92-1	BC531
MPS5551M	160	80 - 250	@	10	100	6.0	625		TO92-1	2N5401
2N5831	160	80 - 250	@	10	100	4.0	625		TO92-1	
2N5832	160	175 - 500	@	10	100	4.0	625		TO92-1	
PN5965	180	50 - 250	@	10	100	4.0	700	2.0	TO5-4	
2N5833	180	50 - 250	@	10	100	4.0	625		TO92-1	
MPSA43	200	50 - 200	@	30	50	4.0	625	1.0	TO92-1	MPSA93
MPSA42	300	40 - 200	@	30	50	3.0	625	1.0	TO92-1	MPSA92

TRANSISTORS—SMALL SIGNAL

PNP HIGH VOLTAGE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO}) PLASTIC PACKAGE

TYPE	V_{CEO} VOLTS MIN	h_{FE} h_{FE} MIN - MAX	@	I_C mA	f_T MHz MIN	C_{ob} pF MAX	P_D T_A 25°C mW	P_D T_C 25°C W	Package	NPN Complement
MPSL51	100	40 - 250	@	50	60	8.0	625	1.0	TO92-1	MPSL01
BC530	120	40 - 180	@	10	100	6.0	625	1.0	TO92-1	BC532
2N5400	120	40 - 180	@	10	100	6.0	625	1.0	TO92-1	2N5550
BC531	150	60 - 240	@	10	100	6.0	625	1.0	TO92-1	BC533
2N4888	150	40 - 400	@	10	30	4.0	300	0.8	TO5-4	
PN4888	150	40 - 400	@	10	30	4.0	625	1.0	TO92-1	
2N5401	150	60 - 240	@	10	100	6.0	625	1.0	TO92-1	MPS5551M
2N4889	150	80 - 300	@	10	40	4.0	300	0.8	TO5-4	
PN4889	150	80 - 300	@	10	40	4.0	625	1.0	TO92-1	
MPSA93	200	30 - 150	@	30	50	8.0	625	1.0	TO92-1	MPSA43
PN4357	240	80 - 300	@	10	40	7.0	625	1.0	TO92-1	
MPSA92	300	25	@	30	50	6.0	625	1.0	TO92-1	MPSA42

NPN RF–IF AMPLIFIER AND OSCILLATOR TRANSISTORS (BY ASCENDING FREQUENCY) METAL PACKAGE

TYPE	P.G. dB MIN	@	f MHz	V_{CEO} VOLTS MIN	f_T MHz MIN	C_{ob} pF MAX	NF dB MAX	@	f MHz	P_D T_A 25°C mW	Package
SE5023	22.5	@	45	20	300	0.5	6.0	@	45	175	TO18-3
SE5024	22.5	@	45	20	300	0.5	6.0	@	45	175	TO18-3
BF167	27	@	45	30	300	0.22	5.0	@	45	175	TO18-3
SE5055	27	@	45	20	300	0.22	5.0	@	45	175	TO18-3
SE5040	27	@	45	30	300	0.22	5.0	@	45	175	TO18-3
SE5036	29	@	45	30	500	0.3	5.0	@	45	20	TO18-3
SE5050	20	@	100	20	300	0.5	4.0	@	100	175	TO18-3
SE5051	20	@	100	20	300	0.5				175	TO18-3
BF222	20 (Typ)	@	100	30	400	0.4 (Typ)	5.0	@	0.1	310	TO18-3
2N918	15.0	@	200	15	600	1.7	6.0	@	60	200	TO18-3
SE5052	16	@	200	20	375		4.0	@	200	175	TO18-3
SE5022	18	@	200	20	300	0.5				175	TO18-3
SE5020	20	@	200	20	375	0.5	3.3	@	200	175	TO18-3
SE5021	20	@	200	20	375	0.5	4.0	@	200	175	TO18-3
SE5035	22	@	200	30	600	0.3				200	TO18-3
2N3137	6.0	@	250	20	500	3.5				600	TO5-1

NPN RF–IF AMPLIFIER AND OSCILLATOR TRANSISTORS (BY ASCENDING FREQUENCY) PLASTIC PACKAGE

TYPE	PG (OSC. Po) dB @ f MIN MHz	V_{CEO} VOLTS MIN	f_T MHz MIN	C_{ob} (C_{cb}) pF MAX	NF dB @ f MAX MHz	P_D T_A 25°C mW	Package
2N5127		12	150	(3.5)		200	TO18-4
PE3100		30	400	(0.8)		425 (65°C)	TO92-1
SE1010		15	200	3.5	5.5 @ 1.0	200	TO18-4
BF160		12	400	2.0		310	TO18-4
2N3564	10 @ 30	15	400	3.5		200	TO18-4
BF152	28 @ 10.7	12	600	1.7		310	TO18-4
BF159	22 @ 40	20	600	1.2	3.5 (Typ) @ 60	310	TO18-4
BF163	22 @ 40	40	400	0.8 (Typ)	3.0 (Typ) @ 40	310	TO18-4
PE5025	25 @ 45	30	300	(1.0)		425 (65°C)	TO92-1
PE5013	25 @ 45	20	300	(0.4)	4.0 @ 45	300 (65°C)	TO92-1
PE5029	28 @ 45	30	500	(0.4)	6.0 @ 45	425 (65°C)	TO92-1
PE5030B	28 @ 45	40	600	(0.4)		425 (65°C)	TO92-1
2N3688	29 @ 45	40	400	1.6		200	TO18-4
PN3688	29 @ 45	40	400	1.6		200	TO92-1
2N3689	29 @ 45	40	400	1.6		200	TO18-4
PN3689	29 @ 45	40	400	1.6		200	TO92-1
PE5015	20 @ 100	20	300	(0.5)	4.0 @ 100	300 (65°C)	TO92-1
SE5006	20 @ 100	40	400	1.6		200	TO18-4
2N5126		20	300	(1.6)		200	TO18-4
PN5126		20	300	(1.6)		200	TO92-1
BF162	15 @ 200	40	200	1.2	5.5 @ 200	310	TO18-4
EN918	14 @ 200	15	600	1.7	6.0 @ 60	200	TO18-4
2N3563	14 @ 200	12	600	1.7		200	TO18-4
2N3690	15 @ 200	40	400	1.6	5.5 @ 200	200	TO18-4
PN3690	15 @ 200	40	400	1.6	5.5 @ 200	200	TO92-1
MPS918	15 @ 200	15	600	1.7	6.0 @ 60	625	TO92-1
2N5130	17 @ 200	12	450	(1.7)		200	TO18-4
PN5130	17 @ 200	12	450	(1.7)		200	TO92-1
PE5031	19 @ 200	30	500	0.4	4.5 @ 200	625 (65°C)	TO92-1
PE5010	20 @ 200	30	375	(0.5)	3.3 @ 200	300 (65°C)	TO92-1
SE3001	12 @ 500	12	600	1.7		200	TO18-4
SE3002	12 @ 500	12	600	1.7		200	TO18-4
2N5770	15 @ 500	15	900	(1.7)	6.0 @ 60	625	TO92-1
EN918	(30) @ 500	15	600	1.7	6.0 @ 60	200	TO18-4
2N5770	(30) @ 500	15	900	1.7	6.0 @ 60	625	TO92-1
MPS3563	(30) @ 500	12	600	1.7	6.0 @ 60	625	TO92-1
MPS918	(30) @ 500	15	600	1.7	6.0 @ 60	625	TO92-1
SE3002	(3.0) @ 930	12	600	1.7		200	TO18-4

TRANSISTORS—POWER

NPN
TO5 PACKAGE

(ALSO SEE SMALL SIGNAL GENERAL PURPOSE AMPLIFIER AND HIGH VOLTAGE SECTIONS)

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	@	I_C AMP	$V_{CE(sat)}$ VOLTS MAX	@	I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	PNP Complement
2N4237	40	1.0	30 - 150	@	0.25	0.6	@	1.0	6.0	2.0	2N4234
BC323	60	5.0	50 - 250	@	0.5	0.15	@	0.5	7.0		
BFX34	60	5.0	40 - 150	@	2.0	1.0	@	0.5	5.0	70	
2N4238	60	1.0	30 - 150	@	0.25	0.6	@	1.0	6.0	2.0	2N4235
2N4895	60	5.0	40 - 120	@	2.0	1.0	@	5.0	7.0	50	
2N4896	60	5.0	100 - 300	@	2.0	1.0	@	5.0	7.0	80	
2N4239	80	1.0	30 - 150	@	0.25	0.6	@	1.0	6.0	2.0	2N4236
2N4897	80	5.0	40 - 120	@	2.0	1.0	@	5.0	7.0	50	
2N3440	250	0.1	40 - 160	@	0.02	0.5	@	0.05	10	15	
2N3439	350	0.1	40 - 160	@	0.02	0.5	@	0.05	10	15	

PNP
TO5 PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	@	I_C AMP	$V_{CE(sat)}$ VOLTS MAX	@	I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	NPN Complement
2N4234	40	1.0	30 - 150	@	0.25	0.6	@	1.0	6.0	3.0	2N4237
2N4235	60	1.0	30 - 150	@	0.25	0.6	@	1.0	6.0	3.0	2N4238
2N4236	80	1.0	30 - 150	@	0.25	0.5	@	1.0	6.0	3.0	2N4239

NPN
TO66 PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	@	I_C AMP	$V_{CE(sat)}$ VOLTS MAX	@	I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	PNP Complement
2N4910	40	1.0	20 - 100	@	0.5	0.6	@	1.0	25	3.0	2N4898
2N4231	40	3.0	25 - 100	@	1.5	0.7	@	1.5	35	4.0	
2N3054	55	4.0	25 - 100	@	0.5	1.0	@	0.5	25	1.0	
2N4911	60	1.0	20 - 100	@	0.5	0.5	@	1.0	25	3.0	2N4899
2N4232	60	3.0	25 - 100	@	1.5	0.7	@	1.5	35	4.0	
2N4912	80	1.0	20 - 100	@	0.5	0.6	@	1.0	25	3.0	2N4900
2N4233	80	3.0	25 - 100	@	1.5	0.7	@	1.5	35	4.0	
2N6233	225	5.0	25 - 125	@	1.0	0.5	@	1.0	50	20	
2N6234	275	5.0	25 - 125	@	1.0	0.5	@	1.0	50	20	
SE9051	275	10	20 - 100	@	1.0	1.0	@	5.0	50	20	
SE9331	300	1.0	30 - 250	@	0.1	2.5	@	0.1	20	10	
2N6235	325	5.0	25 - 100	@	1.0	0.5	@	1.0	50	20	
SE9052	325	10	20 - 100	@	1.0	1.0	@	5.0	50	20	

PNP
TO66 PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	h_{FE} @ I_C AMP	$V_{CE(sat)}$ @ VOLTS MAX	$V_{CE(sat)}$ @ I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	PNP Complement
2N4898	40	1.0	20 - 100	@ .50	0.6	@ 1.0	25	3.0	2N4910
2N4899	50	1.0	20 - 100	@ .50	0.6	@ 1.0	25	3.0	2N4911
2N3740	60	1.0	30 - 100	@ .25	0.6	@ 1.0	25	4.0	
2N4900	80	1.0	20 - 100	@ .50	0.6	@ 1.0	25	3.0	2N4912
2N3741	80	1.0	30 - 100	@ .25	0.5	@ 1.0	25	4.0	

NPN
TO220 (PLASTIC TO66) PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	h_{FE} @ I_C AMP	$V_{CE(sat)}$ @ VOLTS MAX	$V_{CE(sat)}$ @ I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	PNP Complement
BD221	40	4.0	30 - 120	@ 1.0	1.0	@ 1.0	36	0.8	BD224
2N6129	40	7.0	20 - 100	@ 2.5	1.4	@ 7.0	50	2.5	2N6132
2N6121	45	4.0	25 - 100	@ 1.5	0.6	@ 1.5	40	2.5	2N6124
BD222	60	4.0	20 - 80	@ 1.5	1.0	@ 1.5	36	0.8	BD225
2N6122	60	4.0	25 - 100	@ 1.5	0.6	@ 1.5	40	2.5	2N6125
2N6130	60	7.0	20 - 100	@ 2.5	1.4	@ 7.0	50	2.5	2N6133
BD220	70	4.0	30 - 120	@ 0.5	1.0	@ 0.5	36	0.8	BD223
2N6123	80	4.0	20 - 80	@ 1.5	0.6	@ 1.5	40	2.5	2N6126
2N6131	80	7.0	20 - 100	@ 2.5	2.0	@ 7.0	50	2.5	2N6134

PNP
TO220 (PLASTIC TO66) PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	h_{FE} @ I_C AMP	$V_{CE(sat)}$ @ VOLTS MAX	$V_{CE(sat)}$ @ I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	NPN Complement
BD224	40	4.0	30 - 120	@ 1.0	1.0	@ 1.0	36	0.8	BD221
2N6132	40	7.0	20 - 100	@ 2.5	1.4	@ 7.0	50	2.5	2N6129
2N6124	45	4.0	25 - 100	@ 1.5	0.6	@ 1.5	40	2.5	2N6121
BD225	60	4.0	20 - 80	@ 1.5	1.0	@ 1.5	36	0.8	BD222
2N6125	60	4.0	25 - 100	@ 1.5	0.6	@ 1.5	40	2.5	2N6122
2N6133	60	7.0	20 - 100	@ 2.5	1.4	@ 7.0	50	2.5	2N6130
BD223	70	4.0	30 - 120	@ 0.5	1.0	@ 0.5	36	0.8	BD220
2N6126	80	4.0	20 - 80	@ 1.5	0.6	@ 1.5	40	2.5	2N6123
2N6134	80	4.0	20 - 100	@ 2.5	1.8	@ 7.0	50	2.5	2N6131

TRANSISTORS—POWER

NPN
TO59 (POWER STUD) PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	@	I_C AMP	$V_{CE(sat)}$ @ VOLTS MAX	@	I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	PNP Complement
2N4116	80	5.0	100 - 300	@	2.0	1.5	@	5.0	37	70	2N5005
2N4115	80	5.0	40 - 120	@	2.0	1.5	@	5.0	37	70	2N5003
2N5004	80	5.0	70 - 200	@	2.5	1.5	@	5.0	50	70	2N5005
2N5002	80	5.0	30 - 90	@	2.5	1.5	@	5.0	50	60	2N5003

PNP
TO59 (POWER STUD) PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	@	I_C AMP	$V_{CE(sat)}$ @ VOLTS MAX	@	I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	NPN Complement
2N5005	80	5.0	70 - 200	@	2.5	1.5	@	5.0	50	70	2N5004
2N5003	80	5.0	30 - 90	@	2.5	1.5	@	5.0	50	60	2N5002

NPN
TO3 PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	@ I_C AMP	$V_{CE(sat)}$ VOLTS MAX	@ I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	PNP Complement
2N5067	40	5.0	20 - 80	@ 1.0	1.5	@ 5.0	87.5	4.0	2N4901
2N4913	40	5.0	25 - 100	@ 2.5	1.5	@ 5.0	87.5	4.0	2N4904
2N5301	40	30	15 - 60	@ 15	2.0	@ 20	200	2.0	2N4398
2N5068	60	5.0	20 - 80	@ 1.0	1.5	@ 5.0	87.5	4.0	2N4902
2N4914	60	5.0	25 - 100	@ 2.5	1.5	@ 5.0	87.5	4.0	2N4905
2N3713	60	10	25 - 90	@ 1.0	1.0	@ 5.0	150	2.5	2N3789
2N3715	60	10	50 - 150	@ 1.0	0.8	@ 5.0	150	2.5	2N3791
2N3055	60	15	20 - 70	@ 4.0	1.1	@ 4.0	117	0.8	
2N5302	60	30	15 - 60	@ 15	2.0	@ 20	200	2.0	2N4399
2N5069	80	5.0	20 - 80	@ 1.0	1.5	@ 5.0	87.5	4.0	2N4903
2N4915	80	5.0	25 - 100	@ 2.5	1.5	@ 5.0	87.5	4.0	2N4906
2N3714	80	10	25 - 90	@ 1.0	1.0	@ 5.0	150	2.5	2N3790
2N3716	80	10	50 - 150	@ 1.0	0.8	@ 5.0	150	2.5	2N3792
2N5303	80	20	15 - 60	@ 10	2.0	@ 20	200	2.0	

PNP
TO3 PACKAGE

TYPE	V_{CEO} VOLTS MIN	I_C AMPS MAX	h_{FE} MIN - MAX	@ I_C AMP	$V_{CE(sat)}$ VOLTS MAX	@ I_C AMP	P_D $T_C = 25°C$ W	f_T MHz MIN	NPN Complement
2N4901	40	5.0	20 - 80	@ 1.0	1.5	@ 5.0	87.5	4.0	2N5067
2N4904	40	5.0	25 - 100	@ 2.5	1.5	@ 5.0	87.5	4.0	2N4913
2N4907	40	10	20 - 80	@ 4.0	2.0	@ 10	150	4.0	
2N4398	40	30	15 - 60	@ 15	2.0	@ 20	200	4.0	2N5301
2N4902	60	5.0	20 - 80	@ 1.0	1.5	@ 5.0	87.5	4.0	2N5068
2N4905	60	5.0	25 - 100	@ 2.5	1.5	@ 5.0	87.5	4.0	2N4914
2N3789	60	10	15	@ 3.0	1.0	@ 4.0	150	4.0	2N3713
2N4908	60	10	20 - 80	@ 4.0	2.0	@ 10	150	4.0	
2N3791	60	10	50 - 150	@ 1.0	1.0	@ 5.0	150	4.0	2N3715
2N4399	60	30	15 - 60	@ 15	2.0	@ 20	200	4.0	2N5302
2N4903	80	5.0	20 - 80	@ 1.0	1.5	@ 3.0	87.5	4.0	2N5069
2N4906	80	5.0	25 - 100	@ 2.5	1.5	@ 5.0	87.5	4.0	2N4915
2N3790	80	10	25 - 90	@ 1.0	1.0	@ 5.0	150	4.0	2N3714
2N4909	80	10	20 - 80	@ 4.0	2.0	@ 10	150	4.0	
2N3792	80	10	30	@ 3.0	1.0	@ 5.0	150	4.0	2N3716

TRANSISTORS—FIELD EFFECT

N–CHANNEL RF AMPLIFIER JUNCTION FIELD EFFECT TRANSISTORS (BY ASCENDING V_{GSS}) PLASTIC PACKAGE

TYPE	V_{GSS} VOLTS MIN	I_{GSS} nA MAX	I_{DSS} mA MIN - MAX	$V_{GS(OFF)}$ VOLTS MAX	C_{ISS} pF MAX	Y_{fs} μmho MIN	NF dB MAX	NF @ f kHz	NF dB MAX	NF @ f MHz	Package
MPF111	20	100	0.5 - 20	10	4.5	500					TO92-1
MPF109	25	1.0	0.5 - 24	8.0	7.0	800	2.5	@ 1.0			TO92-1
2N5484	25	1.0	1.0 - 5.0	3.0	5.0	3000	2.5	@ 1.0	3.0	@ 100	TO92-1
2N5457	25	1.0	1.0 - 5.0	6.0	7.0	1000					TO92-1
MPF108	25	1.0	0.5 - 24	8.0	7.0	2000	2.5	@ 1.0	3.0	@ 100	TO92-1
2N5458	25	1.0	2.0 - 9.0	7.0	7.0	1500					TO92-1
2N5485	25	1.0	4.0 - 10	4.0	5.0	3500	2.5	@ 1.0	4.0	@ 400	TO92-1
2N5459	25	1.0	4.0 - 16	8.0	7.0	2000					TO92-1
2N5486	25	1.0	8.0 - 20	6.0	5.0	4000	2.5	@ 1.0	4.0	@ 400	TO92-1
MPF102	25	2.0	2.0 - 20	8.0	7.0	1600					TO92-1
MPF112	25	100	1.0 - 25	10	8.0 (Typ)	1000					TO92-1

P–CHANNEL GENERAL PURPOSE AMPLIFIER JUNCTION FIELD EFFECT TRANSISTORS (NUMERIC LISTING) PLASTIC PACKAGE

TYPE	V_{GSS} VOLTS MIN	I_{GSS} nA MAX	I_{DSS} mA MIN - MAX	$V_{GS(OFF)}$ VOLTS MAX	C_{ISS} pF MAX	Y_{fs} μmho MIN	NF dB MAX	NF @ f kHz	Package
2N4342	25	10	4.0 - 12	5.5	2000	20	1.5	@ 0.1	TO18-4
2N4343	25	1.0	10 - 30	10	4000	20	1.5	@ 0.1	TO18-4
2N4360	20	10	3.0 - 30	10	2000	20	1.5	@ 0.1	TO18-4
2N5033	20	10	0.3 - 3.5	2.5	1000	25	2.0	@ 1.0	TO18-4

N–CHANNEL RF DUAL GATE MOS FIELD EFFECT TRANSISTOR METAL PACKAGE

TYPE	V_{GSS} VOLTS MIN	I_{GSS} nA MAX	I_{DSX} mA MIN - MAX	$V_{GS(OFF)}$ VOLTS MAX	Y_{fs} μmho TYP	C_{ISS} pF MAX	Gps dB MIN	Gps @ f MHz	NF dB MAX	Package
FT0601	6.0	20	5.0 - 30	4.0	13000	10	16	@ 200	4.0	TO18-3

TYPE	V_{CEO} VOLTS MIN	h_{FE} MIN - MAX	h_{FE} @	I_C mA	MATCHING h_{FE} %	MATCHING V_{BE} mV	Package
2N2920A	60	150 - 600	@	0.01	10	1.5	TO5-9
2N2920	60	150 - 600	@	0.01	10	3.0	TO5-9
2N2979	60	150 - 600	@	0.01	10	3.0	TO18-5
2N2919A	60	60 - 240	@	0.01	10	1.5	TO5-9
2N2919	60	60 - 240	@	0.01	10	3.0	TO5-9
2N2978	60	60 - 240	@	0.01	10	3.0	TO18-5
2N2916	45	150 - 600	@	0.01	10	5.0	TO5-9
2N2916A	45	150 - 600	@	0.01	15	2.0	TO5-9
2N2975	45	150 - 600	@	0.01	20	3.0	TO5-9
2N2977	45	150 - 600	@	0.01	20	5.0	TO18-5
2N2918	45	150 - 600	@	0.01	20	5.0	TO5-9
2N2642	45	100 - 300	@	0.01	10	5.0	TO5-9
2N2643	45	100 - 300	@	0.01	20	10	TO5-9
2N2915	45	60 - 240	@	0.01	10	3.0	TO5-9
2N2915A	45	60 - 240	@	0.01	15	2.0	TO5-9
2N2974	45	60 - 240	@	0.01	20	3.0	TO18-5
2N2976	45	60 - 240	@	0.01	20	5.0	TO18-5
2N2917	45	60 - 240	@	0.01	20	10	TO5-9
2N2639	45	50 - 300	@	0.01	10	5.0	TO5-9
2N2640	45	50 - 300	@	0.01	20	10	TO5-9
2N3411	30	30 - 120	@	0.1	10	5.0	TO5-9
2N3410	30	30 - 120	@	0.1	10	10	TO5-9
2N3409	30	30 - 120	@	0.1	20	10	TO5-9
2N3729	30	45 - 180	@	1.0	10	3.0	TO5-9
2N3728	30	45 - 180	@	1.0	20	5.0	TO5-9
MD918A	15	50	@	1.0	10	5.0	TO5-9
MD918B	15	50	@	1.0	20	10	TO5-9
2N3424	15	20 - 200	@	3.0	10	5.0	TO5-9
2N3423	15	20 - 200	@	3.0	20	10	TO5-9
MD2369A	15	40 - 140	@	10	10	5.0	TO5-9
MD2369B	15	40 - 140	@	10	20	10	TO5-9

PNP MATCHED DUAL TRANSISTORS

TYPE	V_{CEO} VOLTS MIN	h_{FE} MIN - MAX	h_{FE} @	I_C mA	MATCHING h_{FE} %	MATCHING V_{BE} mV	Package
2N4021	60	100 - 350	@	.01	20	5.0	TO5-9
2N4020	45	250 - 600	@	.01	20	5.0	TO5-9
2N3811A	60	300 - 900	@	0.1	10	5.0	TO5-9
2N3811	60	300 - 900	@	0.1	10	5.0	TO5-9
2N3805A	60	300 - 900	@	0.1	10	5.0	TO18-5
2N3805	60	300 - 900	@	0.1	10	5.0	TO18-5
2N3809	60	300 - 900	@	0.1	10	8.0	TO5-9
2N3803	60	300 - 900	@	0.1	10	8.0	TO18-5
2N4025	60	250 - 600	@	0.1	10	3.0	TO5-9
2N4022	60	250 - 600	@	0.1	20	5.0	TO5-9
2N3810A	60	150 - 450	@	0.1	10	5.0	TO5-9
2N3810	60	150 - 450	@	0.1	10	5.0	TO5-9
2N3804A	60	150 - 450	@	0.1	10	5.0	TO18-5
2N3804	60	150 - 450	@	0.1	10	5.0	TO18-5
2N3808	60	150 - 450	@	0.1	20	8.0	TO5-9
2N3802	60	150 - 450	@	0.1	20	8.0	TO18-5
2N4024	60	100 - 350	@	0.1	10	3.0	TO5-9
2N4023	45	250 - 600	@	0.1	10	3.0	TO5-9
MD3251A	40	100 - 300	@	0.1	10	5.0	TO5-9
MD3250A	40	50 - 150	@	0.1	10	5.0	TO5-9
2N4016	60	135 - 350	@	1.0	10	2.5	TO5-9
2N4015	60	135 - 350	@	1.0	10	5.0	TO5-9
2N3727	45	135 - 350	@	1.0	10	2.5	TO5-9
2N3726	45	135 - 350	@	1.0	10	5.0	TO5-9

NPN UNMATCHED DUAL TRANSISTORS

TYPE	V_{CEO} VOLTS MIN	h_{FE} MIN - MAX	h_{FE} @	I_C mA	MATCHING h_{FE} %	MATCHING V_{BE} mV	Package
2N2914	45	150 - 600	@	0.01			TO5-9
2N2973	45	150 - 600	@	0.01			TO18-5
2N2644	45	100 - 300	@	0.01			TO5-9
2N2972	45	60 - 250	@	0.01			TO18-5
2N2913	45	60 - 240	@	0.01			TO5-9
2N2641	45	50 - 300	@	0.01			TO5-9
MD918	15	50	@	1.00			TO5-9
MD2369	15	40 - 140	@	10			TO5-9
2N3425	15	30 - 120	@	100			TO5-9
MD2219A	40	100 - 300	@	150			TO5-9
MD2218A	40	40 - 120	@	150			TO5-9
MD2219	30	100 - 300	@	150			TO5-9
MD2218	30	40 - 120	@	150			TO5-9

PNP UNMATCHED DUAL TRANSISTORS

TYPE	V_{CEO} VOLTS MIN	h_{FE} MIN - MAX	h_{FE} @	I_C mA	MATCHING h_{FE} %	MATCHING V_{BE} mV	Package
2N4017	80	100 - 350	@	0.01			TO5-9
2N4018	60	100 - 500	@	0.01			TO5-9
2N3807	60	300 - 900	@	0.10			TO5-9
2N3801	60	300 - 900	@	0.10			TO18-5
2N3806	60	150 - 450	@	0.10			TO5-9
2N3800	60	150 - 450	@	0.10			TO18-5
2N4019	45	250 - 500	@	0.10			TO5-9
MD3251	40	100 - 300	@	0.10			TO5-9
MD3250	40	50 - 150	@	0.10			TO5-9
MD2905A	60	100 - 300	@	150			TO5-9
MD2904A	60	40 - 120	@	150			TO5-9
MD2905	40	100 - 300	@	150			TO5-9
MD2904	40	40 - 120	@	150			TO5-9

NPN UNMATCHED QUAD TRANSISTORS

TYPE	V_{CEO} VOLTS MIN	h_{FE} MIN - MAX	h_{FE} @	I_C mA	$V_{CE(sat)}$ VOLTS MAX	@ I_C mA	Package
FPQ3725	50	20		500	0.5	500	TO116-1
FQ3725	50	20		500	0.5	500	TO86-1
FPQ3724	40	30		500	0.5	500	TO116-1
FQ3724	40	30		500	0.5	500	TO86-1

PNP UNMATCHED QUAD TRANSISTORS

TYPE	V_{CEO} VOLTS MIN	h_{FE} MIN - MAX	h_{FE} @	I_C mA	$V_{CE(sat)}$ VOLTS MAX	@ I_C mA	Package
FPQ3468	50	20	@	500	0.5	500	TO116-1
FQ3468	50	20	@	500	0.5	500	TO86-1
FPQ3467	40	30	@	500	0.5	500	TO116-1
FQ3467	40	30	@	500	0.5	500	TO86-1

NPN DARLINGTON TRANSISTORS

TYPE	V_{CEO} VOLTS MIN	h_{FE} MIN - MAX	h_{FE} @	I_C mA	$V_{CE(sat)}$ VOLTS MAX	@ I_C mA	Package
MPSA12	20	20000	@	10	1.0	10	TO92-1
MPSA13	30	5000	@	10	1.5	100	TO92-1
MPSA14	30	10000	@	10	1.5	100	TO92-1
2N997	40	7000 - 70000	@	100	1.6	100	TO18-1
2N998	60	1600 - 8000	@	10	1.2	50	TO18-3
2N999	60	7000 - 70000	@	100	1.6	100	TO18-3
2N2723	60	2000 - 70000	@	10	1.0	10	TO18-3
2N2724	60	7000 - 50000	@	10	1.0	10	TO18-3
2N2725	45	2000 - 10000	@	10	1.0	10	TO18-3

TYPE	POL.	BASIC STANDARD DEVICE	V_{CEO} VOLTS MIN	I_{CBO} nA @ V_{CB} MAX VOLTS	h_{FE} @ I_C h_{FE} MIN - MAX mA	CHIP SIZE MILS	BASIC APPLICATION
DN2484	NPN	2N2484	60	20 @ 45	250 @ 1	17.5 x 17.5	Low Level, Low Noise Amplifier
DN3962	PNP	2N3962	60	20 @ 50	100 - 450 @ 1	13 x 26	Low Level, Low Noise Amplifier
DN918	NPN	2N918	15	20 @ 15	20 @ 3	10 x 15	R.F. Amplifier
DN3250	PNP	2N3250	40	20 @ 40	50 - 300 @ 10	11 x 18	R.F. Amplifier
DN3904	NPN	2N3904	40	50 @ 30	100 - 300 @ 10	10 x 15	General Purpose Amplifier
DN3906	PNP	2N3906	40	50 @ 30	100 - 300 @ 10	11 x 18	General Purpose Amplifier
DN2222A	NPN	2N2222A	40	20 @ 60	100 - 300 @ 100	20 x 20	G.P. Amplifier and Switch
DN2907	PNP	2N2907	40	20 @ 50	100 - 300 @ 100	22.5 x 22.5	G.P. Amplifier and Switch
DN3019	NPN	2N3019	80	20 @ 90	100 - 300 @ 100	20 x 20	G.P. Amplifier and Switch
DN4033	PNP	2N4033	80	50 @ 60	100 - 300 @ 100	27 x 33	G.P. Amplifier and Switch
DN3923	NPN	2N3923	150	20 @ 100	30 - 120 @ 25	20 x 20	High Voltage Amplifier and Switch
DN3930	PNP	2N3930	180	20 @ 100	80 - 300 @ 10	22.5 x 22.5	High Voltage Amplifier and Switch
DN3742	NPN	2N3742	300	200 @ 200	20 - 200 @ 30	35 x 35	High Voltage Amplifier and Switch
DN2369A	NPN	2N2369A	15	400 @ 20	40 - 120 @ 10	10 x 15	High Speed Saturated Switch
DN2894A	PNP	2N2894A	12	50 @ 10	30 @ 10	10 x 15	High Speed Saturated Switch
DN4209	PNP	2N4209	15	20 @ 8	35 @ 1	12 x 17	High Speed Saturated Switch
DN3014	NPN	2N3014	20	300 @ 20	30 - 120 @ 30	15 x 15	High Speed Saturated Switch
DN5455	PNP	2N5455	20	50 @ 15	30 - 120 @ 30	17.5 x 17.5	High Speed Saturated Switch
DN3725	NPN	2N3725	50	1700 @ 60	60 - 150 @ 100	30 x 30	High Speed Core Driver
DN3468	PNP	2N3468	50	100 @ 30	25 @ 100	27 x 33	High Speed Core Driver

DISCRETE PRODUCTS

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INTRODUCTION

DATA SHEETS

The data sheets are arranged in alphanumeric order, based on the first device designation appearing in the title. These data sheets contain only electrical and thermal data. Where applicable, references are made to family curves found in Section 5 and special test circuits in Section 6. On some data sheets, the package illustrations show pin numbers which refer to similar numbers in the package outline section.

BA128

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODE

- **BV . . . 75 V (MIN) @ 100 μA**
- **I_R . . . 100 nA (MAX)**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Junction Temperature		175°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature		350 mW
at 100°C Ambient Temperature		175 mW
Maximum Voltages and Currents		
WIV	Working Inverse Voltage	50 V
I_F	Forward Continuous DC Current	110 mA
I_O	Average Rectified Current	75 mA
i_f	Peak Repetitive Forward Current	225 mA
i_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	2000 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.73	1.0	V	I_F = 50 mA
		0.63	0.79	V	I_F = 10 mA
		0.51	0.64	V	I_F = 1.0 mA
		0.40	0.52	V	I_F = 0.1 mA
I_R	Reverse Current		100	nA	V_R = 50 V
			100	μA	V_R = 50 V, T_A = 100°C
BV	Breakdown Voltage	75		V	I_R = 100 μA
C	Capacitance		5.0	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 428°C/W (derating factor of 2.33 mW/°C).
4. For product family characteristic curves, refer to Section 5 – D6.

BA129

HIGH VOLTAGE GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODE

- **BV . . . 200 V (MIN) @ 100 μA**
- **I_R . . . 10 nA (MAX) @ 180 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65° C to +200° C
Junction Temperature		175° C
Lead Temperature (10 seconds)		260° C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25° C Ambient Temperature		250 mW
at 100° C Ambient Temperature		125 mW
Maximum Voltages and Currents		
WRV	Working Reverse Voltage	180 V
I_F	Forward Continuous Voltage	225 mA
I_O	Average Rectified Current	150 mA
i_f	Peak Repetitive Forward Current	450 mA
i_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	2.0 A

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.78	1.0	V	I_F = 50 mA
		0.69	0.83	V	I_F = 10 mA
		0.60	0.71	V	I_F = 1.0 mA
		0.51	0.60	V	I_F = 0.1 mA
I_R	Reverse Current		10	nA	V_R = 180 V
			5.0	μA	V_R = 180 V, T_A = 100° C
BV	Breakdown Voltage	200		V	I_R = 100 μA
C	Capacitance		6.0	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175° C and jucntion to ambient thermal resistance of 600° C/W (derating factor of 1.67 mW/° C).
4. For product family characteristic curves, refer to Section 5-D5.

BA130

VIDEO DETECTOR FM DISCRIMINATOR

DIFFUSED SILICON PLANAR* DIODE

- V_F . . . 1.0 V (MAX) @ 10 mA
- I_R . . . 100 nA (MAX) @ 25 V

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature		250 mW
at 100°C Ambient Temperature		125 mW
Maximum Voltage and Currents		
WRV	Working Reverse Voltage	25 V
I_F	Forward Current (Continuous)	75 mA
I_O	Average Rectified Current	50 mA
i_f	Peak Repetitive Forward Current	150 mA
i_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	2000 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.69	1.0	V	I_F = 10 mA
		0.56	0.71	V	I_F = 1.0 mA
		0.45	0.58	V	I_F = 0.1 mA
		0.34	0.47	V	I_F = 0.01 mA
I_R	Reverse Current		100	nA	V_R = 25 V
			100	μA	V_R = 25 V, T_A = 100°C
BV	Breakdown Voltage	30		V	I_R = 5.0 μA
C	Capacitance		2.0	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 600°C/W (derating factor of 1.67 mW/°C).
4. For product family characteristic curves, refer to Section 5-D5.

BA164

TEMPERATURE COMPENSATING

DIFFUSED SILICON PLANAR* DIODE

- **$\Delta V_f / °C$ . . . 1.7 mV/°C @ 10 mA (TYP)**
- **V_F . . . 1.0 V (MAX) @ 10 mA**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Temperature	175°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	250 mW
at 45°C Ambient Temperature	225 mW

Maximum Voltages and Currents

WIV	Working Inverse Voltage	15 V
V_R	Reverse Voltage	20 V
I_F	Forward Continuous DC Current	75 mA
i_f	Peak Repetitive Forward Current	150 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		0.85	1.0	V	I_F = 10 mA
I_R	Reverse Current			2.0	μA	V_R = 15 V
				50	μA	V_R = 15 V, T_A = 65°C
BV	Breakdown Voltage	20			V	I_R = 5.0 μA
$\Delta V_F / °C$	Forward Voltage Temperature Coefficient		2.2		mV/°C	I_F = 1.0 mA
			1.7		mV/°C	I_F = 10 mA
			1.35		mV/°C	I_F = 30 mA

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 600°C/W (derating factor of 1.67 mW/°C).
4. For product family characteristic curves, refer to Section 5 - D6.

BA216

OXIDE PASSIVATED

DIFFUSED SILICON PLANAR* DIODE

- V_F . . . 0.7 - 1.0 V @ 15 mA
- V_F . . . 0.58 - 0.80 V @ 3.0 mA

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	175°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation	300 mW
Linear Derating Factor	2.0 mW/°C

Maximum Voltage and Currents

V_R	Reverse Voltage	30 V
V_{RRM}	Repetitive Peak Reverse Voltage	10 V
I_{FAN}	Average Rectified Forward Current	75 mA
I_F	Forward Current	75 mA
I_{FRM}	Recurrent Peak Forward Current	150 mA
I_{FSM}	Peak Forward Surge Current	
	Pulse Width = 1.0 μs	1000 mA
	Pulse Width = 1.0 s	250 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	CONDITIONS
V_F	Forward Voltage	0.5	0.62	V	I_F = 0.2 mA
		0.58	0.80	V	I_F = 3.0 mA
		0.70	1.0	V	I_F = 15 mA
I_R	Reverse Current		1.5	μA	V_R = 10 V

*Planar is a patented Fairchild process.

NOTES:

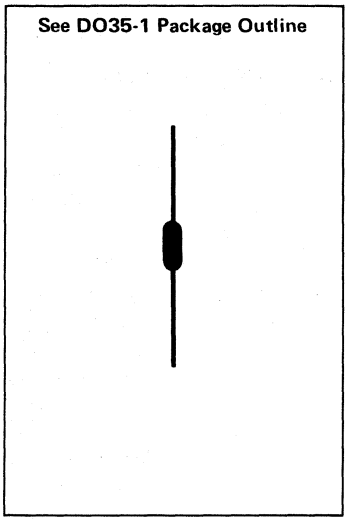
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. For product family characteristic curves, refer to Section 5 - D6.

BA217

OXIDE PASSIVATED

DIFFUSED SILICON PLANAR* DIODE

- **V_F . . . 1.5 V (MAX) @ 50 mA**
- **V_F . . . 1.0 V (MAX) @ 10 mA**



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	175°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipations	300 mW
Linear Derating Factor	2.0 mW/°C

Maximum Voltages and Currents

V_R	Reverse Voltage	30 V
V_{RRM}	Repetitive Peak Reverse Voltage	10 V
I_{FAV}	Average Rectified Forward Current	75 mA
I_F	Forward Current	75 mA
I_{FRM}	Recurrent Peak Forward Current	150 mA
I_{FSM}	Peak Forward Surge Current	
	Pulse Width = 1.0 μs	2000 mA
	Pulse Width = 1.0 s	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		0.7	V	I_F = 1.0 mA
			1.0	V	I_F = 10 mA
			1.5	V	I_F = 50 mA
I_F	Reverse Current		50	nA	V_R = 10 V
			200	nA	V_R = 30 V
C	Capacitance		5.0	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. For product family characteristic curves, refer to Section 5 - D6.

BAX13

HIGH SPEED SWITCHING

DIFFUSED SILICON PLANAR* DIODE

- **C . . . 3.0 pF (MAX)**
- **t_{rr} . . . 4.0 ns (MAX)**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation		300 mW
Linear Derating Factor		2.0 mW/°C
Maximum Voltages and Currents		
V_{RRM}	Repetitive Peak Reverse Voltage	50 V
V_R	Reverse Voltage	50 V
I_{FAV}	Average Rectified Forward Current	75 mA
I_F	Forward Current	75 mA
I_{FRM}	Recurrent Peak Forward Current	150 mA
I_{FSM}	Peak Forward Surge Current	
	Pulse Width = 1.0 μs	2000 mA
	Pulse Width = 1.0 s	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		0.7	V	I_F = 2.0 mA
			0.8	V	I_F = 10 mA, T_A = 100°C
			1.0	V	I_F = 20 mA, (Note 4)
			1.53	V	I_F = 75 mA, (Note 4)
I_R	Reverse Current		25	nA	V_R = 10 V
			10	μA	V_R = 10 V, T_A = 150°C
			50	nA	V_R = 25 V
			200	nA	V_R = 50 V
			25	μA	V_R = 50 V, T_A = 150°C
C	Capacitance		3.0	pF	V_R = 0, f = 1.0 MHz
t_{rr}	Reverse Recovery Time		4.0	ns	I_f = 10 mA, V_r = 6.0 V, R_L = 100Ω, I_R = 1.0 mA
Q_S	Recovered Charge		45	pC	I_f = 10 mA, V_r = 5.0 V, R_L = 500Ω

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 2%.
5. For product family characteristic curves, refer to Section 5-D6.

BAY 71

ULTRA FAST SWITCHING TYPE

DIFFUSED SILICON PLANAR* DIODE

- t_{rr} . . . 4.0 ns (MAX)
- C . . . 2.0 pF (MAX)

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		−65°C to +175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		250 mW
at 125°C Ambient Temperature		85 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	35 V
I_O	Average Rectified Current	75 mA
I_F	Forward Current Steady State DC	115 mA
i_f	Recurrent Peak Forward Current	225 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	2000 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.76	1.00	V	I_F = 20 mA
		0.69	0.88	V	I_F = 10 mA
		0.57	0.69	V	I_F = 1.0 mA
		0.46	0.56	V	I_F - 0.1 mA
I_R	Reverse Current		100	nA	V_R = 35 V
			100	μA	V_R = 35 V, T_A = 125°C
BV	Breakdown Voltage	50		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time (Note 2)		2.0	ns	I_F = 10 mA, I_R = 60 mA, R_L = 100 Ω, V_R = 6.0 V
V_{fr}	Forward Recovery Peak Voltage (Note 3)		3.0	V	I_F = 100 mA (pulsed)
t_{fr}	Forward Recovery Time (Note 3)		40	ns	I_F = 100 mA (pulsed)
Q_S	Stored Charge (Note 4)		65	pC	I_F = 20 mA, I_R = 2.0 mA
			50	pC	I_F = 10 mA, I_R = 1.0 mA
RE	Rectification Efficientcy (Note 6)	45		%	f = 100 MHz
C	Capacitance (Note 5)		2.0	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 1.0 mA.
3. The oscilloscope used as the response detector shall have a bandwidth of at least 10 MHz (3 dB down), and shall be calibrated using a deposited carbon resistor of 50 Ω in the diode test clips. t_{fr} is defined as the difference between the 10% point of the pulse and the point where V_F is to within 10% of the quiescent value.
4. Measured on the Tektronix "S" unit.
5. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
6. Rectification efficiency is defined as the ratio of dc load voltage to peak rf input voltage to the detector circuit, measured with 2.0 V rms input to the circuit. Load resistance 5.0 kΩ, load capacitance 20 pF.
7. For product family characteristic curves, refer to Section 5 — D6.

BAY 72

HIGH SPEED HIGH CONDUCTANCE TYPE

DIFFUSED SILICON PLANAR* DIODE

- **BV . . . 125 V (MIN)**
- **V_F . . . 1.0 V @ 100 mA**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		500 mW
at 150°C Ambient Temperature		83 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	100 V
I_O	Average Rectified Current	225 mA
I_F	Forward Current Steady State DC	375 mA
i_f	Recurrent Peak Forward Current	725 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.78	1.0	V	I_F = 100 mA
		0.73	0.92	V	I_F = 50 mA
		0.63	0.78	V	I_F = 10 mA
		0.51	0.64	V	I_F = 1.0 mA
I_R	Reverse Current		100	nA	V_R = 100 V
			100	μA	V_R = 100 V, T_A = 125°C
BV	Breakdown Voltage	125		V	I_R = 100 μA
t_{rr}	Reverse Recovery Time (Note 2)		50	ns	I_f = 30 mA, I_r = 30 mA
t_{rr}	Reverse Recovery Time (Note 3)		400	ns	I_f = 30 mA, V_r = 35 V, R_L = 2.0 kΩ, C_L = 10 pF
V_{fr}	Forward Recovery Peak Voltage (Note 4)		2.5	V	I_f = 100 mA (pulsed)
t_{fr}	Forward Recovery Time (Note 4)		50	ns	I_f = 100 mA (pulsed)
Q_S	Stored Charge (Note 5)		250	pC	I_f = 20 mA, I_r = 1.0 mA
C_{ob}	Capacitance (Note 6)		5.0	pF	V_R = 0, f = 1.0 MHz
RE	Rectification Efficiency (Note 7)	35		%	f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 1.0 mA.
3. Recovery to 400 kΩ, JAN 256 circuit.
4. The oscilloscope used as the response detector shall have a bandwidth of at least 10 MHz (3 dB down), and shall be calibrated using a deposited carbon resistor of 50 Ω in the diode test clips. t_{fr} is defined as the difference between the 10% point of the pulse and the point where V_F is to be within 10% of the quiescent value. Pulse conditions shall be 0.1 μs wide at base, 20 ns maximum rise time, repetition rate = 100 kHz max.
5. Measured on the Tektronix "S" unit.
6. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
7. Rectification efficiency is defined as the ratio of dc load voltage to peak rf input to the circuit. Load resistance of 5.0 kΩ, load capacitance 20 pF.
8. For product family characteristic curves, refer to Section 5 – D4.

BAY 73

HIGH CONDUCTANCE LOW LEAKAGE TYPE

DIFFUSED SILICON PLANAR* DIODE

- I_R . . . 5.0 nA (MAX) @ 100 V
- BV . . . 125 V (MIN)

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		500 mW
Linear Derating Factor		3.3 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	100 V
I_O	Average Rectified Current	150 mA
I_F	Forward Current Steady State DC	225 mA
i_f	Recurrent Peak Forward Current	450 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.85	1.00	V	I_F = 200 mA
		0.81	0.94	V	I_F = 100 mA
		0.78	0.88	V	I_F = 50 mA
		0.69	0.80	V	I_F = 10 mA
		0.67	0.75	V	I_F = 5.0 mA
		0.60	0.68	V	I_F = 1.0 mA
I_R	Reverse Current		5.0	nA	V_R = 100 V
			500	nA	V_R = 20 V, T_A = 125°C
			1.0	μA	V_R = 100 V, T_A = 125°C
t_{rr}	Reverse Recovery Time		3.0	μs	I_f = 10 mA, V_r = 35 V, R_L = 1.0 kΩ to 100 kΩ, C_L = 10 pF, JAN256
C	Capacitance (Note 2)		8.0	pF	V_R = 0 V
BV	Breakdown Voltage	125		V	I_R = 100 μA

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Capacitance as measured on Boonton Electronic Corporation Model No. 75-A58 capacitance bridge or equivalent.
3. For product family characteristic curves, refer to Section 5 — D5.

BAY 74

HIGH CONDUCTANCE ULTRA FAST TYPE

SILICON PLANAR* EPITAXIAL DIODE

- t_{rr} . . . 4.0 ns (MAX)
- C . . . 3.0 pF (MAX)

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		500 mW
at 125°C Ambient Temperature		190 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	35 V
I_O	Average Rectified Current	200 mA
i_f	Recurrent Peak Forward Current	600 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.85	1.10	V	I_F = 300 mA
		0.82	1.00	V	I_F = 200 mA
		0.78	0.93	V	I_F = 100 mA
		0.73	0.88	V	I_F = 50 mA
		0.65	0.77	V	I_F = 10 mA
		0.54	0.65	V	I_F = 1.0 mA
I_R	Reverse Current		100	nA	V_R = 35 V
			100	μA	V_R = 35 V, T_A = 125°C
BV	Breakdown Voltage	50		V	I_R = 5.0 μA
C	Capacitance		3.0	pF	V_R = 0, f = 1.0 MHz
t_{rr}	Reverse Recovery Time (Note 2)		4.0	ns	I_f = I_r = 10 mA to 200 mA
			6.0	ns	I_f = I_r = 200 mA to 400 mA
t_{rr}	Reverse Recovery Time (Note 3)		6.0	ns	I_f = 10 mA, I_r = 1.0 mA

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 10% of I_f.
3. Recovery to 0.1 mA.
4. For product family characteristic curves, refer to Section 5 – D6.

BAY82

PICOSECOND SWITCHING

DIFFUSED SILICON PLANAR* EPITAXIAL DIODE

- V_F . . . 1.0 V (MAX) @ 20 mA
- t_{rr} . . . 750 ps (MAX)

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation		250 mW
Linear Derating Factor		1.67 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	12 V
I_O	Average Rectified Current	50 mA
i_f	Recurrent Peak Forward Current	150 mA
$i_{f(surge)}$	Peak Forward Surge Current Pulse Width = 1.0 s	150 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.90	1.35	V	I_F = 50 mA
		0.8	1.0	V	I_F = 20 mA
		0.77	0.94	V	I_F = 10 mA
		0.64	0.79	V	I_F = 1.0 mA
		0.53	0.66	V	I_F = 0.1 mA
		0.41	0.53	V	I_F = 0.01 mA
I_R	Reverse Current		100	nA	V_R = 12 V
			50	μA	V_R = 12 V, T_A = 100°C
B_V	Breakdown Voltage	15		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time		750	ps	I_f = 10 mA, I_r = 10 μA, R_L = 100 Ω
C	Capacitance		1.3	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fiarchild process.

NOTES;

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 600°C/W (derating factor of 1.67 mW/°C).
4. For product family characteristic curves, refer to Section 5 - D7.

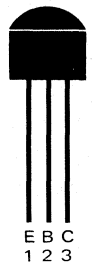
BC113 • BC114

NPN LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **SILICON NITRIDE PASSIVATED FOR IMPROVED STABILITY**
- **V_{CEO} . . . 25 V (MIN)**
- **h_{FE} . . . 200 (MIN) @ 1.0 mA**
- **NF . . . 2.5 dB (TYP) (BC113), 3.0 dB (MAX) (BC114) @ 1.0 kHz**

See TO18-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to 125°C
Operating Junction Temperature		125°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3),		
Total Dissipation at 25°C Case Temperature		0.5 W
at 25°C Ambient Temperature		0.2 W
at 45°C Ambient Temperature		0.16 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	25 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain		170			I_C = 10 μA, V_{CE} = 5.0 V
		120	250			I_C = 100 μA, V_{CE} = 5.0 V
		200	350	1000		I_C = 1.0 mA, V_{CE} = 5.0 V
h_{FE}	DC Current Gain (Note 5)		100			I_C = 50 mA, V_{CE} = 5.0 V
V_{BE}	Base to Emitter Voltage (Note 5)		0.64	0.70	V	I_C = 1.0 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation (Note 5)		0.15	0.35	V	I_C = 1.0 mA, I_B = 0.1 mA
I_{CES}	Collector Cutoff Current		0.5	50	nA	V_{CB} = 20 V, I_E = 0
			0.1	5.0	μA	V_{CB} = 20 V, I_E = 0, T_A = 65°C
I_{EBO}	Emitter Reverse Current		0.5	50	nA	V_{EB} = 5.0 V, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	30			V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0			V	I_E = 10 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	30			V	I_C = 10 mA, I_B = 0
h_{fe}	Small Signal Current Gain		400			I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{ie}	Input Resistance		10		kΩ	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{oe}	Output Conductance		20		μΩ	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{re}	Voltage Fedback Ratio		4.2		x10−4	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
C_{ob}	Output Capacitance		2.7	4.0	pF	I_E = 0, V_{CB} = 5.0 V

SYMBOL	CHARACTERISTIC	BC113 MIN.	BC113 TYP.	BC113 MAX.	BC114 MIN.	BC114 TYP.	BC114 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)		400		200	400			I_C = 10 mA, V_{CE} = 5.0 V
h_{fe}	High Frequency Gain	3.0	5.0		3.5	5.0			I_C = 1.0 mA, V_{CE} = 5.0 V, f = 20 MHz
NF	Noise Figure		2.5			1.5	3.0	dB	I_C = 30 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 10 kΩ, BW = 200 Hz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

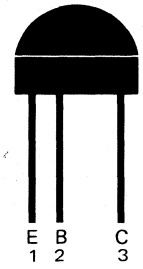
BC115

NPN GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 30 V (MIN)
- h_{FE} . . . 100 - 400 @ 10 mA, 50 (MIN) @ 1.0 mA and 100 mA

See TO5-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +125°C
Operating Junction Temperature		125°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		0.80 W
at 25°C Ambient Temperature		0.30 W
at 45°C Ambient Temperature		0.20 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V
V_{EBO}	Emitter to Base Voltage	5 V
I_C	Collector Current	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	50			V_{CE} = 10 V, I_C = 1.0 mA
		100	400		V_{CE} = 10 V, I_C = 10 mA
		50			V_{CE} = 10 V, I_C = 100 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		0.90	V	I_C = 100 mA, I_B = 10 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		1.0	V	I_C = 100 mA, I_B = 10 mA
I_{CBO}	Collector Cutoff Current		100	nA	V_{CB} = 20 V, I_E = 0
			5.0	μA	V_{CB} = 20 V, I_E = 0, T_A = 65°C
BV_{CBO}	Collector to Base Breakdown Voltage	40		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 100 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	30		V	I_C = 30 mA, I_B = 0
C_{ob}	Output Capacitance		25	pF	I_E = 0, V_{CB} = 10 V

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on application involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C, junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 333°C/W (derating factor of 3.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS15.

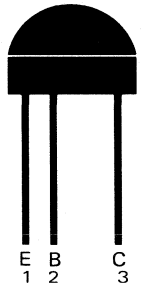
BC116A

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 40 V (MIN)
- h_{FE} . . . 80-240 @ 150 mA
- $V_{CE(sat)}$ . . . 0.4 V (MAX) @ 150 mA
- f_T . . . 130 MHz (MIN)
- COMPLEMENTS . . . 2N3569

See TO5-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +125°C
Operating Junction Temperature	125°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	0.8 W
at 75°C Case Temperature	0.4 W
at 25°C Ambient Temperature	0.3 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	−45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V
V_{EBO}	Emitter to Base Voltage	−5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	70			I_C = 10 mA, V_{CE} = −10 V
		80	240		I_C = 150 mA, V_{CE} = −10 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		−1.1	V	I_C = 50 mA, I_B = 5.0 mA
			−1.3	V	I_C = 150 mA, I_B = 15 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		−1.0	V	I_C = 50 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.25	V	I_C = 50 mA, I_B = 5.0 mA
	(Note 5)		−0.4	V	I_C = 150 mA, I_B = 15 mA
I_{CBO}	Collector Reverse Current		50	nA	V_{CB} = −20 V, I_E = 0
			10	μA	V_{CB} = −20 V, I_E = 0, T_A = 75°C
BV_{CBO}	Collector to Base Breakdown Voltage	−45		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		V	I_E = 10 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage	−40		V	I_C = 10 mA, I_B = 0
	(Notes 4 & 5)				
h_{fe}	Small Signal Current Gain	70			I_C = 10 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{fe}	High Frequency Current Gain	1.3			I_C = 30 mA, V_{CE} = −10 V, f = 100 MHz
C_{TE}	Emitter Transition Capacitance		25	pF	I_C = 0, V_{BE} = −0.5 V
C_{ob}	Output Capacitance		10	pF	I_E = 0, V_{CB} = −10 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 125°C/W (derating factor of 8 mW/°C; junction to ambient thermal resistance of 333°C/W (derating factor of 3 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS15.

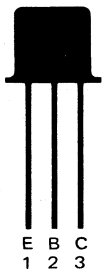
BC119 • BC139

NPN-PNP SMALL SIGNAL GENERAL PURPOSE COMPLEMENTARY AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **V_{CEO} . . . 30 V (MIN) (BC119), 40 V (MIN) (BC139)**
- **h_{FE} . . . 40–120 @ 150 mA (BC119), 40 (MIN) @ 100 mA (BC139)**
- **COMPLEMENTS . . . BC119 (NPN) - BC139 (PNP)**

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature, (10 seconds)			260°C
Maximum Power Dissipation (Notes 2 & 3)		**BC119**	**BC139**
Total Dissipation at 25°C Case Temperature		5.0 W	3.0 W
at 75°C Case Temperature		3.5 W	2.15 W
at 25°C Ambient Temperature		0.8 W	0.7 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage	60 V	−40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	−40 V
V_{EBO}	Emitter to Base Voltage	5.0 V	−5.0 V
I_C	Collector Current		500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC119 MIN.	BC119 MAX.	BC139 MIN.	BC139 MAX.	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
h_{FE}	DC Current Gain (Note 5)	40					I_C = 50 mA, V_{CE} = 1.0 V
				40			I_C = 100 mA, V_{CE} = 10 V
		40	120				I_C = 150 mA, V_{CE} = 1.0 V
				20			I_C = 300 mA, V_{CE} = 1.0 V
		25					I_C = 500 mA, V_{CE} = 10 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		2.0			V	I_C = 1.0 A, I_B = 100 mA
	(Note 5)		1.2			V	I_C = 150 mA, I_B = 15 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		1.0			V	I_C = 150 mA, V_{CE} = 1.0 V
	(Note 5)		1.8			V	I_C = 500 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.35			V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		1.1			V	I_C = 500 mA, I_B = 50 mA
			1.5			V	I_C = 1.0 A, I_B = 100 mA
					−0.8	V	I_C = 300 mA, I_B = 30 mA
I_{EBO}	Emitter Cutoff Current		100			nA	V_{EB} = 4.0 V, I_C = 0
I_{CBO}	Collector Cutoff Current		50			nA	V_{CB} = 40 V, I_E = 0
					50	nA	V_{CB} = 30 V, I_E = 0
			20			μA	V_{CB} = 40 V, I_E = 0, T_A = 150°C
					50	μA	V_{CB} = 30 V, I_E = 0, T_A = 75°C
BV_{CBO}	Collector to Base Breakdown Voltage	60				V	I_C = 100 μA, I_E = 0
				−40		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0				V	I_E = 100 μA, I_C = 0
				−5.0		V	I_E = 10 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage	30				V	I_C = 30 mA, I_B = 0
	(Note 5)			−40		V	I_C = 10 mA, I_B = 0
h_{fe}	High Frequency Current Gain	2.0					I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Output Capacitance		25			pF	I_E = 0, V_{CB} = 10 V
	Two BC139 pair h_{FE} ratio			0.8	1.25		I_C = 300 mA, V_{CE} = 1.0 V
	BC139/BC119 pair h_{FE} ratio	0.8	1.25	0.8	1.25		I_C = 300 mA, V_{CE} = 1.0 V
	Two BC119 pair h_{FE} ratio	0.8	1.25				I_C = 300 mA, V_{CE} = 5.0 V

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 200°C, junction to case thermal resistance of 35°C/W (derating factor of 28.6 mW/°C), and junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C) for BC119. These ratings give a maximum junction temperature of 200°C, junction to case thermal resistance of 58.3°C/W (derating factor of 17.1 mW/°C) and junction to ambient thermal resistance of 250°C/W (derating factor of 4 mW/°C) for BC139.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 – SS15 for BC119 and SS22 for BC139.

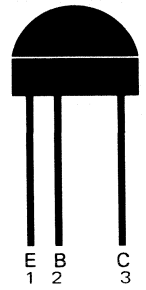
BC125 • BC126

NPN-PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 30 V (MIN)
- h_{FE} . . . 30 (MIN) @ 150 mA, 1.0 V
- COMPLEMENTS . . . BC125 (NPN) - BC126 (PNP)

See TO5-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +125°C
Operating Junction Temperature			125°C
Lead Temperature, (10 seconds)			260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			0.8 W
at 25°C Ambient Temperature			0.3 W
at 45°C Ambient Temperature			0.24 W
Maximum Voltages and Current		**BC125**	**BC126**
V_{CBO}	Collector to Base Voltage	50 V	−35 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	−30 V
V_{EBO}	Emitter to Base Voltage	5.0 V	−5.0 V
I_C	Collector Current		600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC125 MIN.	BC125 MAX.	BC126 MIN.	BC126 MAX.	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
h_{FE}	DC Current Gain (Note 5)	30		30			I_C = 50 mA, V_{CE} = 1.0 V
		30		30	120		I_C = 150 mA, V_{CE} = 1.0 V
		25		25			I_C = 1.0 mA, V_{CE} = 10 V
		30		30			I_C = 10 mA, V_{CE} = 10 V
V_{BE} (sat)	Base to Emitter Saturation Voltage (Note 5)		1.3		−1.3	V	I_C = 150 mA, I_B = 15 mA
V_{BE} (On)	Base to Emitter "On" Voltage (Note 5)		1.0		−1.0	V	I_C = 50 mA, V_{CE} = 1.0 V
V_{CE} (sat)	Collector to Emitter Saturation				−0.25	V	I_C = 50 mA, I_B = 5.0 mA
	Voltage (Note 5)		0.5		−0.5	V	I_C = 150 mA, I_B = 15 mA
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = 20 V, I_E = 0
			20		20	μA	V_{CB} = 20 V, I_E = 0, T_A = 75°C
BV_{CBO}	Collector to Base Breakdown Voltage	50		−35		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0				V	I_E = 100 μA, I_C = 0
				−5.0		V	I_E = 10 μA, I_C = 0
	Collector to Emitter Sustaining	30				V	I_C = 30 mA, I_B = 0
	Voltage (Note 5)			−30		V	I_C = 10 mA, I_B = 0
h_{fe}	High Frequency Current Gain	2.0					I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Output Capacitance		25			pF	I_E = 0, V_{CB} = 10 V
	BC125/BC126 pair h_{FE} ratio	0.8	1.25	0.8	1.25		I_C = 50 mA, V_{CE} = 1.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be imparied.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C, junction to case thermal resistance of 125°C/W (derating factor of 8 mW/°C); junction to ambient thermal resistance of 333°C/W (derating factor of 3.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS15 for BC125 and SS22 for BC126.

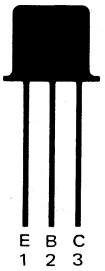
BC140 • BC141 (NPN) • BC160 • BC161 (PNP)

NPN-PNP SMALL SIGNAL COMPLEMENTARY GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 40 V (BC140, BC160), 60 V (MIN) (BC141, BC161)
- h_{FE} . . . 40-400 @ 100 mA
- FOUR h_{FE} GROUPS
- COMPLEMENTS . . . BC140, BC141 (NPN) BC161 (PNP)

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +175°C
Operating Junction Temperature	175°C

Maximum Power Dissipation

	BC140	BC141	BC160, BC161
Total Dissipation at 45°C Ambient Temperature	650 mW	650 mW	650 mW
at 45°C Case Temperature, $V_{CE} \leq 7.0$ V	3.7 W		
at 45°C Case Temperature, $V_{CE} \leq 8.5$ V		3.7 W	
at 60°C Case Temperature, $V_{CE} \leq 8.0$ V			3.2 W

Maximum Voltages and Currents

		BC140	BC141	BC160	BC161
V_{CES}	Collector to Emitter Voltage	80 V	100 V	−40 V	−60 V
V_{CEO}	Collector to Emitter Voltage	40 V	60 V	−40 V	−60 V
V_{EBO}	Emitter to Base Voltage	7.0 V	7.0 V	−5.0 V	−5.0 V
I_C	Collector Current	1.0 A	1.0 A	1.0 A	1.0 A
I_B	Base Current	100 mA	100 mA	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC140, BC141 MIN.	BC140, BC141 MAX.	BC160, BC161 MIN.	BC160, BC161 MAX.	UNITS	TEST CONDITIONS Reverse Voltage Polarity for PNP
I_{CES}	Collector Current BC140/160		100		100	nA	V_{CE} = 40 V
	BC141/161		100		100	nA	V_{CE} = 60 V
	BC140/160		100		100	μA	V_{CE} = 40 V, T_A = 150°C
	BC141/161		100		100	μA	V_{CE} = 60 V, T_A = 150°C
BV_{CES}	Collector to Emitter Breakdown Voltage						
	BC140	80				V	I_C = 100 μA, V_{CE} = 0
	BC141	100				V	I_C = 100 μA, V_{CE} = 0
	BC160			−40		V	I_C = 100 μA, V_{CE} = 0
	BC161			−60		V	I_C = 100 μA, V_{CE} = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)						
	BC140	40				V	I_C = 30 mA
	BC141	60				V	I_C = 30 mA
	BC160			−40		V	I_C = 50 mA
	BC161			−60		V	I_C = 50 mA
BV_{EBO}	Emitter to Base Breakdown Voltage (Note 4)	7.0		−5.0		V	I_E = 100 μA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		1.0		−1.0	V	I_C = 1.0 A, I_B = 100 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 4)		1.8		−1.7	V	V_{CE} = 1.0 V, I_C = 1.0 A
h_{FE}	DC Pulse Current Gain	40	400	40	400		V_{CE} = 1.0 V, I_C = 100 mA

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 35°C/W (derating factor of 28.6 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 - SS17 for BC140/41, and SS24 for BC160/61.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	BC140, BC141 MIN.	BC140, BC141 MAX.	BC160, BC161 MIN.	BC160, BC161 MAX.	UNITS	TEST CONDITIONS Reverse Voltage Polarity for PNP
f_T	Current Gain Bandwidth Product	50		50		MHz	V_{CE} = 10 V, I_C = 50 mA, f = 20 MHz
C_{cb}	Collector to Base Capacitance		25		30	pF	V_{CB} = 10 V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		80		180	pF	V_{EB} = –0.5 V, f = 1.0 MHz
t_{on}	Turn On Time (see test circuits no. 2011 for BC140/141 and No. 593 for BC160/161)		250		500	ns	I_C = 100 mA, I_{B1} = 5.0 mA
t_{off}	Turn Off Time (see test circuits no. 2011 for BC140/141 and no. 593 for BC160/161)		850		650	ns	I_C = 100 mA, $I_{B1} = -I_{B2}$ = 5.0 mA

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS Reverse Voltage Polarity for PNP
h_{FE}	DC Current Gain Gain Grouping – 6	40	100		I_C = 100 mA,
	–10	63	160		V_{CE} = 1.0 V
	–16	100	250		
	–25	160	400		

4

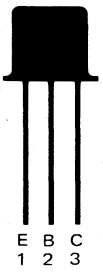
BC142

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 60 V (MIN)
- h_{FE} . . . 20 (MIN) @ 200 mA
- COMPLEMENT . . . BC143

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	5.0 W
at 75°C Case Temperature	3.6 W
at 25°C Ambient Temperature	0.8 W
at 45°C Ambient Temperature	0.7 W

Maximum Voltages and Current

V_{CBO}	Collector to Base Voltage	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	20			I_C = 200 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.4	V	I_C = 200 mA, I_B = 20 mA
I_{CBO}	Collector Cutoff Current		50	nA	V_{CB} = 40 V, I_E = 0
			50	μA	V_{CB} = 40 V, I_E = 0, T_A = 150°C
BV_{CBO}	Collector to Base Breakdown Voltage	80		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 100 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Note 5)	60		V	I_C = 30 mA, I_B = 0

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 35°C/W (derating factor of 28.6 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. These ratings refer to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS17.

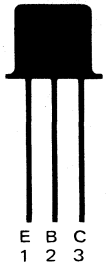
BC143

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 60 V (MIN)
- h_{FE} . . . 20 (MIN) @ 300 mA
- COMPLEMENT . . . BC142

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	4.0 W
at 75°C Case Temperature	2.86 W
at 25°C Ambient Temperature	0.8 W
at 45°C Ambient Temperature	0.7 W

Maximum Voltages and Current

V_{CBO}	Collector to Base Voltage	−60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V
V_{EBO}	Emitter to Base Voltage	−5.0 V
I_C	Collector Current	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	20			I_C = 300 mA, V_{CE} = −1.0 V
		15			I_C = 500 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.5	V	I_C = 500 mA, I_B = 50 mA
			−1.0	V	I_C = 1.0 A, I_B = 100 mA
I_{CBO}	Collector Cutoff Current		50	nA	V_{CB} = −30 V, I_E = 0
			50	μA	V_{CB} = −30 V, I_E = 0, T_A = 75°C
BV_{CBO}	Collector to Base Breakdown Voltage	−60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		V	I_E = 10 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Note 5)	−60		V	I_C = 10 mA, I_B = 0

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 43.7°C/W (derating factor of 23 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. These ratings refer to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS24.

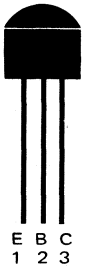
BC153 • BC154 • BC225

PNP LOW LEVEL LOW NOISE SMALL SIGNAL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 40 V (MIN)
- h_{FE} . . . 160 (MIN) 100 μA, 10 mA (BC154)
- NF . . . 2.5 dB (MAX) @ 1.0 kHz (BC154)

See TO18-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +125°C
Operating Junction Temperature		125°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		0.50 W
at 25°C Ambient Temperature		0.20 W
at 45°C Ambient Temperature		0.16 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	−40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V
V_{EBO}	Emitter to Base Voltage	−5.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTIC (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC153 MIN.	BC153 MAX.	BC154 MIN.	BC154 MAX.	BC225 MIN.	BC225 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	50		160		90			I_C = 100 μA, V_{CE} = −5.0 V
		50		160		90			I_C = 1.0 mA, V_{CE} = −5.0 V
		50		160		90			I_C = 10 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.25		−0.25		−0.25	V	I_C = 10 mA, I_B = 0.5 mA
I_{CBO}	Collector Cutoff Current		50		50		50	nA	V_{CB} = −30 V, I_E = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−40		−40		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		−5.0		V	I_E = 10 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−40		−40		−40		V	I_C = 5.0 mA, I_B = 0
NF	Noise Figure				2.5			dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 10 kΩ, Power Bandwidth = 200 Hz
					2.5			dB	I_C = 250 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 1.0 kΩ, Power Bandwidth = 200 Hz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS33.

BC204

PNP LOW LEVEL LOW NOISE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . −45 V (MIN)
- h_{FE} . . . 50–450 @ 2.0 mA

See TO18-4 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +125°C
Operating Junction Temperature		125°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		0.5 W
at 25°C Ambient Temperature		0.2 W
Maximum Voltages		
V_{CBO}	Collector to Base Voltage	−50 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−45 V
V_{EBO}	Emitter to Base Voltage	−5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	50	450		I_C = 2.0 mA, V_{CE} = −5.0 V
$V_{BE(ON)}$	Base to Emitter "On" Voltage	−0.55	−0.75	V	I_C = 2.0 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.3	V	I_C = 10 mA, I_B = 0.5 mA
I_{CBO}	Collector Reverse Current		50	nA	V_{CB} = −45 V, I_E = 0
			3.0	μA	V_{CB} = −45 V, I_E = 0, T_A = 65°C
BV_{CBO}	Collector to Base Breakdown Voltage	−50		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		V	I_C = 0, I_E = 10 μA
LV_{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−45		V	I_C = 5.0 mA, I_B = 0
NF	Noise Figure		10	dB	I_C = 200 μA, V_{CE} = −5.0 V, R_S = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz

SYMBOL	CHARACTERISTIC	BC204VI		BC204A		BC204B		TEST CONDITIONS
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
h_{FE}	DC Current Gain (Note 5)	50	120	110	220	200	450	I_C = 2.0 mA, V_{CE} = −5.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

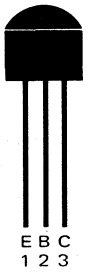
BC205

PNP LOW LEVEL LOW NOISE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 20 V (MIN) @ 5.0 mA
- h_{FE} . . . 110-450 @ 2.0 mA (BC205), 400-800 @ 2.0 mA (BC205C)

See TO18-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−25°C to +125°C
Operating Junction Temperature	125°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	0.5 W
at 25°C Ambient Temperature	0.2 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	−25 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−20 V
V_{EBO}	Emitter to Base Voltage	−5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	110	450		I_C = 2.0 mA, V_{CE} = −5.0 V
$V_{BE(ON)}$	Base to Emitter "On" Voltage	−0.55	−0.75	V	I_C = 2.0 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.3	V	I_C = 10 mA, I_B = 0.5 mA
I_{CBO}	Collector Reverse Current		50	nA	V_{CB} = −20 V, I_E = 0
			3.0	μA	V_{CB} = −20 V, I_E = 0, T_A = 65°C
BV_{CBO}	Collector Base Breakdown Voltage	−25		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter Base Breakdown Voltage	−5.0		V	I_E = 10 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−20		V	I_C = 5.0 mA, I_B = 0
NF	Noise Figure		10	dB	I_C = 200 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 2.0 kΩ, BW = 200 Hz

SYMBOL	CHARACTERISTIC	BC205A MIN.	BC205A MAX.	BC205B MIN.	BC205B MAX.	BC205C MIN.	BC205C MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain	110	220	200	450	400	800	I_C = 2.0 mA, V_{CE} = −5.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse Conditions: length = 300 μs; duty cycle = 1%.

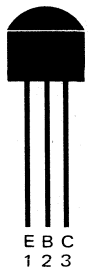
BC206

PNP LOW LEVEL LOW NOISE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- **V_{CEO} . . . −20 V (MIN)**
- **h_{FE} . . . 200 (MIN) @ 2.0 mA (BC206)**
  . . . 400–800 @ 2.0 mA, (BC206C)

See TO18-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +125°C
Operating Junction Temperature	125°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	0.5 W
25°C Ambient Temperature	0.2 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	−25 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−20 V
V_{EBO}	Emitter to Base Voltage	−5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	200	800		I_C = 2.0 mA, V_{CE} = −5.0 V
$V_{BE(ON)}$	Base to Emitter "On" Voltage	−0.55	−0.75		I_C = 2.0 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.3		I_C = 10 mA, I_B = 0.5 mA
I_{CBO}	Collector Reverse Current		50	nA	V_{CB} = −20 V, I_E = 0
			3.0	μA	V_{CB} = −20 V, I_E = 0, T_A = 65°C
BV_{CBO}	Collector to Base Breakdown Voltage	−25		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		V	I_E = 10 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−20		V	I_C = 5.0 mA, I_B = 0
NF	Noise Figure		4.0	dB	I_C = 200 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 2.0 kΩ, BW = 200 Hz

SYMBOL	CHARACTERISTIC	BC206B		BC206C		TEST CONDITIONS
		MIN.	MAX.	MIN.	MAX.	
h_{FE}	DC Current Gain (Note 5)	200	450	400	800	I_C = 2.0 mA, V_{CE} = −5.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS33.

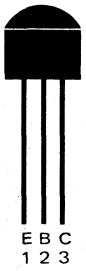
BC207 • BC208 • BC209

NPN LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- **SILICON NITRIDE PASSIVATED FOR IMPROVED STABILITY**
- **NF . . . 4.0 dB (MAX) @ 1.0 kHz (BC209)**
- **h_{FE} . . . 420–800 @ 2.0 mA (BC208C, BC209C)**
  . . . 100 (MIN) @ 10 μA (BC208C, BC209C)

See TO18-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +125°C
Operating Junction Temperature	125°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	200 mW
at 25°C Case Temperature	500 mW

Maximum Voltages and Current

		BC207	BC208 BC209
V_{CBO}	Collector to Base Voltage	50 V	25 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V	25 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC207 MIN.	BC207 MAX.	BC208 MIN.	BC208 MAX.	BC209 MIN.	BC209 MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		0.25		0.25		0.25	V	I_C = 10 mA, I_B = 0.5 mA
			0.60		0.60		0.60	V	I_C = 100 mA, I_B = 5.0 mA
I_{CBO}	Collector Cutoff Current		15					nA	V_{CB} = 40 V, I_E = 0
			15					μA	V_{CB} = 40 V, I_E = 0, T_A = 65°C
					15		15	nA	V_{CB} = 20 V, I_E = 0
					15		15	μA	V_{CB} = 20 V, I_E = 0, T_A = 65°C
BV_{CBO}	Collector to Base Breakdown Voltage	50		25		25		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		5.0		V	I_E = 10 μA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Note 4)	45		20		20		V	I_C = 10 mA, I_B = 0
C_{ob}	Output Capacitance		6.0		6.0		6.0	pF	V_{CB} = 10 V, I_C = 0, f = 1.0 MHz
NF	Noise Figure		10		10			dB	I_C = 0.2 mA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 2.0 kΩ, Power Bandwidth of 200 Hz
							4.0	dB	I_C = 0.2 mA, V_{CE} = 5.0 V, R_S = 2.0 kΩ, Power Bandwidth of 15.7 kHz with 3.0 dB points at 10 Hz and 10 kHz
h_{FE}	DC Current Gain	110	450	110	800	200	800		I_C = 2.0 mA, V_{CE} = 5.0 V
						70			I_C = 10 μA, V_{CE} = 5.0 V

SYMBOL	CHARACTERISTIC	BC207A BC208A MIN.	BC207A BC208A MAX.	BC207B BC208B BC209B MIN.	BC207B BC208B BC209B MAX.	BC208C BC209C MIN.	BC208C BC209C MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain	110	220	200	450	420	800	I_C = 2.0 mA, V_{CE} = 5.0 V
				40		100		I_C = 10 μA, V_{CE} = 5.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 1%
5. For product family characteristic curves, refer to Section 5-SS18.

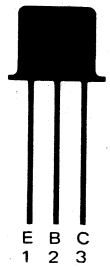
BC286 • BC287

NPN-PNP GENERAL PURPOSE SMALL SIGNAL COMPLEMENTARY AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **V_{CEO} . . . 60 V (MIN) @ 10 mA**
- **h_{FE} . . . 20 (MIN) @ 500 mA**
- **COMPLEMENTS . . . BC286 (NPN), BC287 (PNP)**

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (10 seconds)			260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			4.0 W
at 25°C Ambient Temperature			0.8 W
at 45°C Ambient Temperature			0.708 W
Maximum Voltages and Current		**BC286**	**BC287**
V_{CBO}	Collector to Base Voltage	70 V	60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	60 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
I_C	Collector Current	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC286 MIN.	BC286 TYP.	BC286 MAX.	BC287 MIN.	BC287 TYP.	BC287 MAX.	UNITS	TEST CONDITIONS Reverse Voltage Polarity for PNP
h_{FE}	DC Current Gain		85			125			I_C = 10 mA, V_{CE} = 2.0 V
			120			125			I_C = 100 mA, V_{CE} = 2.0 V
			85			100			I_C = 250 mA, V_{CE} = 2.0 V
		20	50	180	20	85	200		I_C = 500 mA, V_{CE} = 2.0 V
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.92			−0.95		V	I_C = 500 mA, V_{CE} = 2.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation		0.2			−0.25		V	I_C = 500 mA, I_B = 50 mA
	Voltage (Note 5)		0.4	1.0		−0.45	−1.0	V	I_C = 1.0 A, I_B = 100 mA
I_{CBO}	Collector Cutoff Current		0.1	20		0.1	50	nA	V_{CB} = 30 V, I_E = 0
BV_{CBO}	Collector to Base Breakdown Voltage	70						V	I_C = 100 μA, I_E = 0
					−60			V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0						V	I_E = 100 μA, I_C = 0
					−5.0			V	I_E = 10 μA, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining	60			−60			V	I_C = 10 mA, I_B = 0
	Voltage (Notes 4 & 5)								
h_{fe}	Small Signal Current Gain		25			75			I_C = 500 mA, V_{CE} = 2.0 V, f = 1.0 kHz
			120			110			I_C = 100 mA, V_{CE} = 2.0 V, f = 1.0 kHz
h_{fe}	High Frequency Current Gain		5.0						I_C = 50 mA, V_{CE} = 5.0 V, f = 20 MHz
						5.0			I_C = 50 mA, V_{CE} = 5.0 V, f = 100 MHz
C_{ob}	Output Capacitance		12			20		pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 43.7°C/W (derating factor of 22.8 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

BC317 • BC318 • BC319

NPN LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- SILICON NITRIDE PASSIVATED FOR IMPROVED STABILITY
- V_{CEO} . . . 20 V, 30 V AND 45 V (MIN)
- NF . . . 4.0 dB (MAX) @ 1.0 kHz (BC319)
- h_{FE} . . . 110 (MIN) @ 2.0 mA
  . . . 420-800 @ 2.0 mA (BC318C, BC319C)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W

Maximum Voltages and Currents		**BC317**	**BC318**	**BC319**
V_{CEO}	Collector to Emitter Voltage	45 V	30 V	20 V
V_{CBO}	Collector to Base Voltage	50 V	45 V	30 V
V_{EBO}	Emitter to Base Voltage	6.0 V	5.0 V	5.0 V
I_C	Collector Current	150 mA	150 mA	150 mA
I_{CM}	Collector Current	300 mA	300 mA	300 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC317 MIN.	BC317 MAX.	BC318 MIN.	BC318 MAX.	BC319 MIN.	BC319 MAX.	UNITS	TEST CONDITIONS
C_{ob}	Output Capacitance		4.0		4.0		4.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
NF	Noise Figure		6.0		6.0		4.0	dB	I_C = 200 μA, V_{CE} = 5.0 V, R_G = 2.0 kΩ f = 1.0 kHz, BW = 200 Hz
							4.0	dB	I_C = 200 μA, V_{CE} = 5.0 V, R_G = 2.0 kΩ f = 30 Hz to 15 kHz
I_{CBO}	Collector Cutoff Current		30		30		30	nA	V_{CB} = 20 V, I_E = 0
			15		15		15	μA	V_{CB} = 20 V, I_E = 0, T_A = 100°C
$V_{CE(sat)}$	Collector Saturation Voltage		0.20		0.20		0.20	V	I_C = 10 mA, I_B = 0.5 mA
			0.50		0.50		0.50	V	I_C = 100 mA, I_B = 5.0 mA
$V_{BE(ON)}$	Base to Emitter "On"	0.57	0.72	0.57	0.72	0.57	0.72	V	I_C = 2.0 mA, V_{CE} = 5.0 V
	Voltage		0.77		0.77		0.77	V	I_C = 10 mA, V_{CE} = 5.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	50		45		30		V	I_C = 100 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage	45		30		20		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		5.0		5.0		V	I_E = 100 μA, I_C = 0
h_{fe}	Small Signal Current Gain	125	500	125	900	240	900	V	I_C = 2.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{FE}	DC Current Gain	110	450	100	800	200	800		I_C = 2.0 mA, V_{CE} = 5.0 V

SYMBOL	CHARACTERISTIC	BC317A BC318A MIN.	BC317A BC318A MAX	BC317B BC318B BC319B MIN.	BC317B BC318B BC319B MAX.	BC318C BC319C MIN.	BC318C BC319C MAX.	TEST CONDITIONS
h_{fe}	Small Signal Current Gain	125	260	240	500	450	900	I_C = 2.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{FE}	DC Current Gain			40		100		I_C = 10 μA, V_{CE} = 5.0 V
		110	220	200	450	420	800	I_C = 2.0 mA, V_{CE} = 5.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. For product family characteristic curves, refer to Section 5-SS18.

BC320 • BC321 • BC322

PNP LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C**
- **NF . . . 4.0 dB (MAX) (BC322)**
- **h_{FE} . . . 110 (MIN) @ 2.0 mA (BC320, BC321)**
  . . . 400-800 @ 2.0 mA (BC321C, BC322C)
- **V_{CEO} . . . −20 V, −30 V, AND −45 V (MIN)**

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperatures	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W

Maximum Voltages and Current

		BC320	BC321	BC322
V_{CEO}	Collector to Emitter Voltage	−45 V	−30 V	−20 V
V_{CBO}	Collector to Base Voltage	−50 V	−45 V	−30 V
V_{EBO}	Emitter to Base Voltage	−6.0 V	−5.0 V	−5.0 V
I_C	Collector Current	150 mA	150 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC320 MIN.	BC320 MAX.	BC321 MIN.	BC321 MAX.	BC322 MIN.	BC322 MAX.	UNITS	TEST CONDITIONS
C_{ob}	Output Capacitance		4.0		4.0		4.0	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
NF	Noise Figure		6.0		6.0		4.0	dB	I_C = 200 μA, V_{CE} = −5.0 V, R_G = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz
							4.0	dB	I_C = 200 μA, V_{CE} = −5.0 V, R_G = 2.0 kΩ, f = 30 Hz−15 kHz
I_{CBO}	Collector Cutoff Current		30		30		30	nA	V_{CB} = −20 V, I_E = 0
			15		15		15	μA	V_{CB} = −20 V, I_E = 0, T_A = 100°C
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.20		−0.20		−0.20	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(ON)}$	Base Emitter "On" Voltage	−0.57	−0.72	−0.57	−0.72	−0.57	−0.72	V	I_C = 2.0 mA, V_{CE} = −5.0 V
			−0.77		−0.77		−0.77	V	I_C = 10 mA, V_{CE} = −5.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	−50		−45			−30	V	I_C = 100 μA, I_E = 0
V_{CEO}	Collector to Emitter Sustaining Voltage	−45		−30			−20	V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		−5.0			−5.0	V	I_E = 100 μA, I_C = 0
h_{fe}	Small Signal Current Gain	125	500	125	900	240	900		I_C = 2.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{FE}	DC Current Gain	110	450	110	800	200	800		I_C = 2.0 mA, V_{CE} = −5.0 V

SYMBOL	CHARACTERISTIC	BC320A BC321A MIN.	BC320A BC321A MAX.	BC320B BC321B BC322B MIN.	BC320B BC321B BC322B MAX.	BC321C BC322C MIN.	BC321C BC322C MAX.	TEST CONDITIONS
h_{fe}	Small Signal Current Gain	125	260	240	500	450	900	I_C = 2.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{FE}	DC Current Gain	110	220	200	450	400	800	I_C = 2.0 mA, V_{CE} = −5.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS33.

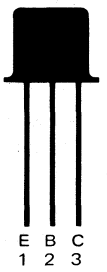
BC323

NPN GENERAL PURPOSE POWER

SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 60 V (MIN) @ 50 mA
- $V_{CE(sat)}$ . . . 0.15 V (MAX) @ 500 mA

See TO5-2 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +200°C
Operating Junction Temperature		200°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		7.0 W
at 25°C Ambient Temperature		0.8 W
at 45°C Ambient Temperature		0.7 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	100 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V
V_{CES}	Collector to Emitter Voltage	100 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	5.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	45	140	225		I_C = 50 mA, V_{CE} = 1.0 V
		50	160	250		I_C = 500 mA, V_{CE} = 1.0 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		0.7	0.9	V	I_C = 500 mA, I_B = 50 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.07	0.15	V	I_C = 500 mA, I_B = 50 mA
I_{EBO}	Emitter Reverse Current		0.01	10	μA	V_{EB} = 4.0 V, I_C = 0
I_{CBO}	Collector Reverse Current			100	μA	V_{CB} = 100 V, I_E = 0
			0.02	10	μA	V_{CB} = 40 V, I_E = 0
			0.35		μA	V_{CB} = 40 V, I_E = 0, T_A = 75°C
BV_{CES}	Collector to Emitter Breakdown Voltage	100			V	I_C = 1.0 mA, V_{EB} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0			V	I_E = 1.0 mA, I_C = 0
LV_{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60			V	I_C = 50 mA, I_B = 0
h_{fe}	High Frequency Current Gain		5.0			I_C = 500 mA, V_{CE} = 5.0 V, f = 20 MHz
C_{TE}	Emitter Transition Capacitance			500	pF	I_C = 0, V_{EB} = 0.5 V
C_{ob}	Output Capacitance			80	pF	I_E = 0, V_{CB} = 10 V

*Planar is a patented Farichild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 25°C/W (derating factor of 40 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. These ratings refer to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: pulse length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - PWR1.

BC520 • BC521

NPN LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW (MIN) @ T_A = 25°C
- SILICON NITRIDE PASSIVATED FOR IMPROVED STABILITY
- V_{CEO} . . . 45 V (BC521), 60 V (MIN) (BC520)
- h_{FE} . . . 600-1400 @ 10 mA (BC521)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Lead Temperature (10 seconds)			260°C
Maximum Power Dissiaption (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			1.0 W
at 25°C Ambient Temperature			0.625 W
at 70°C Ambient Temperature			0.400 W
Maximum Voltages and Current		**BC520**	**BC521**
V_{CBO}	Collector to Base Voltage	60 V	45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	45 V
V_{EBO}	Emitter to Base Voltage	8.0 V	8.0 V
I_C	Collector Current	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC520 MIN.	BC520 TYP.	BC520 MAX.	BC521 MIN.	BC521 TYP.	BC521 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	100	200		350	735			I_C = 10 μA, V_{CE} = 5.0 V
		120	250		400	840			I_C = 100 μA, V_{CE} = 5.0 V
		135	290		500	960			I_C = 1.0 mA, V_{CE} = 5.0 V
		150	310	700	600	950	1400		I_C = 10 mA, (Note 5) V_{CE} = 5.0 V
NF	Noise Figure		2.5	6.0		3.5	6.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 1.0 kΩ, BW = 400 Hz
			1.5			1.5	4.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 10 kΩ, BW = 400 Hz
			4.0			2.5	8.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 100 kΩ, BW = 400 Hz
			1.5	3.0		1.5	3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 10 kΩ, BW = 400 Hz
			2.5			4.0		dB	I_C = 100 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 1.0 kΩ, BW = 10 Hz
			1.0	3.0		1.0	3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, BW = 15.7 kHz
I_{CBO}	Collector Cutoff Current			2.0				nA	I_E = 0, V_{CB} = 45 V
							2.0	nA	I_E = 0, V_{CB} = 30 V
				50				nA	I_E = 0, V_{CB} = 45 V, T_A = 65°C
							50	nA	I_E = 0, V_{CB} = 30 V, T_A = 65°C
I_{EBO}	Emitter Cutoff Current			1.0			1.0	nA	I_C = 0, V_{EB} = 5.0 V
BV_{CEO}	Collector to Emitter Breakdown Voltage	60			45			V	I_C = 5.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	60			45			V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	8.0			8.0			V	I_C = 0, I_E = 10 μA

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS8.

BC520 • BC521

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd.)

SYMBOL	CHARACTERISTIC	BC520 MIN.	BC520 TYP.	BC520 MAX.	BC521 MIN.	BC521 TYP.	BC521 MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)			0.2			0.2	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage	0.5		0.7	0.5		0.7	V	I_C = 1.0 mA, V_{CE} = 5.0 V
h_{fe}	High Frequency Current Gain	1.0			1.0		1.5		I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance			2.5			3.0	pF	V_{CB} = 10 V, I_E = 0
C_{eb}	Emitter to Base Capacitance			6.0			6.0	pF	V_{EB} = 0.5 V, I_C = 0
h_{fe}	Small Signal Current Gain	150		1000	600		2000		I_C = 10 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{ie}	Input Resistance		8.5			28		kΩ	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{oe}	Output Conductance		24			74		μmho	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		7.0			23		$x10^{-4}$	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz

SYMBOL	CHARACTERISTIC	BC520 MIN.	BC520 MAX.	BC520B MIN.	BC520B MAX.	BC520C MIN.	BC520C MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain	180	800	180	460	380	800	I_C = 2.0 mA, V_{CE} = 5.0 V

SYMBOL	CHARACTERISTIC	BC521 MIN.	BC521 MAX.	BC521C MIN.	BC521C MAX.	BC521D MIN.	BC521D MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain	380	1550	380	800	750	1550	I_C = 2.0 mA, V_{CE} = 5.0 V

BC522

NPN LOW LEVEL LOW NOISE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- SILICON NITRIDE PASSIVATED FOR IMPROVED STABILITY
- V_{CEO} . . . 20 V (MIN)
- h_{FE} . . . 400 - 2200 @ 2.0 mA

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current

V_{CBO}	Collector to Base Voltage	20 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	20 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	150				I_C = 10 μA, V_{CE} = 5.0 V
		350	1580			I_C = 100 μA, V_{CE} = 5.0 V
		400		2200		I_C = 2.0 mA, V_{CE} = 5.0 V
NF	Narrow Band Noise Figure		1.5	3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, BW = 400 Hz, f = 1.0 kHz
NF	Wide Band Noise Figure		1.0	3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, BW = 15.7 kHz, f = 10 Hz to 10 kHz
I_{CBO}	Collector Cutoff Current			10	nA	I_E = 0, V_{CB} = 20 V
				50	nA	I_E = 0, V_{CB} = 20 V, T_A = 65°C
I_{EBO}	Emitter Cutoff Current			10	nA	I_C = 0, V_{EB} = 5.0 V
				10	μA	I_C = 0, V_{EB} = 6.0 V
BV_{CEO}	Collector to Emitter Breakdown Voltage	20			V	I_C = 5.0 mA, I_B = 0
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)			0.2	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage	0.5		0.75	V	I_C = 1.0 mA, V_{CE} = 5.0 V
h_{fe}	High Frequency Gain	1.0				I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance			4.0	pF	V_{CB} = 5.0 V, I_E = 0

SYMBOL	CHARACTERISTIC	BC522C MIN.	BC522C MAX.	BC522D MIN.	BC522D MAX.	BC522E MIN.	BC522E MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain	400	800	750	1550	1200	2200	I_C = 2.0 mA, V_{CE} = 5.0 V

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

BC523

NPN LOW LEVEL LOW NOISE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- SILICON NITRIDE PASSIVATED FOR IMPROVED STABILITY
- V_{CEO} . . . 45 V (MIN)
- h_{FE} . . . 100 (MIN) @ 10 μA
  . . . 150-170 @ 10 mA
- V_{EBO} . . . 12 V (MIN)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W

Maximum Voltages and Current

V_{CBO}	Collector to Base Voltage	45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V
V_{EBO}	Emitter to Base Voltage	12 V
I_C	Collector Current (Continuous)	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	100			I_C = 10 μA, V_{CE} = 5.0 V
		120			I_C = 100 μA, V_{CE} = 5.0 V
		135			I_C = 1.0 mA, V_{CE} = 5.0 V
h_{fe}	DC Current Gain (Note 5)	150	700		I_C = 10 mA, V_{CE} = 5.0 V
		180	800		I_C = 2.0 mA, V_{CE} = 5.0 V
I_{CBO}	Collector Cutoff Current		2.0	nA	I_E = 0, V_{CB} = 45 V
			50	nA	I_E = 0, V_{CB} = 45 V, T_A = 65°C
I_{EBO}	Emitter Cutoff Current		1.0	nA	I_C = 0, V_{EB} = 5.0 V
			10	μA	I_C = 0, V_{EB} = 12 V
V_{CEO}	Collector to Emitter Breakdown Voltage	45		V	I_C = 5.0 mA, I_B = 0
V_{CBO}	Collector to Base Breakdown Voltage	45		V	I_C = 10 μA, I_E = 0
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.2	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(ON)}$	Base to Emitter Voltage	0.5	0.7	V	I_C = 1.0 mA, V_{CE} = 5.0 V
h_{fe}	High Frequency Gain	1.0			I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		4.0	pF	V_{CB} = 5.0 V, I_E = 0
C_{eb}	Emitter to Base Capacitance		6.0	pF	V_{EB} = 0.5 V, I_C = 0
h_{fe}	Small Signal Current Gain	100			I_C = 10 mA, V_{CE} = 5.0 V, f = 1.0 kHz

SYMBOL	CHARACTERISTIC	BC523B MIN.	BC523B MAX.	BC523C MIN.	BC523C MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain	180	400	380	800	I_C = 2.0 mA, V_{CE} = 5.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150° and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS8.

BC526

PNP LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −50 V (MIN)
- h_{FE} . . . 60-800 (BC526) @ 2.0 mA
- h_{fe} . . . 350-600 (BC526C) @ 2.0 mA
- NF . . . 4.0 dB (MAX) WIDE BAND (BC526B, BC526C)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 25°C Ambient Temperature		0.625 W
at 70°C Ambient Temperature		0.400 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	−60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−50 V
V_{EBO}	Emitter to Base Voltage	−6.0 V
I_C	Collector Current	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		15	nA	V_{CB} = −30 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		15	nA	V_{EB} = −4.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	40			I_C = 10 μA, V_{CE} = −5.0 V
		60	800		I_C = 2.0 mA, V_{CE} = −5.0 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−1.1	V	I_C = 100 mA, I_B = 5.0 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.6	V	I_C = 100 mA, I_B = −5.0 mA
BV_{CBO}	Collector to Base Breakdown Voltage	−60		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage	−50		V	I_C = 2.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		V	I_C = 0, I_E = 10 μA
C_{ob}	Output Capacitance		5.0	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	100	600		I_C = 2.0 mA, V_{CE} = 5.0 V, f = 1.0 MHz
f_T	Current Gain Bandwidth Product	100		MHz	I_C = 10 mA, V_{CE} = −5.0 V

SYMBOL	CHARACTERISTIC	BC526A MIN.	BC526A MAX.	BC526B MIN.	BC526B MAX.	BC526C MIN.	BC526C MAX.	UNITS	TEST CONDITIONS
h_{fe}	Small Signal Current Gain	100	300	200	400	350	600		I_C = 2.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
NF	Noise Figure		10		4.0		4.0	dB	V_{CE} = −5.0 V, I_C = 200 μA, R_S = 2.0 kΩ, BW = 15.7 kHz
					4.0		4.0	dB	V_{CE} = −5.0 V, I_C = 200 μA, R_G = 2.0 kΩ, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS33.

BC527 • BC528 • BC537 • BC538

PNP-NPN SMALL SIGNAL COMPLEMENTARY GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 60 V (MIN) (BC527, BC537), 80 V (MIN) (BC528, BC538)
- h_{FE} . . . 50 (MIN) FROM 10 mA TO 500 mA, 15 (MIN) @ 1.0A, 40–400 @ 100 mA
- FOUR h_{FE} GROUPS
- COMPLEMENTS . . . BC527, BC528 (PNP), BC537, BC538 (NPN)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current (Reverse Voltage Polarity for PNP)

		BC527 BC537	BC528 BC538
V_{CBO}	Collector Base Voltage	60 V	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	80 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC527 BC537 MIN.	BC527 BC537 MAX.	BC528 BC538 MIN.	BC528 BC538 MAX.	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = 40 V
					10	nA	V_{CB} = 60 V
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 4.0 V
h_{FE}	DC Current Gain (Note 5)	40	400	40	400		V_{CE} = 1.0 V, I_C = 100 mA
		50		50			V_{CE} = 10 V, I_C = 10 mA
		50		50			V_{CE} = 10 V, I_C = 150 mA
		50		50			V_{CE} = 10 V, I_C = 500 mA
		15		15			V_{CE} = 10 V, I_C = 1.0 A
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		1.3		1.3	V	I_C = 150 mA, I_B = 15 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.7		0.7	V	I_C = 500 mA, I_B = 50 mA
			1.2		1.5	V	I_C = 1.0 A, I_B = 100 mA
BV_{CBO}	Collector to Base Breakdown Voltage	60		80		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_C = 0, I_E = 10 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	60		80		V	I_C = 10 mA, I_B = 0
h_{fe}	High Frequency Current Gain	1.0		1.0			I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		15		15	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz

SYMBOL	CHARACTERISTIC		MIN.	MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain	Gain Grouping −6	40	100	I_C = 100 mA, V_{CE} = 1.0 V
		−10	63	160	
		−16	100	250	
		−25	160	400	

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS24 for BC527/8, SS17 for BC537/8.

BC530 • BC531

PNP SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −120 V (MIN) (BC530), 150 V (MIN) (BC531)
- h_{FE} . . . 40-180 (BC530), 60-240 (BC531) @ 10 mA
- COMPLEMENTS . . . BC532, BC533

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to 150°C
Operating Junction Temperature			150°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature			0.625 W
at 25°C Case Temperature			1.0 W
Maximum Voltages and Current		**BC530**	**BC531**
V_{CBO}	Collector to Base Voltage	−130 V	−160 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−120 V	−150 V
V_{EBO}	Emitter to Base Voltage	−6.0 V	−6.0 V
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise stated)

SYMBOL	CHARACTERISTIC	BC530 MIN.	BC530 MAX.	BC531 MIN.	BC531 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	−120		−150		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−130		−160		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		−6.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = −100 V, I_E = 0
					50	nA	V_{CB} = −120 V, I_E = 0
			100			μA	V_{CB} = −100 V, I_E = 0, T_A = 100°C
					50	μA	V_{CB} = −120 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = −3.0 V, I_C = 0
h_{FE}	DC Pulse Current Gain	30		50			I_C = 1.0 mA, V_{CE} = −5.0 V
	(Note 5)	40	180	60	240		I_C = 10 mA, V_{CE} = −5.0 V
		40		50			I_C = 50 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		−0.20		−0.20	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		−0.25		−0.25	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		−1.0		−1.0	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		−1.0		−1.0	V	I_C = 50 mA, I_B = 5.0 mA
f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 10 mA, V_{CE} = −10 V, f = 100 MHz
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	30	200	40	200		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
			8.0		8.0	dB	I_C = 250 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, f = 10 Hz to 15.7 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS25.

BC532 • BC533

NPN SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 140 V (MIN) (BC532), 160 V (MIN) (BC533)
- h_{FE} . . . 60-250 (BC532), 40-250 (BC533) @ 10 mA
- COMPLEMENTS . . . BC530, BC531

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature			0.625 W
at 25°C Case Temperature			1.0 W
Maximum Voltages and Current		**BC532**	**BC533**
V_{CBO}	Collector to Base Voltage	160 V	180 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	140 V	160 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC532 MIN.	BC532 MAX.	BC533 MIN.	BC533 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	140		160		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	160		180		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_C = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = 100 V, I_E = 0
					50	nA	V_{CB} = 120 V, I_E = 0
			100			μA	V_{CB} = 100 V, I_E = 0, T_A = 100°C
					50	μA	V_{CB} = 120 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Pulse Current Gain	60		40			I_C = 1.0 mA, V_{CE} = 5.0 V
	(Note 5)	60	250	40	250		I_C = 10 mA, V_{CE} = 5.0 V
		20		25			I_C = 50 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		0.15		0.15	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		0.25		0.20	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		1.0		1.0	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		1.2		1.0	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		30		30	pF	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz
f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz
h_{fe}	Small Signal Current Gain	50	200	50	200		I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
NF	Noise Figure		10		8.0	dB	I_C = 250 μA, V_{CE} = 5.0 V, R_S = 1.0 kΩ, f = 10 Hz to 15.7 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

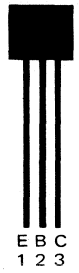
BC534 • BC535

PNP-NPN SMALL SIGNAL GENERAL PURPOSE COMPLEMENTARY AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 80 V (MIN)
- h_{FE} . . . 50 (MIN) @ 10 mA and 100 mA
- COMPLEMENTS . . . BC534 (PNP), BC535 (NPN)

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperatures	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current (Reverse Voltage Polarity for PNP)

V_{CBO}	Collector to Base Voltage	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	80 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless state otherwise) Reverse voltage polarity for PNP.

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	80		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		V	I_C = 100 μA, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	80		V	I_C = 100 μA, I_E = 0
I_{CBO}	Collector Cutoff Current		100	nA	V_{CB} = 80 V, I_E = 0
h_{FE}	DC Current Gain (Note 5)	50			I_C = 10 mA, V_{CE} = 1.0 V
		50			I_C = 100 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25	V	I_C = 100 mA, I_B = 10 mA
$V_{BE(ON)}$	Base to Emitter 'On" Voltage (Note 5)		1.2	V	I_C = 100 mA, V_{CE} = 1.0 V
f_T	Current Gain Bandwidth Product	50		MHz	I_C = 100 mA, V_{CE} = 1.0 V, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS24 for BC534 and SS17 for BC535.

BC727 • BC728 • BC737 • BC738

PNP-NPN COMPLEMENTARY AUDIO FREQUENCY DRIVERS AND OUTPUT AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 40 V (MIN) BC727, BC737; 25 V (MIN), BC728, BC738
- h_{FE} . . . 63-630 @ 100 mA, 63 (MIN) FROM 100 mA to 500 mA, 30 (MIN) @ 1.0 A BC728, BC738
- FOUR h_{FE} GROUPS
- COMPLEMENTS . . . BC727, BC728 (PNP); BC737, BC738 (NPN)

See TO92-1 Package Outline

E B C
1 2 3

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Lead Temperature (10 seconds)			260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			1.0 W
at 25°C Ambient Temperature			0.625 W
at 70°C Ambient Temperature			0.400 W
Maximum Voltages and Current		**BC727, BC737**	**BC728, BC738**
V_{CBO}	Collector to Base Voltage	50 V	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	40 V	25 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
I_C	Collector Current	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BC727, BC737 MIN.	BC727, BC737 MAX.	BC728, BC738 MIN.	BC728, BC738 MAX.	UNITS	TEST CONDITIONS Reverse Voltage Polarity for PNP
h_{FE}	DC Current Gain (Note 5)	63	630	63	630		V_{CE} = 1.0 V, I_C = 100 mA
		63		63			V_{CE} = 1.0 V, I_C = 500 mA
		15		30			V_{CE} = 1.0 V, I_C = 1.0 A
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		1.2		1.2	V	I_C = 500 mA, I_B = 50 mA
			1.3		1.3	V	I_C = 1.0 A, I_B = 100 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.7		0.7	V	I_C = 500 mA, I_B = 50 mA
BV_{CBO}	Collector to Base Breakdown Voltage	50		30		V	I_C = 100 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	40		25		V	I_C = 10 mA, I_B = 0
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Output Capacitance		20		20	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = 40 V
					10	nA	V_{CB} = 25 V
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 4.0 V
			100		100	μA	V_{EB} = 5.0 V

SYMBOL	CHARACTERISTIC		MIN.	MAX.	TEST CONDITIONS Reverse Voltage Polarity for PNP
h_{FE}	DC Current Gain	Gain Grouping −10	63	160	V_{CE} = 1.0 V, I_C = 100 mA
		−16	100	250	V_{CE} = 1.0 V, I_C = 100 mA
		−25	160	400	V_{CE} = 1.0 V, I_C = 100 mA
		−40	250	630	V_{CE} = 1.0 V, I_C = 100 mA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

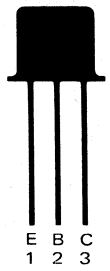
BD115

NPN HIGH VOLTAGE GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* TRANSISTOR

- V_{CEO} . . . 180 V (MIN)
- h_{FE} . . . 22 (MIN) @ 50 mA
- $r_b'C_c$ . . . 100 ps (MAX)

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +200°C
Operating Junction Temperature		200°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 50°C Ambient Temperature		6.0 W
(Mounted on a 1.5 mm Al blackened heat sink of at least 30 cm^2) at 25°C Ambient Temperature		0.875 W
Maximum Voltages and Currents		
V_{CBO}	Collector to Base Voltage	245 V
V_{CEO}	Collector to Emitter Voltage	180 V
V_{CER}	Collector to Emitter Voltage	245 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	150 mA
I_{CM}	Collector Current (Peak)	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
I_{EBO}	Emitter Cutoff Current		100	μA	I_C = 0, V_{EB} = 5.0 V
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 4)		1.0	V	I_C = 50 mA, V_{CE} = 100 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		9.0	V	I_C = 100 mA, I_B = 10 mA
h_{FE}	DC Current Gain (Note 4)	22			I_C = 50 mA, V_{CE} = 100 V
$r_b'C_c$	Feedback Time Constant		100	ps	I_E = 10 mA, V_{CB} = 10 V, f = 10 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 25°C/W (derating factor of 40 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle <2%.

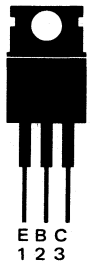
BD220 • BD221 • BD222

36 WATT NPN SILICON POWER

MOLDED SILICON DIFFUSED BI-MESAR™ TRANSISTORS

- P_D . . . 36 W (MIN)
- I_C . . . 4.0 A (MAX)
- COMPLEMENTS . . . BD223, BD224, BD225

See TO220-00 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	235°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation	36 W
Linear Derating Factor	288 mW/°C

Maximum Voltages and Currents

		BD220	BD221	BD222
V_{CBO}	Collector to Base Voltage	80 V	60 V	80 V
V_{EBO}	Emitter to Base Voltage	7.0 V	5.0 V	5.0 V
V_{CEV}	Collector to Emitter Voltage (V_{EB} = 1.5 V)	80 V	60 V	80 V
V_{CER}	Collector to Emitter Voltage (R_{BE} = 100 Ω)	75 V	50 V	70 V
V_{CEO}	Collector to Emitter Voltage	70 V	40 V	60 V
I_C	Collector Current (Continuous)	4.0 A	4.0 A	4.0 A
I_B	Base Current (Continuous)	2.0 A	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BD220 MIN.	BD220 MAX.	BD221 MIN.	BD221 MAX.	BD222 MIN.	BD222 MAX.	UNITS	TEST CONDITIONS
I_{CEV}	Collector Cutoff Current		0.5				0.5	mA	V_{CE} = 65 V, V_{EB} = 1.5 V
					2.0			mA	V_{CE} = 35 V, V_{EB} = 1.5 V
			10				10	mA	V_{CE} = 80 V, V_{BE} = 1.5 V
					10			mA	V_{CE} = 60 V, V_{BE} = 1.5 V
			3.0				3.0	mA	V_{CE} = 65 V, V_{EB} = 1.5 V, T_C = 150°C
					5.0			mA	V_{CE} = 35 V, V_{EB} = 1.5 V, T_C = 150°C
I_{CER}	Collector Cutoff Current		0.5				0.5	mA	V_{CE} = 50 V, R_{BE} = 100 Ω
			10					mA	V_{CE} = 75 V, R_{BE} = 100 Ω
					10			mA	V_{CE} = 50 V, R_{BE} = 100 Ω
							10	mA	V_{CE} = 70 V, R_{BE} = 100 Ω
			2.0				2.0	mA	V_{CE} = 50 V, R_{BE} = 100 Ω, T_C = 150°C
I_{EBO}	Emitter Cutoff Current		1.0					mA	V_{EB} = 7.0 V, I_C = 0
					1.0		1.0	mA	V_{EB} = 5.0 V, I_C = 0
h_{FE}	DC Pulse Current Gain (Note 4)	30	120						I_C = 0.5 A, V_{CE} = 4.0 V
				30	120				I_C = 1.0 A, V_{CE} = 4.0 V
						20	80		I_C = 1.5 A, V_{CE} = 4.0 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	70		40		60		V	I_C = 100 mA, I_B = 0
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 4)		1.1					V	I_C = 0.5 A, V_{CE} = 4.0 V
					1.3			V	I_C = 1.0 A, V_{CE} = 4.0 V
							1.5	V	I_C = 1.5 A, V_{CE} = 4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		1.0					V	I_C = 0.5 A, I_B = 50 mA
					1.0			V	I_C = 1.0 A, I_B = 100 mA
							1.0	V	I_C = 1.5 A, I_B = 150 mA

Additional Electrical Characteristics on following page.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 3.47°C/W (derating factor of 288 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 2%.
5. For product family characteristic curves, refer to Section 5 - PWR5.

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	BD220 MIN.	BD220 MAX.	BD221 MIN.	BD221 MAX.	BD222 MIN.	BD222 MAX.	UNITS	TEST CONDITIONS
f_T	Current Gain Bandwidth Product	0.8		0.8		0.8		MHz	V_{CE} = 4.0 V, I_C = 0.2 A, f = 100 kHz
t_{on}	Saturated Turn On Time		5.0					μs	I_C = 0.5 A, I_{B1} = 50 mA, V_{CC} = 30 V
					5.0			μs	I_C = 1.0 A, I_{B1} = 100 mA, V_{CC} = 30 V
							5.0	μs	I_C = 1.5 A, I_{B1} = 150 mA, V_{CC} = 30 V
t_{off}	Saturated Turn Off Time		15					μs	I_C = 0.5 A, I_{B1} = I_{B2} = 50 mA, V_{CC} = 30 V
					15			μs	I_C = 1.0 A, I_{B1} = I_{B2} = 100 mA, V_{CC} = 30 V
							15	μs	I_C = 1.5 A, I_{B1} = I_{B2} = 150 mA, V_{CC} = 30 V

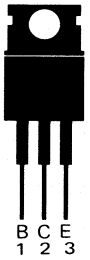
BD223 • BD224 • BD225

36 WATT PNP SILICON POWER

MOLDED SILICON DIFFUSED BI-MESAR™ TRANSISTORS

- P_D . . . 36 W (MIN)
- I_C . . . 4.0 A (MAX)
- COMPLEMENTS . . . BD220, BD221, BD222

See TO220-00 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	235°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation	36 W
Linear Derating Factor	288 mW/°C

Maximum Voltages and Currents		**BD223**	**BD224**	**BD225**
V_{CBO}	Collector to Base Voltage	−80 V	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−7.0 V	−5.0 V	−5.0 V
V_{CEV}	Collector to Emitter Voltage (V_{EB} = 1.5 V)	−80 V	−60 V	−80 V
V_{CER}	Collector to Emitter Voltage (R_{BE} = 100 Ω)	−75 V	−50 V	−70 V
V_{CEO}	Collector to Emitter Voltage	−70 V	−40 V	−60 V
I_C	Collector Current (Continuous)	4.0 A	4.0 A	4.0 A
I_B	Base Current (Continuous)	2.0 A	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BD223 MIN.	BD223 MAX.	BD224 MIN.	BD224 MAX.	BD225 MIN.	BD225 MAX.	UNITS	TEST CONDITIONS
I_{CEV}	Collector Cutoff Current		0.5				0.5	mA	V_{CE} = −65 V, V_{EB} = −1.5 V
					2.0			mA	V_{CE} = −35 V, V_{EB} = −1.5 V
			10				10	mA	V_{CE} = −80 V, V_{BE} = −1.5 V
					10			mA	V_{CE} = −60 V, V_{BE} = −1.5 V
			3.0				3.0	mA	V_{CE} = −65 V, V_{EB} = −1.5 V, T_C = 150°C
					5.0			mA	V_{CE} = −35 V, V_{EB} = −1.5 V, T_C = 150°C
I_{CER}	Collector Cutoff Current		0.5				0.5	mA	V_{CE} = −50 V, R_{BE} = 100 Ω
			10					mA	V_{CE} = −75 V, R_{BE} = 100 Ω
					10			mA	V_{CE} = −50 V, R_{BE} = 100 Ω
							10	mA	V_{CE} = −70 V, R_{BE} = 100 Ω
			2.0				2.0	mA	V_{CE} = −50 V, R_{BE} = 100 Ω, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		1.0					mA	V_{EB} = −7.0 V, I_C = 0
					1.0		1.0	mA	V_{EB} = −5.0 V, I_C = 0
h_{FE}	DC Pulse Current Gain (Note 4)	30	120						I_C = 0.5 A, V_{CE} = −4.0 V
				30	120				I_C = 1.0 A, V_{CE} = −4.0 V
						20	80		I_C = 1.5 A, V_{CE} = −4.0 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	−70		−40		−60		V	I_C = 100 mA, I_B = 0
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 4)		−1.1					V	I_C = 0.5 A, V_{CE} = −4.0 V
					−1.3			V	I_C = 1.0 A, V_{CE} = −4.0 V
							1.5	V	I_C = 1.5 A, V_{CE} = −4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		−1.0					V	I_C = 0.5 A, I_B = 50 mA
					−1.0			V	I_C = 1.0 A, I_B = 100 mA
							−1.0	V	I_C = 1.5 A, I_B = 150 mA

Additional Electrical Characteristics on following page.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 3.47°C/W (derating factor of 288 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 2%.
5. For product family characteristic curves, refer to Section 5 - PWR14.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	BD223 MIN.	BD223 MAX.	BD224 MIN.	BD224 MAX.	BD225 MIN.	BD225 MAX.	UNITS	TEST CONDITIONS
f_T	Current Gain Bandwidth Product	0.8		0.8		0.8		MHz	$V_{CE} = -4.0$ V, $I_C = 0.2$ A, f = 100 kHz
t_{on}	Saturated Turn On Time		5.0					μs	$I_C = 0.5$ A, $I_{B_1} = 50$ mA, $V_{CC} = -30$ V
					5.0			μs	$I_C = 1.0$ A, $I_{B_1} = 100$ mA, $V_{CC} = -30$ V
							5.0	μs	$I_C = 1.5$ A, $I_{B_1} = 150$ mA, $V_{CC} = -30$ V
t_{off}	Saturated Turn Off Time		15					μs	$I_C = 0.5$ A, $I_{B1} = I_{B2} = 50$ mA, $V_{CC} = -30$ V
					15			μs	$I_C = 1.0$ A, $I_{B1} = I_{B2} = 100$ mA, $V_{CC} = -30$ V
							15	μs	$I_C = 1.5$ A, $I_{B_1} = I_{B_2} = 150$ mA, $V_{CC} = -30$ V

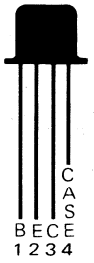
BF167 • SE5040

NPN RF-AGC AMPLIFIER

DIFFUSED SILICON PLANAR* TRANSISTOR

- **PG . . . 24 dB (MIN) @ 36 MHz**
- **NF . . . 3.0 dB (TYP) @ 36 MHz**
- **Forward AGC Capability Guaranteed @ –50 dB**

See TO18-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

		BF167	SE5040
Maximum Temperatures			
Storage Temperature			–55°C to +175°C
Operating Junction Temperature			175°C
Lead Temperature (10 seconds)			260°C
Maximum Power Dissipation (Notes 2 & 3)		**BF167**	**SE5040**
Total Dissipation at 25°C Ambient Temperature		150 mW	175 mW
at 45°C Ambient Temperature		130 mW	
at 25°C Case Temperature			260 mW
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage	40 V	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	30 V
V_{EBO}	Emitter to Base Voltage	4.0 V	3.0 V
I_C	Collector Current	25 mA	25 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	SE5040 MIN.	SE5040 TYP.	SE5040 MAX.	BF167 MIN.	BF167 TYP.	BF167 MAX.	UNITS	CONDITIONS
h_{FE}	DC Current Gain (Note 5)					35			I_C = 1.0 mA, V_{CE} = 10 V
		20	80	220	30	60			I_C = 4.0 mA, V_{CE} = 10 V
						20			I_C = 10 mA, V_{CE} = 10 V
$V_{BE(ON)}$	Base to Emitter "On" Voltage					0.70		V	I_C = 4.0 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)			2.0		0.7	0.95	V	I_C = 10 mA, I_B = 5.0 mA
I_{CES}	Collector Reverse Current						50	nA	V_{CE} = 10 V, V_{EB} = 0
							5.0	μA	V_{CE} = 10 V, V_{EB} = 0, T_A = 100°C
BV_{CBO}	Collector to Base Breakdown Voltage				40			V	I_C = 10 μA, I_E = 0
		30						V	I_C = 100 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage				40			V	I_C = 10 μA, V_{EB} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage				4.0			V	I_E = 10 μA, I_C = 0
		3.0						V	I_E = 100 μA, I_C = 0
h_{fe}	High Frequency Current Gain	3.0	5.0			6.0			I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz
C_{re}	Feedback Capacitance					0.14		pF	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 MHz
NF	Narrow Band Noise Figure					3.0		dB	I_C = 4.0 mA, V_{CE} = 10 V, f = 36 MHz, R_S = 100 Ω
PG	Power Gain				24	31		dB	I_E = 4.0 mA, V_{EE} = –25 V, f = 36 MHz
	(see test circuit no. 422)	27	29					dB	V_{BB} = 2.0 V, f = 45 MHz, V_{CC} = 12 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)				30			V	I_C = 5.0 mA, I_B = 0
		30						V	I_C = 1.0 mA, I_B = 0
V_{AGC}	AGC Voltage for 30 dB Gain Reduction (see test circuit no. 422)	4.3	5.0	6.2				V	V_{CC} = 12 V, f = 45 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C, junction to ambient thermal resistance of 1000°C/W (derating factor of 1.0 mW/°C) for BF167. For SE5040, junction to case thermal resistance of 583°C/W (derating factor of 1.73 mW/°C); junction to ambient thermal resistance of 850°C/W (derating factor of 1.17 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	SE5040 MIN.	SE5040 TYP.	SE5040 MAX.	BF167 MIN.	BF167 TYP.	BF167 MAX.	UNITS	TEST CONDITIONS
I_{AGC}	Collector Current for 30 dB Gain Reduction (see test circuit no. 422)		8.5					mA	V_{CC} = 12 V, f = 45 MHz
V_{AGC}	AGC Voltage for 50 dB Gain Reduction (see test circuit no. 422)		7.50	9.0				V	V_{CC} = 12 V, f = 45 MHz
NF	Noise Figure (see test circuit no. 422)		2.7	5.0				dB	V_{BB} = 2.0 V, f = 45 MHz, V_{CC} = 12V
C_{cb}	Collector Base Capacitance		0.14	0.22		0.14		pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
I_{CBO}	Collector Cutoff Current			50				nA	I_E = 0, V_{CB} = 20 V
R_{iep}	Input Resistance, Common Emitter		300			300		Ω	I_C = 4.0 mA, V_{CE} = 10 V, f = 45 MHz
C_{iep}	Input Capacitance, Common Emitter		22			22		pF	I_C = 4.0 mA, V_{CE} = 10 V, f = 45 MHz
R_{oep}	Output Resistance, Common Emitter		45			45		kΩ	I_C = 4.0 mA, V_{CE} = 10 V, f = 45 MHz
C_{oep}	Output Capacitance, Common Emitter		1.3			1.3		pF	I_C = 4.0 mA, V_{CE} = 10 V, f = 45 MHz

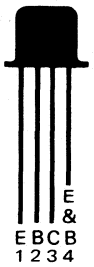
BF222

NPN RF-AGC AMPLIFIER

DIFFUSED SILICON PLANAR* TRANSISTOR

- **PG . . . 20 dB (TYP) @ 100 MHz**
- **NF . . . 2.0 dB (MAX) @ 100 MHz**
- **FORWARD AGC CAPABILITY**

See TO18-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +175°C
Operating Junction Temperature	175°C

Maximum Power Dissipation (Note 2)

Total Dissipation at 25°C Case Temperature	0.260 W
at 25°C Ambient Temperature	0.175 W
at 45°C Ambient Temperature	0.152 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	50 V
V_{CEO}	Collector to Emitter Voltage	50 V
V_{EBO}	Emitter to Base Voltage	5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
NF	Noise Figure			2.0	dB	I_C = 4.0 mA, V_{CE} = 5.0 V, f = 100 MHz, R_S = 150 Ω
PG	Power Gain		20		dB	I_C = 4.0 mA, V_{CE} = 5.0 V, f = 100 MHz
V_{AGC}	AGC Voltage for 30 dB Gain Reduction		6.0		V	f = 100 MHz
C_{re}	Reverse Transfer Capacity, Common Emitter		0.37		pF	I_C = 2.0 mA, V_{CE} = 7.0 V, f = 1.0 MHz (Emitter and Can Guarded)
h_{FE}	DC Pulse Current Gain (Note 4)	20	60			I_C = 2.0 mA, V_{CE} = 7.0 V
I_{CBO}	Collector Cutoff Current		1.0		nA	I_E = 0, V_{CB} = 10 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 3 & 4)	50			V	I_C = 5.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	50			V	I_C = 50 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0			V	I_C = 0, I_E = 50 μA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.74		V	I_C = 2.0 mA, V_{CE} = 7.0 V
h_{fe}	High Frequency Current Gain		4.0			I_C = 2.0 mA, V_{CE} = 7.0 V, f = 100 MHz

*Planar is a patented Fairchild process

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 583°C/W (derating factor of 1.73 mW/°C); junction to ambient thermal resistance of 850°C/W (derating factor of 1.17 mW/°C).
3. Rating refers to a high current point where collector to emitter voltage is lowest.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 - SS3.

BF257 • BF258 • BF259

NPN SMALL SIGNAL HIGH VOLTAGE VIDEO DRIVERS

SILICON PLANAR* EPITAXIAL TRANSISTORS

- **V_{CEO} . . . 300 V (MIN) (BF259)**
- **h_{FE} . . . 25 (MIN) @ 30 mA**
- **f_T . . . 75 MHz (TYP)**
- **C_{cb} . . . 2.5 pF (TYP) (BF259)**

See TO5-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +175°C
Operating Junction Temperature	175°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	7.0 W
at 25°C Ambient Temperature	1.0 W

Maximum Voltages and Current		**BF257**	**BF258**	**BF259**
V_{CBO}	Collector to Base Voltage	160 V	250 V	300 V
V_{CER}	Collector to Emitter Voltage (R_{BE} = 1.0 kΩ)	160 V	250 V	300 V
V_{CEO}	Collector to Emitter Voltage	160 V	250 V	300 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
I_C	Collector Current	100 mA	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BF257 MIN.	BF257 TYP.	BF257 MAX.	BF258 MIN.	BF258 TYP.	BF258 MAX.	BF259 MIN.	BF259 TYP.	BF259 MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	160			250			300			V	I_C = 100 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage	160			250			300			V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0			5.0			5.0			V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current			50							nA	V_{CB} = 100 V, I_E = 0
							50				nA	V_{CB} = 200 V, I_E = 0
										50	nA	V_{CB} = 250 V, I_E = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage			1.0			1.0			1.0	V	I_C = 30 mA, I_B = 6.0 mA
h_{FE}	DC Current Gain	25			25			25				V_{CE} = 10 V, I_C = 30 mA
C_{cb}	Collector to Base Capacitance		3.5			3.0			2.5		pF	V_{CB} = 30 V, I_E = 0, f = 1.0 MHz
f_T	Transition Frequency		75			75			75		MHz	V_{CE} = 10 V, I_C = 15 mA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 25°C/W (derating factor of 40 mW/°C); junction to ambient thermal resistance of 175°C/W (derating factor of 5.71 mW/°C).

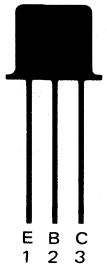
BF336 • BF337 • BF338

NPN SMALL SIGNAL HIGH VOLTAGE VIDEO DRIVERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- V_{CEO} . . . 225 V (MIN) (BF338)
- f_T . . . 50 MHz (MIN) @ 30 mA
- C_{re} . . . 3.5 pF (MAX)

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65° C to +200° C
Operating Junction Temperature	200° C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25° C Ambient Temperature	1.0 W
at 40° C Case Temperature	3.0 W

Maximum Voltages and Current		**BF336**	**BF337**	**BF338**
V_{CBO}	Collector to Base Voltage	185 V	250 V	300 V
V_{CER}	Collector to Emitter Voltage ($R_{BE} \leq 1.0$ kΩ)	185 V	250 V	300 V
V_{CEO}	Collector to Emitter Voltage	180 V	200 V	225 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
I_C	Collector Current	100 mA	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BF336 MIN.	BF336 MAX.	BF337 MIN.	BF337 MAX.	BF338 MIN.	BF338 MAX.	UNITS	TEST CONDITIONS
I_{CER}	Collector Reverse Current		100					μA	V_{CE} = 150 V, R_{BE} = 1.0 kΩ
					100			μA	V_{CE} = 200 V, R_{BE} = 1.0 kΩ
							100	μA	V_{CE} = 250 V, R_{BE} = 1.0 kΩ
BV_{CBO}	Collector to Base Breakdown Voltage	185		250		300		V	I_C = 1.0 mA, I_E = 0
BV_{CER}	Collector to Emitter Breakdown Voltage	185		250		300		V	I_C = 1.0 mA, R_{BE} = 1.0 kΩ, $T_A \leq 150°C$
BV_{CEO}	Collector to Emitter Breakdown Voltage	180		200		225		V	I_C = 4.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		5.0		V	I_C - 0.1 mA, I_C = 0
$V_{BE(ON)}$	Base to Emitter Voltage (Note 4)		1.2		1.2		1.2	V	V_{CE} = 10 V, I_C = 30 mA
h_{FE}	DC Current Gain (Note 4)	20		20		20			V_{CE} = 10 V, I_C = 30 mA
f_T	Current Gain Bandwidth Product	50		50		50		MHz	V_{CE} = 20 V, I_C = 30 mA, f = 20 MHz
C_{re}	Common Emitter Reverse Transfer Capacitance		3.5		3.5		3.5	pF	V_{CE} = 20 V, I_C = 10 mA, f = 500 kHz
$r_b'C_c$	Collector to Base Time Constant		100		100		100	ps	V_{CB} = 20 V, I_E = 30 mA, f = 10 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200° C and junction to case thermal resistance of 20° C/W (derating factor of 50 mW/° C); junction to ambient thermal resistance of 175° C/W (derating factor of 5.71 mW/° C).
4. Pulse conditions: length = 300 μs; duty cycle <2%.

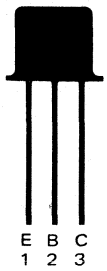
BFX34

NPN HIGH CURRENT GENERAL PURPOSE POWER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 60 V (MIN)
- h_{FE} . . . 40-150 @ I_C = 2.0 A

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +200°C
Operating Junction Temperature		200°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		5.0 W
at 25°C Ambient Temperature		0.87 W
Maximum Voltages		
V_{CBO}	Collector to Base Voltage	120 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V
V_{EBO}	Emitter to Base Voltage	6.0 V

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain		100			I_C = 1.0 A, V_{CE} = 2.0 V
	(Note 5)		75			I_C = 1.5 A, V_{CE} = 0.6 V
		40	80	150		I_C = 2.0 A, V_{CE} = 2.0 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		1.3	1.6	V	I_C = 5.0 V, I_B = 0.5 A
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.4	1.0	V	I_C = 5.0 A, I_B = 0.5 A
I_{CES}	Collector Reverse Current		0.02	10	μA	V_{CE} = 60 V, V_{BE} = 0
I_{EBO}	Emitter Cutoff Current		0.05	10	μA	I_C = 0, V_{EB} = 4.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	120			V	I_C = 5.0 mA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0			V	I_E = 1.0 mA, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60			V	I_C = 100 mA, I_B = 0
h_{fe}	High Frequency Current Gain	3.5	5.0			I_C = 0.5 A, V_{CE} = 5.0 V, f = 20 MHz
C_{ob}	Output Capacitance		40	100	pF	I_E = 0, V_{CB} = 10 V
C_{TE}	Emitter Transition Capacitance		300	400	pF	I_C = 0, V_{EB} = 0.5 V
t_{on}	Turn On Time		0.25	0.6	μs	I_C = 5.0 A, I_{B1} = 5.0 A
t_{off}	Turn Off Time		0.6	1.2	μs	I_C = 5.0 A, I_{B1} = I_{B2} = 0.5 A

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 35°C/W (derating factor of 28.6 mW/°C); junction to ambient thermal resistance of 201°C/W (derating factor of 4.97 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - PWR1.

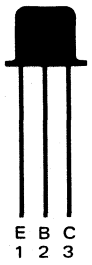
BFX37

PNP LOW LEVEL LOW NOISE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . −60 V (MIN)
- h_{FE} . . . 70-300 @ 10 μA
- . . . 100 (MIN) @ 1.0 mA
- NF . . . 3.0 dB (MAX) @ 1.0 kHz, 10 kHz AND WIDE BAND

See TO18-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +200°C
Operating Junction Temperature		200°C
Lead Temperature (60 seconds)		300°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.2 W
at 25°C Ambient Temperature		0.36 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	−60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V
V_{EBO}	Emitter to Base Voltage	−6.0 V
I_C	Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	70	300		I_C = 10 μA, V_{CE} = −5.0 V
		85			I_C = 100 μA, V_{CE} = −5.0 V
		100			I_C = 1.0 mA, V_{CE} = −5.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	100			I_C = 10 mA, V_{CE} = −5.0 V
		30			I_C = 10 μA, V_{CE} = −5.0 V, T_A = −55°C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		−0.9	V	I_C = 10 mA, I_B = 0.5 mA
			−1.0	V	I_C = 50 mA, I_B = 5.0 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.25	V	I_C = 10 mA, I_B = 0.5 mA
			−0.4	V	I_C = 50 mA, I_B = 5.0 mA
I_{CES}	Collector Cutoff Current		20	nA	V_{CE} = −50 V, V_{EB} = 0
			20	μA	V_{CE} = −50 V, V_{EB} = 0, T_A = 125°C
I_{EBO}	Emitter Cutoff Current		10	nA	I_C = 0, V_{EB} = −4.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	−60		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−60		V	I_C = 10 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		V	I_E = 10 μA, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−60		V	I_C = 5.0 mA, I_B = 0
h_{fe}	High Frequency Current Gain	2.0			I_C = 0.5 mA, V_{CE} = −5.0 V, f = 20 MHz
C_{ob}	Output Capacitance		6.0	pF	I_E = 0, V_{CB} = −5.0 V
C_{ib}	Input Capacitance		15	pF	I_C = 0, V_{EB} = −0.5 V
NF	Narrow Band Noise Figure		3.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, f = 1.0 kHz, Power Bandwidth of 200 Hz
			3.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 10 kHz, R_S = 10 kΩ, Power Bandwidth of 2.0 kHz
NF	Wide Band Noise Figure		3.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, Power Bandwidth of 15.7 kHz with 3.0 dB points at 10 Hz and 10 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 146°C/W (derating factor of 6.75 mW/°C); junction to ambient thermal resistance of 485°C/W (derating factor of 2.06 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS33.

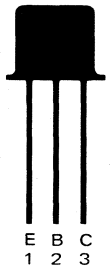
BFX38 • BFX39 • BFX40 • BFX41

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 55 V (MIN) (BFX38/39), 75 V (MIN) (BFX40/41)
- h_{FE} . . . 85 (MIN) (BFX38/40), 40 (MIN) (BFX39/41) @ 100 mA
  . . . 60 (MIN) (BFX38/40), 25 (MIN) (BFX39/41) @ 500 mA
  . . . GUARANTEED @ 1.0 A
- t_{on} . . . 100 ns (MAX) @ 500 mA, t_{off} . . . 400 ns (MAX) @ 500 mA
- COMPLEMENTS . . . BFY56, 2N3020

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	4.0 W
at 25°C Ambient Temperature	0.8 W

Maximum Voltages and Current		**BFX38, BFX39**	**BFX40, BFX41**
V_{CBO}	Collector to Base Voltage	−55 V	−75 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−55 V	−75 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		V	$I_C = 0$, $I_E = 10\ \mu A$
$V_{BE\ (sat)}$	Base to Emitter Saturation Voltage (Note 5)		−0.9	V	$I_C = 150$ mA, $I_B = 15$ mA
			−1.1	V	$I_C = 500$ mA, $I_B = 50$ mA
$V_{CE\ (sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.15	V	$I_C = 150$ mA, $I_B = 15$ mA
			−0.5	V	$I_C = 500$ mA, $I_B = 50$ mA
h_{fe}	High Frequency Current Gain	1.0			$I_C = 50$ mA, $V_{CE} = -10$ V, f = 100 MHz
C_{ob}	Output Capacitance		20	pF	$I_E = 0$, $V_{CB} = -10$ V
C_{TE}	Emitter Transistion Capacitance		120	pF	$I_C = 0$, $V_{EB} = -0.5$ V
t_{on}	Turn On Time (see test circuit no. 341)		100	ns	$I_C = 500$ mA, $I_{B1} = 50$ mA, $V_{CC} = -30$ V
t_s	Storage Time (see test circuit no. 341)		350	ns	$I_C = 500$ mA, $I_{B1} = I_{B2} = 50$ mA, $V_{CC} = -30$ V
t_f	Fall Time (see test circuit no. 341)		50	ns	$I_C = 500$ mA, $I_{B1} = I_{B2} = 50$ mA, $V_{CC} = -30$ V

SYMBOL	CHARACTERISTIC	BFX38 MIN.	BFX38 MAX.	BFX39 MIN.	BFX39 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	60		30			$I_C = 100\ \mu A$, $V_{CE} = -5.0$ V
		85		40			$I_C = 100$ mA, $V_{CE} = -5.0$ V
		60		25			$I_C = 500$ mA, $V_{CE} = -5.0$ V
		30		15			$I_C = 1.0$ A, $V_{CE} = -5.0$ V
		30		15			$I_C = 100$ mA, $V_{CE} = -5.0$ V, $T_A = -55°C$
I_{CBO}	Collector Cutoff Current		50		50	nA	$I_E = 0$, $V_{CB} = -40$ V
			50		50	μA	$I_E = 0$, $V_{CB} = -40$ V, $T_A = 125°C$
BV_{CBO}	Collector to Base Breakdown Voltage	−55		−55		V	$I_E = 0$, $I_C = 10\ \mu A$
LV_{CEO}	Collector to Emitter Sustaining Voltage (Note 5)	−55		−55		V	$I_C = 10$ mA, $I_B = 0$

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 43.7°C/W (derating factor of 22.8 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS24.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	BFX40 MIN.	BFX40 MAX.	BFX41 MIN.	BFX41 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	60		30			I_C = 100 μA, V_{CE} = −5.0 V
		85		40			I_C = 100 mA, V_{CE} = −5.0 V
		60		25			I_C = 500 mA, V_{CE} = −5.0 V
		25		10			I_C = 1.0 A, V_{CE} = −5.0 V
		30		15			I_C = 100 mA, V_{CE} = −5.0 V, T_A = −55°C
I_{CBO}	Collector Cutoff Current		50		50	nA	I_E = 0, V_{CB} = −50 V
			50		50	μA	I_E = 0, V_{CB} = −50 V, T_A = 125°C
BV_{CBO}	Collector to Base Breakdown Voltage	−75		−75		V	I_E = 0, I_C = 10 μA
LV_{CEO}	Collector to Emitter Sustaining Voltage (Note 5)	−75		−75		V	I_C = 10 mA, I_B = 0

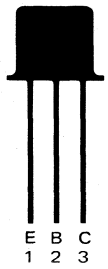
BFY50 • BFY51 • BFY52

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 35 V (MIN) (BFY50)
- h_{FE} . . . 30 (MIN) @ 150 mA, 15 (MIN) @ 1.0 A (BFY50)

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 50°C Case Temperature	5.0 W
at 25°C Ambient Temperature	0.8 W

Maximum Voltages and Currents		**BFY50**	**BFY51**	**BFY52**
V_{CBO}	Collector to Base Voltage	80 V	60 V	40 V
V_{CEO}	Collector to Emitter Voltage	35 V	30 V	20 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V	6.0 V
I_C	Collector Current	1.0 A	1.0 A	1.0 A
I_{CM}	Collector Current (Peak)	1.0 A	1.0 A	1.0 A
I_E	Emitter Current	1.0 A	1.0 A	1.0 A
I_{EM}	Emitter Current (Peak)	1.0 A	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	BFY50 MIN.	BFY50 MAX.	BFY51 MIN.	BFY51 MAX.	BFY52 MIN.	BFY52 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		50					nA	$I_E = 0, V_{CB} = 60$ V
					50			nA	$I_E = 0, V_{CB} = 40$ V
							50	nA	$I_E = 0, V_{CB} = 30$ V
			2.5					μA	$I_E = 0, V_{CB} = 60$ V, $T_A = 100°C$
					2.5			μA	$I_E = 0, V_{CB} = 40$ V, $T_A = 100°C$
							2.5	μA	$I_E = 0, V_{CB} = 30$ V, $T_A = 100°C$
I_{EBO}	Emitter Cutoff Current		50		50		50	nA	$I_C = 0, V_{EB} = 5.0$ V
			2.8		2.8		2.8	μA	$I_C = 0, V_{EB} = 5.0$ V, $T_A = 100°C$
I_B	Base Current		4.85		3.65		2.45	mA	$I_E = 150$ mA, $V_{CB} = 6.0$ V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.20		0.35		0.35	V	$I_C = 150$ mA, $I_B = 15$ mA
	(Note 4)		1.0		1.6		1.6	V	$I_C = 1.0$ A, $I_B = 100$ mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		2.0		2.0		2.0	V	$I_C = 1.0$ A, $I_B = 100$ mA
h_{fe}	Small Signal Current Gain	10		30		30			$I_C = 1.0$ mA, $V_{CE} = 6.0$ V, f = 1.0 kHz
h_{FE}	DC Current Gain (Note 4)	20		30		30			$I_C = 10$ mA, $V_{CE} = 10$ V
		30		40		60			$I_C = 150$ mA, $V_{CE} = 10$ V
		15		15		15			$I_C = 1.0$ A, $V_{CE} = 10$ V
		20		25		30			$I_C = 500$ mA, $V_{CE} = 10$ V
C_{cb}	Collector to Base Capacitance		12		12		12	pF	$I_E = 0, V_{CB} = 12$ V
f_T	Transistion Frequency	60		50		50		MHz	$I_C = 50$ mA, $V_{CE} = 6.0$ V

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 35°C/W (derating factor of 28.6 mW/°C); junction to ambient thermal resistance of 220°C/W (derating factor of 4.54 mW/°C).
4. Measured under pulsed conditions to avoid excess dissipation with a lead length of 1 cm.
5. For product family characteristic curves, refer to Section 5 - SS17.

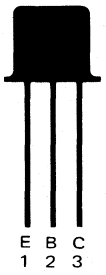
BFY56

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIER AND SWITCH

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 45 V (MIN)
- h_{FE} . . . 30-150 @ 150 mA
  . . . 20 (MIN) @ 500 mA
- t_{on} . . . 225 ns (MAX) @ 150 mA
- t_{off} . . . 625 ns (MAX) @ 150 mA
- COMPLEMENTS . . . BFX39

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65° C to +200° C
Operating Junction Temperature		200° C
Lead Temperature (60 seconds)		300° C
Maximum Power Dissipations (Notes 2 & 3)		
Total Dissipation at 25° C Case Temperature		5.0 W
at 25° C Ambient Temperature		0.8 W
Maximum Voltages		
V_{CBO}	Collector to Base Voltage	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V
V_{EBO}	Emitter to Base Voltage	5.0 V

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	15			I_C = 0.1 mA, V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain (Note 5)	20			I_C = 500 mA, V_{CE} = 10 V
		30	150		I_C = 150 mA, V_{CE} = 1.0 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		1.5	V	I_C = 150 mA, I_B = 15 mA
			2.3	V	I_C = 1.0 A, I_B = 100 mA
$V_{CE(sat)}$	Collector Saturation Voltage		0.3	V	I_C = 150 mA, I_B = 15 mA
	(Note 5 & 6)		1.2	V	I_C = 1.0 A, I_B = 100 mA
I_{CBO}	Collector Cutoff Current		50	nA	I_E = 0, V_{CB} = 50 V
I_{EBO}	Emitter Cutoff Current		100	nA	I_C = 0, V_{EB} = 4.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	80		V	I_E = 0, I_C = 100 μA
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_C = 0, I_E = 100 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	45		V	I_B = 0, I_C = 30 mA
	(Note 5)				
h_{fe}	High Frequency Current Gain	2.0			I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Output Capacitance		25	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
C_{TE}	Emitter Transition Capacitance		80	pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz
t_{on}	Turn On Time (see test circuit no. 288)		225	ns	I_C = 150 mA, I_{B1} = 7.5 mA
t_{off}	Turn Off Time (see test circuit no. 288)		625	ns	I_C = 150 mA, I_{B1} = 7.5 mA, I_{B2} = −7.5 mA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200° C and junction to case thermal resistance of 35° C/W (derating factor of 28.6 mW/° C); junction to ambient thermal resistance of 219° C/W (derating factor of 4.56 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. Saturation voltage measured with 6.35 mm lead length (0.25 inch).
7. For product family characteristic curves, refer to Section 5-SS17.

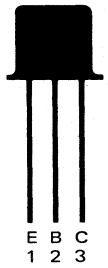
BFY64

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIER AND SWITCH

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . −40 V (MIN)
- h_{FE} . . . 80 (MIN) @ 10 mA
- t_{on} . . . 50 ns (MAX) @ 300 mA
- t_{off} . . . 120 ns (MAX) @ 300 mA

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	3.0 W
at 25°C Ambient Temperature	0.7 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	−40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V
V_{EBO}	Emitter to Base Voltage	−5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	80			I_C = 10 mA, V_{CE} = −10 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		−1.1	V	I_C = 50 mA, I_B = 2.5 mA
			−1.4	V	I_C = 150 mA, I_B = 15 mA
			−2.2	V	I_C = 500 mA, I_B = 50 mA
$V_{CE(sat)}$	Collector Saturation Voltage		−0.3	V	I_C = 50 mA, I_B = 2.5 mA
	(Note 5)		−0.5	V	I_C = 150 mA, I_B = 15 mA
			−1.8	V	I_C = 500 mA, I_B = 50 mA
I_{CES}	Collector Cutoff Current		30	nA	V_{CE} = −25 V, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−40		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		V	I_E = 10 μA, I_C = 0
V_{CEO}	Collector to Emitter Sustaining Voltage	−40		V	I_C = 10 mA, I_B = 0
	(Notes 4 & 5)				
h_{fe}	High Frequency Current Gain	2.0			I_C = 50 mA, V_{CE} = −20 V, f = 100 MHz
C_{ob}	Output Capacitance		10	pF	I_E = 0, V_{CB} = −10 V, f = 1.0 MHz
C_{TE}	Emitter Transistion Capacitance		25	pF	I_C = 0, V_{EB} = −0.5 V, f = 1.0 MHz
t_{on}	Turn On Time (see test circuit no. 222)		50	ns	I_C = 300 mA, I_{B1} = 30 mA
t_{off}	Turn Off Time (see test circuit no. 222)		120	ns	I_C = 300 mA, I_{B1} = 30 mA, I_{B2} = −30 mA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 58.3°C/W (derating factor of 17.2 mW/°C); junction to ambient thermal resistance of 250°C/W (derating factor of 4.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS22.

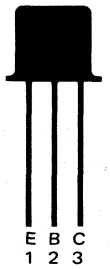
BSX32

NPN SMALL SIGNAL, HIGH VOLTAGE HIGH CURRENT SATURATED SWITCH

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 40 V (MIN)
- h_{FE} . . . 60-150 @ 100 mA
- . . . 25 (MIN) @ 500 mA
- t_{on} . . . 60 ns (MAX) @ 500 mA
- t_{off} . . . 60 ns (MAX) @ 500 mA
- Complements . . . 2N5022

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +200°C
Operating Junction Temperature		200°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		3.5 W
at 25°C Ambient Temperature		0.8W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	65 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	40 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	DC Collector Current	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	30			I_C = 10 mA, V_{CE} = 1.0 V
		60	150		I_C = 100 mA, V_{CE} = 1.0 V
		25			I_C = 500 mA, V_{CE} = 1.0 V
		20			I_C = 1.0 A, V_{CE} = 5.0 V
		30			I_C = 100 mA, V_{CE} = 1.0 V, T_A = −55°C
		15			I_C = 500 mA, V_{CE} = 1.0 V, T_A = −55°C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		0.9	V	I_C = 100 mA, I_B = 10 mA
			1.5	V	I_C = 500 mA, I_B = 50 mA
			2.0	V	I_C = 1.0 A, I_B = 100 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.25	V	I_C = 100 mA, I_B = 10 mA
	(Note 5)		0.50	V	I_C = 500 mA, I_B = 50 mA
			0.85	V	I_C = 1.0 A, I_B = 100 mA
I_{CBO}	Collector Cutoff Current		4.0	μA	V_{CB} = 50 V, I_E = 0
BV_{CBO}	Collector to Base Breakdown Voltage	65		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		V	I_E = 100 μA, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	40		V	I_C = 10 mA, I_B = 0
	(Notes 4 & 5)				
h_{fe}	High Frequency Current Gain	3.0			I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		10	pF	V_{CB} = 10 V, f = 1.0 MHz
C_{TE}	Emitter Transition Capacitance		55	pF	V_{EB} = 0.5 V, f = 1.0 MHz
t_{on}	Turn On Time (see test circuit no. 265)		60	ns	I_C = 500 mA, I_{B1} = 50 mA
t_{off}	Turn Off Time (see test circuit no. 265)		60	ns	I_C = 500 mA, I_{B1} = I_{B2} = 50 mA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 50°C/W (derating factor of 20 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS13.

MATCHED DIODE ASSEMBLIES EPOXY ENCAPSULATED

GENERAL DESCRIPTION — Customers' requirements and inquiries constitute the basis for the types of assemblies offered as off the shelf items, and influence our efforts to obtain and publish technical information. For this reason, we encourage requests for assemblies not currently offered as standard items or requests for additional information.

The specifications contained on the succeeding pages are a condensed revision of the most popular circuit configurations used. Custom assemblies tailored to individual circuit requirements are available on request.

Normal delivery is two to four weeks for types listed in this brochure. For custom assemblies, an additional one to two weeks is required.

MAXIMUM RATINGS (25°C Ambient Temperature unless otherwise noted)

		FD1389	FD2389	FD3389	FD6389
V_R	Reverse Voltage	75 V	150 V	125 V	50 V
I_O	Average Rectified Current	75 mA	100 mA	150 mA	200 mA
I_F	Forward Current DC	115 mA	150 mA	225 mA	300 mA
i_f	Recurrent Peak Forward Current	225 mA	300 mA	450 mA	600 mA
$I_{f\ (surge)}$	1.0 s Pulse Width	0.5 A	1.0 A	1.0 A	1.0 A
$i_{f\ (surge)}$	1.0 μs Pulse Width	2.0 A	4.0 A	4.0 A	4.0 A
P_D	Power Dissipation	250 mW	500 mW	500 mW	500 mW
T_A	Operating Temperature	— — — — — — — —	−65°C to +175°C	— — — —	
T_{stg}	Storage Temperature, Ambient	— — — —	−65°C to +200°C	— — — —	

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

BV (min)	Breakdown Voltage at 5.0 μA	100 V	—	—	—
	at 100 μA	—	200 V	150 V	75 V
I_R (max)	Reverse Leakage at V_R	100 nA	100 nA	1.0 nA	100 nA
	at V_R, 150°C	100 μA	100 μA	3.0 μA	100 μA
C (max)	Capacitance at 0 V	1.5 pF	5.0 pF	6.0 pF	3.0 pF
V_F (max)	Forward Voltage at 200 mA	—	1.0 V	1.0 V	1.0 V
	at 100 mA	—	.925 V	.930 V	.920 V
	at 50 mA	—	.860 V	.880 V	.860 V
	at 20 mA	1.0 V	.790 V	.840 V	.790 V
	at 10 mA	.875 V	.740 V	.810 V	.750 V
	at 5.0 mA	.800 V	.700 V	.770 V	.710 V
	at 2.0 mA	.725 V	.620 V	.730 V	.670 V
	at 1.0 mA	.670 V	.610 V	.710 V	.630 V
t_{rr} (max)	$I_f = I_r = 10$ mA, Recover to 1.0 mA	4.0 ns	—	—	4.0 ns
t_{rr} (max)	$I_f = I_r = 30$ mA, Recover to 1.0 mA	—	50 ns	—	—
t_{rr} (max)	$I_f = I_r = 200$ mA, Recover to 20 mA	—	—	—	4.0 ns

4

MATCHED DIODE ASSEMBLIES EPOXY ENCAPSULATED

MATCHING CHARACTERISTICS (Apply over temperature range of −55°C to +100°C)

FORWARD VOLTAGE MATCHED ASSEMBLIES

Basic Diode Specification	Forward Current Matching Range	Maximum Forward Voltage Difference (ΔV_F) Between Diodes	Assembly Type Number: Encapsulated Pair	Unencapsulated Pair	Encapsulated Quad	Unencapsulated Quad	Bridge	Family Reference (See Sec. 5)
FD1389	10 μA to 1.0 mA	3.0 mV	FA2310E	FA2310U	FA4310E	FA4310U	FA3310	D6
FD1389	10 μA to 1.0 mA	10 mV	FA2311E	FA2311U	FA4311E	FA4311U	FA3311	D6
FD1389	1.0 mA to 10 mA	5.0 mV	FA2312E	FA2312U	FA4312E	FA4312U	FA3312	D6
FD1389	1.0 mA to 10 mA	15 mV	FA2313E	FA2313U	FA4313E	FA4313U	FA3313	D6
FD2389	10 μA to 1.0 mA	3.0 mV	FA2320E	FA2320U	FA4320E	FA4320U	FA3320	D4
FD2389	10 μA to 1.0 mA	10 mV	FA2321E	FA4321U	FA4321E	FA4321U	FA3321	D4
FD2389	1.0 mA to 10 mA	5.0 mV	FA2322E	FA2322U	FA4322E	FA4322U	FA3322	D4
FD2389	1.0 mA to 10 mA	15 mV	FA2323E	FA2323U	FA4323E	FA4323U	FA3323	D4
FD2389	10 mA to 100 mA (pulse only)	10 mV	FA2324E	FA2324U	FA4324E	FA4324U	FA3324	D4
FD2389	10 mA to 100 mA (pulse only)	20 mV	FA2325E	FA2325U	FA4325E	FA4325U	FA3325	D4
FD6389	10 mA to 100 mA (pulse only)	10 mV	FA2360E	FA2360U	FA4360E	FA4360U	FA3360	D6
FD6389	10 mA to 100 mA (pulse only)	20 mV	FA2361E	FA2361U	FA4361E	FA4361U	FA3361	D6

REVERSE CURRENT – FORWARD VOLTAGE MATCHED ASSEMBLIES (Basic Diode Specifications: FD3389)

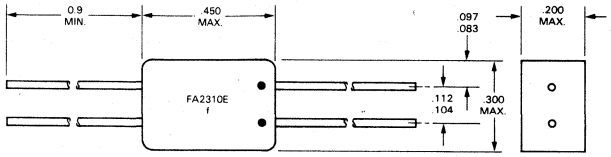
Maximum Reverse Current Difference (ΔI_R) Between Diodes	Forward Current Matching Range	Maximum Forward Voltage Difference (ΔV_F) Between Diodes	Assembly Type Number: Encapsulated Pair	Unencapsulated Pair	Encapsulated Quad	Unencapsulated Quad	Bridge	Family Reference (See Sec. 5)
2.0 nA + 0.064 · V_R	10 μA to 1.0 mA	10 mV	FA2330E	FA2330U	FA4330E	FA4330U	FA3330	D5
2.0 nA + 0.064 · V_R	1.0 mA to 10 mA	15 mV	FA2331E	FA2331U	FA4331E	FA4331U	FA3331	D5
2.0 nA + 0.064 · V_R	10 mA to 100 mA (pulse only)	20 mV	FA2332E	FA2332U	FA4332E	FA4332U	FA3332	D5
4.0 nA + 0.128 · V_R	10 μA to 1.0 mA	10 mV	FA2333E	FA2333U	FA4333E	FA4333U	FA3333	D5
4.0 nA + 0.128 · V_R	1.0 mA to 10 mA	15 mV	FA2334E	FA2334U	FA4334E	FA4334U	FA3334	D5
4.0 nA + 0.128 · V_R	10 mA to 100 mA (pulse only)	20 mV	FA2335E	FA2335U	FA4335E	FA4335U	FA3335	D5

NOTES:

1. The "Basic Diode Specification" column refers to the specifications listed in the table on the preceding page. These specifications are guaranteed for each individual diode of the assembly.
2. The "Maximum Reverse Current Difference (ΔI_R) Between Diodes" means that the difference in reverse current between the diode having the highest I_R and the diode having the lowest I_R in an assembly will not exceed the specified limit. "V_R" is the reverse voltage bias in volts at which the test is performed and may be any value between 0 and 125 V as the user desires. As an example, the specification limit for an FA2330E at a reverse bias of 10 V would be 2.0 nA + 0.064·10 = 2.6 nA. See Figure 6 for ΔI_R test circuit.
3. The "Forward Current Matching" ranges of 10 μA to 10 mA may be applied either as a dc current or pulse input current. For the 10 mA to 100 mA current range, the ΔV_F is guaranteed only for short duty cycle (1% or less) input current pulses. Conditions of test in both cases are defined by Figure 5.
4. All specifications are available in five basic configurations as listed under the "Assembly Type Number" column. Encapsulated pairs, quads, and bridges are supplied in the configurations illustrated in Figures 1, 2, and 3 respectively. Unencapsulated pairs and quads meet the dimensional requirements of Figure 4 and are taped securely together for shipment.
5. Capacitance (C) cannot be monitored independently on each diode in a bridge configuration. In measuring this parameter on bridge configurations, the capacitance limit is 4/3 the limit listed in the basic diode specifications table.
6. For matched bridges, the forward current range specified is "per leg." That is, twice the current specified is applied to the assembly.

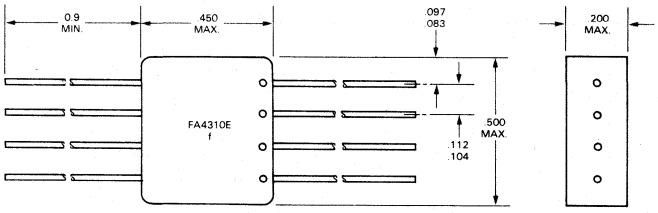
MATCHED DIODE ASSEMBLIES EPOXY ENCAPSULATED

FIG. 1 ENCAPSULATED MATCHED PAIR PACKAGE DIMENSIONS.



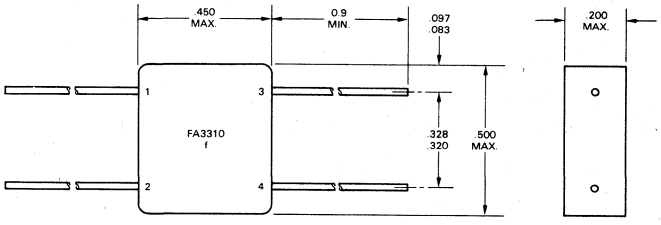
NOTES:
1. Dots denote cathode ends of diodes.
2. All dimensions in inches.

FIG. 2 ENCAPSULATED MATCHED QUAD PACKAGE DIMENSIONS.



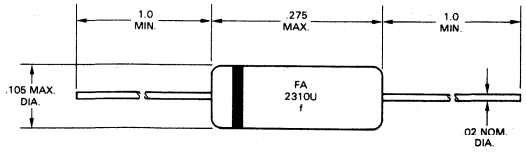
NOTES:
1. Dots denote cathode ends of diodes.
2. All dimensions in inches.

FIG. 3 BRIDGE PACKAGE DIMENSIONS.



NOTES:
1. Numbers 1 and 2 denote the common anode and common cathode terminals of the bridge, respectively. Terminals 3 and 4 denote the two cathode-anode terminals.
2. All dimensions in inches.

FIG. 4 INDIVIDUAL DIODE DIMENSIONS FOR UNENCAPSULATED MATCHED PAIRS AND QUADS.



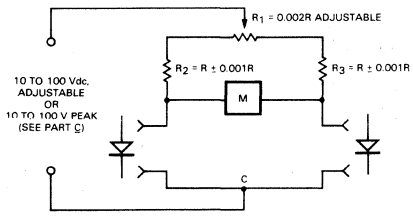
NOTES:
1. Band denotes cathode end of diode.
2. All dimensions in inches.

4

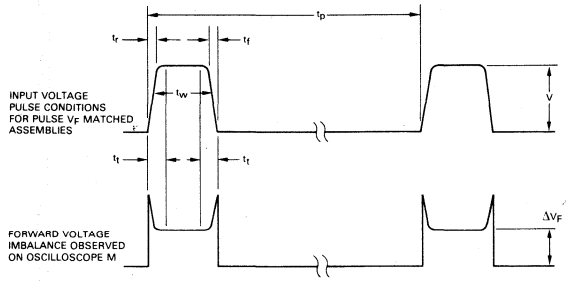
MATCHED DIODE ASSEMBLIES EPOXY ENCAPSULATED

FIG. 5 ΔV_F DIODE MATCHING CIRCUITS.

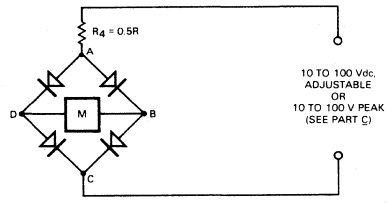
a.



b.



c.



t_r	Pulse Rise Time (10 to 90% Amplitude)	= 1.0 μs Max.
t_f	Pulse Fall Time (90 to 10% Amplitude)	= 1.0 μs Max.
t_w	Pulse Width (50% Amplitude)	= 10 ± 2.0 μs
t_t	Transient Time	= 1.0 μs Min.
t_p	Period	= 1.0 ms
V	Voltage Input to Circuit "A or B"	= 10 to 100 V Adjustable
ΔV_F	Forward Voltage Difference Between Diodes (Measured Between Transient Times)	= As Specified

NOTES:

1. R varies depending on the current range. For the most often used current ranges, R is as follows:

Current Range (amperes)	R (ohms)
10^{-5} to 10^{-4}	10^6
10^{-4} to 10^{-3}	10^5
10^{-3} to 10^{-2}	10^4
or 10^{-n} to 10^{-n+1}	10^{n+1}

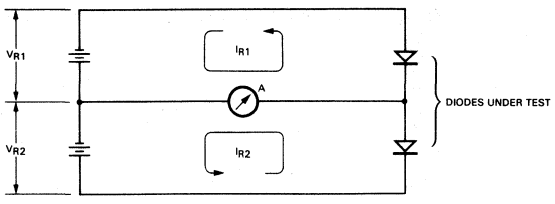
2. The input voltage pulse conditions illustrated in part C are employed at Fairchild in testing. The user may deviate from the specific conditions above with no variation in results providing the following general conditions are met:

   a. $\frac{tw}{tp} \leqslant 0.01$

   b. $tw < 10$ ms

   c. Transients occuring during pulse rise and fall times are ignored in observing ΔV_F.

FIG. 6 ΔI_R DIODE MATCHING CIRCUIT



NOTES:

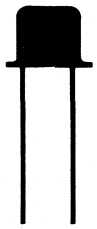
1. $V_{R2} = -V_{R1} \pm 1\%$.
2. $I_{R2} - I_{R1} = \Delta I_R$ (difference in I_R between two diodes under test).
3. A is a center reading μμ ammeter.

FCT REFERENCE SERIES

DIFFUSED SILICON PLANAR* DIODES

- **TC @ 0.1 mA AND SINGLE CHIP CONSTRUCTION**
- **V_Z . . . 6.7 NOMINAL**
- **VOLTAGE TOLERANCE . . . ±5.0% (Note 1)**
- **I_R . . . 100 nA (MAX) @ 5.0 V**
- **T_J (MAX) . . . 175°C**

See TO18-1 Package Outline



(Center Lead is Clipped)

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

TYPE	TEMPERATURE COEFFICIENT @ 100 μA	TEMPERATURE RANGE
FCT 1021	± .001%/ °C	0 to +100°C
FCT 1022	± .002%/ °C	
FCT 1025	± .005%/ °C	
FCT 1121	± .001%/ °C	−55°C to +100°C
FCT 1122	± .002%/ °C	
FCT 1125	± .005%/ °C	

*Planar is a patented Fairchild process.

NOTES:
1. Voltage tolerances tighter than ±5% are available upon request.
2. Temperature coefficient is determined by measuring V_Z at the two temperature extremes and using the following formula:

$$TC = \frac{(V_{T1} - V_{T2})\,100}{V(T_1 - T_2)} \quad \text{where} \quad V = \frac{V_{T1} + V_{T2}}{2}$$

3. Devices are mounted in two-leaded TO18 packages and with a black dot opposite cathode lead on side of case.
4. For product family characteristic curves, refer to Section 5 - D3.

FD300 • FD333 • FDH300 • FDH333

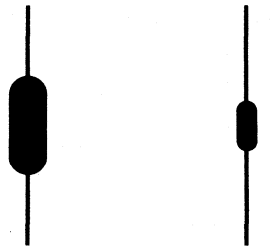
HIGH CONDUCTANCE LOW LEAKAGE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 150 V (MIN) @ 100 μA**
- **I_R . . . 1.0 nA (MAX) @ 125 V (FD300), 3.0 nA (MAX) @ 125 V (FD333)**

See Package Outlines

DO7-1 **DO35-1**



FD300 **FDH300**
FD333 **FDH333**

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Temperature			175°C
Maximum Power Dissipation (Notes 2 & 3)		**FD300, FD333**	**FDH300, FDH333**
Total Dissipation at 25°C Ambient Temperature		400 mW	500 mW
Linear Derating Factor		2.67 mW/°C	3.33 mW/°C
Maximum Voltages and Currents			
WIV	Working Inverse Voltage	125 V	125 V
I_O	Average Rectified Current	150 mA	200 mA
I_F	Forward Current Steady State	375 mA	500 mA
i_f	Recurrent Peak Forward Current	450 mA	600 mA
$i_{f(surge)}$	Peak Forward Surge Current		
	Pulse Width = 1.0 s	500 mA	1000 mA
	Pulse Width = 1.0 μs	4000 mA	4000 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FD300, FDH300 MIN.	FD300, FDH300 MAX.	FD333, FDH333 MIN.	FD333, FDH333 MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage			0.9	1.15	V	I_F = 300 mA
				0.88	1.08	V	I_F = 250 mA
			1.0	0.87	1.05	V	I_F = 200 mA
				0.86	0.97	V	I_F = 150 mA
			0.92	0.83	0.94	V	I_F = 100 mA
			0.88	0.80	0.89	V	I_F = 50 mA
			0.8			V	I_F = 10 mA
			0.75			V	I_F = 5.0 mA
			0.68			V	I_F = 1.0 mA
I_R	Reverse Current		1.0		3.0	nA	V_R = −125 V
			3.0			μA	V_R = −125 V, T_A = 150°C
					500	nA	V_R = −125 V, T_A = 100°C
C	Capacitance		6.0		6.0	pF	V_R = 0
BV	Breakdown Voltage	150		150		V	I_R = 100 μA

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 375°C/W (derating factor of 2.67 mW/°C) for FD300 and FD333; junction to ambient thermal resistance of 300°C/W (derating factor of 3.33 mW/°C) for FDH300 and FDH333.
4. Leads are tinned. Gold-plate with nickel strike may be obtained when specified.
5. For family characteristic curves, refer to Section 5 - D5.

FD400 • FD444 • FDH400 • FDH444

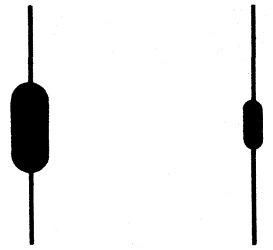
HIGH VOLTAGE GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 200 V (MIN)-FD400, FDH400**
  . . . 150 V (MIN)-FD444, FDH444
- **V_F . . . 1.1 V (MAX) @ 300 mA - FD400, FDH400**
  @ 200 mA - FD444, FDH444

See Package Outlines

DO7-1 **DO35-1**



FD400 **FDH400**
FD444 **FDH444**

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Temperature	175°C

Maximum Power Dissipation (Notes 2 & 3)	**FD400, FD444**	**FDH400, FDH444**
Total Dissipation at 25°C Ambient Temperature	400 mW	500 mW
Linear Derating Factor	2.67 mW/°C	3.33 mW/°C

Maximum Voltage and Currents		**FD400**	**FD444**	**FDH400**	**FDH444**
WIV	Working Inverse Voltage	175 V	125 V	175 V	125 V
I_O	Average Rectified Current	175 mA	175 mA	200 mA	200 mA
I_F	Forward Current Steady State	400 mA	400 mA	500 mA	500 mA
i_f	Recurrent Peak Forward Current	600 mA	600 mA	600 mA	600 mA
$i_{f\ (surge)}$	Peak Forward Surge Current				
	Pulse width = 1.0 s	1.0 A	1.0 A	1.0 A	1.0 A
	Pulse width = 1.0 μs	4.0 A	4.0 A	4.0 A	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FD400, FDH400 MIN.	FD400, FDH400 MAX.	FD444, FDH400 MIN.	FD444, FDH400 MAX.	UNITS	TEST CONDITIONS
V_F	Pulsed Forward Voltage (Note 4)		1.1		1.2	V	I_F = 300 mA
V_F	Forward Voltage		1.0		1.1	V	I_F = 200 mA
BV	Breakdown Voltage	200		150		V	I_R = 100 μA
I_R	Reverse Current		100			nA	V_R = 150 V
					50	nA	V_R = 100 V
			100			μA	V_R = 150 V, T_A = 150°C
					100	μA	V_R = 100 V, T_A = 150°C
C	Capacitance		2.0		2.5	pF	V_R = 0, f = 1.0 MHz
t_{rr}	Reverse Recovery Time		50		60	ns	I_f = 30 mA, I_r = 30 mA
							R_L = 100Ω, I_{rr} = 3.0 mA

*Planar is a patented Fairchild process.

NOTES:

1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 375°C/W (derating factor of 2.67 mW/°C) for FD400 and FD444, junction to ambient thermal resistance of 300°C/W (derating factor of 3.33 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle ≤2%.
5. For product family characteristic curves, refer to Section 5-D4.

FD/FDH/FDN600 • FD/FDH/FDN666

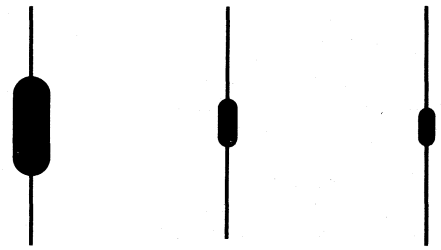
ULTRA FAST

DIFFUSED SILICON PLANAR* EPITAXIAL DIODES

- **C . . . 2.5 pF (MAX) FD/FDH/FDN600, 3.5 pF (MAX) FD/FDH/FDN666**
- **V_F . . . 1.0 V (MAX) @ 100 mA (FD/FDH/FDN666)**
  . . . 1.0 V (MAX) @ 200 mA (FD/FDH/FDN600)
- **t_{rr} . . . 4.0 ns (MAX) @ $I_f = I_r = 10$ mA**

See Package Outlines

DO7-1 DO35-1 DO34-1



FD600 FD666 FDH600 FDH666 FDN600 FDN666

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature		−65°C to +200°C	
Operating Temperature		175°C	
Maximum Power Dissipation		**FD600 FD666**	**FDH/FDN600 FDH/FDN666**
Total Dissipation		400 mW	500 mW
Linear Derating Factor		2.67 mW/°C	3.33 mW/°C
Maximum Voltage and Currents		**FD/FDH/ FDN600**	**FD/FDH/ FDN666**
WIV	Working Inverse Voltage	50 V	25 V
I_O	Average Rectified Current	200 mA	200 mA
i_f	Recurrent Peak Forward Current	600 mA	600 mA
$i_{f(surge)}$	Peak Forward Surge Current		
	Pulse Width = 1.0 s	1.0 A	1.0 A
	Pulse Width = 1.0 μs	4.0 A	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FD/FDH/FDN600 MIN.	FD/FDH/FDN600 MAX.	FD/FDH/FDN666 MIN.	FD/FDH/FDN666 MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 200 mA
			0.92		1.0	V	I_F = 100 mA
			0.86		0.86	V	I_F = 50 mA
			0.79		0.79	V	I_F = 10 mA
			0.65		0.65	V	I_F = 1.0 mA
I_R	Reverse Current		0.1			μA	V_R = −50 V
					0.1	μA	V_R = −25 V
			100			μA	V_R = −50 V, T_A = 150°C
					100	μA	V_R = −25 V, T_A = 150°C
BV	Breakdown Voltage	75		40		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time (Note 2)		4.0		4.0	ns	$I_f = I_r$ = 10 mA, R_L = 100 Ω
			6.0		6.0	ns	$I_f = I_r$ = 200 mA, R_L = 100 Ω
C	Capacitance (Note 3)		2.5		3.5	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 0.1 I_R.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
4. Leads are tinned. Gold-plate with nickel strike may be obtained when specified.
5. For product family characteristic curves, refer to Section 5-D6.

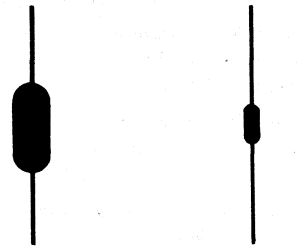
PICOSECOND COMPUTER

DIFFUSED SILICON PLANAR* DIODES

- **C . . . 1.0 pF (MAX) @ V_R = 0, f = 1.0 MHz (FD700, FDN700)**
- **t_{rr} . . . 700 ps (MAX) @ $I_f = I_r$ = 10 mA, R_L = 100 Ω (FD700, FDN700)**
- **CONTROLLED FORWARD CONDUCTANCE**

See Package Outlines

DO7-1 **DO34-1**



FD700 **FDN700**
FD777 **FDN777**

ABSOLUTE MAXIMUM RATINGS (Note 1)

		FD/FDN700	FD/FDN777
Maximum Temperatures			
Storage Temperature		−65°C to +200°C	−65°C to +200°C
Operating Temperature		175°C	175°C
Maximum Power Dissipation			
Total Dissipation		1.67 mW/°C	1.67 mW/°C
Linear Derating Factor		2.0 mW/°C	2.0 mW/°C
Maximum Voltages and Currents			
WIV	Working Inverse Voltage	20 V	8.0 V
I_O	Average Rectified Current	50 mA	50 mA
I_F	Forward Current Steady State dc	150 mA	150 mA
i_f	Recurrent Peak Forward Current	150 mA	150 mA
$i_{f(surge)}$	Peak Forward Surge Current Pulse Width = 1.0 s	250 mA	250 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FD/FDN700 MIN.	FD/FDN700 MAX.	FD/FDN777 MIN.	FD/FDN777 MAX	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.89	1.10	0.89	1.35	V	I_F = 50 mA
		0.81	0.95	0.81	1.00	V	I_F = 20 mA
		0.76	0.88	0.76	0.94	V	I_F = 10 mA
		0.64	0.74	0.64	0.79	V	I_F = 1.0 mA
		0.52	0.61	0.52	0.64	V	I_F = 0.1 mA
		0.42	0.50	0.42	0.53	V	I_F = 0.01 mA
BV	Breakdown Voltage	30		15		V	I_R = 5.0 μA
I_R	Reverse Current		50			nA	V_R = 20 V
					100	nA	V_R = 8.0 V
			50			μA	V_R = 20 V, T_A = 150°C
					50	μA	V_R = 8.0 V, T_A = 150°C
τ	Minority Carrier Lifetime		450		450	ps	(see Note 2)
t_{rr}	Reverse Recovery Time (Note 3)		700		750	ps	$I_f = I_r$ = 10 mA, R_L = 100 Ω
C	Capacitance		1.0		1.3	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Measured as suggested by S. M. Krakauer, IRE Proceedings, Volume 60, July 1962, pp. 1674 - 1675.
3. Recovery to 0.1 I_R.
4. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
5. For product family characteristic curves, refer to Section 5 - D7.

FDH900 • FDH999

HIGH SPEED SWITCHING

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 45 V (FDH900), 35 V (FDH999)**
- **t_{rr} . . . 4.0 ns (FDH900), 5.0 ns (FDH999)**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +175°C
Operating Temperature	150°C

Maximum Power Dissipation

Total Dissipation at 25°C Ambient Temperature	400 mW
at 125°C Ambient Temperature	170 mW

Maximum Voltage and Currents

WIV	Working Inverse Voltage	25 V
I_O	Average Rectified Current	200 mA
i_f	Recurrent Peak Forward Current	600 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0s	1.0A
	Pulse Width = 1.0 μs	4.0A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FDH900 MIN.	FDH900 MAX.	FDH999 MIN.	FDH999 MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	45		35		V	I_R = 5.0 μA
I_R	Reverse Current				1.0	μA	V_R = 25 V
			500			nA	V_R = 40 V
V_F	Forward Voltage				1.0	V	I_F = 10 mA
			1.1				I_F = 100 mA
C	Capacitance		3.0		5.0	pF	V_R = 0, f = 1.0 MHz
t_{rr}	Reverse Recovery Time		4.0		5.0	ns	I_f = 10 mA, I_r = 10 mA, R_L = 100Ω, I_{rr} = 1.0 mA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. For product family characteristic curves, refer to Section 5-D6.

FH1100 • 1N5390

HOT CARRIER

DIFFUSED SILICON DIODE

- **Q_S . . . 1.6 pC (TYP)**
- **C . . . 1.0 pF (MAX)**
- **NF . . . 10 dB (MAX) @ f = 890 MHz**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C) (Note 2)

	FH1100	1N5390
Maximum Temperatures		
Storage Temperature	−55°C to +150°C	−65°C to +150°C
Operating Temperature	125°C	125°C
Maximum Power Dissipation		
Total Dissipation	100 mW	100 mW
Linear Derating Factor	1.0 mW/°C	1.0 mW/°C

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage				0.55	V	I_F = 10 mA
I_R	Leakage Current	FH1100			1.0	μA	V_R = 1.0 V
		1N5390			50	nA	V_R = 1.0 V
BV	Breakdown Voltage		5.0			V	I_R = 100 μA
C	Capacitance				1.0	pF	V_R = 0, f = 1.0 MHz
NF	Noise Figure				10	dB	f = 890 MHz
Q_S	Stored Charge (Note 1)	FH1100		1.6		pC	I_f = 10 mA
		1N5390			3.0	pC	I_f = 10 mA

*Planar is a patented Fairchild process.

NOTES:
1. Measured on B-Line Electronics QS-3 stored charge meter.
2. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
3. For product family characteristic curves, refer to Section 5 — D12.

FJT1100 • FJT1101 • FJT2000

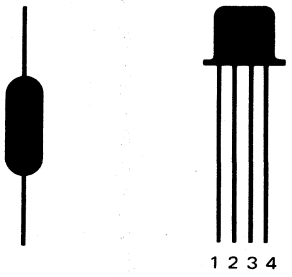
PICOAMPERE

DIFFUSED SILICON PLANAR* EPITAXIAL DIODES

- **I_R . . . 1.0 pA @ 5.0 V (FJT1100)**
  . . . 5.0 pF @ 5.0 V (FJT1101, FJT2000)

See Package Outlines

DO7-1 TO18-3



FJT1100
FJT1101

FJT2000

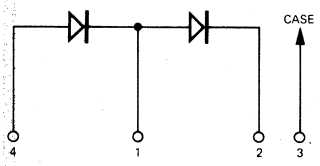
ABSOLUTE MAXIMUM RATINGS (Note 1)

	FJT1100, FJT1101	FJT2000
Maximum Temperatures		
Storage Temperature	−55°C to +200°C	−55°C to +125°C
Operating Temperature	175°C	125°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature	250 mW	125 mW
Maximum Current		
I_F DC Forward Current	150 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FJT1100 MIN.	FJT1100 MAX.	FJT1101 MIN.	FJT1101 MAX.	FJT2000 MIN.	FJT2000 MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	30		20				V	I_R = 5.0 μA
						35		V	I_R = 1.0 μA
I_R	Reverse Current		1.0		5.0		5.0	pA	V_R = 5.0 V
			10		15			pA	V_R = 15 V
							500	pA	V_R = 5.0 V, T_A = 80°C
							10	pA	V_R = 20 V
V_F	Forward Voltage		1.05		1.10			V	I_F = 50 mA
							1.0	V	I_F = 10 mA
C	Capacitance		1.5		1.8		1.3	pF	V_R = 0, f = 1.0 MHz
t_{rr}	Reverse Recovery Time (Note 2)						250	ns	$I_f = I_r$ = 10 mA, I_{rr} = 1.0 mA

LEAD CONNECTION



FJT2000

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life of satisfactory performance may be imparied.
2. For product family characteristic curves and test circuits, refer to Section 5 - D2.

FQ3467 • FQ3468 • FPQ3467 • FPQ3468

PNP QUAD CORE DRIVERS

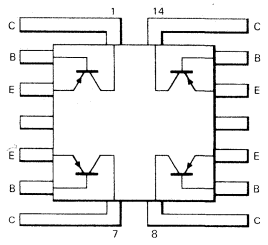
DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 50 V (MIN)
- t_{on} . . . 25 ns (TYP)
- t_{off} . . . 65 ns (TYP)
- COMPACT PACKAGING . . . FOUR TRANSISTORS PER PACKAGE

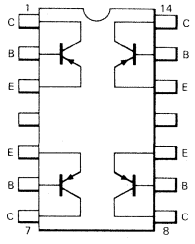
CONNECTION DIAGRAMS

See Package Outlines

TO86-1



TO116-1



FQ3467
FQ3468

FPQ3467
FPQ3468

ABSOLUTE MAXIMUM RATINGS (Note 1)

	FQ3467 FQ3468	FPQ3467 FPQ3468
Maximum Temperatures		
Storage Temperature	−65°C to +200°C	−65°C to +150°C
Operating Junction Temperature	200°C	150°C
Lead Temperature (60 seconds)	300°C	300°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature	0.5 W	2.0 W

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FQ/FPQ3467 MIN.	FQ/FPQ3467 MAX.	FQ/FPQ3468 MIN.	FQ/FPQ3468 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	−40		−50		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−50		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Base Breakdown Voltage	−40		−50		V	I_C = 10 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		1.0		1.0	μA	V_{CB} = −25 V, I_E = 0
			120		120	μA	V_{CB} = −25 V, I_E = 0, T_A = 100°C
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 4)		−1.2		−1.5	V	I_C = 500 mA, I_B = 50 mA
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 4)		−0.5		−0.5	V	I_C = 500 mA, I_B = 50 mA
			−0.5		−0.5	V	I_C = 500 mA, I_B = 50 mA, T_A = 55 C
			−0.6		−0.6	V	I_C = 500 mA, I_B = 50 mA, T_A = 100°C
h_{FE}	DC Pulse Current Gain (Note 4)	40		25			I_C = 150 mA, V_{CE} = −1.0 V
		30		20			I_C = 500 mA, V_{CE} = −1.0 V
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 50 mA, V_{CE} = −10 V, f = 100 MHz
t_{on}	Turn On Time (Note 5)		40		40	ns	$I_C \approx$ 500 mA, $I_{B1} \approx$ 50 mA
t_{off}	Turn Off Time (Note 5)		90		90	ns	$I_C \approx$ 500 mA, $I_{B1} \approx -I_{B2} \approx$ 50 mA
t_s	Storage Time (Note 5)		60		60	ns	$I_C \approx$ 500 mA, $I_{B1} \approx -I_{B2} \approx$ 50 mA
C_{cb}	Collector to Base Capacitance		25		25	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		100		100	pF	V_{EB} = −0.5 V, I_C = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. This rating gives a maximum junction temperature of 150°C and junction to ambient thermal resistance of 62.5°C/W (derating factor of) 16 mW/ °C), for FPQ3467 and FPQ3468. This rating gives a maximum junction temperature of 200°C and junction to ambient thermal resistance of 350°C/W (derating factor of 28.6 mW/ °C), for FQ3467 and FQ3468.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 - SS7.

FPQ3724 • FPQ3725 • FQ3724 • FQ3725

NPN QUAD CORE DRIVER

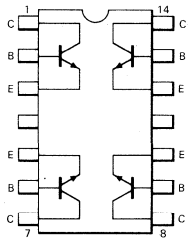
DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **$V_{CEO(sus)}$ . . . 50 V (FQ/FPQ3725)**
- **HIGH CURRENT . . . 500 mA**
- **t_{on} . . . 25 ns (TYP)**
- **t_{off} . . . 45 ns (TYP)**
- **COMPLEMENTS . . . FPQ/FQ3467 AND FPQ/FQ3468**

CONNECTION DIAGRAMS

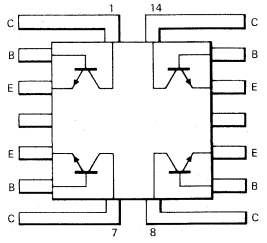
See Package Outlines

TO116-1



FPQ3724
FPQ3725

TO86-1



FQ3724
FQ3725

ABSOLUTE MAXIMUM RATINGS (Note 1)

	FPQ3724/5	FQ3724/5
Maximum Temperatures		
Storage Temperature	−65°C to +150°C	−65°C to +200°C
Operating Junction Temperature	150°C	200°C
Lead Temperature (60 seconds)	300°C	300°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature	2.0 W	0.5 W

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FQ/FPQ3724 MIN.	FQ/FPQ3724 MAX.	FQ/FPQ3725 MIN.	FQ/FPQ3725 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	40		50		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	70		80		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	70		80		V	I_C = 10 μA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		1.7		1.7	μA	V_{CB} = 40 V, I_E = 0
			120		120	μA	V_{CB} = 40 V, I_E = 0, T_A = 100°C
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)		1.2		1.2	V	I_C = 500 mA, I_B = 50 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		0.5		0.5	V	I_C = 500 mA, I_B = 50 mA
			0.5		0.5	V	I_C = 500 mA, I_B = 50 mA, T_A = −55°C
			0.6		0.6	V	I_C = 500 mA, I_B = 50 mA, T_A = 100°C
h_{FE}	DC Pulse Current Gain (Note 4)	50		50			I_C = 100 mA, V_{CE} = 1.0 V
		30		20			I_C = 500 mA, V_{CE} = 1.0 V
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz
t_{on}	Turn On Time (see test circuit no. 265)		35		35	ns	I_C = 500 mA, I_{B1} = 50 mA
t_{off}	Turn Off Time (see test circuit no. 265)		60		60	ns	I_C = 500 mA, I_{B1} = I_{B2} = 50 mA
t_s	Storage Time (see test circuit no. 265)		50		50	ns	I_C = 500 mA, I_{B1} = I_{B2} = 50 mA
C_{eb}	Emitter to Base Capacitance		60		60	pF	I_C = 0, V_{EB} = 0.5 V
C_{cb}	Collector to Base Capacitance		12		12	pF	I_E = 0, V_{CB} = 10 V

*Planar is a patented Fairchild process

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 62.5°C/W (derating factor of 16 mW/°C) for FPQ3724 and FPQ3725.
   These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 350°C/W (derating factor of 2.86 mW/°C) for FQ3724 and FQ3725.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5-SS13.

FSA1410M • FSA1411M • FSA2002M • FSA2003M

AIR ISOLATED MONOLITHIC ARRAYS 8 COMMON CATHODE 8 COMMON ANODE

DIFFUSED SILICON PLANAR* DIODES

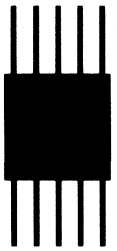
- **C . . . 4.0 pF MAX**
- **ΔV_F . . . 15 mV (MAX) @ 10 mA**

See Package Outlines

TO5-11
(10-LEAD)

FSA1410M
FSA1411M

TO85-1



FSA2002M
FSA2003M

ABSOLUTE MAXIMUM RATINGS (Note 1)

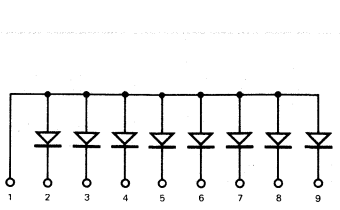
Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Temperature		200°C
Maximum Power Dissipation		
Dissipation per Junction		400 mW
per Package		600 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	55 V
I_F	Forward Current Steady State DC	350 mA
i_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

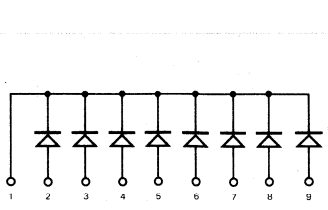
SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	I_R = 10 μA
V_F	Forward Voltage (Note 2)		1.5	V	I_F = 500 mA
			1.1	V	I_F = 200 mA
			1.0	V	I_F = 100 mA
I_R	Reverse Current		100	nA	V_R = 40 V
			100	μA	V_R = 40 V, T_A = 150°C
C	Capacitance		4.0	pF	V_R = 0, f = 1.0 MHz
V_{FM}	Peak Forward Voltage (Note 3)		4.0	V	I_F = 500 mA, t_r < 10 ns
t_{fr}	Forward Recovery Time (Note 3)		40	ns	I_f = 500 mA, t_r < 10 ns
t_{rr}	Reverse Recovery Time (Note 3)		10	ns	I_f = I_r = 10-200 mA
					R_L = 100 Ω, Rec. to I_R
			50	ns	I_f = 500 mA, I_r = 50 mA
					R_L = 100 Ω, Rec. to 5.0 mA
ΔV_F	Forward Voltage Match (Note 3)		15	mV	I_F = 10 mA

4

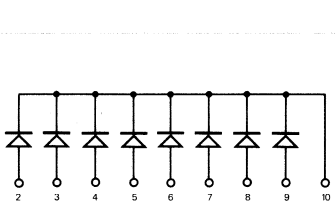
CIRCUIT DIAGRAMS



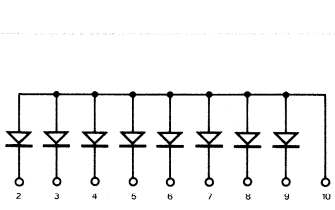
FSA1410M



FSA1411M



FSA2002M



FSA2003M

*Planar is a patented Fairchild process.

NOTES:
1. Ratings apply to individual diodes. For multiple diode operations, total power must not exceed power dissipation rating listed.
2. These values apply for a single 8 ms pulse.
3. For product family characteristic curves and test circuits, refer to Section 5 - D11.

FSA2500M • FSA2501M • FSA2502M

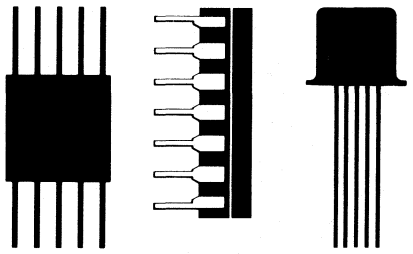
AIR ISOLATED MONOLITHIC CORE DRIVERS

DIFFUSED SILICON PLANAR* DIODES

- **C . . . 5.0 pF MAX**
- **V_F . . . 1.5 V (MAX) @ 500 mA**
- **t_{rr} . . . 50 ns (MAX)**

See Package Outlines

TO85-1 **TO116-2** **TO5-11** 10-LEAD



FSA2500M **FSA2501M** **FSA2502M**

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +200°C
Operating Temperature	150°C

Maximum Power Dissipation (Note 3)

Dissipation per Junction	400 mW
per Package	650 mW

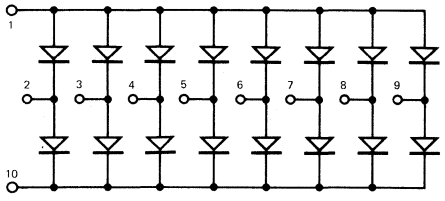
Maximum Voltage and Currents (Note 2)

PIV	Peak Inverse Voltage	55 V
I_F	DC Forward Current	350 mA
i_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	2.0 A

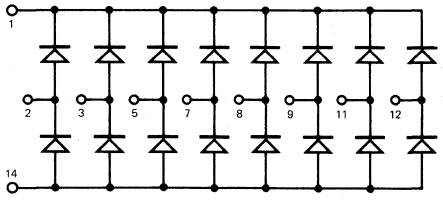
ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature) (Note 4)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	I_R = 10 μA
V_F	Forward Voltage (Note 5)		1.0	V	I_F = 100 mA
			1.1	V	I_F = 200 mA
			1.5	V	I_F = 500 mA
ΔV_F	Forward Voltage Match (Note 8)		15	mV	I_F = 10 mA
I_R	Reverse Current (Note 6)		100	nA	V_R = 40 V
			200	μA	V_R = 40 V, T_A = 150°C
C	Capacitance (Note 7)		5.0	pF	V_R = 0, f = 1.0 MHz
t_{fr}	Forward Recovery Time (Note 8)		40	ns	I_f = 500 mA
t_{rr}	Reverse Recovery Time (Note 8)		10	ns	I_f = I_r = 10 mA to 200 mA
					R_L = 100 Ω, I_{rr} = 0.1 I_R
			50	ns	I_f = 500 mA, I_r = 50 mA
					R_L = 100 Ω, I_{rr} = 5.0 mA

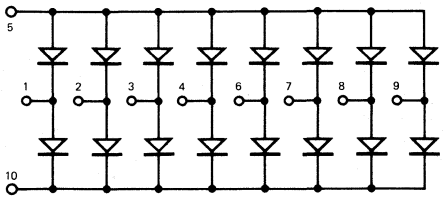
CIRCUIT DIAGRAMS



FSA2500M



FSA2501M



FSA2502M

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited, except for I_R.
5. These values apply for a single 8 ms pulse.
6. To measure reverse current of an individual diode, see test circuits, Note 8.
7. The capacitance is measured from pin to pin across any one of the diodes. The interaction of other diodes is therefore included in the measured value.
8. For product family characteristic curves and test circuits refer to Section 5-D11.

FSA2503M • FSA2504M

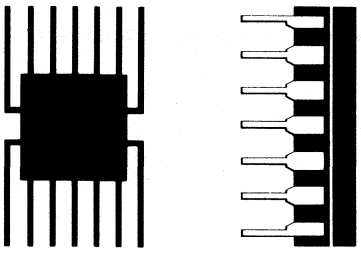
AIR ISOLATED MONOLITHIC CORE DRIVERS

DIFFUSED SILICON PLANAR* DIODES

- **C . . . 5.0 pF (MAX)**
- **V_F . . . 1.5 V (MAX) @ 500 mA**
- **t_{rr} . . . 50 ns (MAX)**

See Package Outlines

TO86-1 **TO116-2**



FSA2504M **FSA2503M**

ABSOLUTE MAXIMUM RATINGS (Note 1)

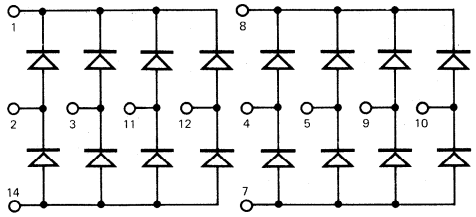
Maximum Temperatures	
Storage Temperature	−55°C to +200°C
Operating Temperature	150°C
Maximum Power Dissipation (Note 3)	
Dissipation per Junction	400 mW
per Package	650 mW
Maximum Voltage and Currents (Note 2)	
PIV Peak Inverse Voltage	55 V
I_F DC Forward Current	350 mA
i_f Peak Forward Surge Current	
Pulse Width = 1.0 s	1.0 A
Pulse Width = 1.0 μs	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature) (Note 4)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	I_R = 10 μA
V_F	Forward Voltage (Note 5)		1.0	V	I_F = 100 mA
			1.1	V	I_F = 200 mA
			1.5	V	I_F = 500 mA
ΔV_F	Forward Voltage Match (Note 8)		15	mV	I_F = 10 mA
I_R	Reverse Current (Note 6)		100	nA	V_R = 40 V
			200	μA	V_R = 40 V, T_A = 150°C
C	Capacitance (Note 7)		5.0	pF	V_R = 0, f = 1.0 MHz
t_{fr}	Forward Recovery Time (Note 8)		40	ns	I_f = 500 mA
t_{rr}	Reverse Recovery Time (Note 8)		10	ns	I_f = I_r = 10 mA to 200 mA, R_L = 100 Ω, I_{rr} = 0.1 I_R
			50	ns	I_f = 500 mA, I_r = 50 mA, R_L = 100 Ω, I_{rr} = 5.0 mA

4

CIRCUIT DIAGRAMS



FSA2503M
FSA2504M
Dual 8 Diode Array

NOTES:

*Planar is a patented Fairchild process.

1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited, except for I_R.
5. These values apply for a single 8 ms pulse.
6. To measure reverse current of an individual diode, see test circuits, Note 8.
7. The capacitance is measured from pin to pin across any one of the diodes. The interaction of other diodes is therefore included in the measured value.
8. For product family characteristic curves and circuits, refer to Section 5 - D11.

FSA2508M • FSA2509M • FSA2510M

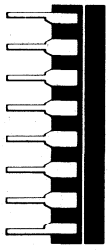
AIR ISOLATED MONOLITHIC CORE DRIVERS

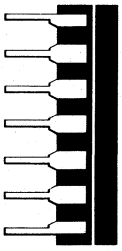
DIFFUSED SILICON PLANAR* DIODES

- **C . . . 5.0 pF MAX**
- **V_F . . . 1.3 V (MAX) @ 500 mA**
- **t_{rr} . . . 50 ns (MAX)**

See Package Outlines

TO116-3 **TO116-1**





FSA2508M

FSA2509M
FSA2510M

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Temperature	150°C

Maximum Power Dissipation (Note 3)

Dissipation per Junction	400 mW
per Package	650 mW

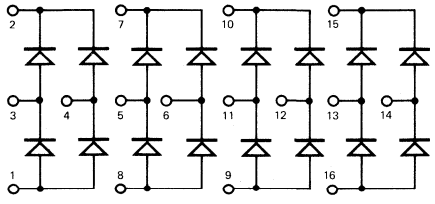
Maximum Voltage and Currents (Note 2)

PIV	Peak Inverse Voltage	55 V
I_F	DC Forward Current	350 mA
i_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	2.0 A

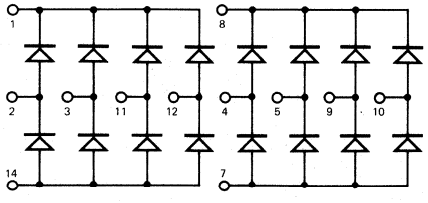
ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature) (Note 4)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	I_R = 10 μA
V_F	Forward Voltage (Note 5)		1.0	V	I_F = 100 mA
			1.1	V	I_F = 200 mA
			1.3	V	I_F = 500 mA
ΔV_F	Forward Voltage Match (Note 8)		15	mV	I_F = 10 mA
I_R	Reverse Current (Note 6)		100	nA	V_R = 40 V
			200	μA	V_R = 40 V, T_A = 150°C
C	Capacitance (Note 7)		5.0	pF	V_R = 0, f = 1.0 MHz
t_{fr}	Forward Recovery Time (Note 8)		40	ns	I_f = 500 mA
t_{rr}	Reverse Recovery Time (Note 8)		10	ns	I_f = I_r = 10 mA to 200 mA
					R_L = 100 Ω, I_{rr} = 0.1 I_R
			50	ns	I_f = 500 mA, I_r = 50 mA
					R_L = 100 Ω, I_{rr} = 5.0 mA

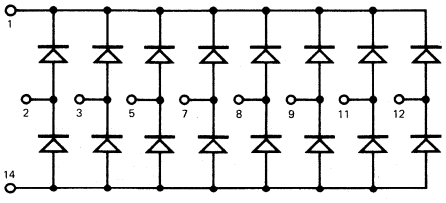
CIRCUIT DIAGRAMS



FSA2508M
4 Quad Diode Array



FSA2509M
Dual 8 Diode Array



FSA2510M
16 Diode Array

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited, except for I_R.
5. These values apply for a single 8 ms pulse.
6. To measure reverse current of an individual diode see test circuits, Note 8.
7. The capacitance is measured from pin to pin across any one of the diodes. The interaction of other diodes is therefore included in the measured value.
8. For product family characteristic curves and test circuits, refer to Section 5 - D11.

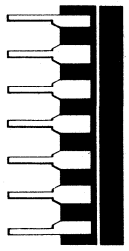
FSA2563M • FSA2564M • FSA2565M • FSA2566M

COMMON CATHODE COMMON ANODE

DIFFUSED SILICON PLANAR* AIR ISOLATED MONOLITHIC DIODE ARRAYS

- **C . . . 5.0 pF (MAX)**
- **V_F . . . 1.3 V (MAX) @ 500 mA**
- **ΔV_F . . . 15 mV (MAX)**

See TO116-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Temperature	+150°C

Maximum Power Dissipation (Note 3)

Total Dissipation per Junction	400 mW
per Package	600 mW

Maximum Voltage and Currents (Note 2)

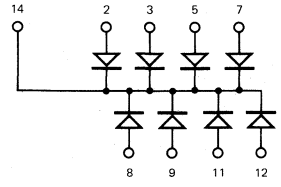
PIV	Peak Inverse Voltage	55 V
I_F	DC Forward Current	350 mA
i_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 10 μs	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 4)

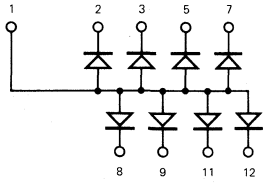
SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	I_R = 10 μA
V_F	Forward Voltage (Note 5)		1.0	V	I_F = 100 mA
			1.1	V	I_F = 200 mA
			1.3	V	I_F = 500 mA
I_R	Reverse Current (Note 6)		100	nA	V_R = 40 V
			100	μA	V_R = 40 V, T_A = 125°C
C	Capacitance (Note 7)		5.0	pF	V_R = 0 V, f = 1.0 MHz
V_{FM}	Peak Forward Voltage (Note 6)		4.0	V	I_F = 500 mA
t_{fr}	Forward Recovery Time (Note 6)		40	ns	I_F = 500 mA
t_{rr}	Reverse Recovery Time (Note 6)		10	ns	$I_f = I_r$ = 10 mA to 200 mA, R_L = 100 Ω, I_{rr} = 0.1 I_r
			50	ns	I_f = 500 mA, I_r = 50 mA, R_L = 100 Ω, I_{rr} = 5.0 mA
ΔV_F	Forward Voltage Match (Note 6)		15	mV	I_f = 10 mA

4

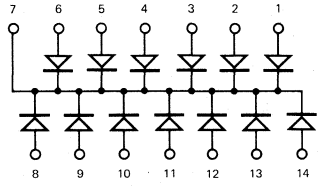
CIRCUIT DIAGRAMS



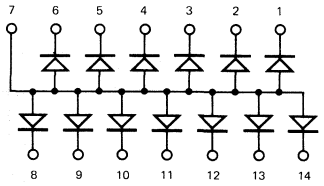
FSA2563M



FSA2564M



FSA2565M



FSA2566M

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited, except for I_R.
5. These values apply for a single 8 ms pulse.
6. For product family characteristic curves and test circuits, refer to Section 5 - D11.
7. The capacitance is measured from pin to pin across any one of the diodes. The interaction of other diodes is therefore included in the measured value.
8. To measure reverse current of an individual diode, see test circuits. (Note 6)

FSA2619M/20M/21M • FSA2719M/20M/21M

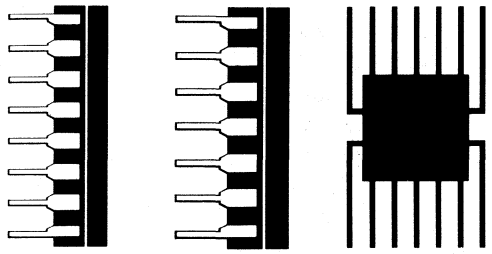
AIR ISOLATED MONOLITHIC ARRAYS

DIFFUSED SILICON PLANAR* DIODES

- **C . . . 4.0 pF MAX**
- **ΔV_F . . . 15 mV MAX @ 10 mA**

See Package Outlines

TO116-3 **TO116-1** **TO86-1**



FSA2619M FSA2719M | **FSA2620M FSA2720M** | **FSA2621M FSA2721M**

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C) (Notes 1 & 7)

Maximum Temperatures

Storage Temperature	**FSA2621M, FSA2721M**	−55°C to +150°C
	FSA2619M, FSA2620M, FSA2719M, FSA2720M	−55°C to +200°C
Operating Temperature		150°C

Maximum Power Dissipation

Total Dissipation per Junction	400 mW
per Package	600 mW

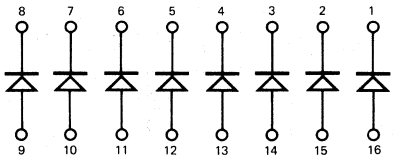
Maximum Voltage and Currents (Note 2)

V_R	Reverse Voltage at −65°C to +150°C	**FSA2619M**	75 V
		FSA2719M	65 V
I_O	Average Rectified Forward Current		200 mA
I_O	Average Rectified Forward Current at 150°C		10 mA
I_F	Recurrent Peak Forward Current		350 mA
$i_{f(surge)}$	Surge Current, Pulse Width = 1.0 s		1.0 A
RE	Minimum Rectification Efficiency @ 100 MHz @ 2.0 V rms		45%

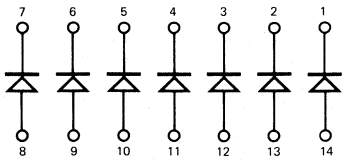
ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 4)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	FSA2719M	75		V	I_R = 5.0 μA
		FSA2619M	100		V	I_R = 100 μA
I_R	Reverse Current (Note 6)	FSA2619M		5.0	μA	V_R = 75 V
				0.025	μA	V_R = −20 V
				50	μA	V_R = −20 V, T_A = 150°C
		FSA2719M		100	nA	V_R = −50 V
				100	μA	V_R = −50 V, T_A = 150°C
V_F	Forward Voltage (Note 5)			1.0	V	I_F = 10 mA
t_{rr}	Reverse Recovery Time (Note 7)	FSA2619M		5.0	ns	$I_f = I_r$ = 10 mA, I_{rr} = 1.0 mA
		FSA2719M		6.0	ns	$I_f = I_r$ = 10 mA, I_{rr} = 1.0 mA
C	Capacitance (Note 7)	FSA2619M		4.0	pF	V_R = 0
		FSA2719M		3.0	pF	V_R = 0
ΔV_F	Forward Voltage Match (Note 7)			15	mV	I_F = 10 mA
t_{fr}	Forward Recovery Time (Note 7)	FSA2619M		2.5	ns	50 mA Peak square wave, 0.1 μs Pulse Width, 5.0 kHz - 100 kHz
V_{FM}	Peak Forward Voltage	FSA2719M		3.0	V	I_F = 100 mA, $t_r \leq$ 10 ns

CIRCUIT DIAGRAMS



FSA2619M
FSA2719M
8 Diodes



FSA2720M • FSA2721M
FSA2620M • FSA2621M
7 Diodes

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited.
5. These values apply for a single 8 ms pulse.
6. To measure reverse current of an individual diode see test circuit note 7.
7. For product family characteristic curves and circuits refer to Section 5 - D11.
8. FSA2719M denotes series FSA2719M, FSA2720M, FSA2721M; FSA2619M denotes series FSA2619M, FSA2620M, FSA2621M.

FSA2702M/3M/4M/5M • FSA2770M

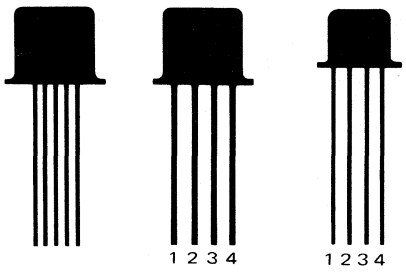
AIR ISOLATED MONOLITHIC ARRAYS

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 60 V (MIN) @ 10 μA**
- **t_{rr} . . . 6.0 ns (MAX) @ $I_f = I_r = 10$ mA**

See Package Outlines

TO5-11 (10-LEAD) | TO5-12 | TO18-3



FSA2770M | FSA2702M FSA2704M | FSA2703M FSA2705M

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +200°C
Operating Temperature	150°C

Maximum Power Dissipation (Note 2)

Total Dissipation	500 mW

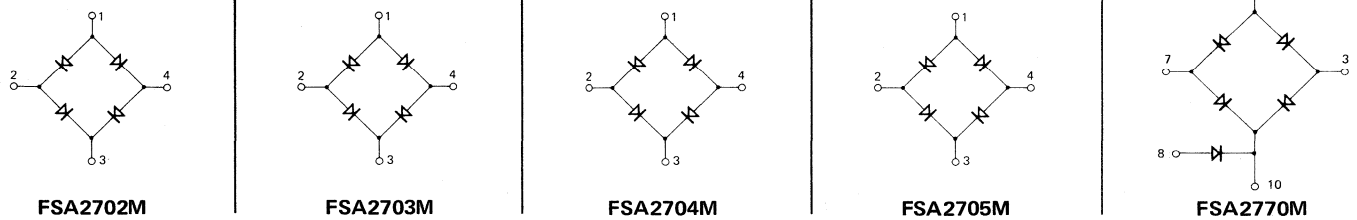
Maximum Voltages and Currents (Note 3)

PIV	Peak Inverse Voltage	55 V
I_F	DC Forward Current	350 mA
I_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 4)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	$I_R = 100$ μA
I_R	Reverse Current (Note 6)		100	nA	$V_R = 40$ V
			100	μA	$V_R = 40$ V, $T_A = 150$°C
C	Capacitance (Note 7)		4.0	pF	$V_R = 0$
V_F	Forward Voltage (Note 5)		1.000	V	$I_F = 200$ mA
			.920	V	$I_F = 100$ mA
			.850	V	$I_F = 50$ mA
			.780	V	$I_F = 20$ mA
			.740	V	$I_F = 10$ mA
			.700	V	$I_F = 5.0$ mA
			.650	V	$I_F = 2.0$ mA
			.620	V	$I_F = 1.0$ mA
t_{rr}	Reverse Recovery Time (Note 8)		6.0	ns	$I_f = I_r = 10$ mA, $I_{rr} = 1.0$ mA
			8.0	ns	$I_f = I_r = 200$ mA, $I_{rr} = 20$ mA
ΔV_F	Forward Voltage Match (Note 8) FSA2702, FSA2703, FSA2770		3.0	mV	$I_F = 10$ μA to 10 mA, $T_A = -55$°C to +100°C
ΔI_R	Reverse Current Match (Note 8) FSA2702, FSA2703, FSA2770		1.0	μA	$V_R = 10$ V, $T_A = -55$°C to +100°C

CIRCUIT DIAGRAMS



FSA2702M | FSA2703M | FSA2704M | FSA2705M | FSA2770M

See additional circuit diagrams and test circuits on following page.

*Planar is a patented Fairchild process.

NOTES:

1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited, except for I_R, ΔI_R and ΔV_F. (Note 6)
5. These values apply for a single 8 ms pulse.
6. To measure reverse current of an individual diode, see test circuits, Note 8.
7. The capacitance is measured from pin to pin across any one of the diodes. The interaction of other diodes is therefore included in the measured value.
8. For product family characteristic curves and test circuits, refer to Section 5-D11.

FSA2771M through FSA2774M

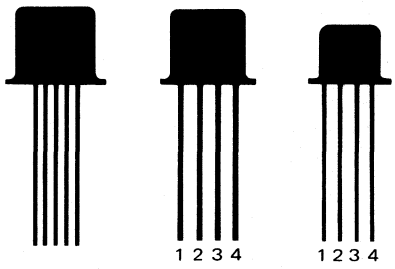
AIR ISOLATED MONOLITHIC ARRAYS

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 60 V (MIN) @ 10 μA**
- **t_{rr} . . . 6.0 ns (MAX) @ $I_f = I_r = 10$ mA**

See Package Outlines

TO5-11 (10-LEAD) TO5-12 TO18-3



FSA2771M
FSA2772M **FSA2773M** **FSA2774M**

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +200°C
Operating Temperature	150°C

Maximum Power Dissipation (Note 2)

Total Dissipation	500 mW

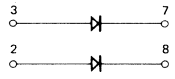
Maximum Voltage and Currents (Note 3)

PIV	Peak Inverse Voltage	55 V
I_F	DC Forward Current	350 mA
I_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

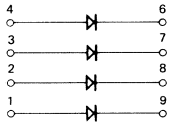
ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 4)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	$I_R = 100$ μA
I_R	Reverse Current (Note 6)		100	nA	$V_R = 40$ V
			100	μA	$V_R = 40$ V, $T_A = 150$°C
V_F	Forward Voltage (Note 5)		1.0	V	$I_F = 100$ mA
C	Capacitance (Note 7)		3.0	pF	$V_R = 0$ V
t_{rr}	Reverse Recovery Time (Note 8)		6.0	ns	$I_f = I_r = 10$ mA, $I_{rr} = 1.0$ mA
ΔV_F	Forward Voltage Match (Note 8)		3.0	mV	$I_f = 20$ μA − 2.0 mA
					T_A = −55°C to +100°C

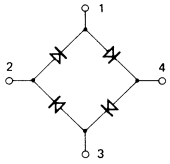
CIRCUIT DIAGRAMS



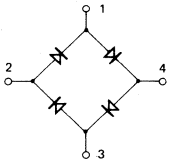
FSA2771M



FSA2772M



FSA2773M



FSA2774M

See test circuits on following page.

NOTES:

*Planar is a patented Fairchild process.

1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited, except for I_R, ΔI_R and ΔV_F. (Note 6)
5. These values apply for a single 8 ms pulse.
6. To measure reverse current of an individual diode, see test circuits, Note 8.
7. The capacitance is measured from pin to pin across any one of the diodes. The interaction of other diodes is therefore included in the measured value.
8. For product family characteristic curves and test circuits, refer to Section 5-D11.

FSA2775M through FSA2786M

AIR ISOLATED MONOLITHIC ARRAYS

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 60 V (MIN) @ 10 μA**
- **t_{rr} . . . 6.0 ns (MAX) @ $I_f = I_r = 10$ mA**

See TO5-11 Package Outline
(10-LEAD)

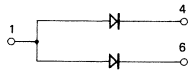
ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +200°C
Operating Temperature		150°C
Maximum Power Dissipation (Note 2)		
Total Dissipation		500 mW
Maximum Voltage and Currents (Note 3)		
PIV	Peak Inverse Voltage	55 V
I_F	DC Forward Current	350 mA
I_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

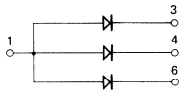
ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 4)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	$I_R = 10$ μA
V_F	Forward Voltage (Note 5)		1.5	V	$I_F = 500$ mA
			1.1	V	$I_F = 200$ mA
			1.0	V	$I_F = 100$ mA
I_R	Reverse Current (Note 6)		100	nA	$V_R = 40$ V
			100	μA	$V_R = 40$ V, $T_A = 150$°C
C	Capacitance (Note 7)		3.0	pF	$V_R = 0$, f = 1.0 MHz
V_{FM}	Peak Forward Voltage (Note 8)		4.0	V	$I_f = 500$ mA, $t_r < 10$ ns
t_{fr}	Forward Recovery Time (Note 8)		40	ns	$I_f = 500$ mA, $t_r < 10$ ns
t_{rr}	Reverse Recovery Time (Note 8)		10	ns	$I_f = I_r = 10$–200 mA, $R_L = 100\ \Omega$, Rec. to I_R
			50	ns	$I_f = 500$ mA, $I_r = 50$ mA, $R_L = 100\ \Omega$, Rec. to 5.0 mA
ΔV_F	Forward Voltage Match (Fig. 3)		15	mV	$I_F = 10$ mA

CIRCUIT DIAGRAMS



FSA2775M



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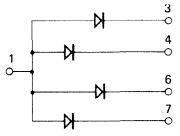

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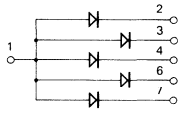


FSA2778M

See additional circuit diagrams on following page.

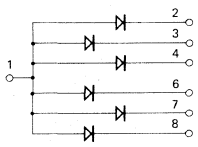
NOTES:

*Planar is a patented Fairchild process.

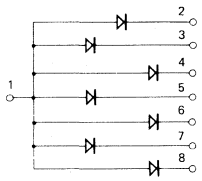
1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited, except for I_R, ΔI_R and ΔV_F. (Note 6)
5. These values apply for a single 8 ms pulse.
6. To measure reverse current of an individual diode, see test circuits, Note 8.
7. The capacitance is measured from pin to pin across any one of the diodes. The interaction of other diodes is therefore included in the measured value.
8. For product family characteristic curves and test circuits refer to Section 5-D11.

FSA2775M through FSA2786M

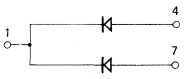
CIRCUIT DIAGRAMS



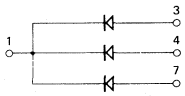
FSA2779M



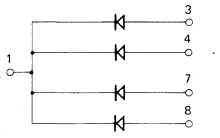
FSA2780M



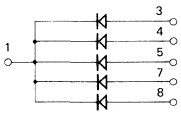
FSA2781M



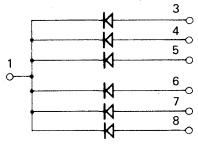
FSA2782M



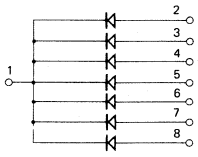
FSA2783M



FSA2784M



FSA2785M



FSA2786M

FSA2787M • FSA2788M

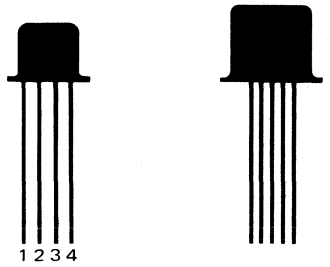
AIR ISOLATED MONOLITHIC ARRAYS

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 60 V (MIN) @ 10 μA**
- **t_{rr} . . . 6.0 ns (MAX) @ $I_f = I_r$ = 10 mA**

See Package Outlines

TO18-3 | TO5-11 (10-LEAD)



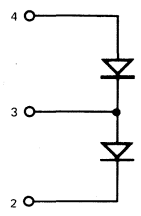
FSA2787M | FSA2788M

ABSOLUTE MAXIMUM RATINGS (Note 1)

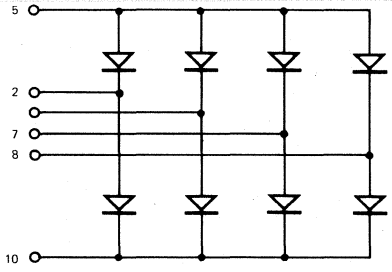
Maximum Temperatures		
Storage Temperature		−55°C to +200°C
Operating Temperature		150°C
Maximum Power Dissipation (Note 2)		
Total Dissipation		500 mW
Maximum Voltage and Currents (Note 3)		
PIV	Peak Inverse Voltage	55 V
I_F	DC Forward Current	350 mA
I_f	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 4)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	60		V	I_R = 10 μA
V_F	Forward Voltage (Note 5)		1.0	V	I_F = 100 mA
			1.1	V	I_F = 200 mA
			1.5	V	I_F = 500 mA
I_R	Reverse Current (Note 6)		100	nA	V_R = 50 V
			200	μA	V_R = 50 V, T_A = 150°C
C	Capacitance (Note 7)		7.0	pF	V_R = 0 V, f = 1.0 MHz
V_{FM}	Peak Forward Voltage (Note 8)		4.0	V	I_f = 500 mA
t_{fr}	Forward Recovery Time (Note 8)		40	ns	I_f = 500 mA
t_{rr}	Reverse Recovery Time (Note 8)		10	ns	$I_f = I_r$ = 10 mA to 200 mA
					R_L = 100 Ω, I_{rr} = 0.1 I_R
			50	ns	I_f = 500 mA, I_r = 50 mA
					R_L = 100 Ω, I_{rr} = 5.0 mA



FSA2787M



FSA2788M

See test circuits on following page.

NOTES:

1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These values apply for a single 50 ms pulse.
3. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
4. Limits and typical electrical characteristics apply to single diode operation only. The diodes not under test are open circuited, except for I_R, ΔI_R and ΔV_F. (Note 6)
5. These values apply for a single 8 ms pulse.
6. To measure reverse current of an individual diode, see test circuits, Note 8.
7. The capacitance is measured from pin to pin across any one of the diodes. The interaction of other diodes is therefore included in the measured value.
8. For product family characteristic curves and test circuits refer to Section 5-D11.

*Planar is a patented Fairchild process.

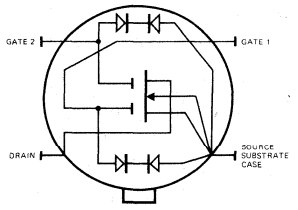
FT0601 • SE5315

GATE PROTECTED MOS CASCODE N-CHANNEL FIELD EFFECT RF AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- **G_{ps} . . . 16 dB (MIN), 19 dB (TYP) @ 200 MHz (FT0601); 20 dB (MIN), 25 dB (TYP) @ 100 MHz (SE5315)**
- **NF . . . 4.0 dB (MAX), 2.5 dB (TYP) @ 200 MHz (FT0601); 4.0 dB (MAX), 2.0 dB (TYP) @ 100 MHz (SE5315)**
- **C_{rs} . . . .05 pF (MAX), 0.025 pF (TYP)**
- **IMPROVED CROSS MODULATION REJECTION CAPABILITY**
- **WIDE DYNAMIC OPERATING RANGE**
- **AGC CAPABILITY TO 50 dB (TYP)**

INTERNAL CONNECTIONS
(BOTTOM)



See TO18-3 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	175°C

Maximum Power Dissipation (Note 2)

Total Dissipation at 25°C Ambient Temperature	0.33 W
Linear Derating Factor	2.2 mW/°C

Maximum Voltages and Current

V_{DS}	Drain to Source Voltage	25 V
V_{G1S}(dc)	Gate No. 1 Source Voltage	−6.0 V to +1.0 V
V_{G1S}(ac)	Gate No. 1 Source Voltage	−6.0 V to +6.0 V
V_{G2S}(dc and ac)	Gate No. 2 Source Voltage	−6.0 V to +6.0 V
I_D	Drain Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	SE5315 MIN.	SE5315 TYP.	SE5315 MAX.	FT0601 MIN.	FT0601 TYP.	FT0601 MAX.	UNITS	TEST CONDITIONS
G_{ps}	Power Gain (unneutralized) (see test circuit no. 580)	20	25					dB	V_{DD} = +15 V, $I_D \cong$ 10 mA, V_{G2S} = +4.0 V, f = 100 MHz
	(see test circuit no. 564)				16	19		dB	V_{DD} = +15 V, $I_D \cong$ 8.0 mA, V_{G2S} = +4.0 V, f = 200 MHz
NF	Noise Figure (see test circuit no. 580)		2.0	4.0					V_{DD} = +15 V, $I_D \cong$ 10 mA, V_{G2S} = +4.0 V, f = 100 MHz
	(see test circuit no. 564)					2.5	4.0	dB	V_{DS} = +15 V, $I_D \cong$ 8.0 mA, V_{G2S} = +4.0 V, f = 200 MHz
C_{rss}	Small Signal Short Circuit Reverse Transfer Capacitance		0.025	0.05		0.025	0.05	pF	V_{DS} = +15 V, I_D = 10 mA, V_{G2S} = +4.0 V, f = 1.0 MHz
I_{DSX}	Biased Drain Current	5.0	15	30	5.0	15	30	mA	V_{DS} = +15 V, V_{G2S} = 4.0 V, V_{G1S} = 0
g_{fs}	Forward Transconductance	7.0	11		7.0	11		mmho	V_{DS} = +15 V, I_D = 10 mA, V_{G2S} = +4.0 V, f = 1.0 kHz
$V_{G1S(OFF)}$	Gate no. 1 to Source Cutoff Voltage		−1.5	−4.0		−1.5	−4.0	V	V_{DS} = +15 V, I_D = 0.2 mA, V_{G2S} = +4.0 V
$V_{G2S(OFF)}$	Gate no. 2 to Source Cutoff Voltage		−1.5	−4.0		−1.5	−4.0	V	V_{DS} = +15 V, I_D = 0.2 mA, V_{G1S} = 0
BV_{G1SS}	Gate no. 1 to Source Breakdown Voltage (Note 3)	±6.0	±13	±25	±6.0	±13	±25	V	I_{G1S} = ±100 μA, V_{DS} = 0, V_{G2S} = 0
BV_{G2SS}	Gate no. 2 to Source Breakdown Voltage (Note 3)	±6.0	±13	±25	±6.0	±13	±25	V	I_{G2S} = ±100 μA, V_{DS} = 0, V_{G1S} = 0
BV_{DSX}	Breakdown Voltage, Drain to Source, Substrate	25			25			V	V_{G1S} = V_{G2S} = −4.0 V, I_D = 10 μA
I_{G1SS}	Gate no. 1 to Source Leakage Current		±0.003	±20		±0.003	±20	nA	V_{G1S} = +1.0 V or −6.0 V, V_{DS} = 0, V_{G2S} = 0
I_{G2SS}	Gate no. 2 Source Leakage Current		±0.003	±20		±0.003	±20	nA	V_{G2S} = ±6.0 V, V_{DS} = 0, V_{G1S} = 0

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. This is the breakdown voltage of the protection diodes. The diodes prevent voltage transients from exceeding this range.
4. For product family characteristic curves, refer to Section 5 - SS26.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	SE5315 MIN.	SE5315 TYP.	SE5315 MAX.	FT0601 MIN.	FT0601 TYP.	FT0601 MAX.	UNITS	TEST CONDITIONS
C_{iss}	Small Signal Short Circuit Input Capacitance					7.0	10	pF	V_{DS} = +15 V, I_D = 10 mA V_{G2S} = +4.0 V, f = 1.0 MHz
C_{oss}	Small Signal Short Circuit Output Capacitance					2.6	3.5	pF	V_{DS} = +15 V, I_D = 10 mA V_{G2S} = +4.0 V, f = 1.0 MHz
$\|Y_{fs}\|$	Magnitude of Forward Transfer Admittance					13		mmho	V_{DS} = +15 V, I_D = 10 mA, V_{G2S} = +4.0 V, f = 200 MHz
Θ	Phase Angle of Forward Transfer Admittance					–40		degree	V_{DS} = +15 V, I_D = 10 mA, V_{G2S} = +4.0 V, f = 200 MHz
R_{iss}	Input Resistance					600		Ω	V_{DS} = +15 V, I_D = 10 mA V_{G2S} = +4.0 V, f = 200 MHz
R_{oss}	Output Resistance					4.5		kΩ	V_{DS} = +15 V, I_D = 10 mA V_{G2S} = +4.0 V, f = 200 MHz

4

MD918 • MD918A • MD918B

DUAL NPN ULTRA HIGH FREQUENCY OSCILLATORS AND AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- f_T . . . 600 MHz (MIN)
- C_{ob} . . . 1.7 pF (MAX) @ 10 V
- ELECTRICALLY SIMILAR TO 2N918

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Note 1)

	One Side	Both Sides
Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		200°C
Maximum Power Dissipation (Note 2)		
Total Dissipation at 25°C Ambient Temperature	300 mW	400 mW
Linear Derating Factor	1.7 mW/°C	2.3 mW/°C
Maximum Voltages and Current		
V_{CEO} Collector to Emitter Voltage		15 V
V_{EBO} Emitter to Base Voltage		5.0 V
V_{CBO} Collector to Base Voltage		30 V
I_C Collector Current		50 mA

MATCHING CHARACTERISTICS FOR EACH SIDE (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN	MAX	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 3)	MD918A	0.9	1.0		I_C = 1.0 mA, V_{CE} = 5.0 V
		MD918B	0.8	1.0		
$\lvert V_{BE1}-V_{BE2}\rvert$	Base Voltage Differential	MD918A		5.0	mV	I_C = 1.0 mA, V_{CE} = 5.0 V
		MD918B		10		
$\frac{\Delta(V_{BE1}-V_{BE2})}{\Delta T_A}$	Base Voltage Differential Change	MD918A		10	μV/°C	I_C = 1.0 mA, V_{CE} = 5.0 V T_A = −55°C to +125°C
		MD918B		20		

ELECTRICAL CHARACTERISTICS FOR EACH SIDE (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	15		V	I_B = 0, I_C = 3.0 mA
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	I_C = 1.0 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		0.01	μA	V_{CB} = 15 V, I_E = 0
			1.0	μA	V_{CB} = 15 V, I_E = 0, T_A = 150°C
h_{FE}	DC Current Gain	50			I_C = 1.0 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.2	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		0.9	V	I_C = 10 mA, I_B = 1.0 mA
f_T	Current Gain Bandwidth Product	600		MHz	I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		1.7	pF	V_{CB} = 10 V, I_E = 0, f = 140 kHz
			3.0	pF	V_{CB} = 0, I_E = 0, f = 140 kHz
C_{ib}	Input Capacitance		2.0	pF	V_{EB} = 0.5 V, I_C = 0, f = 140 kHz
NF	Noise Figure		6.0	dB	I_C = 1.0 mA, V_{CE} = 6.0 V, f = 60 MHz, R_S = 400 Ω

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. Lowest of two h_{FE} ratings is taken as h_{FE1} for purposes of this ratio.
4. For product family characteristic curves, refer to Section 5-SS27.

MD2218 • MD2218A • MD2219 • MD2219A

DUAL NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON* PLANAR EPITAXIAL TRANSISTORS

- **ELECTRICALLY SIMILAR TO THE CORRESPONDING 2N NUMBER**

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Operating and Storage Junction Temperature	−65°C to +200°C

Maximum Power Dissipation (Note 2)	**One Side**	**Both Sides**
Total Dissipation at 25°C Ambient Temperature	500 mW	600 mW
Linear Derating Factor	2.9 mW/°C	3.4 mW/°C
Total Dissipation at 25°C Case Temperature	1.2 W	2.0 W
Linear Dearting Factor	6.83 mW/°C	11.43 mW/°C

Maximum Voltages and Current		**MD2218 MD2219**	**MD2218A MD2219A**
V_{CEO}	Collector to Emitter Voltage	30 V	40 V
V_{CBO}	Collector to Base Voltage	60 V	75 V
V_{EBO}	Emitter to Base Voltage	5.0 V	6.0 V
I_C	Collector Current	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (each side) (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MD2218 MD2219 MIN.	MD2218 MD2219 MAX.	MD2218A MD2219A MIN.	MD2218A MD2219A MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 2)	30		40		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	60		75		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		6.0		V	I_E = 10 μA, I_C = 0
I_{CEX}	Collector Cutoff Current		20		15	nA	V_{CE} = 50 V, V_{EB} = 3.0 V
			25		25	μA	V_{CE} = 50 V, V_{EB} = 3.0 V, T_A = 150°C
I_{BL}	Base Cutoff Current		30		30	nA	V_{CE} = 50 V, V_{EB} = 3.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 3)		0.4		0.3	V	I_C = 150 mA, I_B = 15 mA
			1.2		0.9	V	I_C = 300 mA, I_B = 30 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 3)	0.6	1.3	0.6	1.2	V	I_C = 150 mA, I_B = 15 mA
			2.0		1.8	V	I_C = 300 mA, I_B = 30 mA
f_T	Current Gain Bandwidth Product	200 (MD2218) 250 (MD2219)		250 (MD2218A) 300 (MD2219A)			I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz
C_{ob}	Output Capacitance		8.0		8.0	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		30		25	pF	V_{BE} = 0.5 V, I_C = 0, f = 100 kHz
t_d	Delay Time		20		15	ns	V_{CC} = 30 V, $V_{EB(off)}$ = 0.5 V, I_C = 150 mA, I_{B1} = 15 mA
t_r	Rise Time		40		30	ns	V_{CC} = 30 V, $V_{EB(off)}$ = 0.5 V, I_C = 150 mA, I_{B1} = 15 mA

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor may be impaired.
2. Pulse Conditions: length ≤ 300 μs; duty cycle = ≤ 2%.
3. For product family characteristic curves, refer to Section 5 - SS15.

ELECTRICAL CHARACTERISTICS (each side) (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	MD2218 MD2219 MIN.	MD2218 MD2219 MAX.	MD2218A MD2219A MIN.	MD2218A MD2219A MAX.	UNITS	TEST CONDITIONS
t_s	Storage Time		280		250	ns	V_{CC} = 30 V, I_C = 150 mA, $I_{B1} = I_{B2}$ = 15 mA
t_f	Fall Time		70		60	ns	V_{CC} = 30 V, I_C = 150 mA $I_{B1} = I_{B2}$ = 15 mA

SYMBOL	CHARACTERISTIC	MD2218 MD2218A MIN.	MD2218 MD2218A MAX.	MD2219 MD2219A MIN.	MD2219 MD2219A MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 3)	20		35			I_C = 0.1 mA, V_{CE} = 10 V
		25		50			I_C = 1.0 mA, V_{CE} = 10 V
		35		75			I_C = 10 mA, V_{CE} = 10 V
		40	120	100	300		I_C = 150 mA, V_{CE} = 10 V
		20		50			I_C = 150 mA, V_{CE} = 1.0 V
		20 (MD2218)		30 (MD2219)			I_C = 300 mA, V_{CE} = 10 V
		25 (MD2218A)		40 (MD2219A)			I_C = 300 mA, V_{CE} = 10 V

MD2369 • MD2369A • MD2369B

DUAL NPN HIGH FREQUENCY SATURATED SWITCHING TYPE

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- t_{on} . . . 15 ns (MAX) @ 10 mA
- t_{off} . . . 20 ns (MAX) @ 10 mA
- ELECTRICALLY SIMILAR TO 2N2369A

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Maximum Power Dissipation		**One Side**	**Both Sides**
Total Dissipation at 25°C Ambient Temperature		500 mW	600 mW
Linear Derating Factor		1.5 mW/°C	2.0 mW/°C
Maximum Voltages and Currents			
V_{CEO}	Collector to Emitter Voltage		15 V
V_{CBO}	Collector to Base Voltage		40 V
V_{EBO}	Emitter to Base Voltage		5.0 V
I_C	Collector Current Pulse Width = 10 μs		500 mA

MATCHING CHARACTERISTICS FOR EACH SIDE (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 3)	MD2369A	0.9	1.0		I_C = 3.0 mA, V_{CE} = 1.0 V
		MD2369B	0.8	1.0		
$\lvert V_{BE1}-V_{BE2}\rvert$	Base Voltage Differential	MD2369A		5.0	mV	I_C = 3.0 mA, V_{CE} = 1.0 V
		MD2369B		10		
$\frac{\Delta(V_{BE1}-V_{BE2})}{\Delta T_A}$	Base Voltage Differential Gradient	MD2369A		10	μV/°C	I_C = 3.0 mA, V_{CE} = 1.0 V, T_A = −55°C to +125°C
		MD2369B		20		

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	15		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	40		V	I_C = 10 mA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		30	nA	V_{CB} = 20 V, I_E = 0
			30	μA	V_{CB} = 20 V, I_E = 0, T_A = 150°C
h_{FE}	DC Current Gain (Note 4)	40	140		I_C = 10 mA, V_{CE} = 1.0 V
		20			I_C = 10 mA, V_{CE} = 1.0 V, T_A = −55°C
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.25	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage	0.7	0.85	V	I_C = 10 mA, I_B = 1.0 mA
f_T	Current Gain Bandwidth Product	500		MHz	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		4.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 140 kHz
C_{ib}	Input Capacitance		4.0	pF	V_{BE} = 1.0 V, I_C = 0, f = 140 MHz
τ_s	Charge Storage Time Constant		13	ns	I_C = 10 mA, I_{B1} = I_{B2} = 2.5 mA
t_{on}	Turn On Time		15	ns	I_C = 10 mA, I_{B1} = 3.0 mA, V_{BB} = −1.5 V, V_{IN} = +12.1 V
t_{off}	Turn Off Time		20	ns	I_C = 10 mA, I_{B1} = I_{B2} = 3.0 mA, V_{BB} = −9.15 V, V_{IN} = +19.9 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. Lowest of two h_{FE} ratings is taken as h_{FE1} for purposes of this ratio.
4. Pulse conditions: length = 300 μs; duty cycle = 2%.
5. For product family characteristic curves, refer to Section 5 - SS28

MD2904 • MD2904A • MD2905 • MD2905A

DUAL PNP HIGH SPEED SWITCHES AND CORE DRIVERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **BV_{CBO} . . . 60 V (MIN)**
- **ELECTRICALLY SIMILAR TO THE CORRESPONDING 2N NUMBER**
- **COMPLEMENTS . . . MD2218, MD2218A, MD2219, MD2219A**

See TO5-9 Package Outline

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ABSOLUTE MAXIMUM RATINGS (Each Side) (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		200°C
Maximum Power Dissipation	**One Side**	**Both Sides**
Total Dissipation at 25°C Ambient Temperature	500 mW	600 mW
Linear Derating Factor	2.9 mW/°C	3.4 mW/°C
at 25°C Case Temperature	1.2 W	2.0 W
Linear Derating Factor	6.83 mW/°C	11.43 mW/°C

Maximum Voltages and Current		**MD2904 MD2905**	**MD2904A MD2905A**
V_{CEO}	Collector to Emitter Voltage	−40 V	−60 V
V_{CBO}	Collector to Base Voltage	−60 V	−60 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	600 mA	600 mA

ELECTRICAL CHARACTERISTICS FOR EACH SIDE (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MD2904 MIN.	MD2904 MAX.	MD2904A MIN.	MD2904A MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 2)	−40		−60		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_B = 10 μA, I_C = 0
I_{CEX}	Collector Cutoff Current		20		20	nA	V_{CE} = −50 V, V_{EB} = −3.0 V
			30		30	μA	V_{CE} = −50 V, V_{EB} = −3.0 V, T_A = 150°C
I_{BL}	Base Cutoff Current		30		30	nA	V_{CE} = −50 V, V_{EB} = 3.0 V
h_{FE}	DC Current Gain (Note 2)	20		40			I_C = 0.1 mA, V_{CE} = −10 V
		25		40			I_C = 1.0 mA, V_{CE} = −10 V
		35		40			I_C = 10 mA, V_{CE} = −10 V
		40	120	40	120		I_C = 150 mA, V_{CE} = −10 V
		20		40			I_C = 500 mA, V_{CE} = −10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.4		−0.4	V	I_C = 150 mA, I_B = 15 mA
			−1.6		−1.6	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Base Emitter Saturation		−1.3		−1.3	V	I_C = 150 mA, I_B = 15 mA
			−2.6		−2.6	V	I_C = 500 mA, I_B = 50 mA
f_T	Current Gain Bandwidth Product	200		200		MHz	I_C = 50 mA, V_{CE} = −20 V, f = 100 MHz
C_{ob}	Output Capacitance		8.0		8.0	pF	V_{CB} = −10 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		30		30	pF	V_{EB} = −2.0 V, I_C = 0, f = 100 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length ≤ 300 μs; duty cycle ≤ 2%.
3. For product family characteristic curves, refer to Section 5 - SS22.

ELECTRICAL CHARACTERISTICS FOR EACH SIDE (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	MD2904 MIN.	MD2904 MAX.	MD2904A MIN.	MD2904A MAX.	UNITS	TEST CONDITIONS
t_{on}	Turn On Time (see test circuit no. 558)		45		45	ns	V_{CC} = −30 V, $V_{BE(OFF)}$ = −0.5 V, V_{DD} = 0, V_{BB} = +27.9 V, I_C = 150 mA, I_{B1} = 15 mA
t_d	Delay Time (see test circuit no. 558)		12		12	ns	V_{CC} = −30 V, $V_{BE(OFF)}$ = −0.5 V, V_{DD} = 0, V_{BB} = 27.9 V, I_C = 150 mA, I_{B1} = 15 mA
t_r	Rise Time (see test circuit no. 558)		35		35	ns	V_{CC} = −30 V, $V_{BE(OFF)}$ = −0.5 V, V_{DD} = 0, V_{BB} = 27.9 V, I_C = 150 mA, I_{B1} = 15 mA
t_{off}	Turn Off Time (see test circuit no. 558)		130		130	ns	V_{CC} = −30 V, I_C = 150 mA, V_{DD} = 0, V_{BB} = 27.9 V, I_{B1} = I_{B2} = 15 mA
t_s	Storage Time (see test circuit no. 558)		100		100	ns	V_{CC} = −30 V, I_C = 150 mA, V_{DD} = 0 V_{BB} = 27.9 V, I_{B1} = I_{B2} = 15 mA
t_f	Fall Time (see test circuit no. 558)		40		40	ns	V_{CC} = −30 V, I_C = 150 mA, V_{DD} = 0, V_{BB} = 27.9 V, I_{B1} = I_{B2} = 15 mA

SYMBOL	CHARACTERISTIC	MD2905 MIN.	MD2905 MAX.	MD2905A MIN.	MD2905A MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 2)	−40		−60		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_B = 10 μA, I_C = 0
I_{CEX}	Collector Cutoff Current		20		20	nA	V_{CE} = −50 V, V_{EB} = −3.0 V
			30		30	μA	V_{CE} = −50 V, V_{EB} = −3.0 V, T_A = 150°C
I_{BL}	Base Cutoff Current		30		30	nA	V_{CE} = −50 V, V_{EB} = 3.0 V
h_{FE}	DC Current Gain (Note 2)	35		75			I_C = 0.1 mA, V_{CE} = −10 V
		50		100			I_C = 1.0 mA, V_{CE} = −10 V
		75		100			I_C = 10 mA, V_{CE} = −10 V
		100	300	100	300		I_C = 150 mA, V_{CE} = −10 V
		30		50			I_C = 500 mA, V_{CE} = −10 V
$V_{CE(sat)}$	Collector to Emitter Saturation		−0.4		−0.4	V	I_C = 150 mA, I_B = 15 mA
	Voltage (Note 2)		−1.6		−1.6	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Base Emitter Saturation		−1.3		−1.3	V	I_C = 150 mA, I_B = 15 mA
	Voltage (Note 2)		−2.6		−2.6	V	I_C = 500 mA, I_B = 50 mA
f_T	Current Gain Bandwidth Product	200		200		MHz	I_C = 50 mA, V_{CE} = −20 V, f = 100 MHz
C_{ob}	Output Capacitance		8.0		8.0	pF	V_{CB} = −10 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		30		30	pF	V_{EB} = −2.0 V, I_C = 0, f = 100 kHz
t_{on}	Turn On Time (see test circuit no. 558)		45		45	ns	V_{CC} = −30 V, $V_{BE(OFF)}$ = −0.5 V, V_{DD} = 0, V_{BB} = +27.9 V, I_C = 150 mA, I_{B1} = 15 mA
t_d	Delay Time (see test circuit no. 558)		12		12	ns	V_{CC} = −30 V, $V_{BE(OFF)}$ = −0.5 V, V_{DD} = 0, V_{BB} = +27.9 V, I_C = 150 mA, I_{B1} = 15 mA
t_r	Rise Time (see test circuit no. 558)		35		35	ns	V_{CC} = −30 V, $V_{BE(OFF)}$ = −0.5 V, V_{DD} = 0, V_{BB} = +27.9 V, I_C = 150 mA, I_{B1} = 15 mA
t_{off}	Turn Off Time (see test circuit no. 558)		130		130	ns	V_{CC} = −30 V, I_C = 150 mA, V_{DD} = 0, V_{BB} = +27.9 V, I_{B1} = I_{B2} = 15 mA
t_s	Storage Time (see test circuit no. 558)		100		100	ns	V_{CC} = −30 V, I_C = 150 mA, V_{DD} = 0, V_{BB} = +27.9 V, I_{B1} = I_{B2} = 15 mA
t_f	Fall Time (see test circuit no. 558)		40		40	ns	V_{CC} = −30 V, I_C = 150 mA, V_{DD} = 0, V_{BB} = +27.9 V, I_{B1} = I_{B2} = 15 mA

4

MD3250 • MD3250A • MD3251 • MD3251A

DUAL PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . −40 V (MIN)
- ELECTRICALLY SIMILAR TO 2N3250

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Each Side) (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Maximum Power Dissipation		**One Side**	**Both Sides**
Total Dissipation at 25°C Ambient Temperature		500 mW	600 mW
Linear Derating Factor		2.9 mW/°C	3.4 mW/°C
Total Dissipation at 25°C Case Temperature		1.2 W	2.0 W
Linear Derating Factor		6.85 mW/°C	11.42 mW/°C
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage		−50 V
V_{CEO}	Collector to Emitter Voltage		−40 V
V_{EBO}	Emitter to Base Voltage		−5.0 V
I_C	DC Collector Current		50 mA

MATCHING CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MD3250A, MD3251A MIN.	MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 2)	0.9	1.0		I_C = 100 μA to 1.0 mA, V_{CE} = −5.0 V
$\lvert V_{BE1}-V_{BE2}\rvert$	Base Voltage Differential		5.0	mV	I_C = 10 μA to 10 mA, V_{CE} = −5.0 V
			3.0	mV	I_C = 100 μA, V_{CE} = −5.0 V
$\frac{\Delta(V_{BE1}-V_{BE2})}{\Delta T_A}$	Base Voltage Differential Change		10	mV/°C	I_C = 100 μA, V_{CE} = −5.0 V, T_A = −55°C to +25°C
			10	mV/°C	I_C = 100 μA, V_{CE} = −5.0 V, T_A = +25°C to +125°C

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MD3250 MD3250A MIN.	MAX.	MD3251 MD3251A MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	−50		−50		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 3)	−40		−40		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = −50 V, I_E = 0
			10		10	μA	V_{CB} = −50 V, I_E = 0, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		20		20	nA	V_{EB} = −3.0 V, I_C = 0

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor may be impaired.
2. Lowest of two h_{FE} ratings is taken as h_{FE1} for purposes of this ratio.
3. Pulse conditions: length ≤ 300 μs; duty cycle ≤ 2%.
4. For product family characteristic curves, refer to Section 5-SS23.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	MD3250 MD3250A MIN.	MD3250 MD3250A MAX.	MD3251 MD3251A MIN.	MD3251 MD3251A MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Forward Current	25		50			I_C = 10 μA, V_{CE} = –5.0 V
	Transfer Ratio (Note 3)	50	150	100	300		I_C = 100 μA, V_{CE} = –5.0 V
		25		50			I_C = 100 μA, V_{CE} = –5.0 V, T_A = –55°C
		50	150	100	300		I_C = 1.0 mA, V_{CE} = –5.0 V
		50		100			I_C = 10 mA, V_{CE} = –5.0 V
		15		30			I_C = 50 mA, V_{CE} = –5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation		–0.25		–0.25	V	I_C = 10 mA, I_B = 1.0 mA
	Voltage (Note 3)		–0.50		–0.50	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation	–0.6	–0.9	–0.6	–0.9	V	I_C = 10 mA, I_B = 1.0 mA
	Voltage (Note 3)		–1.2		–1.2	V	I_C = 50 mA, I_B = 5.0 mA
f_T	Current Gain Bandwidth Product	200		250		MHz	I_C = 10 mA, V_{CE} = –20 V, f = 100 MHz
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = –5.0 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		8.0		8.0	pF	V_{EB} = –0.5 V, I_C = 0, f = 100 kHz
h_{fe}	Small Signal Current Gain	50	200	100	400		I_C = 1.0 mA, V_{CE} = –10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		10		20	x10^{-4}	I_C = 1.0 mA, V_{CE} = –10 V, f = 1.0 kHz
h_{ie}	Input Impedance	1.0	6.0	2.0	12	kΩ	I_C = 1.0 mA, V_{CE} = –10 V, f = 1.0 kHz
h_{oe}	Output Admittance	4.0	40	10	60	μmhos	I_C = 1.0 mA, V_{CE} = –10 V, f = 1.0 kHz
NF	Wide Band Noise Figure		4.0		3.0	dB	I_C = 100 μA, V_{CE} = –10 V, R_G = 3.0 kΩ, BW = 10 Hz to 15.7 kHz

4

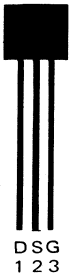
MPF102 • MPF108 • MPF109

N-CHANNEL JUNCTION FIELD EFFECT

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **VHF AMPLIFIER . . . MPF102, MPF108**
- **DRAIN AND SOURCE INTERCHANGEABLE**
- **C_{rss} . . . 3.0 pF (MAX) @ 15 V (MPF102, MPF109)**

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W

Maximum Voltages and Currents

V_{DS}	Drain to Source Voltage	25 V
V_{DG}	Drain to Gate Voltage	25 V
V_{GS}	Gate to Source Voltage	−25 V
I_G	Gate Current	10 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPF102 MIN.	MPF102 MAX.	MPF108 MIN.	MPF108 MAX.	MPF109 MIN.	MPF109 MAX.	UNITS	TEST CONDITIONS
BV_{GSS}	Gate to Source Breakdown Voltage	−25		−25		−25		V	I_G = 10 μA, V_{DS} = 0
I_{GSS}	Gate Reverse Current		2.0					nA	V_{GS} = −15 V, V_{DS} = 0
			2.0					μA	V_{GS} = −15 V, V_{DS} = 0, T_A = 100°C
					1.0		−1.0	nA	V_{GS} = −15 V, V_{DS} = 0
					−1.0			μA	V_{GS} = −15 V, V_{DS} = 0, T_A = 100°C
$V_{GS(OFF)}$	Gate to Source Cutoff Voltage		8.0					V	V_{DS} = 15 V, I_D = 2.0 nA
				0.5	8.0	0.2	8.0	V	V_{DS} = 15 V, I_D = 10 μA
V_{GS}	Gate Source Voltage	0.5	7.5					V	V_{DS} = 15 V, I_D = 0.2 mA
I_{DSS}	Zero Gate Voltage Drain Current (Note 4)	2.0	20	1.5	24	0.5	24	mA	V_{DS} = 15 V, V_{GS} = 0
y_{fs}	Forward Transfer Admittance (Note 4)	2.0	7.5	2.0	7.5	0.8	6.0	mmhos	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz
		1.6		1.6				mmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
C_{iss}	Input Capacitance		7.0		6.5		7.0	pF	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz
C_{rss}	Reverse Transfer Capacitance		3.0		2.5		3.0	pF	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz
Re y_{is}	Input Conductance		0.8		0.8			mmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
Re y_{os}	Output Conductance		0.2		0.2			mmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
y_{os}	Output Admittance				75		75	μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz
NF	Noise Figure				2.5		2.5	dB	V_{DS} = 15 V, V_{GS} = 0, R_G = 1 MΩ, f = 1.0 kHz
					3.0			dB	V_{DS} = 15 V, V_{GS} = 0, R_G = 1.0 kΩ, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length ≤ 630 ms; duty cycle ≤ 10%.

MPF111 • MPF112

N-CHANNEL JUNCTION FIELD EFFECT

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **C_{rss} . . . 1.5 pF (TYP) @ 10 V**
- **DRAIN AND SOURCE INTERCHANGEABLE**
- **C_{iss} . . . 4.5 pF (TYP) @ 10 V**

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W

Maximum Voltages and Current		**MPF111**	**MPF112**
V_{DS}	Drain to Source Voltage	20 V	25 V
V_{DE}	Drain to Gate Voltage	20 V	25 V
V_{ES}	Gate to Source Voltage	−20 V	−25 V
I_E	Gate Current	10 mA	10 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPF111 MIN.	MPF111 MAX.	MPF112 MIN.	MPF112 MAX.	UNITS	TEST CONDITIONS
BV_{GSS}	Gate to Source Breakdown Voltage	−20		−25		V	$I_G = -10\ \mu A$, $V_{DS} = 0$
I_{GSS}	Gate Reverse Current		100		100	nA	$V_{GS} = -10$ V, $V_{DS} = 0$
$V_{GS(OFF)}$	Gate to Source Cutoff Voltage	−0.5	−10	−0.5	−10	V	$V_{DS} = 10$ V, $I_D = 1.0\ \mu A$
I_{DSS}	Zero Gate Voltage Drain Current (Note 4)	0.5	20	1.0	25	mA	$V_{DS} = 10$ V, $V_{GS} = 0$
Y_{fs}	Forward Transfer Admittance (Note 4)	0.5		1.0	7.5	mmhos	$V_{DS} = 10$ V, $V_{GS} = 0$, f = 1.0 kHz
				0.8		mmhos	$V_{DS} = 10$ V, $V_{GS} = 0$, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length ≤ 630 ms; duty cycle ≤ 10%.

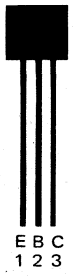
MPS2711 • MPS2712

NPN LOW POWER SMALL SIGNAL

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 18 V (MIN)
- h_{FE} . . . 75-225 @ 2.0 mA (MPS2712)
- C_{ob} . . . 4.0 pF (MAX)
- COMPLEMENTS . . . 2N4125, 2N4126

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current

V_{CEO}	Collector to Emitter Voltage (Note 4)	18 V
V_{CBO}	Collector to Base Voltage	18 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS2711 MIN.	MPS2711 MAX.	MPS2712 MIN.	MPS2712 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	30	90	75	225		V_{CE} = 4.5 V, I_C = 2.0 mA
I_{CBO}	Collector Cutoff Current		500		500	nA	V_{CB} = 18 V, I_E = 0,
			1.5		1.5	μA	V_{CB} = 18 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter to Base Cutoff Current		500		500	nA	V_{EB} = 5.0 V, I_C = 0
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	30	120	80	200		V_{CE} = 10 V, I_C = 2.0 mA, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semicondutor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS14.

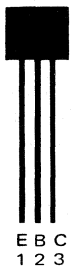
MPS2923 • MPS2924 • MPS2925

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C**
- **V_{CEO} . . . 25 V (MIN)**
- **h_{fe} . . . 235-470 @ 2.0 mA (MPS2925)**
- **COMPLEMENTS . . . 2N4125, 2N4126**

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 25°C Ambient Temperature		0.625 W
at 70°C Ambient Temperature		0.400 W
Maximum Voltages and Currents		
V_{CBO}	Collector to Base Voltage	25 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	25 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS2923 MIN.	MPS2923 MAX.	MPS2924 MIN.	MPS2924 MAX.	MPS2925 MIN.	MPS2925 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		500		500		500	nA	V_{CB} = 25 V, I_E = 0
			15		15		15	μA	V_{CB} = 25 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		500		500		500	nA	V_{EB} = 5.0 V, I_C = 0
h_{fe}	Small Signal Current	90	180	150	300	235	470		V_{CE} = 10 V, I_C = 2.0 mA, f = 1.0 kHz
C_{ob}	Output Capacitance		12		12		12	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

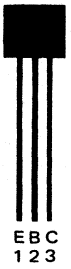
MPS2926 • MPS3721

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C**
- **V_{CEO} . . . 18 V (MIN)**
- **h_{fe} . . . 35-470 @ 2.0 mA MPS2926**
- **. . . 60-660 @ 2.0 mA MPS3721**
- **COMPLEMENTS . . . 2N4125**

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W
at 25°C Case Temperature	1.0 W
Maximum Voltages and Current	
V_{CEO} Collector to Emitter Voltage (Note 4)	18 V
V_{CBO} Collector to Base Voltage	18 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS2926 MIN.	MPS2926 MAX.	MPS3721 MIN.	MPS3721 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		0.5		0.5	μA	V_{CB} = 18 V, I_E = 0
			15		15	μA	V_{CB} = 18 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		0.5		0.5	μA	V_{EB} = 5.0 V, I_C = 0
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	35	470	60	660		V_{CE} = 10 V, I_C = 2.0 mA, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

MPS3392 through MPS3395

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 25 V (MIN)
- h_{FE} . . . 150-300 (MPS3392), 90-180 (MPS3393) @ 2.0 mA
  . . . 55-110 (MPS3394), 150-500 (MPS3395) @ 2.0 mA
- COMPLEMENTS . . . 2N4125, 2N4126

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W
at 25°C Case Temperature	1.0 W
Maximum Voltages and Current	
V_{CEO} Collector to Emitter Voltage (Note 4)	25 V
V_{CBO} Collector to Base Voltage	25 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS3392 MIN.	MPS3392 MAX.	MPS3393 MIN.	MPS3393 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	25		25		V	I_C = 1.0 mA, I_B = 0
I_{CBO}	Collector Cutoff Current		100		100	nA	V_{CB} = 18 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 5.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	150	300	90	180		V_{CE} = 4.5 V, I_C = 2.0 mA
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	150	500	90	400		V_{CE} = 4.5 V, I_C = 2.0 mA, f = 1.0 kHz

SYMBOL	CHARACTERISTIC	MPS3394 MIN.	MPS3394 MAX.	MPS3395 MIN.	MPS3395 MAX	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	25		25		V	I_C = 1.0 mA, I_B = 0
I_{CBO}	Collector Cutoff Current		100		100	nA	V_{CB} = 18 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 5.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	55	110	150	500		V_{CE} = 4.5 V, I_C = 2.0 mA
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	55	300	150	800		V_{CE} = 4.5 V, I_C = 2.0 mA, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

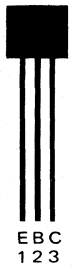
MPS3702 • MPS3703

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- **P_D . . . 625 mW @ T_A = 25°C**
- **V_{CEO} . . . −30 V (MIN) (MPS3703)**
- **h_{FE} . . . 60-300 @ 50 mA (MPS3702)**
- **$V_{CE(sat)}$ . . . −0.25 V (MAX) @ 50 mA**
- **COMPLEMENTS . . . MPS3704 through MPS3706**

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to 150°C
Operating Junction Temperature			150°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature			0.625 W
at 70°C Ambient Temperature			0.400 W
at 25°C Case Temperature			1.0 W
Maximum Voltages and Current		**MPS3702**	**MPS3703**
V_{CEO}	Collector to Emitter Voltage (Note 4)	−25 V	−30 V
V_{CBO}	Collector to Base Voltage	−40 V	−50 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	200 mA	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS3702 MIN.	MPS3702 MAX.	MPS3703 MIN.	MPS3703 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	−25		−30		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−50		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100		100	nA	V_{CB} = −20 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = −3.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	60	300	30	150		I_C = 50 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.25		−0.25	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)	−0.6	−1.0	−0.6	−1.0	V	I_C = 50 mA, V_{CE} = −5.0 V
f_T	Current Gain Bandwidth Product	100		100		MHz	I_C = 50 mA, V_{CE} = −5.0 V, f = 20 MHz
C_{ob}	Output Capacitance		12		12	pF	V_{CB} = −10 V, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

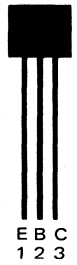
MPS3704 • MPS3705 • MPS3706

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW (MIN) @ T_A = 25°C
- V_{CEO} . . . 30 V (MIN) (MPS3704/5)
- h_{FE} . . . 100-300 @ 50 mA (MPS3704)
- $V_{CE(sat)}$ . . . 0.6 V (MAX) @ 100 mA (MPS3704)
- COMPLEMENTS . . . MPS3702, MPS3703

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature			0.625 W
at 70°C Ambient Temperature			0.400 W
at 25°C Case Temperature			1.0 W
Maximum Voltages and Current		**MPS3704, MPS3705**	**MPS3706**
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	20 V
V_{CBO}	Collector to Base Voltage	50 V	40 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
I_C	Collector Current	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS3704 MIN.	MPS3704 MAX.	MPS3705 MIN.	MPS3705 MAX.	MPS3706 MIN.	MPS3706 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	30		30		20		V	I_C = 10 mA, I_E = 0
BV_{CBO}	Collector to Base Breakdown Voltage	50		50		40		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		5.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100		100		100	nA	V_{CB} = 20 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100		100	nA	V_{EB} = 3.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	100	300	50	150	30	600		I_C = 50 mA, V_{CE} = 2.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.6		0.8		1.0	V	I_C = 100 mA, I_B = 5.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)	0.5	1.0	0.5	1.0	0.5	1.0	V	I_C = 100 mA, V_{CE} = 2.0 V
f_T	Current Gain Bandwidth Product	100		100		100		MHz	I_C = 50 mA, V_{CE} = 2.0 V, f = 20 MHz
C_{ob}	Output Capacitance		12		12		12	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

MPS3707 through MPS3711

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 30 V (MIN)
- h_{FE} . . . 100-400 @ 100 μA (MPS3707)
- NF . . . 5.0 dB (MAX) (MPS3707)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 25°C Ambient Temperature		0.625 W
at 70°C Ambient Temperature		0.400 W
Maximum Voltages and Current		
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V
V_{CBO}	Collector to Base Voltage	30 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	30 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS3707 MIN.	MPS3707 MAX.	MPS3708 MIN.	MPS3708 MAX.	MPS3709 MIN.	MPS3709 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	30		30		30		V	I_C = 1.0 mA, I_B = 0
I_{CBO}	Collector Cutoff Current		100		100		100	nA	V_{CB} = 20 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100		100	nA	V_{EB} = 6.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	100	400						I_C = 100 μA, V_{CE} = 5.0 V
				45	660	45	165		I_C = 1.0 mA, V_{CE} = 5.0 V
NF	Noise Figure		5.0					dB	V_{CE} = 5.0 V, I_C = 100 μA
									R_G = 5.0 kΩ, BW = 15.7 kHz
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		1.0		1.0		1.0	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(ON)}$	Base to Emitter Voltage	0.5	1.0	0.5	1.0	0.5	1.0	V	I_C = 1.0 mA, V_{CE} = 5.0 V
h_{fe}	Small Signal Current Gain	100	550						I_C = 100 μA, V_{CE} = 5.0 V, f = 1.0 kHz
				45	800	45	250		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz

SYMBOL	CHARACTERISTIC	MPS3710 MIN.	MPS3710 MAX.	MPS3711 MIN.	MPS3711 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	30		30		V	I_C = 1.0 mA, I_B = 0
I_{CBO}	Collector Cutoff Current		100		100	nA	V_{CB} = 20 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 6.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)						I_C = 100 μA, V_{CE} = 5.0 V
		90	330	180	660		I_C = 1.0 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		1.0		1.0	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(ON)}$	Base to Emitter Voltage	0.5	1.0	0.5	1.0	V	I_C = 1.0 mA, V_{CE} = 5.0 V
h_{fe}	Small Signal Current Gain	90	450	180	800		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

MPS5172

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- h_{FE} . . . 100-500 @ I_C = 10 mA
- $V_{CE(sat)}$ . . . 0.25 V (MAX) @ I_C = 10 mA
- COMPLEMENTS . . . 2N4126

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	260°C
Maximum Power Dissiaption (Notes 2 & 3)	
Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W
Maximum Voltages and Current	
V_{CEO} Collector to Emitter Voltage (Note 4)	25 V
V_{CBO} Collector to Base Voltage	25 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	25		V	I_C = 10 mA, I_B = 0
I_{CES}	Collector Cutoff Current		100	nA	V_{CE} = 25 V, V_{BE} = 0
I_{CBO}	Collector Cutoff Current		100	nA	V_{CB} = 25 V, I_E = 0
			10	μA	V_{CB} = 25 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		100	nA	V_{BE} = 5.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	100	500		I_C = 10 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage	0.5	1.2	V	I_C = 10 mA, V_{CE} = 10 V
C_{cb}	Collector to Base Capacitance	1.6	10	pF	V_{CB} = 0, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	100	750		I_C = 10 mA, V_{CE} = 10 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

MPS6512 through MPS6515

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 30 V (MIN) (MPS6512/13), 25 V (MIN) (MPS6514/15)
- h_{FE} . . . 150-300 (MPS6514), 250-500 (MPS6515) @ 2.0 mA
  . . . 90 (MIN) (MPS6514), 150 (MIN) (MPS6515) @ 100 mA
- COMPLEMENTS . . . MPS6516 THROUGH MPS6519

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 70°C Ambient Temperature	0.400 W
at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W

Maximum Voltages and Current

		MPS6512 MPS6513	MPS6514 MPS6515
V_{CBO}	Collector to Base Voltage	40 V	40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	25 V
V_{EBO}	Emitter to Base Voltage	4.0 V	4.0 V
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS6512 MIN.	MPS6512 MAX.	MPS6513 MIN.	MPS6513 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	30		30		V	I_C = 0.5 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = 30 V, I_E = 0
			1.0		1.0	μA	V_{CB} = 30 V, I_E = 0, T_A = 60°C
h_{FE}	DC Current Gain (Note 5)	50	100	90	180		I_C = 2.0 mA, V_{CE} = 10 V
		30		60			I_C = 100 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5		0.5	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz

SYMBOL	CHARACTERISTIC	MPS6514 MIN.	MPS6514 MAX.	MPS6515 MIN.	MPS6515 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	25		25		V	I_C = 0.5 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = 30 V, I_E = 0
			1.0		1.0	μA	V_{CB} = 30 V, I_E = 0, T_A = 60°C
h_{FE}	DC Current Gain (Note 5)	150	300	250	500		I_C = 2.0 mA, V_{CE} = 10 V
		90		150			I_C = 100 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5		0.5	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS14.

MPS6516 through MPS6519

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C**
- **V_{CEO} . . . 40 V (MIN) (MPS6516-MPS6518), 25 V (MIN) (MPS6519)**
- **h_{FE} . . . 150-300 (MPS6518) 250-500 (MPS6519) @ 2.0 mA**
  . . . 90 (MIN) (MPS6518) 150 (MIN) (MPS6519) @ 100 mA
- **COMPLEMENTS . . . MPS6512 THROUGH MPS6515**

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Junction Temperature	150°C

Maximum Power Dissipation

Total Dissipation at 70°C Ambient Temperature	0.400 W
at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W

Maximum Voltages and Current

		MPS6516/17/18	MPS6519
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V	−25 V
V_{CBO}	Collector to Base Voltage	−40 V	−25 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.0 V
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS6516 MIN.	MPS6516 MAX.	MPS6517 MIN.	MPS6517 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter	−40		−40		V	I_C = 0.5 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = −30 V, I_E = 0
			1.0		1.0	μA	V_{CB} = −30 V, I_E = 0, T_A = 60°C
h_{FE}	DC Current Gain (Note 5)	50	100	90	180		I_C = 2.0 mA, V_{CE} = −10 V
		30		60			I_C = 100 mA, V_{CE} = −10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.5		−0.5	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = −10 V, I_E = 0, f = 100 kHz

SYMBOL	CHARACTERISTIC	MPS6518 MIN.	MPS6518 MAX.	MPS6519 MIN.	MPS6519 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	−40		−25		V	I_C = 0.5 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		50			nA	V_{CB} = −30 V, I_E = 0
					50	nA	V_{CB} = −20 V, I_E = 0
			1.0			μA	V_{CB} = −30 V, I_E = 0, T_A = 60°C
					1.0	μA	V_{CB} = −20 V, I_E = 0, T_A = 60°C
h_{FE}	DC Current Gain (Note 5)	150	300	250	500		I_C = 2.0 mA, V_{CE} = −10 V
		90		150			I_C = 100 mA, V_{CE} = −10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.5		−0.5	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = −10 V, I_E = 0, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS23.

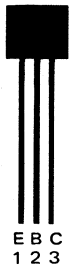
MPS6520 • MPS6521

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 25 V (MIN)
- h_{FE} . . . 100 (MIN) (MPS6520), 150 (MIN) (MPS6521) @ 100 μA
- . . . 200-400 (MPS6520), 300-600 (MPS6521) @ 2.0 mA
- NF . . . 3.0 dB (MAX) @ I_C = 10 μA, WIDE BAND
- COMPLEMENTS . . . MPS6522, MPS6523

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 70°C Ambient Temperature	0.400 W
at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W

Maximum Voltages and Current

V_{CBO}	Collector to Base Current	40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	25 V
V_{EBO}	Emitter to Base Voltage	4.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS6520 MIN.	MPS6520 MAX.	MPS6521 MIN.	MPS6521 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	25		25		V	I_C = 0.5 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = 30 V, I_E = 0
			1.0		1.0	μA	V_{CB} = 30 V, I_E = 0, T_A = 60°C
h_{FE}	DC Current Gain	100		150			I_C = 100 μA, V_{CE} = 10 V
		200	400	300	600		I_C = 2.0 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5		0.5	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
NF	Noise Figure		3.0		3.0	dB	V_{CE} = 5.0 V, I_C = 10 μA, Rg = 10 kΩ Power Bandwidth = 15.7 kHz 3.0 dB points @ 10 Hz and 10 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS14.

MPS6522 • MPS6523

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- h_{FE} . . . 150 (MIN) @ 100 μA (MPS6523)
  . . . 300-600 @ 2.0 mA (MPS6523)
- NF . . . 3.0 dB (MAX) @ 10 μA, WIDE BAND
- V_{CEO} . . . 25 V (MIN)
- COMPLEMENTS . . . MPS6520, MPS6521

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current

V_{CEO}	Collector to Emitter Voltage	−25 V
V_{CBO}	Collector to Base Voltage	−25 V
V_{EBO}	Emitter to Base Voltage	−4.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS6522 MIN.	MPS6522 MAX.	MPS6523 MIN.	MPS6523 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	−25		−25		V	I_C = 0.5 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = −20 V, I_E = 0, T_A = 60°C
			1.0		1.0	μA	V_{CB} = −20 V, I_E = 0, T_A = 60°C
h_{FE}	DC Current Gain	100		150			I_C = 100 μA, V_{CE} = −10 V
		200	400	300	600		I_C = 2.0 mA, V_{CE} = −10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.5		−0.5	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = −10 V, I_E = 0, f = 100 kHz
NF	Noise Figure		3.0		3.0	dB	I_E = 10 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, P B W = 15.7 kHz 3.0 dB points @ 10 Hz and 10 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS23.

MPS6530 • MPS6531 • MPS6532

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C**
- **V_{CEO} . . . 40 V (MIN)**
- **h_{FE} . . . 90-270 @ 100 mA (MPS6531)**
- **COMPLEMENTS . . . MPS6533M, MPS6534, MPS6535M**

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

		MPS6530	MPS6531	MPS6532
Maximum Temperatures				
Storage Temperature			−55°C to +150°C	
Operating Junction Temperature			150°C	
Lead Temperature (10 seconds)			260°C	
Maximum Power Dissipation (Notes 2 & 3)				
Total Dissipation at 25°C Case Temperature			1.0 W	
at 25°C Ambient Temperature			0.625 W	
at 70°C Ambient Temperature			0.400 W	
Maximum Voltages and Current		**MPS6530**	**MPS6531**	**MPS6532**
V_{CBO}	Collector to Base Voltage	60 V	60 V	50 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	40 V	40 V	30 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
I_C	Collector Current	600 mA	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS6530 MIN.	MPS6530 MAX.	MPS6531 MIN.	MPS6531 MAX.	MPS6532 MIN.	MPS6532 MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		50		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage	40		40		30		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		50		50			nA	V_{CB} = 40 V, I_E = 0
							100	nA	V_{CB} = 30 V, I_E = 0
			2.0		2.0			μA	V_{CB} = 40 V, I_E = 0, T_A = 60°C
							5.0	μA	V_{CB} = 30 V, I_E = 0, T_A = 60°C
h_{FE}	DC Current Gain (Note 5)	30		60					I_C = 10 mA, V_{CE} = 1.0 V
		40	120	90	270	30			I_C = 100 mA, V_{CE} = 1.0 V
		25		50					I_C = 500 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5		0.3		0.5	V	I_C = 100 mA, I_B = 10 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		1.0		1.0		1.2	V	I_C = 100 mA, I_B = 10 mA
C_{ob}	Output Capacitance		5.0		5.0		5.0	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5-SS15.

MPS6533M • MPS6534M • MPS6535M

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 40 V (MIN) (MPS6533M/4M)
- h_{FE} . . . 90-270 @ 100 mA (MPS6534M)
- COMPLEMENTS . . . MPS6530, MPS6531, MPS6532

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

		MPS6533M	MPS6534M	MPS6535M
Maximum Temperatures				
Storage Temperature			−55°C to +150°C	
Operating Junction Temperature			150°C	
Maximum Power Dissipation (Notes 2 & 3)				
Total Dissipation at 25°C Case Temperature			1.0 W	
at 25°C Ambient Temperature			0.625 W	
at 70°C Ambient Temperature			0.400 W	
Maximum Voltages and Current		**MPS6533M**	**MPS6534M**	**MPS6535M**
V_{CBO}	Collector to Base Voltage	−40 V	−40 V	−30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V	−40 V	−30 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.0 V	−4.0 V
I_C	Collector Current	600 mA	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS6533M MIN.	MPS6533M MAX.	MPS6534M MIN.	MPS6534M MAX.	MPS6535M MIN.	MPS6535M MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−40		−30		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage	−40		−40		−30		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		−4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		50		50			nA	V_{CB} = −30 V, I_E = 0
							100	nA	V_{CB} = −20 V, I_E = 0
			2.0		2.0			μA	V_{CB} = −30 V, I_E = 0 T_A = 60°C
							5.0	μA	V_{CB} = −20 V, I_E = 0 T_A = 60°C
h_{FE}	DC Current Gain (Note 5)	30		60					I_C = 10 mA, V_{CE} = −1.0 V
		40	120	90	270	30			I_C = 100 mA, V_{CE} = −1.0 V
		25		50					I_C = 500 mA, V_{CE} = −10 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.5		−0.3		−0.5	V	I_C = 100 mA, I_B = 10 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		−1.0		−1.0		−1.2	V	I_C = 100 mA, I_B = 10 mA
C_{ob}	Output Capacitance		8.0		8.0		8.0	pF	V_{CB} = −10 V, I_E = 0, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C; junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5-SS22.

MPS6560 • MPS6561 • MPS6562 • MPS6563

NPN-PNP SMALL SIGNAL GENERAL PURPOSE COMPLEMENTARY AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C**
- **V_{CEO} . . . 25 V (MPS6560/2), 20 V (MPS6561/3)**
- **h_{FE} . . . 50-200 @ 500 mA (MPS6560/2), @ 350 mA (MPS6561/3)**
- **$V_{CE(sat)}$ . . . 0.5 V (MAX) @ 500 mA (MPS6560/2), @ 350 mA (MPS6561/3)**
- **COMPLEMENTS . . . MPS6560, MPS6561 (NPN)–MPS6562, MPS6563 (PNP)**

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current

		MPS6560 MPS6562	MPS6561 MPS6563
V_{CEO}	Collector to Emitter Voltage (Note 4)	25 V	20 V
V_{CBO}	Collector to Base Voltage	25 V	20 V
V_{EBO}	Emitter to Base Voltage	4.0 V	4.0 V
I_C	Collector Current	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted.) Note: Negative Voltage for PNP

SYMBOL	CHARACTERISTIC	MPS6560 MPS6562 MIN.	MPS6560 MPS6562 MAX.	MPS6561 MPS6563 MIN.	MPS6561 MPS6563 MAX.	UNITS	TEST CONDITIONS
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		−5.0		V	I_E = 100 μA, I_C = 0
I_{CEO}	Collector Cutoff Current		100			nA	V_{CE} = 25 V, I_B = 0
					100	nA	V_{CE} = 20 V, I_B = 0
I_{CBO}	Collector Cutoff Current		100		100	nA	V_{CB} = 20 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	35		35			I_C = 10 mA, V_{CE} = 1.0 V
		50		50			I_C = 100 mA, V_{CE} = 1.0 V
		50	200				I_C = 500 mA, V_{CE} = 1.0 V
				50	200		I_C = 350 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage		0.5			V	I_C = 500 mA, I_B = 50 mA
	(Note 5)				−0.5	V	I_C = 350 mA, I_B = 35 mA
$V_{BE(On)}$	Base Emitter "On" Voltage (Note 5)		1.2			V	I_C = 500 mA, V_{CE} = 1.0 V
					−1.2	V	I_C = 350 mA, V_{CE} = 1.0 V
f_T	Current Gain Bandwidth Product	60		60		MHz	I_C = 10 mA, V_{CE} = 10 V, f = 30 MHz
C_{ob}	Output Capacitance		30		30	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS15 for MPS6560, MPS6561; for SS22 for MPS6563; and SS24 for MPS6562.

MPS6565 • MPS6566

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 45 V (MIN)
- h_{FE} . . . 100 – 400 @ 10 mA (MPS6566)
- COMPLEMENTS . . . 2N3905, 2N3906

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 70°C Ambient Temperature		0.400 W
at 25°C Ambient Temperature		0.625 W
Maximum Voltages and Current		
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V
V_{CBO}	Collector to Base Voltage	60 V
V_{EBO}	Emitter to Base Voltage	4.0 V
I_C	Collector Current	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPS6565 MIN.	MPS6565 MAX.	MPS6566 MIN.	MPS6566 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	45		45		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100		100	nA	V_{CB} = 30 V, I_E = 0
h_{FE}	DC Current Gain (Note 5)	40	160	100	400		I_C = 10 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.4		0.4	V	I_C = 10 mA, I_B = 1.0 mA
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

MPS6571

NPN LOW LEVEL HIGH GAIN AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 20 V (MIN)
- h_{FE} . . . 250-1000 @ 100 μA

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperature

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current

V_{CEO}	Collector to Emitter Voltage (Note 4)	20 V
V_{CBO}	Collector to Base Voltage	20 V
V_{EBO}	Emitter to Base Voltage	3.0 V
I_C	Collector Current (Continuous)	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	20		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	25		V	I_C = 100 μA, I_E = 0
I_{CBO}	Collector Cutoff Current		50	nA	V_{CB} = 20 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		50	nA	$V_{EB(OFF)}$ = 3.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	250	1000		I_C = 100 μA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.5	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		0.8	V	I_C = 10 mA, V_{CE} = 5.0 V
f_T	Current Gain Bandwidth Product	50		MHz	I_C = 500 μA, V_{CE} = 5.0 V, f = 20 MHz
C_{ob}	Output Capacitance		4.5	pF	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

MPSA05 • MPSA06

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 60 V (MIN) (MPSA05), 80 V (MIN) (MPSA06)
- h_{FE} . . . 50 (MIN) @ 10 mA AND 100 mA
- $V_{CE\ (sat)}$ . . . 0.25 V (MAX) @ 100 mA
- COMPLEMENTS . . . MPSA55, MPSA56 (PNP)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			1.0 W
at 25°C Ambient Temperature			0.625 W
at 70°C Ambient Temperature			0.400 W
Maximum Voltages and Current		**MPSA05**	**MPSA06**
V_{CBO}	Collector to Base Voltage	60 V	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	80 V
V_{EBO}	Emitter to Base Voltage	4.0 V	4.0 V
I_C	Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPSA05 MIN.	MPSA05 MAX.	MPSA06 MIN.	MPSA06 MAX	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	60		80		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = 60 V, I_E = 0
					100	nA	V_{CB} = 80 V, I_E = 0
h_{FE}	DC Current Gain (Note 5)	50		50			I_C = 10 mA, V_{CE} = 1.0 V
		50		50			I_C = 100 mA, V_{CE} = 1.0 V
$V_{CE\ (sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25		0.25	V	I_C = 100 mA, I_B = 10 mA
$V_{BE\ (ON)}$	Base to Emitter "On" Voltage		1.2		1.2	V	I_C = 100 mA, V_{CE} = 1.0 V
f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 100 mA, V_{CE} = 1.0 V, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS17.

MPSA09

NPN LOW LEVEL LOW NOISE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 50 V (MIN)
- h_{FE} . . . 100-600 @ 100 μA
- NF . . . 1.4 dB (TYP) @ 1.0 kHz

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current

V_{CEO}	Collector to Emitter Voltage (Note 4)	50 V
V_{CBO}	Collector to Base Voltage	50 V
I_C	Collector Current (Peak)	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	50		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	50		V	I_C = 0.1 mA, I_E = 0
I_{CBO}	Collector Cutoff Current		100	nA	V_{CB} = 25 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100	nA	V_{EB} = 3.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	100	600		I_C = 0.1 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.9	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		1.0	V	I_C = 1.0 mA, V_{CE} = 5.0 V
f_T	Current Gain Bandwidth Product	30		MHz	I_C = 0.5 mA, V_{CE} = 5.0 V, f = 20 MHz
C_{ob}	Output Capacitance		5.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

MPSA12

NPN MONOLITHIC DARLINGTON AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- h_{FE} . . . 20,000 (MIN) @ 10 mA
- V_{CEO} . . . 20 V (MIN)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages

V_{CEO}	Collector to Emitter Voltage (Note 4)	20 V
V_{EBO}	Emitter to Base Voltage	10 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	20,000				I_C = 10 mA, V_{CE} = 5.0 V
I_{CES}	Collector Reverse Current			100	nA	V_{CE} = 15 V, V_{BE} = 0
I_{CBO}	Collector Cutoff Current			100	nA	V_{CB} = 15 V, I_C = 0
I_{EBO}	Emitter Cutoff Current			100	nA	V_{EB} = 10 V, I_C = 0
h_{fe}	Small Signal Current Gain		35			I_C = 10 mA, V_{CE} = 5.0 V, f = 1.0 kHz
$V_{CE(sat)}$	Collector Saturation Voltage			1.0	V	I_C = 10 mA, I_B = 0.01 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage			1.4	V	I_C = 10 mA, V_{CE} = 5.0 V
C_{ob}	Output Capacitance		8.0		pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
BV_{CES}	Collector to Emitter Breakdown Voltage	20			V	I_C = 100 μA, I_B = 0

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS20.

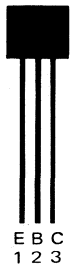
MPSA13 • MPSA14

NPN MONOLITHIC DARLINGTON AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **h_{FE} . . . 20,000 (MIN) @ 10.0 mA (MPSA14)**
- **V_{CEO} . . . 30 V (MIN)**

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 25°C Ambient Temperature		0.625 W
at 70°C Ambient Temperature		0.400 W
Maximum Voltages and Current		
V_{CES}	Collector to Emitter Voltage	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V
V_{CBO}	Collector to Base Voltage	30 V
V_{EBO}	Emitter to Base Voltage	10 V
I_C	Collector Current	300 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPSA13 MIN.	MPSA13 TYP.	MPSA13 MAX.	MPSA14 MIN.	MPSA14 TYP.	MPSA14 MAX.	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	30			30			V	I_C = 100 μA, I_B = 0
I_{CBO}	Collector Cutoff Current			100			100	nA	V_{CB} = 30 V, I_E = 0
I_{EBO}	Emitter Cutoff Current			100			100	nA	V_{EB} = 10 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	5,000			10,000				I_C = 10 mA, V_{CE} = 5.0 V
		10,000			20,000				I_C = 100 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.8	1.5		0.8	1.5	V	I_C = 100 mA, I_B = 0.1 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		1.25	2.0		1.25	2.0	V	I_C = 100 mA, V_{CE} = 5.0 V
f_T	Current Gain Bandwidth Product	125	200		125	200		MHz	I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz
C_{ob}	Output Capacitance		5.0			5.0		pF	V_{CB} = 10 V, I_E = 0
NF	Noise Figure		2.0			2.0		dB	I_C = 1.0 mA, V_{CE} = 5.0 V, R_S = 100 kΩ, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest
5. Pulse conditions: length = 300 μs; duty cycle = 2%.

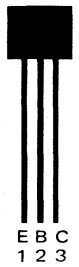
MPSA20 • MPSA70

NPN-PNP SMALL SIGNAL GENERAL PURPOSE COMPLEMENTARY AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 40 V (MIN)
- h_{FE} . . . 40-400 @ 5.0 mA
- $V_{CE(sat)}$ . . . 0.25 V (MAX) @ 10 mA
- C_{ob} . . . 4.0 pF (MAX) 10 V
- COMPLEMENTS . . . MPSA20 (NPN), MPSA70 (PNP)

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W
Maximum Voltages and Current	
V_{CEO} Collector to Emitter Voltage (Note 4)	40 V
V_{EBO} Emitter to Base Voltage	4.0 V
I_C Collector Current (Continuous)	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
BV_{CEO}	Collector to Emitter Breakdown Voltage	40		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100	nA	V_{CB} = 30 V, I_E = 0
h_{FE}	DC Current Gain (Note 5)	40	400		I_C = 5.0 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25	V	I_C = 10 mA, I_B = 1.0 mA
f_T	Current Gain Bandwidth Product	125		MHz	I_C = 5.0 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		4.0	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

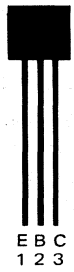
MPSA42 • MPSA43

NPN SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIERS

SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 300 V (MIN) (MPSA42), 200 V (MIN) (MPSA43)
- h_{FE} . . . 40 (MIN) @ 10 mA
- f_T . . . 50 MHz (MIN)
- COMPLEMENTS . . . MPSA92, MPSA93

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W

Maximum Voltages and Currents

		MPSA42	MPSA43
V_{CEO}	Collector to Emitter Voltage (Note 4)	300 V	200 V
V_{CBO}	Collector to Base Voltage	300 V	200 V
V_{EBO}	Emitter to Base Voltage	8.0 V	6.0 V
I_C	Collector Current (Continuous)	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPSA42 MIN.	MPSA42 MAX.	MPSA43 MIN.	MPSA43 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	300		200		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	300		200		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	8.0		6.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		0.1			μA	V_{CB} = 200 V, I_E = 0
					0.1	μA	V_{CB} = 160 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		0.1			μA	V_{EB} = 6.0 V, I_C = 0
					0.1	μA	V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Current Gain	25		25			I_C = 1.0 mA, V_{CE} = 10 V
		40		40			I_C = 10 mA, V_{CE} = 10 V
		40		50	200		I_C = 30 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.5		0.4	V	I_C = 20 mA, I_B = 2.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		0.9		0.9	V	I_C = 20 mA, I_B = 2.0 mA
f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		3.0		4.0	pF	V_{CB} = 20 V, I_E = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = ≤2%.

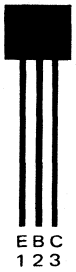
MPSA55 • MPSA56

PNP SMALL SIGNAL GENERAL PURPOSE COMPLEMENTARY AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −60 V (MIN) (MPSA55), 80 V (MIN) (MPSA56)
- h_{FE} . . . 50 (MIN) @ 10 mA AND 100 mA
- $V_{CE(sat)}$ . . . −0.25 V (MAX) @ 100 mA
- COMPLEMENTS . . . MPSA05, MPSA06 (NPN)

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			1.0 W
at 25°C Ambient Temperature			0.625 W
at 70°C Ambient Temperature			0.400 W
Maximum Voltages and Current		**MPSA55**	**MPSA56**
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{CEO}	Collector to Emitter Voltage	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.0 V
I_C	Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPSA55 MIN.	MPSA55 MAX.	MPSA56 MIN.	MPSA56 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	−60		−80		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = −60 V, I_E = 0
					100	nA	V_{CB} = −80 V, I_E = 0
h_{FE}	DC Current Gain (Note 5)	50		50			I_C = 10 mA, V_{CE} = −1.0 V
		50		50			I_C = 100 mA, V_{CE} = −1.0 V
$V_{CE\ (sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.25		−0.25	V	I_C = 100 mA, I_B = 10 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		−1.2		−1.2	V	I_C = 100 mA, V_{CE} = −1.0 V
f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 100 mA, V_{CE} = −1.0 V, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS24.

MPSA92 • MPSA93

PNP SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- BV_{CEO} . . . 300 V (MIN) (MPSA92), 200 V (MIN) (MPSA93)
- h_{FE} . . . 40 (MIN) @ 10 mA
- f_T . . . 50 MHz (MIN)
- COMPLEMENTS . . . MPSA42, MPSA43

See TO92-1 Package Outlines

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W

Maximum Voltages and Current		**MPSA92**	**MPSA93**
V_{CEO}	Collector to Emitter Voltage	−300 V	−200 V
V_{CBO}	Collector to Base Voltage	−300 V	−200 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current (Continuous)	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPSA92 MIN.	MPSA92 MAX.	MPSA93 MIN.	MPSA93 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	−300		−200		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−300		−200		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		0.25			μA	V_{CB} = −200 V, I_E = 0
					0.25	μA	V_{CB} = −160 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		0.1		0.1	μA	V_{EB} = −3.0 V, I_C = 0
h_{FE}	DC Current Gain	25		25			I_C = 1.0 mA, V_{CE} = −10 V
		40		40			I_C = 10 mA, V_{CE} = −10 V
		25		30	150		I_C = 30 mA, V_{CE} = −10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.5		−0.4	V	I_C = 20 mA, I_B = 2.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		−0.9		−0.9	V	I_C = 20 mA, I_B = 2.0 mA
f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 10 mA, V_{CE} = −20 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		6.0		8.0	pF	V_{CB} = −20 V, I_E = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 - SS4.

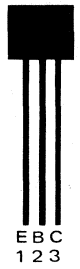
MPSL01 • MPSL51

NPN-PNP HIGH VOLTAGE COMPLEMENTARY SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C**
- **$V_{CE\ (sat)}$ . . . 0.30 V (MAX) @ 50 mA**
- **V_{CEO} . . . 120 V (MIN) (MPSL01), 100 V (MIN) (MPSL51)**
- **COMPLEMENTS . . . MPSL01 (NPN) – MPSL51 (PNP)**

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			1.0 W
at 25°C Ambient Temperature			0.625 W
at 70°C Ambient Temperature			0.400 W
Maximum Voltages and Current		**MPSL01**	**MPSL51**
V_{CEO}	Collector to Emitter Voltage (Note 4)	120 V	−100 V
V_{CBO}	Collector to Base Voltage	140 V	−100 V
V_{EBO}	Emitter to Base Voltage	5.0 V	−4.0 V
I_C	Collector Current (Continuous)	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPSL01 MIN.	MPSL01 MAX.	MPSL51 MIN.	MPSL51 MAX.	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
BV_{CEO}	Collector to Emitter Voltage (Note 3)	120		−100		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	140		−100		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		−4.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		1.0			μA	V_{CB} = 75 V, I_E = 0
					1.0	μA	V_{CB} = 50 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100			nA	V_{EB} = 4.0 V, I_C = 0
					100	nA	V_{EB} = 3.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	50	300				V_{CE} = 5.0 V, I_C = 10 mA
				40	250		V_{CE} = 5.0 V, I_C = 50 mA
$V_{CE\ (sat)}$	Collector to Emitter Saturation Voltage		0.20		−0.25	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		0.30		−0.30	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE\ (sat)}$	Base to Emitter Saturation Voltage		1.2		−1.2	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		1.4		−1.2	V	I_C = 50 mA, I_B = 5.0 mA
f_T	Current Gain Bandwidth Product	60		60		MHz	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		8.0		8.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	30		20			I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz

*Planar is a patented Fairchild process

NOTES:

1. The maximum ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic, refer to Section 5-SS16 for MPSL01; SS25 for MPSL51.

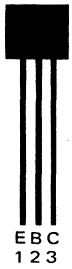
MPSL07 • MPSL08

PNP SMALL SIGNAL HIGH SPEED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- t_{on} . . . 20 ns (MAX) @ 10 mA
- t_{off} . . . 40 ns (MAX) @ 10 mA
- τ_s . . . 15 ns (MAX) (MPSL07), 20 ns (MAX) (MPSL08) @ 10 mA
- $V_{CE(sat)}$ . . . 0.15 V (MAX) @ 10 mA
- f_T . . . 500 MHz (MIN) (MPSL07), 700 MHz (MIN) (MPSL08) @ 10 mA
- COMPLEMENTS . . . MPS2369

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperature

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W

Maximum Voltages and Current

		MPSL07	MPSL08
V_{CBO}	Collector to Base Voltage	−6.0 V	−12 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−6.0 V	−12 V
V_{EBO}	Emitter to Base Voltage	−4.5 V	−4.5 V
I_C	Collector Current	80 mA	80 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MPSL07 MIN.	MPSL07 MAX.	MPSL08 MIN.	MPSL08 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	−6.0		−12		V	I_C = 3.0 mA, I_B = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−6.0		−12		V	I_C = 100 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−6.0		−12		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.5		−4.5		V	I_E = 100 μA, I_C = 0
I_{CES}	Collector Cutoff Current		10			nA	V_{CE} = −3.0 V, V_{BE} = 0
					10	nA	V_{CE} = −6.0 V, V_{BE} = 0
I_{CES}	Collector Cutoff Current		5.0			μA	V_{CE} = −3.0 V, V_{BE} = 0, T_A = 65°C
					5.0	μA	V_{CE} = −6.0 V, V_{BE} = 0, T_A = 65°C
I_B	Base Current		10			nA	V_{CE} = −3.0 V, V_{BE} = 0
					10	nA	V_{CE} = −6.0 V, V_{BE} = 0
h_{FE}	DC Current Gain (Note 5)	15		15			I_C = 1.0 mA, V_{CE} = −0.5 V
		30	120	30	120		I_C = 10 mA, V_{CE} = −3.0 V
		30		30			I_C = 50 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation		−0.15		−0.15	V	I_C = 10 mA, I_B = 1.0 mA
	Voltage (Note 5)		−0.5		−0.5	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage	−0.73	−0.88	−0.73	−0.88	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		−1.5		−1.5	V	I_C = 50 mA, I_B = 5.0 mA
f_T	Current Gain Bandwidth Product	500				MHz	I_C = 10 mA, V_{CE} = −5.0 V, f = 100 MHz
				700		MHz	I_C = 10 mA, V_{CE} = −10 V, f = 100 MHz
C_{ob}	Output Capacitance		3.0		3.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 140 kHz
C_{ib}	Input Capacitance		5.0		5.0	pF	V_{EB} = −0.5 V, I_C = 0, f = 140 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For additional product family characteristic curves, refer to Section 5 – SS31.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) **(Cont'd)**

SYMBOL	CHARACTERISTIC	MPSL07 MIN.	MPSL07 MAX.	MPSL08 MIN.	MPSL08 MAX.	UNITS	TEST CONDITIONS
t_{on}	Turn On Time (see test circuit no. 348)		20		20	ns	I_C = 10 mA, I_{B1} = 1.0 mA
t_{off}	Turn Off Time (see test circuit no. 348)		40		40	ns	I_C = 10 mA, I_{B1} = I_{B2} = 1.0 mA
τ_s	Charge Storage Time (see test circuit no. 234)		15		20	ns	I_C = 10 mA, I_{B1} = I_{B2} = 10 mA

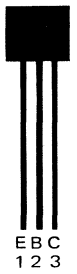
PE5025

NPN IF AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- OPTIMIZED FOR FINAL VIDEO IF AMPLIFIER
- C_{re} . . . 1.0 pF (MAX)
- g_{oe} . . . 200 μmho (MAX)
- G_{pe} . . . 25 dB (MIN) @ f = 45 MHz
- V_{CEO} . . . 30 V (MIN)

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C

Maximum Power Dissipation (Notes 2 & 5)

Total Dissipation at or below 65°C Ambient Temperature	0.425 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	30 V
V_{CEO}	Collector to Emitter Voltage (Note 3)	30 V
V_{EBO}	Emitter to Base Voltage	3.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
G_{pe}	Power Gain, Fixed Neutralization (see test circuit no. 320)	25		dB	I_C = 10 mA, V_{CE} = 10 V, f = 45 MHz
C_{re}	Reverse Transfer Capacitance	0.6	1.1	pF	I_E = 0, V_{CB} = 10 V, f ≤ 1.0 MHz
g_{oe}	Output Admittance, Input Short Circuit	30	200	μmho	I_C = 10 mA, V_{CE} = 10 V, f = 45 MHz
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	30		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	I_E = 10 μA, I_C = 0
h_{FE}	DC Pulse Current Gain (Note 4)	20	100		I_C = 10 mA, V_{CE} = 10 V
h_{fe}	High Frequency Current	3.0	7.0		I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		0.6	V	I_C = 20 mA, I_B = 1.0 mA,
I_{CEO}	Collector Cutoff Current		1.0	μA	I_B = 0, V_{CE} = 30 V
I_{CBO}	Collector Cutoff Current		50	nA	I_E = 0, V_{CB} = 30 V

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
3. Rating refers to a high current point where collector to emitter voltage is lowest.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
6. For product family characteristic curves, refer to Section 5 - SS6.

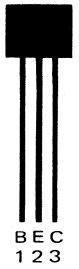
PE5029 • PE5030B • PE5031

NPN RF-IF AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **PE5031 . . . VHF AMPLIFIER AND MIXER**
- **PE5030B . . . THIRD VIDEO IF**
- **PE5029 . . . RF IF AMPLIFIER**
- **C_{cb} . . . 0.4 pF (MAX)**
- **PG . . . 22 dB (MIN) @ 200 MHz (PE5031)**
- **NF . . . 4.5 dB (MAX) @ 200 MHz (PE5031)**

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (60 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at or below 65°C Ambient Temperature	0.425 W

Maximum Voltages		**PE5029**	**PE5030B**	**PE5031**
V_{CBO}	Collector to Base Voltage	35 V	45 V	40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	40 V	30 V
V_{EBO}	Emitter to Base Voltage	3.0 V	4.5 V	4.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	PE5029 MIN.	PE5029 MAX.	PE5030B MIN.	PE5030B MAX.	PE5031 MIN.	PE5031 MAX.	UNITS	TEST CONDITIONS
G_{PE}	Power Gain								
	(see test circuit no. 592)	28						dB	V_{CC} = 12 V, V_{BB} = 2.5 V, f = 45 MHz
	(see test circuit no. 573)					22		dB	V_{CC} = 12 V, f = 200 MHz
	(see test circuit no. 596)			27				dB	V_{CE} = 10 V, I_C = 10 mA, f = 45 MHz
NF	Noise Figure								
	(see test circuit no. 592)		6.0					dB	V_{CC} = 12 V, f = 45 MHz
	(see test circuit no. 573)						4.5	dB	V_{CC} = 12 V, f = 200 MHz
C_{cb}	Collector to Base Capacitance		0.40	0.25	0.40		0.40	pF	V_{CB} = 15 V, I_E = 0, f = 1.0 MHz
h_{FE}	DC Current Gain	30	225			30	180		V_{CE} = 10 V, I_C = 5.0 mA
	(Note 5)			45	150				V_{CE} = 15 V, I_C = 7.0 mA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	30		40		30		V	I_C = 1.0 mA, I_B = 0
I_{CBO}	Collector Cutoff Current		200		100		100	nA	V_{CB} = 30 V, I_E = 0
BV_{CBO}	Collector to Base Breakdown Voltage	30		45		40		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown	3.0				4.0		V	I_C = 0, I_E = 100 μA
	Voltage			4.5				V	I_C = 0, I_E = 10 μA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.85				0.85	V	I_C = 5.0 mA, V_{CE} = 10 V
h_{fe}	High Frequency Current Gain	5.0				6.0			V_{CE} = 10 V, I_C = 5.0 mA, f = 100 MHz
				6.0					V_{CE} = 15 V, I_C = 7.0 mA f = 100 MHz

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C; junction to ambient thermal resistance of 200°C/W derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. GMS = $10 \log \frac{y_{fe}}{y_{re}}$
7. For product family characteristic curves, refer to Section 5-SS12.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) **(Cont'd)**

SYMBOL	CHARACTERISTIC	PE5029 MIN.	PE5029 MAX.	PE5030B MIN.	PE5030B MAX.	PE5031 MIN.	PE5031 MAX.	UNITS	TEST CONDITIONS
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 5)				0.92			V	I_C = 10 mA, I_B = 5.0 mA
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 5)				3.0			V	I_C = 20 mA, I_B = 1.0 mA
							1.0	V	I_C = 10 mA, I_B = 1.0 mA
G_{VE}	Voltage Gain (see test circuit no. 595)			38	46			dB	Fixed Tuned Test Circuit Unneutralized, f = 45 MHz
GMS	Gain Maximum Stable (Note 6)			27				dB	V_{CE} = 15 V, I_C = 7.0 mA f = 45 MHz

PE6020 • PE6021 • SE6020 • SE6021

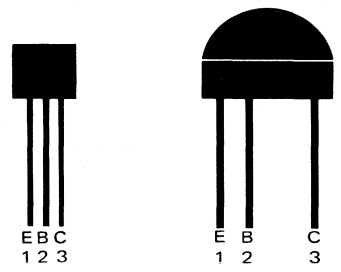
NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PE6020, PE6021)
- V_{CEO} . . . 80 V (MIN) (PE6021)
- h_{FE} . . . 100-300 @ 150 mA
- $V_{CE(sat)}$ . . . 0.5 V (MAX) @ 500 mA; 0.18 V (MAX) @ 150 mA
- f_T . . . 250 MHz (MIN) @ 50 mA
- COMPLEMENTS . . . 2N/MPS4355, 2N/MPS4356

See Package Outlines

TO92-1 TO5-4



PE6020 PE6021 SE6020 SE6021

ABSOLUTE MAXIMUM RATINGS (Note 1)

		PE6020, PE6021	SE6020, SE6021
Maximum Temperatures			
Storage Temperature		−55°C to +150°C	−55°C to +125°C
Operating Junction Temperature		150°C	125°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		1.0 W	0.8 W
at 25°C Ambient Temperature		0.625 W	0.3 W
Maximum Voltages and Current		**PE6020, SE6020**	**PE6021, SE6021**
V_{CBO}	Collector to Base Voltage	60 V	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	80 V
V_{EBO}	Emitter to Base Voltage	6.5 V	6.5 V
I_C	Collector Current	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	PE6020, SE6020 MIN.	PE6020, SE6020 MAX.	PE6021, SE6021 MIN.	PE6021, SE6021 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	30		30			I_C = 100 μA, V_{CE} = 10 V
		60		60			I_C = 1.0 mA, V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain (Note 5)	90		90			I_C = 10 mA, V_{CE} = 10 V
		100		100			I_C = 50 mA, V_{CE} = 1.0 V
		40	300	40			I_C = 150 mA, V_{CE} = 1.0 V
		100	300	100	300		I_C = 150 mA, V_{CE} = 10 V
		70		70			I_C = 300 mA, V_{CE} = 10 V
		45		45			I_C = 500 mA, V_{CE} = 10 V
		10		10			I_C = 150 mA, V_{CE} = 1.0 V, T_A = −55°C
		25		25			I_C = 150 mA, V_{CE} = 10 V, T_A = −55°C
			340		340		I_C = 150 mA, V_{CE} = 1.0 V, T_A = 65°C
			380		380		I_C = 150 mA, V_{CE} = 10 V, T_A = 65°C
h_{fe}	High Frequency Current Gain	2.5	6.0	2.5	6.0		I_C = 50 mA, V_{CE} = 5.0 V, f = 100 MHz
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 5)		0.07		0.07	V	I_C = 10 mA, I_B = 1.0 mA
			0.18		0.18	V	I_C = 150 mA, I_B = 15 mA
			0.31		0.31	V	I_C = 300 mA, I_B = 30 mA
			0.50		0.50	V	I_C = 500 mA, I_B = 50 mA
			0.28		0.28	V	I_C = 150 mA, I_B = 15 mA, T_A = 65°C

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PE6020 and PE6021. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 167°C/W (derating factor of 6.0 mW/°C) for SE6020 and SE6021.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS17.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	PE6020, SE6020 MIN.	PE6020, SE6020 MAX.	PE6021, SE6021 MIN.	PE6021, SE6021 MAX.	UNITS	TEST CONDITIONS
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 5)		0.72		0.72	V	I_C = 10 mA, I_B = 1.0 mA
		0.78	0.90	0.78	0.90	V	I_C = 150 mA, I_B = 15 mA
			1.05		1.05	V	I_C = 300 mA, I_B = 30 mA
			1.30		1.30	V	I_C = 500 mA, I_B = 50 mA
			1.10		1.10	V	I_C = 150 mA, I_B = 15 mA, T_A = –55°C
		0.72		0.72		V	I_C = 150 mA, I_B = 15 mA, T_A = 65°C
$V_{BE(ON)}$	Pulsed Base Emitter "On" Voltage (Note 5)		0.88		0.88	V	I_C = 150 mA, V_{CE} = 10 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		80		V	I_C = 10 mA, I_B = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	60		80		V	I_C = 10 μA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.5		6.5		V	I_C = 0, I_E = 10 μA
I_{CBO}	Collector Cutoff Current		100		100	nA	I_E = 0, V_{CB} = 50 V
			10		10	μA	I_E = 0, V_{CB} = 50 V, T_A = 65°C
I_{EBO}	Emitter Cutoff Current		100		100	nA	I_C = 0, V_{EB} = 4.0 V
C_{cb}	Collector to Base Capacitance		15		15	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		75		75	pF	I_C = 0, V_{EB} = 0.5 V, f= 1.0 MHz
t_{on}	Turn On Time (see test circuit no. 417)		150		150	ns	I_C = 150 mA, I_{B1} = 15 mA
t_{off}	Turn Off Time (see test circuit no. 417)		1.0		1.0	μs	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA

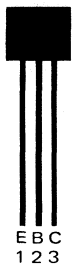
PN4357

PNP SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −240 V (MIN)
- NF . . . 3.0 dB (MAX) @ 1.0 kHz
- h_{FE} . . . 80-300 @ 10 mA
- EXCELLENT BETA LINEARITY FROM 10 μA TO 50 mA

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Soldering Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 5)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	−240 V
V_{CEO}	Collector to Emitter Voltage (Note 3)	−240 V
V_{EBO}	Emitter to Base Voltage	−6.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_{CEO}	Collector to Emitter Sustaining Voltage	−240		V	I_C = 2.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−240		V	I_C = 10 μA, I_E = 0
NF	Narrow Band Noise Figure		10	dB	I_C = 10 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, BW = 15 Hz, f = 100 Hz
			3.0	dB	I_C = 10 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, BW = 150 Hz, f = 1.0 kHz
			3.0	dB	I_C = 10 μA, V_{CE} = −5.0 V R_S = 10 kΩ, BW = 1.5 kHz, f = 10 kHz
h_{FE}	DC Pulse Current Gain (Note 4)	80	300		I_C = 10 mA, V_{CE} = −10 V
h_{FE}	DC Current Gain	60			I_C = 10 μA, V_{CE} = −10 V
		80			I_C = 1.0 mA, V_{CE} = −10 V
		15			I_C = 10 μA, V_{CE} = −10 V, T_A = −55°C
C_{ob}	Output Capacitance		7.0	pF	I_E = 0, V_{CB} = −5.0 V, f = 1.0 MHz
C_{ib}	Input Capacitance		25	pF	V_{EB} = −0.5 V, I_C = 0, f = 1.0 MHz
I_{CBO}	Collector Reverse Current		20	nA	V_{CB} = −200 V, I_E = 0
			20	μA	V_{CB} = −200 V, I_E = 0, T_A = 150°C
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 4)		−0.5	V	I_C = 10 mA, I_B = 1.0 mA
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		V	I_E = 10 μA, I_C = 0
I_{EBO}	Emitter Cutoff Current		10	nA	V_{EB} = −4.0 V, I_C = 0
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 4)		−0.9	V	I_C = 10 mA, I_B = 1.0 mA
h_{fe}	High Frequency Current Gain	−2.0	−8.0	V	I_C = 1.0 mA, V_{CE} = −10 V, f = 20 MHz
h_{fe}	Small Signal Current Gain	100	400		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	25	μmhos	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{ie}	Input Resistance	2.5	12	kΩ	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
3. Rating refers to a high current point where collector to emitter voltage is lowest.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
6. For product family characteristic curves, refer to Section 5 - SS4.

RF400 • RF401

AFC

DIFFUSED SILICON PLANAR* EPITAXIAL DIODES

- **Q . . . 400 (TYP) @ 50 MHz**
- **C3/C20 . . . 2.0 MIN**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS

Maximum Temperature

Storage Temperature	−65°C to +200°C
Operating Temperature	175°C

Maximum Power Dissipation

Total Dissipation	350 mW

Maximum Voltage and Current

WIV	Maximum Working Voltage	30 V
I_F	Forward Current	250 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	35		V	I_R = 10 μA
I_R	Reverse Leakage Current		30	nA	V_R = 30 V
I_R	Reverse Leakage Current		50	μA	V_R = 30 V, T_A = 150°C
Q	Figure of Merit	350			V_R = 4.0 V, f = 50 MHz
		RF400	**RF401**		
	Nominal Capacitance	10	7.0	pF	V_R = 4.0 V, f = 1.0 MHz
	Minimum Capacitance	2.0	2.0		V_R = 0.1 V, f = 1.0 MHz (C0.1)
	Ratio $\frac{C0.1}{C4}$				V_R = 4.0 V, f = 1.0 MHz (C4)
	Minimum Capacitance	2.0	2.0		V_R = 3.0 V, f = 1.0 MHz (C3)
	Ratio $\frac{C3}{C20}$				V_R = 20 V, f = 1.0 MHz (C20)

*Planar is a patented Fairchild process.

NOTE:
1. For product family characteristic curves, refer to Section 5 — D1.

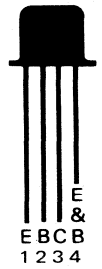
SE5020 • SE5021 • SE5022 • SE5023 • SE5024

NPN SMALL SIGNAL RF-AGC AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- V_{CEO} . . . 20 V
- PERFORMANCE CHARACTERIZED @ 45 MHz & 200 MHz
- V_{AGC} GUARANTEED FOR −30 dB @ 45 MHz & 200 MHz
- C_{re} . . . 0.25–0.5 pF @ 10 V
- NF . . . 3.3 dB (MAX) (SE5020)

See TO18-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−55°C to +175°C
Operating Junction Temperature	175°C
Maximum Power Dissipation (Note 2)	
Total Dissipation at 25°C Case Temperature	0.260 W
at 25°C Ambient Temperature	0.175 W
Maximum Voltages	
V_{CBO} Collector to Base Voltage	20 V
V_{CEO} Collector to Emitter Voltage (Note 3)	20 V
V_{EBO} Emitter to Base Voltage	3.0 V

ELECTRICAL CHARACTERISTICS: (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	SE5020/1/2 MIN.	SE5020/1/2 MAX.	SE5023/4 MIN.	SE5023/4 MAX.	UNITS	TEST CONDITIONS
NF	Noise Figure (see test circuit no. 257)						
	SE5020		3.3			dB	V_{AGC} = 1.4 V, R_S = 75Ω, f = 200 MHz
	SE5021		4.0			dB	
NF	Noise Figure (see test circuit no. 211)				6.0	dB	V_{AGC} = 2.75 V, R_S = 50Ω, f = 45 MHz
PG	Power Gain (see test circuit no. 257)						
	SE5020, SE5021	20	27			dB	V_{AGC} = 1.4 V, R_S = 75Ω, f = 200 MHz
	SE5022	18					
PG	Power Gain (see test circuit no. 211)			22.5	28.5	dB	V_{AGC} = 2.75 V, R_S = 50Ω, f = 45 MHz
V_{AGC}	AGC Voltage for 30 dB Gain Reduction (see test circuit no. 257) SE5020	4.0	5.0			V	R_S = 75 Ω, f = 200 MHz
V_{AGC}	AGC Voltage for 30 dB Gain Reduction (see test circuit no. 211) SE5023			4.4	5.4	V	R_S = 50Ω, f = 45 MHz
	SE5024			5.2	6.2	V	
C_{re}	Reverse Transfer Capacity, Common Emitter	0.25	0.5	0.25	0.5	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz (Emitter & can guarded)
h_{FE}	DC Pulse Current Gain	20	200	20	200		I_C = 4.0 mA, V_{CE} = 5.0 V
I_{CBO}	Collector Cutoff Current		50		50	nA	I_E = 0, V_{CB} = 10 V
$V_{CEO(sus)}$	Collector Emitter Sustaining Voltage (Note 4)	20		20		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown	20		20		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		3.0		V	I_C = 0, I_E = 100 μA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		3.0		3.0	V	I_C = 10 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)		0.96		0.96	V	I_C = 10 mA, I_B = 5.0 mA
h_{fe}	High Frequency Current Gain						
	SE5020, SE5021	3.75	8.0	3.0	8.0		I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz
	SE5022	3.0	8.0				

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 583°C/W (derating factor of 1.75 mW/°C); junction to ambient thermal resistance of 850°C/W (derating factor of 1.17 mW/°C).
3. Rating refers to a high current point where collector to emitter voltage is lowest.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For additional product family characteristic curves, refer to Section 5-SS3.

SE5035 • SE5036

NPN RF-VHF AMPLIFIERS AND MIXERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **C_{cb} . . . 0.3 pF (MAX), 0.22 pF (TYP)**
- **f_T . . . 600 MHz (MIN)**
- **P_G . . . 22 dB (MIN) @ 200 MHz, 29 dB (MIN) @ 45 MHz**
- **C_{GE} . . . 25 dB (TYP)**

See TO18-3 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +175°C
Operating Temperature	175°C

Maximum Power Dissipation (Note 2)

Total Dissipation at 25°C Case Temperature	0.300 W
at 25°C Ambient Temperature	0.200 W

Maximum Voltages		**SE5035**	**SE5036**
V_{CES}	Collector to Emitter Voltage	40 V	35 V
V_{CEO}	Collector to Emitter Voltage (Note 3)	30 V	30 V
V_{EBO}	Emitter to Base Voltage	4.0 V	3.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	SE5035 MIN.	SE5035 TYP.	SE5035 MAX.	SE5036 MIN.	SE5036 TYP.	SE5036 MAX.	UNITS	TEST CONDITIONS
P_G	Neutralized Gain								
	(see test circuit no. 520)	22	27					dB	V_{CC} = 12 V, f = 200 MHz
	(see test circuit no. 422)				29	33		dB	V_{CC} = 12 V, f = 45 MHz
C_{GE}	Conversion Gain, Unneutralized								
	(see test circuit no. 520-45)		25					dB	V_{CC} = 12 V, $I_C \approx$ 4.0 mA, f_{in} = 213 MHz, f_{out} = 45 MHz
G_{PE}	Unneutralized Gain		19.5					dB	V_{CC} = 12 V, f = 200 MHz
	(see test circuit no. 520-200)								
NF	Noise Figure								
	(see test circuit no. 520-200)		2.5					dB	f = 200 MHz
	(see test circuit no. 422)					3.3	5.0	dB	f = 45 MHz
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.75	0.85		0.75	0.85	V	I_C = 5.0 mA, V_{CE} = 10 V
h_{fe}	High Frequency Current Gain	6.0	10		5.0	8.0			I_C = 5.0 mA, V_{CE} = 10 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		0.22	0.3		0.22	0.3	pF	I_E = 0, V_{CB} = 10 V
h_{FE}	DC Current Gain	40	80	180	30	70	225		I_C = 5.0 mA, V_{CE} = 10 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	30			30			V	I_C = 1.0 mA, I_B = 0
I_{CBO}	Collector Cutoff Current			50			50	nA	I_E = 0, V_{CB} = 30 V
BV_{CES}	Collector to Emitter Breakdown Voltage (Shorted Base)	40			35			V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0			3.0			V	I_C = 0, I_E = 100 μA
R_{iep}	Input Resistance, Common Emitter					300		Ω	I_C = 5.0 mA, V_{CE} = 10 V, f = 45 MHz
C_{iep}	Input Capacitance Common Emitter					17		pF	I_C = 5.0 mA, V_{CE} = 10 V, f = 45 MHz
R_{oep}	Output Resistance, Common Emitter					25		kΩ	I_C = 5.0 mA, V_{CE} = 10 V, f = 45 MHz
C_{oep}	Output Capacitance, Common Emitter					1.4		pF	I_C = 5.0 mA, V_{CE} = 10 V, f = 45 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 503°C/W (derating factor of 1.98 mW/°C); junction to ambient thermal resistance of 770°C/W (derating factor of 1.33 mW/°C).
3. Rating refers to a high current point where collector to emitter voltage is lowest.
4. For product family characteristic curves, refer to Section 5 - SS12.

TYPICAL COMMON EMITTER "Y" PARAMETERS FOR SE5035 (T_A = 25°C, V_{CE} = 10 V) (Cont'd)

SYMBOL	PARAMETER	MAGNITUDE		
		I_C = 2.0 mA, f = 200 MHz	I_C = 5.0 mA, f = 200 MHz	I_C = 5.0 mA, f = 45 MHz
$\|Y_{ie}\|$	Input Admittance Output Short Circuit	8.0 + j11.0 mmhos	13.0 + j12.0 mmhos	3.5 + j5.5 mmhos
$\|Y_{re}\|$	Reverse Transadmittance Input Short Circuit	–0.02 – 0.28 mmhos	–0.03 – j0.28 mmhos	0.00 – j0.06 mmhos
$\|Y_{fe}\|$	Forward Transadmittance Output Short Circuit	39.0 – j42.0 mmhos	48.0 – 79.0 mmhos	120 – j42.0 mmhos
$\|Y_{oe}\|$	Output Admittance Input Short Circuit	0.10 + j1.80 mmhos	0.18 + j1.80 mmhos	0.04 + j0.40 mmhos

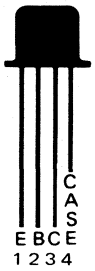
SE5050 • SE5051

NPN SMALL SIGNAL RF AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- **C_{re} . . . 0.25 (MIN) TO 0.50 (MAX) pF**
- **NF . . . 4.0 dB (MAX) @ 100 MHz**
- **PG . . . 20 dB (MIN) @ 100 MHz**

See TO18-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +175°C
Operating Junction Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Case Temperature		0.260 W
at 25°C Ambient Temperature		0.175 W
Maximum Voltages		
V_{CBO}	Collector to Base Voltage	20 V
V_{CEO}	Collector to Emitter Voltage (Note 3)	20 V
V_{EBO}	Emitter to Base Voltage	3.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
NF	Noise Figure SE5050 (see test circuit no. 334)		4.0	dB	V_{AGC} = 2.0 V, R_G = 75 Ω, f = 100 MHz
PG	Power Gain (see test circuit no. 334)	20		dB	V_{AGC} = 2.0 V, R_G = 75 Ω, f = 100 MHz
C_{re}	Reverse Transfer Capacity Common Emitter	0.25	0.50	pF	I_E = 0, V_{CB} = 10 V
h_{fe}	DC Pulse Current Gain (Note 4)	20	200		V_{CE} = 5.0 V, I_C = 4.0 mA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 3 & 4)	20		V	I_C = 1.0 mA, I_B = 0
I_{CBO}	Collector Cutoff Current		50	nA	I_E = 0, V_{CB} = 10 V
BV_{CBO}	Collector to Base Breakdown Voltage	20		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	I_C = 0, I_E = 100 μA
$V_{CE(sat)}$	Collector Saturation Voltage		3.0	V	I_C = 10 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		0.96	V	I_C = 10 mA, I_B = 5.0 mA
h_{fe}	High Frequency Current Gain	3.0			I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 583°C/W (derating factor of 1.73 mW/°C); junction to ambient thermal resistance of 850°C/W (derating factor of 1.17 mW/°C).
3. Rating refers to a high current point where collector to emitter voltage is lowest.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 — SS3.

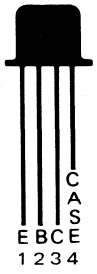
SE5055

NPN RF-AGC AMPLIFIER

DIFFUSED SILICON PLANAR* TRANSISTOR

- C_{cb} . . . 0.13 pF (TYP), 0.22 pF (MAX)
- PG . . . 27 dB (MIN) AT 45 MHz
- V_{AGC} . . . GUARANTEED FOR −30 dB AND −50 dB AT 45 MHz

See TO18-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +175°C
Operating Junction Temperature	175°C

Maximum Power Dissipation (Note 2)

Total Dissipation at 25°C Case Temperature	0.260 W
at 25°C Ambient Temperature	0.175 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	20 V
V_{CEO}	Collector to Emitter Voltage (Note 3)	20 V
V_{EBO}	Emitter to Base Voltage	3.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
PG	Power Gain (see test circuit no. 422)	27	29		dB	V_{BE} = 2.0 V, f = 45 MHz
NF	Noise Figure (see test circuit no. 422)		2.7	5.0	dB	V_{BE} = 2.0 V, f = 45 MHz
V_{AGC}	AGC Voltage for 30 dB Gain Reduction (see test circuit no. 422)	3.3	4.15	5.0	V	V_{CC} = 12 V, f = 45 MHz
I_{AGC}	Collector Current for 30 dB Gain Reduction (see test circuit no. 422)		7.2		mA	V_{CC} = 12 V, f = 45 MHz
V_{AGC}	AGC Voltage for 50 dB Gain Reduction (see test circuit no. 422)		6.15	7.5	V	V_{CC} = 12 V, f = 45 MHz
C_{cb}	Collector to Base Capacitance		0.13	0.22	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
h_{FE}	DC Current Gain	20	80	220		I_C = 2.0 mA, V_{CE} = 10 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	20			V	I_C = 1.0 mA, I_B = 0
I_{CBO}	Collector Cutoff Current			50	nA	I_E = 0, V_{CB} = 20 V
BV_{CBO}	Collector to Base Breakdown Voltage	20			V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0			V	I_C = 0, I_E = 100 μA
$V_{CE(sat)}$	Collector Saturation Voltage			2.75	V	I_C = 10 mA, I_B = 5.0 mA
h_{fe}	High Frequency Current Gain	3.0	5.0			I_C = 2.0 mA, V_{CE} = 10 V, f = 100 MHz
R_{iep}	Input Resistance, Common Emitter		400		Ω	I_C = 2.0 mA, V_{CE} = 10 V, f = 45 MHz
C_{iep}	Input Capacitance, Common Emitter		16		pF	I_C = 2.0 mA, V_{CE} = 10 V, f = 45 MHz
R_{oep}	Output Resistance, Common Emitter		67		kΩ	I_C = 2.0 mA, V_{CE} = 10 V, f = 45 MHz
C_{oep}	Output Capacitance, Common Emitter		1.2		pF	I_C = 2.0 mA, V_{CE} = 10 V, f = 45 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 583°C/W (derating factor of 1.73 mW/°C); junction to ambient thermal resistance of 850°C/W (derating factor of 1.17 mW/°C).
3. Rating refers to a high current point where collector to emitter voltage is lowest.
4. For product family characteristic curves, refer to Section 5-SS10.

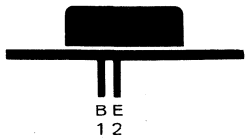
SE9331

HIGH VOLTAGE POWER

DIFFUSED SILICON PLANAR* TRANSISTOR

- V_{CEO} . . . 300 V (MIN)
- h_{FE} . . . 30–250 @ 100 mA
- f_T . . . 10 MHz (MIN) @ 50 mA

See TO66-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +175°C
Operating Junction Temperature		175°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		20 W
Maximum Voltages and Currents		
V_{CEO}	Collector to Emitter Voltage (Note 4)	300 V
V_{CBO}	Collector to Base Voltage	300 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_B	Base Current	250 mA
I_C	Collector Current	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector to Cutoff Current		10	μA	V_{CB} = 300 V
BV_{CEO}	Collector to Emitter Breakdown Voltage	300		V	I_C = 5.0 mA
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		V	I_E = 10 μA
I_{CBO}	Collector Cutoff Current		500	nA	V_{CB} = 250 V
I_{CEO}	Collector to Emitter Cutoff Current		100	μA	V_{CE} = 300 V
h_{FE}	DC Current Gain (Note 4)	30			I_C = 50 mA, V_{CE} = 10 V
		30	250		I_C = 100 mA, V_{CE} = 10 V
f_T	Current to Gain Bandwidth Product	10		MHz	I_C = 50 mA, V_{CE} = 10 V, f = 10 MHz
C_{ob}	Output Capacitance		20	pF	V_{CB} = 100 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		2.5	V	I_C = 100 mA, I_B = 10 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		1.5	V	I_C = 100 mA, I_B = 10 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 4)		1.5	V	I_C = 100 mA, V_{CE} = 10 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 7.5°C/W (derating factor of 133 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle < 2%.
5. For product family characteristic curves, refer to Section 5-PWR8.

1N456 • 1N456A

HIGH CONDUCTANCE LOW LEAKAGE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 30 V (MIN) @ 100 μA**
- **I_R . . . 25 nA (MAX) @ 25 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		200 mW
Linear Derating Factor		1.33 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	25 V
I_O	Average Rectified Current	90 mA
I_F	DC Forward Current	135 mA
i_f	Recurrent Peak Forward Current	450 mA
i_f (surge)	Peak Forward Surge Current	
	Pulse Width of 1.0 s	700 mA
	Pulse Width of 2.0 μs	1200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N456 MIN.	1N456 MAX.	1N456A MIN.	1N456A MAX.	UNITS	TEST CONDITIONS
B_V	Breakdown Voltage	30				V	I_R = 100 μA
				30		V	I_R = 5.0 μA
I_R	Reverse Current		25		25	nA	V_R = 25 V
			5.0		5.0	μA	V_R = 25 V, T_A = 150°C
V_F	Forward Voltage		1.0			V	I_F = 40 mA
					1.0	V	I_F = 100 mA
C	Capacitance		10			pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
3. For product family characteristic curves, refer to Section 5-D5.

1N457 • 1N457A

LOW LEAKAGE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 70 V (MIN) @ 100 μA**
- **I_R . . . 25 nA (MAX) @ 60 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		400 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	60 V
I_O	Average Rectified Current	75 mA
I_F	Forward Current Steady State DC	140 mA
i_f	Recurrent Peak Forward Current	225 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N457 MIN.	1N457 MAX.	1N457A MIN.	1N457A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 20 mA
					1.0	V	I_F = 100 mA
I_R	Reverse Current		25		25	nA	V_R = 60 V
			5.0		5.0	μA	V_R = 60 V, T_A = 150°C
BV	Breakdown Voltage	70		70		V	I_R = 100 μA
C	Capacitance (Note 2)		6.0			pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:

1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
3. For product family characteristic curves, refer to Section 5-D5.

1N458 • 1N458A

LOW LEAKAGE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 150 V (MIN) @ 100 μA**
- **I_R . . . 25 nA (MAX) @ 125 V 1N458**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		400 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	125 V
I_O	Average Rectified Current	55 mA
I_F	Forward Current Steady State DC	115 mA
I_f	Recurrent Peak Forward Current	175 mA
i_f (surge)	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N458 MIN.	1N458 MAX.	1N458A MIN.	1N458A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 7.0 mA
					1.0	V	I_F = 100 mA
I_R	Reverse Current		25			nA	V_R = 125 V
					5.0	nA	V_R = 125 V
			5.0		5.0	μA	V_R = 125 V, T_A = 150°C
BV	Breakdown Voltage	150		150		V	I_R = 100 μA
C	Capacitance (Note 2)		6.0			pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
3. For product family characteristic curves, refer to Section 5-D5.

1N459 • 1N459A

LOW LEAKAGE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 200 V (MIN) @ 100 μA**
- **I_R . . . 25 nA (MAX) @ 175 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		400 W
Maximum Voltages and Currents		
WIV	Working Inverse Voltage	175 V
I_O	Average Rectified Current	40 mA
I_F	Forward Current Steady State DC	100 mA
i_f	Recurrent Peak Forward Current	125 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N459 MIN.	1N459 MAX.	1N459A MIN.	1N459A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 3.0 mA
					1.0	V	I_F = 100 mA
I_R	Reverse Current		25		25	nA	V_R = 175 V
			5.0		5.0	μA	V_R = 175 V, T_A = 150°C
BV	Breakdown Voltage	200		200		V	I_R = 100 μA
C	Capacitance (Note 2)		6.0			pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
3. For product family characteristic curves, refer to Section 5 — D5.

1N461 • 1N461A

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 30 V (MIN) @ 100 μA**
- **I_R . . . 500 nA (MAX) @ 25 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		200 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	25 V
I_O	Average Rectified Current	60 mA
I_F	Forward Current Steady State DC	90 mA
I_f	Recurrent Peak Forward Current	180 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	550 mA
	Pulse Width = 2.0 μs	900 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N461 MIN.	1N461 MAX.	1N461A MIN.	1N461A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 15 mA
					1.0	V	I_F = 100 mA
I_R	Reverse Current		500		500	nA	V_R = 25 V
			30		30	μA	V_R = 25 V, T_A = 150°C
C	Capacitance		10		10	pF	V_R = 0, f = 1.0 MHz
BV	Breakdown Voltage	30		30		V	I_R = 100 μA

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. For product family characteristic curves, refer to Section 5 — D6.

1N462 • 1N462A

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 70 V (MIN) @ 100 μA**
- **I_R . . . 500 nA (MAX) @ 60 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		200 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	60 V
I_O	Average Rectified Current	50 mA
I_R	Forward Current Steady State DC	75 mA
I_f	Recurrent Peak Forward Current	150 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 2.0 μs	800 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N462 MIN.	1N462 MAX.	1N462A MIN.	1N462A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 5.0 mA
					1.0	V	I_F = 100 mA
BV	Breakdown Voltage	70		70		V	I_R = 100 μA
I_R	Reverse Current		500		500	nA	V_R = 60 V
			30		30	μA	V_R = 60 V, T_A = 150°C
C	Capacitance		8.0			pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. For product family characteristic curves, refer to Section 5 — D5.

1N463 • 1N463A

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 200 V (MIN) @ 100 μA**
- **I_R . . . 500 nA (MAX) @ 175 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		200 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	175 V
I_O	Average Rectified Current	30 mA
I_F	Forward Current Steady State DC	50 mA
I_f	Recurrent Peak Forward Current	100 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	400 mA
	Pulse Width = 2.0 μs	700 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N463 MIN.	1N463 MAX.	1N463A MIN.	1N463A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 1.0 mA
					1.0	V	I_F = 100 mA
BV	Breakdown Voltage	200		200		V	I_R = 100 μA
I_R	Reverse Current		500		500	nA	V_R = 175 V
			30		30	μA	V_R = 175 V, T_A = 150°C
C	Capacitance		4.0			pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. For product family characteristic curves, refer to Section 5 — D5.

1N464 • 1N464A

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 150 V (MIN) @ 100 μA**
- **I_R . . . 500 nA (MAX) @ 125 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		200 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	125 V
I_O	Average Rectified Current	40 mA
I_F	Forward Current Steady State DC	60 mA
I_f	Recurrent Peak Forward Current	120 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	400 mA
	Pulse Width = 2.0 μs	700 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N464 MIN.	1N464 MAX.	1N464A MIN.	1N464A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 3.0 mA
					1.0	V	I_F = 100 mA
I_R	Reverse Current		500		500	nA	V_R = 125 V
			30		30	μA	V_R = 125 V, T_A = 150°C
BV	Breakdown Voltage	150		150		V	I_R = 100 μA
C	Capacitance		6.0			pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. For product family characteristic curves, refer to Section 5 — D5.

1N482 through 1N486 • 1N482A/B through 1N486A/B

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- **V_F . . . 1.0 @ 100 mA (1N482A/B THROUGH 1N486A/B)**
- **I_R . . . 0.25 μA, 0.025 μA, 0.05 μA**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Temperature	200°C

Maximum Power Dissipation

Total Dissipation at 25°C Ambient Temperature	250 mW

Maximum Voltage

WIV	Working Inverse Voltage	1N482/A/B	36 V
		1N483/A/B	70 V
		1N484/A/B	130 V
		1N485/A/B	180 V
		1N486/A/B	225 V

Maximum Currents		**1N482 Through 1N486**	**1N482A/B Through 1N486A/B**
I_F	Average Forward Current	100 mA	200 mA
I_F	Average Forward Current @ T_A = 150°C	25 mA	50 mA
i_f	Recurrent Peak Forward Current	400 mA	650 mA
$i_{f(surge)}$	Surge Current	1.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	1N482 through 1N486		1.1	V	V_R = 100 mA
		1N482A through 1N486A		1.0	V	
		1N482B through 1N486B		1.0	V	
I_R	Reverse Current	1N482 through 1N486		0.25	μA	V_R = rated WIV
		1N482A through 1N485A		0.025	μA	
		1N482B through 1N485B		0.025	μA	
		1N486A and 1N486B		0.050	μA	
		1N482 through 1N485		30	μA	V_R = rated WIV, T_A = 150°C
		1N486		50	μA	
		1N482A through 1N485A		15	μA	
		1N486A		25	μA	
		1N482B through 1N485B		5.0	μA	
		1N486B		10	μA	
BV	Breakdown Voltage	1N482/A/B	40		V	I_R = 100 μA
		1N483/A/B	80		V	
		1N484/A/B	150		V	
		1N485/A/B	200		V	
		1N486/A/B	250		V	

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. For product family characteristic curves, refer to Section 5 - D5.

1N625 through 1N629

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- V_F . . . 1.5 V (MAX) @ 4.0 mA
- I_R . . . 1.0 μA (MAX) @ WIV

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	175°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	400 mW
Linear Derating Factor	2.67 mW/°C

Maximum Voltage and Currents		**1N625**	**1N626**	**1N627**	**1N628**	**1N629**
WIV	Working Inverse Voltage	20 V	35 V	75 V	125 V	175 V
I_O	Average Rectified Current	175 mA	175 mA	175 mA	175 mA	175 mA
I_F	Forward Current Steady State	400 mA	400 mA	400 mA	400 mA	400 mA
$i_{f(surge)}$	Peak Forward Surge Current					
	Pulse Width = 1.0 s	500 mA	500 mA	500 mA	500 mA	500 mA
	Pulse Width = 1.0 μs	4.0 A	4.0 A	4.0 A	4.0 A	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage			1.5	V	I_F = 4.0 mA
I_R	Reverse Current			1.0	μA	V_R = rated WIV
				30	μA	V_R = rated WIV, T_A = 100°C
BV	Breakdown Voltage	1N625	30		V	I_R = 100 μA
		1N626	50		V	I_R = 100 μA
		1N627	100		V	I_R = 100 μA
		1N628	150		V	I_R = 100 μA
		1N629	200		V	I_R = 100 μA
t_{rr}	Reverse Recovery Time			1.0	μs	I_F = 30 mA, V_r = 35 V, Recovery to 400 kΩ

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance 375°C/W (derating factor of 2.67 mW/°C).
4. For product family characteristic curves, refer to Section 5 - D4.

1N643 • 1N643A

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODE

- **BV . . . 200 V (MIN) @ 100 μA**
- **I_R . . . 1.0 μA (MAX) @ 100 V**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature		400 mW
Linear Power Derating Factor		2.67 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	175 V
I_O	Average Rectified Current	175 mA
I_F	Forward Current Steady State	400 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0s	500 mA
	Pulse Width = 1.0 μs	4.0A

ELECTRICAL CHARACTERISTICS: (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N643 MIN.	1N643 MAX.	1N643A MIN.	1N643A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 10 mA
					1.0	V	I_F = 100 mA
I_R	Reverse Current		25		25	nA	V_R = 10 V
			5.0		5.0	μA	V_R = 10 V, T_A = 100°C
			1.0		1.0	μA	V_R = 100 V
			15		15	μA	V_R = 100 V, T_A = 100°C
BV	Breakdown Voltage	200		200		V	I_R = 100 μA
t_{rr}	Reverse Recovery Time		300		300	ns	V_r = 40 V, I_f = 5.0 mA, R_L = 2.3 kΩ, C_L = 40 pF, Recovery to 200 kΩ

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 375°C/W (derating factor of 2.67 mW/°C).
4. For product family characteristic curves, refer to Section 5-D4.

1N658

GENERAL PURPOSE

DIFFUSED SILICON PLANAR*EPITAXIAL DIODE

- **BV . . . 120 V (MIN) @ 100 μA**
- **V_F . . . 1.0 V (MAX) @ 100 mA**

See DO 7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature		400 mW
Linear Derating Factor		2.67 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	100 V
I_O	Average Rectified Current	200 mA
I_F	Forward Current Steady State	400 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0	V	I_F = 100 mA
I_R	Reverse Current		50	nA	V_R = 50 V
			25	μA	V_R = 50 V, T_A = 150°C
BV	Breakdown Voltage	120		V	I_R = 100 μA
t_{rr}	Reverse Recovery Time		300	ns	V_R = 40 V, I_F = 5.0 mA, R_L = 2.0 kΩ, C_L = 10 pF, Recovery to 80 kΩ

*Planar is a patented Fairchild process.

NOTES:

1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 375°C/W (derating factor of 2.67 mW/°C).
4. For product family characteristic curves, refer to Section 5 — D4.

1N659 • 1N660 • 1N661

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- V_F . . . 1.0 V (MAX) @ 6.0 mA
- t_{rr} . . . 300 ns (MAX)

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	175°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	400 mW
Linear Derating Factor	2.67 mW/°C

Maximum Voltage and Currents		**1N659**	**1N660**	**1N661**
WIV	Working Inverse Voltage	50 V	100 V	200 V
I_O	Average Rectified Current	175 mA	175 mA	175 mA
I_F	Forward Current Steady State	400 mA	400 mA	400 mA
$i_{f(surge)}$	Peak Forward Surge Current			
	Pulse Width = 1.0s	500 mA	500 mA	500 mA
	Pulse Width = 1.0 μs	4.0A	4.0A	4.0A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N659 MIN.	1N659 MAX.	1N660 MIN.	1N660 MAX.	1N661 MIN.	1N661 MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0		1.0		1.0	V	I_F = 6.0 mA
I_R	Reverse Current		5.0					μA	V_R = 50 V
					5.0			μA	V_R = 100 V
							10	μA	V_R = 200 V
			25					μA	V_R = 50 V, T_A = 100°C
					50			μA	V_R = 100 V, T_A = 100°C
							100	μA	V_R = 200 V, T_A = 100°C
BV	Breakdown Voltage	60		120		240		V	I_R = 100 μA
t_{rr}	Reverse Recovery Time		300		300		300	ns	V_r = 35 V, I_f = 30 mA, R_L = 2.0 kΩ, C_L = 10 pF, Recovery to 400 kΩ

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 375°C/W (derating factor of 2.67 mW/°C).
4. For product family characteristic curves, refer to Section 5-D6 for 1N659, D4 for 1N660 and 1N661.

1N662 • 1N662A • 1N663 • 1N663A

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 100 V (MIN) @ 100 μA**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature		400 mW
Linear Derating Factor		2.67 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	80 V
I_O	Average Rectified Current	175 mA
I_F	Forward Current Steady State	400 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N662 MIN.	1N662 MAX.	1N662A MIN.	1N662A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0			V	I_F = 10 mA
					1.0	V	I_F = 100 mA
I_R	Reverse Current		1.0		1.0	μA	V_R = 10 V
			20		20	μA	V_R = 10 V, T_A = 100°C
			20		20	μA	V_R = 50 V
			100		100	μA	V_R = 50 V, T_A = 100°C
BV	Breakdown Voltage	100		100		V	I_R = 100 μA
t_{rr}	Reverse Recovery Time		500		300	ns	V_r = 40 V, I_f = 5.0 mA, R_L = 2.3 kΩ, C_L = 40 pF, Recovery to 100 kΩ

SYMBOL	CHARACTERISTIC	1N663 MIN.	1N663 MAX.	1N663A MIN.	1N663A MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0		1.0	V	I_F = 100 mA
I_R	Reverse Current		5.0		1.0	μA	V_R = 75 V
			50		15	μA	V_R = 75 V, T_A = 100°C
BV	Breakdown Voltage	100		100		V	I_R = 100 μA
t_{rr}	Reverse Recovery Time		500		300	ns	V_r = 40 V, I_f = 5.0 mA, R_L = 2.3 kΩ, C_L = 40 pF, Recovery to 200 kΩ

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to ambient thermal resistance of 375°C/W (derating factor of 2.67 mW/°C).
4. For product family characteristic curves, refer to Section 5 - D4.

1N746/A through 1N759/A

400 MILLIWATT VOLTAGE REGULATORS

SILICON PLANAR* ZENER DIODES

- **EXTREME LEAKAGE STABILITY**
- **VERY LOW DYNAMIC RESISTANCE**
- **SHARP ZENER KNEES**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 4)

Maximum Temperatures

Storage Temperature	−65°C to +175°C
Operating Temperature	175°C

Maximum Power Dissipation

Power Dissipation	400 mW
Linear Derating Factor	2.67 mW/°C

JEDEC TYPE NO. (Note 1)	V_Z ZENER VOLTAGE NOMINAL V	I_{ZT} TEST CURRENT mA	Z_z MAX. ZENER IMPEDANCE Z_{zT} @ I_{zT} (Note 3) Ω	REVERSE VOLTAGE V	IR MAX. REVERSE CURRENT @ V_R 25°C μA	150°C μA	TEMPERATURE COEFFICIENT (TYPICAL) %/°C
1N746	3.3	20	28	1.0	10	30	−.062
1N747	3.6	20	24	1.0	10	30	−.055
1N748	3.9	20	23	1.0	10	30	−.049
1N749	4.3	20	22	1.0	2.0	30	−.036
1N750	4.7	20	19	1.0	2.0	30	−.018
1N751	5.1	20	17	1.0	1.0	20	−.008
1N752	5.6	20	11	1.0	1.0	20	+.006
1N753	6.2	20	7.0	1.0	0.10	20	+.022
1N754	6.8	20	5.0	1.0	0.10	20	+.035
1N755	7.5	20	6.0	1.0	0.10	20	+.045
1N756	8.2	20	8.0	1.0	0.10	20	+.052
1N757	9.1	20	10	1.0	0.10	20	+.056
1N758	10	20	17	1.0	0.10	20	+.060
1N759	12	20	30	1.0	0.10	20	+.060

*Planar is a patented Fairchild process.

NOTES:

1. The 1N746-1N759 series has a standard Zener Voltage tolerance of ±10%. A tolerance of ±5.0% is also available by suffixing A to the JEDEC type number.
2. For family characteristic curves, refer to Section 5 - D8.
3. The zener impedance Z_{ZT} is derived by superimposing a 60 cycle ac signal, having an rms value equal to 10% of the dc Zener current, on I_{ZT}.
4. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.

1N914/A/B • 1N916/A/B • 1N4148/9 • 1N4446-1N4449

HIGH CONDUCTANCE ULTRA FAST SWITCHES

DIFFUSED SILICON PLANAR* DIODES

- t_{rr} . . . 4.0 ns (MAX)
- BV . . . 100 V (MIN)

See DO35-1 Package Outline & Note 1

ABSOLUTE MAXIMUM RATINGS (Note 2)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation		500 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	75 V
I_O	Average Rectified Current	200 mA
I_F	DC Forward Current	400 mA
I_f	Recurrent Peak Forward Current	600 mA
$I_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage		100		V	I_R = 100 μA
			75		V	I_R = 5.0 μA
I_R	Reverse Current			25	nA	V_R = 20 V
				50	μA	V_R = 20 V, T_A = 150°C
				5.0	μA	V_R = 75 V
V_F	Forward Voltage Drop	1N914B, 1N4448	0.62	0.72	V	I_F = 5.0 mA
		1N916B, 1N4449	0.63	0.73	V	
		1N914, 1N916				
		1N4148, 1N4149		1.0	V	I_F = 10 mA
		1N914A, 1N916A				
		1N4446, 1N4447		1.0	V	I_F = 20 mA
		1N916B, 1N4449		1.0	V	I_F = 30 mA
		1N914B, 1N4448		1.0	V	I_F = 100 mA
t_{rr}	Reverse Recovery Time			4.0	ns	I_f = 10 mA, V_r = 6.0 V, R_L = 100 Ω Rec. to 1.0 mA
C	Capacitance	1N914, 1N914A				
		1N914B, 1N4148		4.0	pF	V_R = 0 V (Note 3)
		1N4446, 1N4447				
		1N916, 1N916A				
		1N916B, 1N4149		2.0	pF	
		1N4448, 1N4449				
V_{fr}	Peak Forward Recovery Voltage	1N914, 1N916				50 mA Peak Square Wave,
		1N914B, 1N916B		2.5	V	0.1 μs pulse width,
		1N4448, 1N4449				5 kHz - 100 kHz rep. rate
RE	Rectification Efficiency	1N914A, 1N914B	45		%	2.0 V rms , f = 100 MHz
		1N916A, 1N916B				

*Planar is a patented Fairchild process.

NOTES:

1. Fairchild retains the option of supplying the 1N914, 1N914A, 1N914B, 1N916, 1N916A and 1N916B in the DO7 package. The 1N914JAN and 1N914JAN TX will be supplied only in the DO7 package.
2. Maximum ratings are limiting values above which life or satisfactory performance may be impaired.
3. Capacitance as measured on Boonton Model 75A Capacitance Bridge or equivalent.
4. For family characteristic curves, refer to Section 5 - D6.

1N957 through 1N973 • 1N957A/B • 1N973A/B

400 MILLIWATT VOLTAGE REGULATORS

SILICON PLANAR* ZENER DIODES

- EXTREME LEAKAGE STABILITY
- VERY LOW DYNAMIC RESISTANCE
- SHARP ZENER KNEES
- PLANAR CONSTRUCTION

See DO7-2 Package Outline & Note 6

ABSOLUTE MAXIMUM RATINGS (Note 1)

Operating Temperature	−65°C to +150°C
Storage Temperature	175°C
Power Dissipation	400 mW
Power Derating Factor	3.2 mW/°C

JEDEC TYPE NO. (Note 2)	V_Z ZENER VOLTAGE NOMINAL V	I_{ZT} TEST CURRENT mA	Z_Z MAX. ZENER IMPEDANCE (Note 3) Z_{ZT} @ I_{ZT} Ω	Z_{zk} Ω	I_{zk} mA	REVERSE VOLTAGE (Note 5) V A	B	I_R MAX. REVERSE CURRENT @ V_R 25°C μA	25°C μA	T.C. TEMPERATURE COEFFICIENT (MAX.) %/°C	I_{ZM} MAX. CURRENT (Note 4) mA
1N957	6.8	18.5	4.5	700	1.0	4.9	5.2	10	50	+.050	47
1N958	7.5	16.5	5.5	700	0.5	5.4	5.7	10	50	+.058	42
1N959	8.2	15	6.5	700	0.5	5.9	6.2	5.0	50	+.062	38
1N960	9.0	14	7.5	700	0.5	6.6	6.9	1.0	10	+.068	35
1N961	10	12.5	8.5	700	0.25	7.2	7.6	1.0	10	+.072	32
1N962	11	11.5	9.5	700	0.25	8.0	8.4	1.0	5.0	+.073	28
1N963	12	10.5	11.5	700	0.25	8.6	9.1	1.0	5.0	+.076	26
1N964	13	9.5	13	700	0.25	9.4	9.9	0.10	5.0	+.079	24
1N965	15	8.5	16	700	0.25	10.8	11.4	0.10	5.0	+.082	21
1N966	16	7.8	17	700	0.25	11.5	12.2	0.10	5.0	+.083	19
1N967	18	7.0	21	750	0.25	13	13.7	0.10	5.0	+.085	17
1N968	20	6.2	25	750	0.25	14.4	15.2	0.10	5.0	+.086	15
1N969	22	5.6	29	750	0.25	15.8	16.7	0.10	1.0	+.087	14
1N970	24	5.2	33	750	0.25	17.3	18.2	0.10	1.0	+.088	13
1N971	27	4.6	41	750	0.25	19.4	20.6	0.10	1.0	+.090	11
1N972	30	4.2	49	1000	0.25	21.6	22.8	0.10	1.0	+.091	10
1N973	33	3.8	58	1000	0.25	23.8	25.1	0.05	1.0	+.092	9.2

NOTES:

*Planar is a patented Fairchild process.

1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. The 1N957 −1N973 series has a 20% tolerance. Add suffix "A" for 10% tolerance, and suffix "B" for 5.0% tolerance.
3. The zener impedances Z_{ZT} and Z_{ZK} are derived by superimposing a 60 cycle ac signal, having an rms value equal to 10% of the dc zener current, on I_{ZT} or I_{ZK}.
4. Maximum zener current ratings (I_{ZM}) are based on the maximum voltage of a 20% tolerance unit. For closer tolerance units or units where the actual zener (V_Z) is known at the operating point, the maximum zener current may be increased according to the operating curve.
5. V_R value for 20% tolerance = 80% lowest V_Z value for each type.
6. When not specified, Fairchild reserves the option of supplying in the DO35 package.
7. For product family characteristic curves, refer to Section 5-D8.

1N3062 • 1N3063 • 1N3064 • 1N4305 • 1N4454

ULTRA FAST LOW CAPACITANCE

DIFFUSED SILICON PLANAR* DIODES

- **C . . . 2.0 pF @ V_R = 0, f = 1.0 MHz**
- **t_{rr} . . . 4.0 ns @ I_f = 10 mA, R_r = 10 mA, V_r = 1.0 V**
- **BV . . . 75 V (MIN)**

See DO7-2 Package Outline & Note 5

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C) (Note 1)

		1N3062 1N3063	1N3064	1N4454	1N4305
Maximum Temperatures					
Storage Temperature		−65°C to +200°C	−65°C to +175°C		−65°C to +200°C
Operating Temperature		−65°C to +175°C	−65°C to +150°C		
Maximum Power Dissipation					
Total Dissipation		250 mW	250 mW	500 mW	500 mW
Linear Derating Factor		1.67 mW/°C	2.0 mW/°C	4.0 mW/°C	2.85 mW/°C
Maximum Voltages and Currents					
WIV	Working Inverse Voltage	50 V	50 V	40 V	75 V
I_O	Average Rectified Current	75 mA	75 mA	200 mA	
I_F	Forward Current Steady State dc	115 mA	115 mA	400 mA	
i_f	Recurrent Peak Forward Current	225 mA	225 mA	600 mA	
i_f (surge)	Peak Forward Surge Current				
	Pulse Width = 1.0 s	500 mA	500 mA	1.0 A	
	Pulse Width = 1.0 μs	2.0 A	2.0 A	4.0 A	

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	1N3062		1.0	V	I_F = 20 mA
		1N3063, 1N4305	0.700	0.850	V	I_F = 10 mA
			0.610	0.710	V	I_F = 2.0 mA
			0.550	0.650	V	I_F = 1.0 mA
			0.505	0.575	V	I_F = 250 μA
		1N3064, 1N4454		1.0	V	I_F = 10 mA
I_R	Reverse Current			0.1	μA	V_R = 50 V
I_R				100	μA	V_R = 50 V, T_A = 150°C
BV	Breakdown Voltage		75		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time (Note 2)	1N4305, 1N3062		2.0	ns	I_f = 10 mA, V_r = 6.0 V, R_L = 100 Ω
		1N3063, 1N3064, 1N4454, 1N4305		4.0	ns	I_f = I_r = 10 mA, R_L = 100 Ω, V_r = 1.0 V
C	Capacitance (Note 4)	1N3062		1.0	pF	V_R = 0, f = 1.0 MHz
		1N3063, 1N3064, 1N4454, 1N4305		2.0	pF	V_R = 0, f = 1.0 MHz
RE	Rectification Efficiency		45		%	f = 1.0 MHz
$\Delta V_F/°C$	Forward Voltage Temperature Coefficient (Note 8)	1N3062, 1N3063, 1N3064		1.8		mV/°C
		1N4454, 1N4305		3.0		mV/°C

NOTES:

*Planar is a patented Fairchild process.

1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 1.0 mA.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
4. Rectification efficiency is defined as the ratio of dc load voltage to peak rf input voltage to the detector circuit, measured with 2.0 V rms input to the circuit. Load resistance 5.0 Ω, load capacitance 20 pF
5. When not specified, Fairchild reserves the right to ship 1N3062, 1N3063, 1N3064 in DO7 package.
6. This value for $\Delta V_F/°C$ is a typical value not a minimum or maximum.
7. For product family characteristic curves, refer to Section 5 - D6.

1N3067

GENERAL PURPOSE

DIFFUSED SILICON DIODE

- **C . . . 4.0 pF @ V_R = 0**
- **t_{rr} . . . 2.0 ns @ I_f = 10 mA, I_r = 60 mA**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−65° C to +200° C
Lead Temperature (2 seconds)	250° C
Maximum Power Dissipation	
Total Dissipation	250 mW
Linear Derating Factor	1.5 mW/°C
Maximum Voltage	
V_R Reverse Voltage	30 V

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0	V	I_F = 5.0 mA
I_R	Reverse Current		0.1	μA	V_R = 20 V
			100	μA	V_R = 20 V, T_A = 150° C
BV	Breakdown Voltage	30		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time (Note 2)		2.0	ns	I_f = 10 mA, I_r = 60 mA, R_L = 100 Ω, V_r = −6.0 V
			4.0	ns	I_f = 10 mA, I_r = 10 mA, V_r = −1.0 V, R_L = 100 Ω
C	Capacitance (Note 3)		4.0	pF	V_R = 0 V, f = 1.0 MHz
RE	Rectification Efficiency (Note 4)	35		%	V_{AC} = 2.0 V, C_L = 20 pF, R_L = 5.0 Ω, f = 100 MHz, Z source = 50 Ω
ΔV/°C	Thermal Coefficient		3.0	mV/°C	

4

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 1.0 mA.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
4. Rectification efficiency is defined as the ratio of dc load voltage to peak rf input voltage to the detector circuit, measured with 2.0 V rms input to the circuit. Load resistance 5.0 kΩ, load capacitance 20 pF.
5. For product family characteristic curves, refer to Section 5 — D6.

1N3069

HIGH CONDUCTANCE HIGH SPEED

DIFFUSED SILICON PLANAR* DIODE

- **BV . . . 65 V (MIN) @ I_R = 5.0 μA**
- **t_{rr} . . . 50 ns (MAX) @ $I_f = I_r$ = 30 mA**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−65° C to +200° C
Operating Temperature	175° C
Lead Temperature (2 seconds)	250° C
Maximum Power Dissipation	
Total Dissipation at 25° C Ambient Temperature	250 mW
Linear Derating Factor	1.5 mW/° C
Maximum Voltage	
WIV Working Inverse Voltage	65 V

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0	V	I_F = 50 mA
I_R	Reverse Current		100	nA	V_R = 50 V
			100	μA	V_R = 50 V, T_A = 150° C
BV	Breakdown Voltage	65		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time		50	ns	$I_f = I_r$ = 30 mA, R_L = 100 Ω, C_L = 10 pF, Recovery to 1.0 mA
C	Capacitance		6.0	pF	V_R = 0, f = 1.0 MHz
RE	Rectification Efficiency (Note 2)	30		%	f = 100 MHz
$\Delta V_F/°C$	Thermal Coefficient		3.0	mV/° C	

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Rectification efficiency is defined as the ratio of dc load voltage to peak rf input voltage to the detector circuit, measured with 2.0 V rms input to the circuit. Load resistance: 5.0 kΩ, load capacitance 20 pF.
3. For product family characteristic curves, refer to Section 5 — D6.

1N3070 • 1N3071

HIGH SPEED HIGH CONDUCTANCE

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 200 V (MIN)**
- **I_R . . . 100 nA (MAX)**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Temperature	−65°C to +175°C

Maximum Power Dissipation

Total Dissipation at 25°C Ambient Temperature	250 mW
at 125°C Ambient Temperature	85 mW

Maximum Voltage and Currents

WIV	Working Inverse Voltage	175 V
I_O	Average Rectified Current	100 mA
I_F	Forward Current Steady State DC	220 mA
I_f	Recurrent Peak Forward Current	300 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0A
	Pulse Width = 1.0 μs	4.0A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N3070 MIN.	1N3070 MAX.	1N3071 MIN.	1N3071 MAX.	UNITS	TEST CONDITIONS
I_R	Reverse Current		100			nA	V_R = 175 V
			100			μA	V_R = 175 V, T_A = 150°C
					100	nA	V_R = 150 V
					100	μA	V_R = 150 V, T_A = 150°C
BV	Breakdown Voltage	200		200		V	I_R = 100 μA
V_F	Forward Voltage		1.0	0.80	1.0	V	I_F = 100 mA
				0.53	0.63	V	I_F = 1.0 mA
				0.76	0.92	V	I_F = 50 mA
				0.64	0.74	V	I_F = 10 mA
C	Capacitance		5.0		5.0	pF	V_R = 0, f = 1.0 MHz
t_{rr}	Reverse Recovery Time (Note 2)		50			ns	$I_f = I_r$ = 30 mA, R_L = 100Ω
					40	ns	$I_f = I_r$ = 30 mA, R_L = 100Ω
					50	ns	$I_f = I_r$ = 30 mA, R_L = 150Ω
					400	ns	I_f = 30 mA, V_r = 35 V, R_L = 2.0 kΩ, C_L = 10 pF, Recover to 400 kΩ
Q_S	Stored Charge				250	pC	I_f = 20 mA, I_r = 1.0 mA
RE	Rectification Efficiency	35		35		%	f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 1.0 mA.
3. Rectification efficiency is defined as the ratio of dc load voltage to peak rf input voltage to the detector circuit, measured with 2.0 V rms input to the circuit. Load resistance: 5.0 kΩ, load capacitance 20 pF.
4. Leads are tinned. Gold-plate with nickel strike may be obtained when specified.
5. For product family characteristic curves, refer to Section 5-D4.

1N3595

HIGH CONDUCTANCE LOW LEAKAGE

DIFFUSED SILICON PLANAR* DIODE

- **BV . . . 150 V (MIN) @ 100 μA**
- **V_F . . . 1.0 V @ 200 mA**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +175°C
Operating Temperature		150°C
Maximum Power Dissipation		
Total Dissipation		500 mW
Linear Derating Factor		4.0 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	125 V
I_O	Average Rectified Current	150 mA
I_F	Forward Current Steady State	225 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	500 mA
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.83	1.0	V	I_F = 200 mA
		0.79	0.92	V	I_F = 100 mA
		0.75	0.88	V	I_F = 50 mA
		0.65	0.80	V	I_F = 10 mA
		0.60	0.75	V	I_F = 5.0 mA
		0.52	0.68	V	I_F = 1.0 mA
I_R	Reverse Current		1.0	nA	V_R = 125 V
			300	nA	V_R = 30 V, T_A = 125°C
			500	nA	V_R = 125 V
			3.0	μA	V_R = 125 V, T_A = 150°C
t_{rr}	Reverse Recovery Time		3.0	μs	I_f = 10 mA, V_r = 3.5 V, R_L = 1.0 kΩ
C	Capacitance (Note 3)		8.0	pF	V_R = 0, f = 1.0 MHz
BV	Breakdown Voltage	150		V	I_R = 100 μA

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
3. Capacitance as measured on Boonton Electronics Corporation Model No. 75A-S8 capacitance bridge or equivalent.
4. For product family characteristic curves, refer to Section 5 — D5.

1N3597

HIGH CONDUCTANCE LOW LEAKAGE

DIFFUSED SILICON PLANAR* DIODE

- **BV . . . 150 V (MIN) @ 100 μA**
- **V_F . . . 1.2 V (MAX) @ 400 mA**

See DO7-2 Package Outline and Note 4

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperature		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation		500 mW
Linear Derating Factor		3.3 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	150 V
I_O	Average Rectified Current	275 mA
I_F	Forward Current Steady State	425 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.2	V	I_F = 400 mA
I_R	Reverse Current		0.1	μA	V_R = 150 V
			100	μA	V_R = 150 V, T_A = 150°C
t_{rr}	Reverse Recovery Time		0.3	μs	I_f = 500 mA, V_r = 50 V
C	Capacitance (Note 3)		5.0	pF	V_R = 0, f = 1.0 MHz
B_V	Breakdown Voltage	150		V	I_R = 100 μA

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
3. Capacitance as measured on Boonton Electronics Corporation Model No. 75-AS8 capacitance bridge or equivalent.
4. When not specified, Fairchild reserves the right to supply in DO35 package.
5. For product family characteristic curves, refer to Section 5 — D4.

1N3600 • 1N4150 • 1N4450 • 1N4610

HIGH CONDUCTANCE ULTRA FAST

DIFFUSED SILICON PLANAR* EPITAXIAL DIODES

- t_{rr} . . . 4.0 ns (MAX)
- V_F . . . 1.0 V (MAX) @ 200 mA

See DO7-2 Package Outline & Note 1

ABSOLUTE MAXIMUM RATINGS (Note 2)

Maximum Temperatures					
Storage Temperature					−65°C to +175°C
Operating Temperature					165°C
Maximum Power Dissipation					
Total Power Dissipation					500 mW
Maximum Voltages and Currents		**1N3600**	**1N4150**	**1N4450**	**1N4610**
WIV	Working Inverse Voltage	50 V	50 V	30 V	55 V
I_O	Average Rectified Current	200 mA	200 mA	200 mA	200 mA
I_F	DC Forward Current	400 mA	400 mA	400 mA	400 mA
i_f	Recurrent Peak Forward Current	900 mA	600 mA	600 mA	600 mA
$i_{f(surge)}$	Peak Forward Surge Current				
	Pulse Width = 1.0 s	1.0 A	1.0 A	1.0 A	1.0 A
	Pulse Width = 1.0 μs	4.0 A	4.0 A	4.0 A	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N3600 1N4150 MIN.	1N3600 1N4150 MAX.	1N4450 MIN.	1N4450 MAX.	1N4610 MIN.	1N4610 MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage								
	1N3600	75						V	I_R = 5.0 μA
	1N4150	50						V	I_R = 100 μA
				40		80		V	I_R = 5.0 μA
I_R	Reverse Current		100					nA	V_R = 50 V
					50			nA	V_R = 30 V
							100	nA	V_R = 55 V
			100					μA	V_R = 50 V, T_A = 150°C
					50			μA	V_R = 30 V, T_A = 150°C
							100	μA	V_R = 55 V, T_A = 150°C
V_F	Forward Voltage			0.42	0.54	0.455	0.505	V	I_F = 0.1 mA
						0.53	0.59	V	I_F = 0.5 mA
		0.54	0.62	0.52	0.64	0.56	0.62	V	I_F = 1.0 mA
						0.640	0.705	V	I_F = 5.0 mA
		0.66	0.74	0.64	0.76	0.67	0.74	V	I_F = 10 mA
		0.76	0.86			0.76	0.84	V	I_F = 50 mA
		0.82	0.92	0.80	0.92	0.80	0.90	V	I_F = 100 mA
		0.87	1.0		1.0	0.85	1.0	V	I_F = 200 mA
						0.875	1.10	V	I_F = 300 mA
C	Capacitance (Note 3)		2.5		4.0		2.0	pF	V_R = 0, f = 1.0 MHz
t_{rr}	Reverse Recovery Time		4.0				4.0	ns	I_f = I_r = 10 mA to 200 mA, R_L = 100 Ω
					4.0			ns	I_f = I_r = 10 mA, R_L = 100 Ω
							2.0	ns	I_f = 10 mA, V_r = 6.0 V, R_L = 100 Ω
			6.0					ns	I_f = I_r = 200 mA to 400 mA, R_L = 100 Ω
t_{fr}	Forward Recovery Time								
	1N4150,1N4610		10				10	ns	I_f = 200 mA, t_r = 0.4 ns, V_{fr} = 1.0 V

*Planar is a patented Fairchild process.

NOTES:
1. Fairchild retains the option of supplying the 1N4610 in the DO-7 package.
2. Maximum ratings are limiting values above which life or satisfactory performance may be impaired.
3. Capacitance as measured on Boonton Model 75-AS8 capacitance bridge or equivalent.
4. Recovery to 0.1 I_F.
5. For family characteristic curves, refer to Section 5 - D6.

1N4001 through 1N4005

NITRIDE PASSIVATED GLASS RECTIFIER

DIFFUSED SILICON PLANAR* DIODES

- **GLASS PACKAGE . . . NON-FLAMMABLE, HERMETIC**
- **NITRIDE PASSIVATED . . . FOR JUNCTION STABILITY**

See DO41-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	175°C

Maximum Voltages and Current

		1N4001	1N4002	1N4003	1N4004	1N4005
$V_{RM(rep)}$	Peak Repetitive Reverse Voltage	50 V	100 V	200 V	400 V	600 V
$V_{RM(wkg)}$	Working Peak Reverse Voltage	50 V	100 V	200 V	400 V	600 V
V_R	DC Blocking Voltage	50 V	100 V	200 V	400 V	600 V
$V_{RM(non\text{-}rep)}$	Non-Repetitive Peak Reverse Voltage (half/wave, single phase, 60 Hz Peak)	50 V	100 V	200 V	400 V	600 V
V_{RM}	rms Input Voltage	35 V	70 V	140 V	280 V	420 V
I_O	Average Rectified Forward Current	1.0 A	1.0 A	1.0 A	1.0 A	1.0 A
$I_{FM(surge)}$	Non-Repetitive Peak Surge Current	30 A	30 A	30 A	30 A	30 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	TYP.	MAX.	UNITS	TEST CONDITIONS
V_F	Maximum Instantaneous Forward Voltage Drop	0.95	1.10	V	I_F = 1.0 A
V_F (AV)	Maximum Full Cycle Average Forward Voltage Drop	0.75	0.80	V	I_O = 1.0 A, T_A = 75°C
I_R	Maximum Reverse Current	0.01	10	μA	(Rated dc Voltage)
		0.50	50	μA	T_A = 100°C
I_R (AV)	Maximum Full Cycle Average Reverse Current	1.0	30	μA	(Rated Reverse Voltage and I_O)

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. For product family characteristic curves, refer to Section 5-D10.

1N4009 • 1N4536

ULTRA HIGH SPEED

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 35 V (MIN) @ 5.0 μA**
- **C . . . 4.0 pF (MAX) @ V_R = 0, f = 1.0 MHz**
- **t_{rr} . . . 4.0 ns (MAX) @ I_f = I_r = 10 mA**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Lead Temperature	300°C

Maximum Power Dissipation (Note 2)

	1N4009	**1N4536**
Total Dissipation	250 mW	500 mW
Linear Derating Factor	1.5 mW/°C	2.85 mW/°C

Maximum Voltage

WIV Working Inverse Voltage	25 V	25 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0	V	I_F = 30 mA
I_R	Reverse Current		0.1	μA	V_R = 50 V
			100	μA	V_R = 50 V, T_A = 150°C
BV	Breakdown Voltage	35		V	I_F = 5.0 μA
t_{rr}	Reverse Recovery (Note 5)		4.0	ns	I_f = I_r = 10 mA
			2.0	ns	I_f = 10 mA, V_r = 6.0 V, R_L = 100Ω
C	Capacitance (Note 3)		4.0	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. This power rating is based on a maximum junction temperature of 200°C.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
4. Rectification efficiency is defined as the ratio of dc load voltage to peak rf input voltage to the detector circuit, measured with 2.0 V rms input to the circuit. Load resistance 5 kΩ, load capacitance 20 pF.
5. Recovery to 1.0 mA.
6. For additional product family characteristic curves, refer to Section 5-D6.

1N4086

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* EPITAXIAL DIODE

- V_F . . . 1.0 V (MAX) @ 100 mA
- I_R . . . 250 nA (MAX) @ 70 V

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−65°C to +200°C
Lead Temperature (2 seconds)	250°C
Maximum Power Dissipation	
Total Dissipation	400 mW
Linear Derating Factor	2.7 mW/°C
Maximum Voltage	
WIV Working Inverse Voltage	70 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		1.0	V	I_F = 200 mA
I_R	Reverse Current		0.25	μA	V_R = 70 V
t_{rr}	Reverse Recovery		200	ns	V_r = 10 V
t_{fr}	Forward Recovery		75	ns	I_f = 300 mA
C	Capacitance (Note 2)		10	pF	V_R = 10 V, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Capacitance as measured on Boonton Electronic Corporation's Model No. 75-AS8 capacitance bridge or equivalent.
3. For product family characteristic curves, refer to Section 5 - D6.

1N4151 • 1N4152 • 1N4153 • 1N4154

ULTRA HIGH SPEED

SILICON PLANAR* EPITAXIAL DIODES

- C . . . 4 pF @ V_R = 0, f = 1.0 MHz
- t_{rr} . . . 2.0 ns @ I_F = 10 mA, V_R = −6.0 V, R_L = 100 Ω

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperature

Storage Temperature	−65°C to +200°C
Lead Temperature (20 seconds)	300°C

Maximum Power Dissipation (Note 2)

	1N4151	1N4152	1N4153	1N4154
Total Dissipation at 25°C Ambient Temperature	500 mW	500 mW	500 mW	500 mW
Linear Derating Factor	2.85 mW/°C	2.85 mW/°C	2.85 mW/°C	2.85 mW/°C

Maximum Voltage

V_R Reverse Voltage	75 V	40 V	75 V	35 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	1N4154		1.0	V	I_F = 30 mA
		1N4151		1.0	V	I_F = 50 mA
		1N4152 & 1N4153	0.49	0.55	V	I_F = 0.1 mA
			0.53	0.59	V	I_F = 0.25 mA
			0.59	0.67	V	I_F = 1.0 mA
			0.62	0.70	V	I_F = 2.0 mA
			0.70	0.81	V	I_F = 10 mA
			0.74	0.88	V	I_F = 20 mA
I_R	Reverse Current	1N4154		0.1	μA	V_R = 25 V
				100	μA	V_R = 25 V, T_A = 150°C
		1N4153, 1N4151		0.05	μA	V_R = 50 V
				50	μA	V_R = 50 V, T_A = 150°C
		1N4152		0.05	μA	V_R = 30 V
				50	μA	V_R = 30 V, T_A = 150°C
BV	Breakdown Voltage	1N4154	35		V	I_R = 5.0 μA
		1N4153, 1N4151	75		V	I_R = 5.0 μA
		1N4152	40		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time			4.0	ns	I_f = 10 mA, I_r = 10 mA (Note 3)
				2.0	ns	I_f = 10 mA, V_r = −6.0 V, R_L = 100Ω
C	Capacitance			4.0	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
3. Recovery to 1.0 mA.
4. For product family characteristic curves, refer to Section 5-D6.

1N4244

PICOSECOND COMPUTER

DIFFUSED SILICON PLANAR* DIODE

- **C . . . 0.8 pF @ V_R = 0 V**
- **t_{rr} . . . 0.75 ns @ $I_f = I_r$ = 10 mA,**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +150°C
Operating Temperature		150°C
Maximum Power Dissipation		
Total Dissipation		250 mW
Linear Derating Factor		2.0 mW/°C
Maximum Voltages and Currents		
WIV	Working Inverse Voltage	10 V
I_O	Average Rectified Current	50 mA
i_f	Recurrent Peak Forward Current	150 mA
$i_{f(surge)}$	Peak Forward Surge Current Pulse Width = 1.0 s	150 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	20		V	I_R = 5.0 μA
V_F	Forward Voltage		1.0	V	I_F = 20 mA
I_{R1}	Reverse Current		100	nA	V_R = 10 V
I_{R2}	Reverse Current		250	nA	V_R = 15 V
I_{R3}	Reverse Current		100	μA	V_R = 10 V, T_A = 150°C
C	Capacitance (Note 3)		0.8	pF	V_R = 0 V, f = 1.0 MHz
t_{rr}	Reverse Recovery Time (Note 2)		0.75	ns	$I_f = I_r$ = 10 mA, R_L = 100 Ω

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 0.1 I_R.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
4. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
5. For product family characteristic curves, refer to Section 5 — D7.

1N4306 • 1N4307

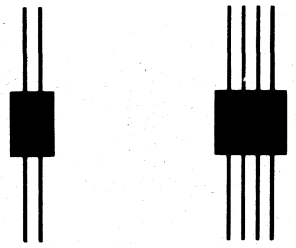
HIGH CONDUCTANCE ULTRA FAST

DIFFUSED SILICON PLANAR* EPITAXIAL DIODES

- **ΔV_F . . . 10-20 mV (MAX)**
- **C . . . 2.0 pF @ V_R = 0, f = 1.0 MHz**
- **t_{rr} . . . 4.0 ns (MAX) @ $I_f = I_r$ = 10 mA**
- **MATCHED PAIR (1N4306)**
- **MATCHED QUAD (1N4307)**

See Package Outlines

TO308-1 **TO310-1**



1N4306 **1N4307**

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

Storage Temperature		−65°C to +150°C
Operating Temperature		150°C

Maximum Power Dissipation

Total Dissipation at 25°C Ambient Temperature		500 mW
at 125°C Ambient Temperature	1N4306	100 mW
	1N4307	170 mW

Maximum Voltage and Currents

WIV	Working Inverse Voltage	50 V
I_O	Average Rectified Current	200 mA
i_f	Recurrent Peak Forward Current	600 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_{F1}	Forward Voltage	0.440	0.550	V	I_F = 100 μA
V_{F2}	Forward Voltage	0.560	0.670	V	I_F = 1.0 mA
V_{F3}	Forward Voltage	0.670	0.810	V	I_F = 10 mA
V_{F4}	Forward Voltage	0.750	1.0	V	I_F = 50 mA
I_{R1}	Reverse Current		50	nA	V_R = 50 V
I_{R2}	Reverse Current		5.0	μA	V_R = 75 V
I_{R3}	Reverse Current		50	μA	V_R = 50 V, T_A = 150°C
C	Capacitance		2.0	pF	V_R = 0, f = 1.0 MHz
t_{rr}	Reverse Recovery Time (Note 2)		4.0	ns	$I_f = I_r$ = 10 mA, R_L = 100 Ω
ΔV_{F1}	Forward Voltage Match		10	mV	I_F = 0.1 to 10 mA, T_A = −55°C to +125°C
ΔV_{F2}	Forward Voltage Match		20	mV	I_F = 10 to 50 mA, T_A = −55°C to +125°C

*Planar is a patented Fairchild process

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 10% of I_F.
3. For product family characteristic curves, refer to Section 5 - D6.

1N4376

PICOSECOND COMPUTER

DIFFUSED SILICON PLANAR* DIODE

- **BV . . . 20 V (MIN) @ 5.0 μA**
- **t_{rr} . . . = 750 ps @ $I_f = I_r = 10$ mA,**
- **C . . . 1.0 pF (MAX) @ $V_R = 0$**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +175°C
Operating Temperature		150°C
Maximum Power Dissipation		
Total Dissipation		250 mW
Linear Derating Factor		2.0 mW/°C
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	10 V
I_O	Average Rectified Current	50 mA
i_f	Recurrent Peak Forward Current	150 mA
i_f (surge)	Peak Forward Surge Current	
	Pulse Width = 1.0 s	150 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTICS	MIN.	MAX.	UNITS	TEST CONDITIONS
B_V	Breakdown Voltage	20		V	$I_R = 5.0$ μA
I_R	Reverse Current		100	nA	$V_R = 10$ V
			100	μA	$V_R = 10$ V, $T_A = 150$°C
V_{F1}	Forward Voltage	0.89	1.10	V	$I_F = 50$ mA
V_{F2}	Forward Voltage	0.81	0.95	V	$I_F = 20$ mA
V_{F3}	Forward Voltage	0.76	0.88	V	$I_F = 10$ mA
V_{F4}	Forward Voltage	0.64	0.74	V	$I_F = 1.0$ mA
V_{F5}	Forward Voltage	0.52	0.61	V	$I_F = 0.1$ mA
V_{F6}	Forward Voltage	0.42	0.50	V	$I_F = 0.01$ mA
t_{rr}	Reverse Recovery Time (Note 2)		750	ps	$I_f = I_r = 10$ mA, $R_L = 100\ \Omega$
C	Capacitance (Note 3)		1.0	pF	$V_R = 0$ V, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 0.1 I_R.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
4. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
5. For product family characteristic curves, refer to Section 5-D7.

1N4531 • 1N4532

ULTRA COMPACT HIGH CONDUCTANCE ULTRA FAST

DIFFUSED SILICON PLANAR* EPITAXIAL DIODES

- **V_F . . . 1.0 V (MAX) @ 10 mA**
- **C . . . 2.0 pF (MAX) (1N4532), 4.0 pF (MAX) 1N4531**

See DO34-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperatures	−65°C to +200°C
Operating Temperature	150°C
Maximum Power Dissipation (Package)	
Total Dissipation	350 mW
Linear Derating Factor	2.8 mW/°C
Maximum Voltage	
WIV Working Inverse Voltage	75 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage			1.0	V	I_F = 10 mA
I_R	Reverse Current	1N4531		25	nA	V_R = 20 V
		1N4532		0.1	μA	V_R = 50 V
		1N4531		50	μA	V_R = 20 V, T_A = 150°C
		1N4532		100	μA	V_R = 50 V, T_A = 150°C
BV	Breakdown Voltage	1N4531	100		V	I_R = 100 μA
		1N4532	75		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time (Note 2)	1N4531		4.0	ns	I_f = 10 mA, V_r = 6.0 V
		1N4532		2.0	ns	I_f = 10 mA, V_r = 6.0 V
		1N4532		4.0	ns	I_f = I_r = 10 mA
V_{fr}	Forward Recovery Peak Voltage (Note 3)	1N4532		3.0	V	I_f = 100 mA (pulsed)
C	Capacitance (Note 4)	1N4531		4.0	pF	V_R = 0, f = 1.0 MHz
		1N4532		2.0	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:

1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 1.0 mA. R_L = 100 Ω.
3. I_F = 100 mA peak square wave; 0.1 μs pulse width; R_L = 50 Ω; $T_R \leq$ 30 ns; Rep. Rate = 5-100 kHz.
4. Capacitance as measured on Boonton Electronic Corporation Model No. 75 — AS8 capacitance bridge or equivalent.
5. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
6. For product family characteristic curves, refer to Section 5 — D6.

1N4533 • 1N4534

ULTRA HIGH SPEED

DIFFUSED SILICON PLANAR* DIODES

- **C . . . 2.0 pF @ V_R = 0, f = 1.0 MHz**
- **t_{rr} . . . 4.0 ns @ I_f = I_r = 10 mA**

See DO34-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature	–65°C to +200°C	
Lead Temperature (10 seconds)	300°C	
Maximum Power Dissipation		
Total Dissipation	500 mW	
Linear Derating Factor	2.85 mW/°C	
Maximum Voltage	**1N4533**	**1N4534**
WIV Working Inverse Voltage	40 V	50 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		0.490	0.550	V	I_F = 0.1 mA
			0.530	0.590	V	I_F = 0.25 mA
			0.590	0.670	V	I_F = 1.0 mA
			0.620	0.700	V	I_F = 2.0 mA
			0.700	0.810	V	I_F = 10 mA
			0.740	0.880	V	I_F = 20 mA
I_R	Reverse Current	1N4533		0.05	μA	V_R = 30 V
		1N4534		0.05	μA	V_R = 50 V
		1N4533		50	μA	V_R = 30 V, T_A = 150°C
		1N4534		50	μA	V_R = 50 V, T_A = 150°C
BV	Breakdown Voltage	1N4533	40		V	I_R = 5.0 μA
		1N4534	75		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time (Note 2)			4.0	ns	I_f = I_r = 10 mA
				2.0	ns	I_f = 10 mA, V_r = –6.0 V, R_L = 100 Ω
C	Capacitance (Note 3)			2.0	pF	V_R = 0 V, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 1.0 mA.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75 — AS8 capacitance bridge or equivalent.
4. For product family characteristic curves, refer to Section 5 — D6.

1N4607

MINIATURE SIZE HIGH CONDUCTANCE ULTRA FAST

DIFFUSED SILICON PLANAR* EPITAXIAL DIODE

- **t_{rr} . . . 4 ns (MAX) @ $I_f = I_r = 500$ mA**
- **BV . . . 85 V (MIN) @ 100 μA**
- **C . . . 4.0 pF (MAX) @ $V_R = 0$**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation		500 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	70 V
I_O	Average Rectified Current	200 mA
I_F	DC Forward Current	400 mA
i_f	Recurrent Peak Forward Current	600 mA
$I_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV	Breakdown Voltage	85		V	$I_R = 100\ \mu A$
I_R	Reverse Current		100	nA	$V_R = 50$ V
			25	μA	$V_R = 50$ V, $T_A = 100°C$
			250	nA	$V_R = 70$ V
V_F	Forward Voltage Drop	0.39	0.50	V	$I_F = 0.1$ mA
		0.50	0.61	V	$I_F = 1.0$ mA
		0.61	0.72	V	$I_F = 10$ mA
	(Note 4)	0.74	0.87	V	$I_F = 100$ mA
	(Note 4)	0.81	0.95	V	$I_F = 250$ mA
	(Note 4)		1.0	V	$I_F = 350$ mA
	(Note 4)		1.1	V	$I_F = 400$ mA
C	Capacitance (Note 2)		4.0	pF	$V_R = 0$
t_{rr}	Reverse Recovery Time (Note 3)		10	ns	$I_f = I_r = 10$ mA, $R_L = 100\ \Omega$
			15	ns	$I_f = I_r = 500$ mA, $R_L = 100\ \Omega$

*Planar is a patented Fairchild process.

NOTES:
1. Maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Capacitance as measured on Boonton Model 75-AS8 capacitance bridge or equivalent.
3. Recovery to 0.1 I_R.
4. Pulse conditions: length ≤ 300 μs; duty cycle ≤ 2%.
5. For family characteristic curves, refer to Section 5 - D6.

1N4727

MINIATURE SIZE HIGH CONDUCTANCE

ULTRA FAST SILICON PLANAR* EPITAXIAL DIODE

- **BV . . . 30 V (MIN) @ 5.0 μA**
- **C . . . 4.0 pF (MAX) V_R = 0 V**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +175°C
Operating Temperature		150°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		500 mW
Total Dissipation at 125°C Ambient Temperature		100 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	20 V
I_O	Average Rectified Current	200 mA
I_F	DC Forward Current	400 mA
i_f	Recurrent Peak Forward Current	600 mA
i_f (surge)	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage		0.85	V	I_F = 10 mA
I_{R1}	Reverse Current		100	nA	V_R = 20 V
I_{R2}	Reverse Current		10	μA	V_R = 20 V, T_A = 100°C
BV	Breakdown Voltage	30		V	I_R = 5.0 μA
Q_S	Stored Charge (Note 2)		40	pC	I_f = 10 mA
C	Capacitance (Note 3)		4.0	pF	V_R = 0 V

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Stored charge as measured on B-Line Corporation Model No. QS-3 stored charge meter or equivalent.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75 — AS8 capacitance bridge or equivalent.
4. Leads are tinned, gold plate with nickel strike may be obtained when specified.
5. For product family characteristic curves, refer to Section 5 — D6.

1N4950

HIGH CONDUCTANCE ULTRA FAST

DIFFUSED SILICON PLANAR* EPITAXIAL DIODE

- **BV . . . 30 V (MIN) @ 5.0 μA**
- **t_{rr} . . . 4.0 ns (MAX) @ $I_f = I_r$ = 10 mA to 200 mA**

See DO7-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Temperature		175°C
Maximum Power Dissipation		
Total Dissipation at 25°C Ambient Temperature		500 mW
at 125°C Ambient Temperature		170 mW
Maximum Voltage and Currents		
WIV	Working Inverse Voltage	25 V
I_O	Average Rectified Current	200 mA
i_f	Recurrent Peak Forward Current	900 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	0.87	1.0	V	I_F = 300 mA
		0.53	0.61	V	I_F = 1.0 mA
		0.64	0.72	V	I_F = 10 mA
		0.72	0.82	V	I_F = 50 mA
		0.77	0.87	V	I_F = 100 mA
		0.83	0.93	V	I_F = 200 mA
I_R	Reverse Current		100	nA	V_R = 25 V
			100	μA	V_R = 25 V, T_A = 150°C
BV	Breakdown Voltage	30		V	I_R = 5.0 μA
C	Capacitance (Note 3)		3.3	pF	V_R = 0
t_{rr}	Reverse Recovery Time (Note 2)		4.0	ns	$I_f = I_r$ = 10 mA to 200 mA, R_L = 100 Ω

*Planar is a patented Fairchild process.

NOTES:

1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 0.1 I_R.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75 — AS8 capacitance bridge or equivalent.
4. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
5. For product family characteristic curves, refer to Section — 5D6.

1N5282

HIGH CONDUCTANCE ULTRA FAST

DIFFUSED SILICON PLANAR* EPITAXIAL DIODE

- **BV . . . 80 V (MIN) @ 5.0 μA**
- **C . . . 2.5 pF @ V_R = 0 V, f = 1.0 MHz**
- **t_{rr} . . . 4.0 ns @ $I_f = I_r$ = 10 mA to 200 mA**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperatures		−65°C to +175°C
Operating Temperature		150°C
Maximum Power Dissipation		
Total Dissipation		500 mW
Linear Derating Factor		4.0 mW/°C
Maximum Voltages and Currents		
WIV	Working Inverse Voltage	55 V
I_O	Average Rectified Current	200 mA
$i_{f(surge)}$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 μs	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage	1.05	1.30	V	I_F = 500 mA (Note 5)
		0.92	1.10	V	I_F = 300 mA
		0.80	0.90	V	I_F = 100 mA
		0.67	0.725	V	I_F = 10 mA
		0.55	0.60	V	I_F = 1.0 mA
		0.45	0.49	V	I_F = 0.1 mA
I_R	Reverse Current		100	nA	V_R = 55 V
			100	μA	V_R = 55 V, T_A = 150°C
BV	Breakdown Voltage	80		V	I_R = 5.0 μA
t_{rr}	Reverse Recovery Time (Note 2)		4.0	ns	$I_f = I_r$ = 10 mA to 200 mA, R_L = 100 Ω
t_{rr}	Reverse Recovery Time		2.0	ns	I_f = 10 mA, V_r = 6.0 V, R_L = 100 Ω
t_{fr}	Forward Recovery Time		10	ns	I_f = 200 mA (Note 7)
V_{pk}	Peak Forward Voltage		2.0	V	I_f = 500 mA (Note 8)
C	Capacitance (Note 3)		2.5	pF	V_R = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:

1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Recovery to 0.1 I_F.
3. Capacitance as measured on Boonton Electronic Corporation Model No. 75 — AS8 capacitance bridge or equivalent.
4. Leads are tinned. Gold plate with nickel strike may be obtained when specified.
5. Pulse conditions: length = 300 μs; duty cycle ≤ 1%.
6. For product family characteristic curves, refer to Section 5 — D6.
7. t_r = 0.4 ns, V_{fr} = 1.0 V, pulse width = 100 ns; duty cycle ≤ 1%.
8. t_r = 8.0 ns, pulse width = 1.0 μs; duty cycle ≤ 1%.

1N5317 • 1N5318 • 1N5319

ULTRA COMPACT HIGH CONDUCTANCE ULTRA FAST

DIFFUSED SILICON PLANAR* EPITAXIAL DIODES

- **C . . . 2.5 pF @ V_R = 0, f = 1.0 MHz**
- **I_R . . . 100 μA (MAX)**
- **t_{rr} . . . 2.0 ns @ I_F = 10 mA, V_R = 6.0 V, R_L = 100 Ω**

See DO34-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−65°C to +175°C
Operating Junction Temperature				150°C
Maximum Power Dissipation (Package) (Note 2)				
Total Dissipation				350 mW
Linear Derating Factor				2.8 mW/°C
Maximum Voltages and Currents		**1N5317**	**1N5318**	**1N5319**
WIV	Working Inverse Voltage	55 V	50 V	25 V
I_O	Average Rectified Current	125 mA	125 mA	100 mA
i_f	Recurrent Peak Forward Current	400 mA	400 mA	400 mA
$i_{f(surge)}$	Peak Forward Surge Current			
	Pulse Width = 1.0 s	500 mA	500 mA	500 mA
	Pulse Width = 1.0 μs	2.0 A	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	1N5317 MIN.	1N5317 MAX.	1N5318 MIN.	1N5318 MAX.	1N5319 MIN.	1N5319 MAX.	UNITS	TEST CONDITIONS
V_F	Forward Voltage (Note 3)	1.05	1.30					V	I_F = 500 mA
		0.92	1.10					V	I_F = 300 mA
				0.87	1.0			V	I_F = 200 mA
		0.80	0.90	0.82	0.92		1.0	V	I_F = 100 mA
				0.76	0.86				I_F = 50 mA
		0.67	0.725	0.66	0.74				I_F = 10 mA
		0.55	0.60	0.54	0.62				I_F = 1.0 mA
		0.45	0.49						I_F = 0.1 mA
I_R	Reverse Current		0.1					μA	V_R = 55 V
					0.1			μA	V_R = 50 V
							0.1	μA	V_R = 25 V
			100					μA	V_R = 55 V, T_A = 150°C
					100			μA	V_R = 50 V, T_A = 150°C
							100	μA	V_R = 25 V, T_A = 150°C
BV	Breakdown Voltage	80		75		40		V	I_R = 5.0 μA
t_{rr1}	Reverse Recovery Time (Note 4)		4.0		4.0		4.0	ns	$I_f = I_r$ = 10 mA to 200 mA, R_L = 100 Ω
t_{rr2}	Reverse Recovery Time (Note 4)		2.0					ns	I_f = 10 mA, V_r = 6.0 V, R_L = 100 Ω
					6.0		6.0	ns	$I_f = I_r$ = 200 mA to 400 mA, R_L = 100 Ω
C	Capacitance (Note 5)		2.5		2.5		3.5	pF	V_R = 0, f = 1.0 MHz
t_{fr}	Forward Recovery Time (Note 6)		10					ns	I_f = 200 mA
V_{pk}	Peak Forward Voltage (Note 7)		2.0					V	I_f = 500 mA

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. Heat sink in copper block 1/4" from diode body.
3. Pulse conditions: length = 300 μs; duty cycle ≤ 1%.
4. Recovery to 0.1 I_r.
5. Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 capacitance bridge or equivalent.
6. t_r = 0.4 ns, V_{fr} = 1.0 V; Pulse width = 100 ns, duty cycle ≤ 1%.
7. t_r = 8.0 ns; Pulse width = 1.0 μs; duty cycle ≤1%.
8. For product family characteristic curves, refer to Section 5 - D6.

1N5794 • 1N5795 • 1N5796 • 1N5797 • 1N5798

1 AMP GLASS ENCAPSULATED RECTIFIER

DIFFUSED SILICON PLANAR* DIODES

- **HERMETIC (Glass) PACKAGE**
- **NITRIDE PASSIVATION FOR JUNCTION STABILITY**
- **DOUBLE STUD CONSTRUCTION**

See DO41-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Temperature	175°C
Lead Temperature	300°C

Maximum Voltages and Currents		**1N5794**	**1N5795**	**1N5796**	**1N5797**	**1N5798**
$V_{RM(wkg)}$	Working Peak Reverse Voltage	50 V	100 V	200 V	400 V	600 V
$V_{RM(rep)}$	Repetitive Peak Reverse Voltage	50 V	100 V	200 V	400 V	600 V
$V_{RM(non\text{-}rep)}$	Non-Repetitive Peak Reverse Voltage	60 V	120 V	240 V	480 V	720 V
V_R	DC Blocking Voltage	50 V	100 V	200 V	400 V	600 V
		ALL DEVICES				
I_O	Average dc Forward Current (Note 2)	1.0 A				
$i_{f(surge)}$	Surge Current @ T_A = 100°C	0.75 A				
	@ T_A = 75°C	30 A				

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
I_{RO}	Reverse Current		30	μA	T_A = 75°C, V_R = Rated $V_{RM(wkg)}$
I_R	DC Reverse Current		200	μA	T_A = 175°C, Rated V_R
V_F	Forward Voltage		0.98	V	T_A = 75°C, I_F = 1.0 A

*Planar is a patented Fairchild process.

NOTES:
1. The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
2. T_A = −20°C to +75°C.
3. For product family characteristics, refer to Section 5 - D10.

1S44

GENERAL PURPOSE SWITCHING

DIFFUSED SILICON PLANAR* DIODES

- **BV . . . 50 V (MIN) @ 100 μA**
- **V_F . . . 1.15 V (MAX) @ 10 mA**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Temperature	175°C

Maximum Power Dissipation

Total Dissipation at 25°C Ambient Temperature	500 mW
Linear Derating Factor	3.33 mW/°C

Maximum Currents and Voltage

i_f	Recurrent Peak Forward Current	225 mA
$i_{f(surge)}$	Surge Current (1.0 s pulse)	500 mA
I_O	Average Forward Current (−65°C to +25°C) (derates at 1.0 mA/°C above 25°C)	75 mA
PIV	Peak Inverse Voltage	40 V

ELECTRICAL CHARACTERISTICS: (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
I_R	Inverse Current		50	nA	V_R = 10 V
V_F	Forward Voltage		1.15	V	I_F = 10 mA
B_V	Reverse Voltage	50		V	I_R = 100 μA
C	Capacitance		6.0	pF	V_R = 0
Q_S	Stored Charge		120	pC	I_F = 10 mA, V_R = 10 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. For product family characteristic curves, refer to Section 5 - D6.

1S920 • 1S921 • 1S922 • 1S923

GENERAL PURPOSE

DIFFUSED SILICON PLANAR* DIODES

- **V_F . . . 1.2 (MAX) @ 200 mA**
- **I_R . . . 100 nA (MAX) @ RATED WIV**

See DO35-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Temperature	200°C
Lead Temperature (2 seconds)	300°C

Maximum Power Dissipation

Total Dissipation at 25°C Ambient Temperature	250 mW
Linear Derating Factor	2.0 mW/° C

Maximum Voltage and Currents

		1S920	1S921	1S922	1S923
WIV	Working Inverse Voltage (−65°C to +100°C)	50 V	100 V	150 V	200 V
I_O	Average Forward Current	200 mA	200 mA	200 mA	200 mA
i_f	Recurrent Peak Forward Current	2.0 A	2.0 A	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTICS	MIN.	MAX.	UNITS	TEST CONDITIONS
I_R	Inverse Current		100	nA	V_R = rated WIV
			10	μA	V_R = rated WIV, T_A = 100°C
V_F	Forward Voltage (Note 2)		1.2	V	I_F = 200 mA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ≤ 2%.
3. For product family characteristic curves, refer to Section 5-D4.

2N706 • 2N706A • MPS706 • MPS706A

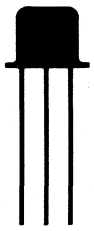
NPN HIGH SPEED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (MPS706, MPS706A)
- V_{CER} . . . 20 V (MIN) @ 10 mA
- h_{FE} . . . 20 (MIN) @ 10 mA
- τ_s . . . 60 ns (MAX) (2N/MPS706), 25 ns (MAX) (2N/MPS706A)
- COMPLEMENTS . . . 2N3012 (TO18), MPS3640 (TO92)

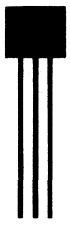
See Package Outlines

TO18-1



2N706
2N706A

TO92-1



MPS706
MPS706A

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	**2N706/706A**	**MPS706/706A**
Storage Temperature	−65°C to +175°C	−55°C to +150°C
Operating Junction Temperature	175°C	150°C
Lead Temperature (10 seconds)	300°C	300°C

Maximum Power Dissipation	**2N706/706A**	**MPS706/706A**
Total Dissipation at 25°C Ambient Temperature	0.3 W	0.625 W
at 25°C Case Temperature	1.0 W	1.0 W

Maximum Voltages		**2N/MPS706**	**2N/MPS706A**
V_{CBO}	Collector to Base Voltage	25 V	25 V
V_{CER}	Collector to Emitter Voltage ($R_{BE} \leq 10\Omega$) (Note 4)	20 V	20 V
V_{EBO}	Emitter to Base Voltage	3.0 V	5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOLS	CHARACTERISTIC	MPS706 MIN.	MPS706 MAX.	MPS706A MIN.	MPS706A MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	20		20	60		V_{CE} = 1.0 V, I_C = 10 mA
$V_{BE\ (sat)}$	Base to Emitter Saturation Voltage (Note 5)		0.9	0.7	0.9	V	I_C = 10 mA, I_B = 1.0 mA
$V_{CE\ (sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.6		0.6	V	I_C = 10 mA, I_B = 1.0 mA
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 10 mA, V_{CE} = 15 V, f = 100 MHz
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = 10 V, I_E = 0. f = 100 kHz
I_{CBO}	Collector Cutoff Current		500		500	nA	V_{CB} = 15 V, I_E = 0
τ_s	Charge Storage Time Constant (see test circuit no. 588)		60		25	ns	I_C = 10 mA, V_{CC} = 10 V, I_{B1} = I_{B2} = 10 mA
I_{EBO}	Emitter Cutoff Current		10		10	μA	V_{EB} = 3.0 V, I_C = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	15		15		V	I_C = 10 mA, I_B = 0
BV_{CER}	Collector to Emitter Breakdown Voltage	20		20		V	I_C = 10 mA, R_{BE} = 10 Ω
BV_{CBO}	Collector to Base Breakdown Voltage	25		25			I_C = 10 μA, I_E = 0
r_b'	Base Resistance		50		50	Ω	I_E = 10 mA, V_{CE} = 15 V, f = 300 MHz
t_{on}	Turn On Time (see test circuit no. 589)		40		40	ns	I_C = 10 mA, I_{B1} = 3.0 mA, V_{CC} = 3.0 V
t_{off}	Turn Off Time (see test circuit no. 589)		75		75	ns	I_C = 10 mA, I_{B1} = 3.0 mA, I_{B2} = 1.5 mA, V_{CC} = 3.0 V

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 150°C/W (derating factor of 6.7 mW/°C); for 2N706 and 2N706A. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for MPS706, MPS706A.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length ≤ 12 μs; duty cycle = 1% for MPS706/A; length = 300 μs; duty cycle = 1% for 2N706/A.
6. For product family characteristic curves, refer to Section 5 - SS5 for 2N706, MPS706 and MPS706A; Section 5 - SS28 for 2N706A.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N706 MIN.	2N706 MAX.	2N706A MIN.	2N706A MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	20		20	60		V_{CE} = 1.0 V, I_C = 10 mA
$V_{BE\ (sat)}$	Base to Emitter Saturation Voltage (Note 5)		0.9	0.7	0.9	V	I_C = 10 mA, I_B = 1.0 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.6		0.6	V	I_C = 10 mA, I_B = 1.0 mA
h_{fe}	High Frequency Current Gain	2.0					I_C = 10 mA, V_{CE} = 15 V, f = 100 MHz
				2.0			I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		6.0			pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
					5.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 1.0 MHz
I_{CBO}	Collector Cutoff Current		300		500	nA	V_{CB} = 15 V, I_E = 0
			30		30	μA	V_{CB} = 15 V, I_E = 0, T_A = 150°C
τ_s	Charge Storage Time Constant (see test circuit no. 3111)		60		25	ns	I_C = 10 mA, V_{CC} = 10 V, I_{B1} = I_{B2} = 10 mA
I_{EBO}	Emitter Cutoff Current				10	μA	V_{EB} = 5.0 V, I_C = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	15		15		V	I_C = 10 mA, I_B = 0
BV_{CER}	Collector to Emitter Breakdown Voltage	20		20		V	I_C = 10 mA, R_{BE} = 10 Ω
BV_{CBO}	Collector to Base Breakdown Voltage	25		25			I_C = 10 μA, I_E = 0
t_{on}	Turn On Time (see test circuit no. 215)			40		ns	I_C = 10 mA, I_{B1} = 3.0 mA, V_{CC} = 3.0 V
t_{off}	Turn Off Time (see test circuit no. 215)				75	ns	I_C = 10 mA, I_{B1} = 3.0 mA, I_{B2} = 1.0 mA, V_{CC} = 3.0 V

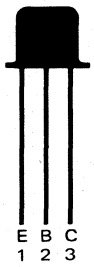
2N709 • FT709 • 2N3010

NPN ULTRA HIGH SPEED SATURATED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* TRANSISTORS

- V_{CEO} . . . 6.0 V (MIN)
- τ_s . . . 6.0 ns (MAX) @ 5.0 mA
- t_{on} & t_{off} . . . 12 ns (MAX) @ 10 mA (FT709, 2N3010)

See TO18-1 Package Outline



FT709 is also available in TO18-2 package

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 100°C Case Temperature	0.5 W
at 25°C Ambient Temperature	0.3 W

Maximum Voltages

		2N709, FT709	2N3010
V_{CBO}	Collector to Base Voltage	15 V	15 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	6.0V	6.0 V
V_{EBO}	Emitter to Base Voltage	4.0 V	4.0 V
V_{CES}	Collector to Emitter Voltage		11 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N709 MIN.	2N709 MAX.	FT709 MIN.	FT709 MAX.	2N3010 MIN.	2N3010 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)			30	125	25	125		I_C = 10 mA, V_{CE} = 0.4 V
		20	120						I_C = 10 mA, V_{CE} = 0.5 V
				20		15			I_C = 1.0 mA, V_{CE} = 0.4 V
				20		15			I_C = 30 mA, V_{CE} = 0.4 V
		15							I_C = 30 mA, V_{CE} = 1.0 V
				12					I_C = 10 mA, V_{CE} = 0.4 V, T_A = −55°C
		10							I_C = 10 mA, V_{CE} = 0.5 V, T_A = −55°C
$V_{BE(sat)}$	Base Saturation Voltage	0.70	0.85					V	I_C = 3.0 mA, I_B = 0.15 mA
	(Note 5)			0.68	0.85	0.68	0.85	V	I_C = 1.0 mA, I_B = 0.1 mA
				0.75	0.95	0.75	0.95	V	I_C = 10 mA, I_B = 1.0 mA
					1.3		1.3	V	I_C = 30 mA, I_B = 3.0 mA
$V_{CE(sat)}$	Collector Saturation Voltage				0.25		0.25	V	I_C = 1.0 mA, I_B = 0.1 mA
	(Note 5)				0.25		0.25	V	I_C = 10 mA, I_B = 1.0 mA
			0.30					V	I_C = 3.0 mA, I_B = 0.15 mA
					0.32			V	I_C = 1.0 mA, I_B = 0.1 mA, T_A = 125°C
					0.38		0.38	V	I_C = 30 mA, I_B = 3.0 mA
					0.42			V	I_C = 10 mA, I_B = 1.0 mA, T_A = 125°C
					0.45			V	I_C = 30 mA, I_B = 3.0 mA, T_A = 125°C
							0.4	V	I_C = 10 mA, I_B = 1.0 mA, T_A = 85°C
C_{ob}	Output Capacitance		3.0		3.0		3.0	pF	I_E = 0, V_{CE} = 5.0 V
C_{ib}	Input Capacitance		2.0		2.0		2.0	pF	I_C = 0, V_{EB} = 0.5 V

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C), at temperatures above 100°C. Power rating is constant at temperatures below 100°C; junction to ambient thermal resistance of 583°C/W (derating factor of 1.71 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS29.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N709 MIN.	2N709 MAX.	FT709 MIN.	FT709 MAX.	2N3010 MIN.	2N3010 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		50		50			nA	$I_E = 0$, $V_{CB} = 5.0$ V
			5.0		5.0			μA	$I_E = 0$, $V_{CB} = 5.0$ V, $T_A = 125°C$
I_{CES}	Collector Reverse Current						100	nA	$V_{CE} = 5.0$ V, $V_{EB} = 0$
							10	μA	$V_{CE} = 11$ V, $V_{EB} = 0$
							5.0	μA	$V_{CE} = 5.0$ V, $V_{EB} = 0$, $T_A = 85°C$
BV_{CBO}	Collector to Base Breakdown Voltage	15		15		15		V	$I_C = 10$ μA, $I_E = 0$
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	6.0		6.0		6.0		V	$I_C = 10$ mA (pulsed) $I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		4.0		V	$I_E = 10$ μA, $I_C = 0$
τ_s	Charge Storage Time Constant (see test circuit no. 3162)		6.0		6.0		6.0	ns	$I_C = 5.0$ mA, $I_{B1} = I_{B2} = 5.0$ mA
t_{on}	Turn On Time (see test circuit no. 3161)		15		12		12	ns	$I_C = 10$ mA, $I_{B1} = 2.0$ mA
t_{off}	Turn Off Time (see test circuit no. 3161)		15		12		12	ns	$I_C = 10$ mA, $I_{B1} = -I_{B2} = 1.0$ mA
f_T	Current Gain Bandwidth	600						MHz	$I_C = 5.0$ mA, $V_{CE} = 4.0$ V, f = 100 MHz
				600		600		MHz	$I_C = 10$ mA, $V_{CE} = 4.0$ V, f = 100 MHz
BV_{CES}	Collector to Emitter Breakdown					11		V	$I_C = 10$ μA, $V_{EB} = 0$

4

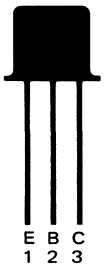
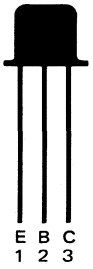
2N718A • 2N/PN1613 • 2N956 • 2N/PN1711

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN1613, PN1711)
- V_{CEO} . . . 32 V (MIN)
- h_{FE} . . . 40-120 @ 150 mA, 20 (MIN) @ 500 mA (2N718A, 2N/PN1613)
  . . . 100-300 @ 150 mA, 40 (MIN) @ 500 mA (2N956, 2N/PN1711)

See Package Outlines

TO 5-1	TO 18-1	TO 92-1
		
E B C 1 2 3	E B C 1 2 3	E B C 1 2 3
2N1613 2N1711	2N718A 2N956	PN1613 PN1711

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	**2N718A/2N1613 2N1711/2N956**		**PN1613/PN1711**
Storage Temperature	−65°C to +200°C		−55°C to +150°C
Operating Junction Temperature	200°C		150°C
Maximum Power Dissipation (Notes 2 & 3)	**2N718A 2N956**	**2N1711 2N1613**	**PN1711 PN1613**
Total Dissipation			
at 25°C Case Temperature	1.8 W	3.0 W	1.0 W
at 100°C Case Temperature	1.0 W	1.7 W	
at 25°C Ambient Temperature	0.5 W	0.8 W	0.625 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	75 V
V_{CER}	Collector to Emitter Voltage ($R_{BE} \leq 10\Omega$) (Note 4)	50 V
†V_{CEO}	Collector to Emitter Voltage	32 V
V_{EBO}	Emitter to Base Voltage	7.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N718A, 2N/PN1613 MIN.	2N718A, 2N/PN1613 MAX.	2N956, 2N/PN1711 MIN.	2N956, 2N/PN1711 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	40	120	100	300		I_C = 150 mA, V_{CE} = 10 V
		35		75			I_C = 10 mA, V_{CE} = 10 V
		20		40			I_C = 500 mA, V_{CE} = 10 V
		20		35			I_C = 10 mA, V_{CE} = 10 V, T_A = −55°C
h_{FE}	DC Current Gain	20		35			I_C = 0.1 mA, V_{CE} = 10 V
				20			I_C = 10 μA, V_{CE} = 10 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		1.3		1.3	V	I_C = 150 mA, I_B = 15 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		1.5		1.5	V	I_C = 150 mA, I_B = 15 mA
h_{fe}	High Frequency Current Gain	3.0		3.5			I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Output Capacitance		25		25	pF	I_E = 0, V_{CB} = 10 V
C_{TE}	Emitter Transition Capacitance		80		80	pF	I_C = 0, V_{EB} = 0.5 V
NF	Noise Figure		12		8.0	dB	I_C = 0.3 mA, V_{CE} = 10 V, f = 1.0 kHz, R_S = 510 Ω; BW = 1.0 Hz
I_{CBO}	Collector Cutoff Current		10		10	nA	I_E = 0, V_{CB} = 60 V
			10		10	μA	I_E = 0, V_{CB} = 60 V, T_A = 150°C
BV_{CBO}	Collector to Base Breakdown Voltage	75		75		V	I_C = 0.1 mA, I_E = 0
$V_{CER(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	50		50		V	I_C = 100 mA, (pulsed), $R_{BE} \leq 10\ \Omega$
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0		7.0		V	I_C = 0, I_E = 0.1 mA
I_{EBO}	Emitter Current		10		5.0	nA	I_C = 0, V_{EB} = 5.0 V

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C; junction to case thermal resistance of 97.2°C/W (derating factor of 10.3 mW/°C), junction to ambient thermal resistance of 350°C/W (derating factor of 2.86 mW/°C) for 2N718A, 2N956; junction to case thermal resistance of 58.3°C/W (derating factor of 17.2 mW/°C) junction to ambient thermal resistance of 219°C (derating factor of 4.56 mW/°C) for 2N1513, 2N1711 . A maximum junction temperature of 150°C for PN1613, PN1711 junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle ≤ 2%.
6. For product family characteristic curves, refer to Section 5 — SS15.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N718A, 2N/PN1613 MIN.	2N718A, 2N/PN1613 MAX.	2N956, 2N/PN1711 MIN.	2N956, 2N/PN1711 MAX.	UNITS	TEST CONDITIONS
h_{ib}	Input Resistance	24	34	24	34	Ω	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
		4.0	8.0	4.0	8.0	Ω	I_C = 5.0 mA, V_{CB} = 10 V, f = 1.0 kHz
h_{rb}	Voltage Feedback Ratio		3.0		5.0	$X10^{-4}$	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
			3.0		5.0	$X10^{-4}$	I_C = 5.0 mA, V_{CB} = 10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	30	100	50	200		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
		35	150	70	300		I_C = 5.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{ob}	Output Conductance	0.05	0.5	0.05	0.5	μmho	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
		0.1	1.0	0.1	1.0	μmho	I_C = 5.0 mA, V_{CB} = 10 V, f = 1.0 kHz
$t_d + t_r + t_f$	(see test circuit no. 287)		30			ns	I_C = 50 mA, V_{CC} = +20 V

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*Planar is a patented Fairchild process.
†Fairchild exceeds JEDEC registered value for this parameter.

2N834 • MPS834

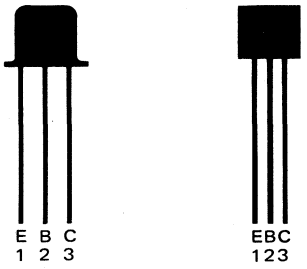
NPN HIGH SPEED SATURATED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C (MPS834)**
- **t_{on} . . . 16 ns (MAX) @ 10 mA (MPS834)**
- **t_{off} . . . 30 ns (MAX) @ 10 mA (MPS834)**
- **t_s . . . 25 ns (MAX) @ 10 mA**
- **COMPLEMENTS . . . 2N408 (TO18), MPSL08 (TO92)**

See Package Outlines

TO18-1 TO92-1



2N834 MPS834

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N834	MPS834
Maximum Temperatures			
Storage Temperature		−65°C to 175°C	−55°C to 150°C
Operating Junction Temperature		175°C	150°C
Lead Temperature (10 seconds)		240°C	260°C
Maximum Power Dissipation (Notes 2 & 3)		**2N834**	**MPS834**
Total Dissipation at 25°C Ambient Temperature		0.300 W	0.625 W
at 25°C Case Temperature		1.0 W	1.0 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage		40 V
V_{CES}	Collector to Emitter Voltage		30 V
V_{EBO}	Emitter to Base Voltage		5.0 V
I_C	Collector Current		200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N834 MIN.	2N834 MAX.	MPS834 MIN.	MPS834 MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	40				V	I_C = 100 μA, I_E = 0
				40		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0				V	I_E = 100 μA, I_C = 0
				5.0		V	I_E = 10 μA, I_C = 0
I_{CES}	Collector Cutoff Current		10		10	μA	V_{CE} = 30 V, V_{BE} = 0
I_{CBO}	Collector Cutoff Current		500		500	nA	V_{CB} = 20 V, I_E = 0
			30			μA	V_{CB} = 20 V, I_E = 0, T_A = 150°C
h_{FE}	DC Current Gain (Note 4)	25		25			I_C = 10 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		0.25		0.25	V	I_C = 10 mA, I_B = 1.0 mA
			0.4		0.4	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		0.9		0.9	V	I_C = 10 mA, I_B = 1.0 mA
f_T	Current Gain Bandwidth Product	350				MHz	I_C = 10 mA, V_{CE} = 15 V, f = 100 MHz
				350		MHz	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
t_{on}	Turn On Time (see test circuit no. 566)		35		16	ns	I_C = 10 mA, I_{B1} = 3.0 mA, V_{CC} = 3.0 V
t_{off}	Turn Off Time (see test circuit no. 566)		75		30	ns	I_C = 10 mA, I_{B1} = 3.0 mA, I_{B2} = 1.0 mA, V_{CC} = 3.0 V
τ_s	Storage Time (see test circuit no. 567)		25		25	ns	I_C = 10 mA, I_{B1} = I_{B2} = 10 mA, V_{CC} = 10 V

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 150°C/W (derating factor of 6.67 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N834. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for MPS834.
4. Pulse conditions: length = 300 μs; duty cycle = ⩽ 2%.
5. For product family characteristic curves, refer to Section 5 — SS28.

2N918 • MPS918 • 2N5770 • 2N3563 • MPS3563

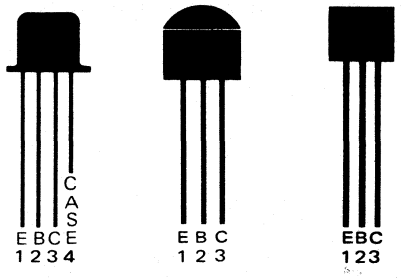
NPN SMALL SIGNAL HIGH FREQUENCY AMPLIFIERS AND OSCILLATORS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **G_{pe} . . . 15 dB (MIN) @ 200 MHz (2N918)**
- **P_D . . . 30 mW (MIN) @ 500 MHz (2N918, 2N5770)**
- **C_{ob} . . . 1.7 pF (MAX) @ 10 V**
- **NF . . . 6.0 dB (MAX) @ 60 MHz**
- **f_T . . . 900 MHz (MIN) (2N5770)**

See Package Outlines

TO18-3 TO18-4 TO92-1



2N918 2N3563 2N5770 MPS3563 MPS918

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	**2N918**	**2N3563**	**MPS918/2N5770 MPS3563**
Storage Temperature	−65°C to +300°C	−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature	200°C	125°C	150°C
Lead Temperature (10 seconds)	260°C	260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation			
at T_A = 25°C	0.2 W	0.2 W	0.625 W
at or below T_A = 65°C			0.300 W
at T_C = 25°C	0.3 W	0.5 W	1.0 W

Maximum Voltages and Current		**2N/MPS3563**	**2N/MPS918 2N5770**
V_{CBO}	Collector to Base Voltage	30 V	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	12 V	15 V
V_{EBO}	Emitter to Base Voltage	2.0 V	3.0 V
I_C	Collector Current	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3563 MPS3563 MIN.	2N3563 MPS3563 MAX.	MPS918 MIN.	MPS918 MAX.	2N5770 2N918 MIN.	2N5770 2N918 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	20	200	20		20			I_C = 3.0 mA, V_{CE} = 1.0 V I_C = 8.0 mA, V_{CE} = 10 V
$V_{CE\ (sat)}$	Collector to Emitter Saturation Voltage (Note 5)				0.4		0.4	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE\ (sat)}$	Base to Emitter Saturation Voltage				1.0		1.0	V	I_C = 10 mA, I_B = 1.0 mA
C_{ob}	Output Capacitance		1.7		1.7		1.7	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
					3.0		(2N918) 3.0	pF	I_E = 0, V_{CB} = 0, f = 1.0 MHz
C_{ib}	Input Capacitance				2.0		(2N5770) 2.0	pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz
							(2N918) 1.6	pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz
I_{CBO}	Collector Cutoff Current		50		10		10	nA	I_E = 0, V_{CB} = 15 V
							1.0	μA	I_E = 0, V_{CB} = 15 V, T_A = 150°C
h_{fe}	High Frequency Current Gain			6.0		6.0 (2N918)			I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz
		6.0	15			9.0 (2N5770)			I_C = 8.0 mA, V_{CE} = 10 V, f = 100 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 584°C/W (derating factor of 1.71 mW/°C); junction to ambient thermal resistance of 875°C/W (derating factor of 1.14 mW/°C) for 2N918. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N3563. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for 2N5770, MPS918 and MPS3563.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length ≤ 300 μs; duty cycle ≤ 1%.
6. For product family characteristic curves, refer to Section 5 — SS27.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3563 MPS3563 MIN.	2N3563 MPS3563 MAX.	MPS918 MIN.	MPS918 MAX.	2N5770 2N918 MIN.	2N5770 2N918 MAX.	UNITS	TEST CONDITIONS
G_{pe}	Available Power Gain (neutralized) (see test circuit no. 254 for 2N918, MPS918, 2N/MPS3563) (see test circuit no. 255 for 2N5770)			15		15		dB	I_C = 6.0 mA, V_{CB} = 12 V, f = 200 MHz
		14	26					dB	I_C = 8.0 mA, V_{CE} = 10 V, f = 200 MHz
P_O	Power Output (see test circuit no. 264)			30		30		mW	I_C = 8.0 mA, V_{CB} = 15 V, f = 500 MHz
η	Collector Efficiency			25		25		%	I_C = 8.0 mA, V_{CB} = 15 V, f = 500 MHz
NF	Noise Figure				6.0		6.0	dB	I_C = 1.0 mA, V_{CE} = 6.0 V, R_G = 400Ω, f = 60 MHz
$V_{CEO\ (sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	12		15		15		V	I_C = 3.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	30						V	I_C = 100 μA, I_E = 0
				30		30		V	I_C = 1.0 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	2.0		3.0		3.0		V	I_E = 10 μA, I_C = 0
$r_b'C_c$	Collector to Base Time Constant	8.0	25					pF	I_C = 8.0 mA, V_{CB} = 10 V, f = 79.8 MHz
h_{fe}	Small Signal Current Gain	20	250						I_C = 8.0 mA, V_{CE} = 10 V, f = 1.0 kHz

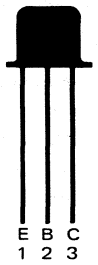
2N930

NPN LOW LEVEL LOW NOISE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- **V_{CEO} . . . 45 V (MIN)**
- **h_{FE} . . . 100–300 @ 10 μA**
- **NF . . . 3.0 dB (MAX) @ 1.0 kHz**

See TO18-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		175°C
Lead Temperature (10 seconds)		300°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		0.6 W
at 25°C Ambient Temperature		0.3 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	30 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)		600		I_C = 10 mA, V_{CE} = 5.0 V
h_{FE}	DC Current Gain	150			I_C = 500 μA, V_{CE} = 5.0 V
		100	300		I_C = 10 μA, V_{CE} = 5.0 V
		20			I_C = 10 μA, V_{CE} = 5.0 V, T_A = −55°C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.6	1.0	V	I_C = 10 mA, I_B = 0.5 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		1.0	V	I_C = 10 mA, I_B = 0.5 mA
h_{ib}	Input Resistance	25	32	Ω	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
h_{ob}	Output Conductance		1.0	μmho	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
h_{rb}	Voltage Feedback Ratio		600	$x10^{-6}$	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	150	600		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{fe}	High Frequency Current Gain	1.0			I_C = 500 μA, V_{CE} = 5.0 V, f = 30 MHz
I_{CBO}	Collector to Base Cutoff Current		10	nA	I_E = 0, V_{CB} = 45 V
I_{CES}	Collector to Emitter Cutoff Current		10	nA	V_{CE} = 45 V, V_{EB} = 0
			10	μA	V_{CE} = 45 V, V_{EB} = 0, T_A = 170°C
I_{EBO}	Emitter to Base Cutoff Current		10	nA	I_C = 0, V_{EB} = 5.0 V
I_{CEO}	Collector to Emitter Cutoff Current		2.0	nA	I_B = 0, V_{CE} = 5.0 V
C_{ob}	Output Capacitance		8.0	pF	I_E = 0, V_{CB} = 5.0 V
NF	Noise Figure		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 10 kΩ, BW = 15.7 kHz
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	45		V	I_C = 10 mA, I_B = 0 (pulsed)
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_C = 0, I_E = 10 nA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 250°C/W (derating factor of 4.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. This rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length ≤ 300 μs; duty cycle ≤ 2%.
6. For product family characteristic curves, refer to Section 5-SS8.

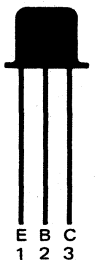
2N997

NPN HIGH GAIN COMPOUND AMPLIFIER

DIFFUSED SILICON PLANAR* TRANSISTOR

- **LV_{CEO} . . . 40 V (MIN)**
- **h_{FE} . . . 7000 (MIN) @ 100 mA**

See TO18-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +300°C
Operating Junction Temperature		175°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation @ 25°C Case Temperature		1.5 W
@ 25°C Ambient Temperature		0.5 W
Maximum Voltages and Currents		
V_{CBO}	Collector to Base Voltage	75 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	40 V
V_{EBO}	Emitter to Base Voltage	7.0 V
I_C	Collector Current	300 mA
I_B	Base Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	1000			I_C = 100 μA, V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain (Note 5)	7000	70000		I_C = 100 mA, V_{CE} = 10 V
		4000			I_C = 10 mA, V_{CE} = 10 V
		1000			I_C = 100 mA, V_{CE} = 10 V, T_A = −55°C
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		1.6	V	I_C = 100 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)	0.9	1.8	V	I_C = 100 mA, V_{CE} = 10 V
I_{CBO}	Collector Cutoff Current		10	nA	I_E = 0, V_{CB} = 60 V
I_{CBO}	Collector Cutoff Current		10	μA	I_E = 0, V_{CB} = 60 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10	nA	I_C = 0, V_{EB} = 5.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	75		V	I_C = 100 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	40		V	I_C = 30 mA, I_B = 0 (pulsed)
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0		V	I_C = 0, I_E = 100 μA

* Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C and junction to case thermal resistance of 100°C/W (derating factor of 10 mW/°C); junction to ambient thermal resistance of 300°C/W (derating factor of 3.33 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle ≤2%.

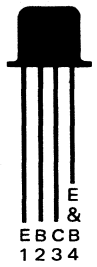
2N998

NPN ULTRA HIGH GAIN COMPOUND AMPLIFIER

DIFFUSED SILICON PLANAR* TRANSISTOR

- h_{FE} . . . 2000 (MIN) @ 100 mA
- LV_{CEO} . . . 60 V (MIN)
- BV_{EBO} . . . 15 V (MIN)
- INTERNAL EMITTER-BASE JUNCTION IS ACCESSIBLE

See TO18-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65° C to +300° C
Operating Junction Temperature	200° C
Lead Temperature (no time limit)	300° C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25° C Case Temperature	1.8 W
at 100° C Case Temperature	1.0 W
at 25° C Ambient Temperature	0.5 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage	100 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V
V_{EBO}	Emitter to Base Voltage	15 V

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	800			I_C = 1.0 mA, V_{CE} = 5.0 V
h_{FE}	DC Pulsed Current Gain (Note 5)	1600	8000		I_C = 10 mA, V_{CE} = 5.0 V
	(Each transistor)	2000			I_C = 100 mA, V_{CE} = 5.0 V
		25			I_C = 10 mA, V_{CE} = 5.0 V
$V_{BE(sat)}$	Base Saturation Voltage		1.8	V	I_C = 50 mA, I_B = 0.5 mA
$V_{CE(sat)}$	Collector Saturation Voltage		1.2	V	I_C = 50 mA, I_B = 0.5 mA
C_{ob}	Output Capacitance		30	pF	I_E = 0, V_{CB} = 10 V
C_{TE}	Emitter Transition Capacitance		50	pF	I_C = 0, V_{EB} = 0.5 V
h_{fe}	Current Gain	1000			I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
I_{CBO}	Collector Cutoff Current		10	nA	I_E = 0, V_{CB} = 90 V
			15	μA	I_E = 0, V_{CB} = 90 V, T_A = 150° C
I_{EBO}	Emitter Cutoff Current		10	nA	I_C = 0, V_{EB} = 10 V
BV_{CBO}	Collector to Base Breakdown Voltage	100		V	I_C = 100 μA, I_E = 0
V_{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		V	I_C = 30 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	15		V	I_C = 0, I_E = 100 μA
NF	Noise Figure (Note 6)		6.0	dB	I_C = 0.1 mA, V_{CE} = 10 V, BW = 200 Hz, f = 1.0 kHz, RG= 5.0 kΩ

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200° C and junction to case thermal resistance of 97.2° C/W (derating factor of 10.3 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. Measured with a constant current supply of 20 μA connected to the emitter of the input transistor.

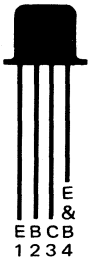
2N999

NPN HIGH GAIN COMPOUND AMPLIFIER

DIFFUSED SILICON PLANAR* TRANSISTOR

- **h_{FE} . . . 7000 (MIN) @ 100 mA**
- **LV_{CEO} . . . 60 V (MIN)**
- **TWO TRANSISTORS INTERNALLY CONNECTED IN DARLINGTON CONFIGURATION**
- **INTERNAL EMITTER-BASE JUNCTION IS ACCESSABLE**

See TO18-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +300°C
Operating Junction Temperature	200°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.8 W
at 100°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.5 W

Maximum Voltages and Current

V_{CBO}	Collector to Base Voltage	60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V
V_{EBO}	Emitter to Base Voltage	15 V
I_C	Collector Current	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	1000			I_C = 100 μA, V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain (Note 5)	7000	70,000		I_C = 100 mA, V_{CE} = 10 V
		4000			I_C = 10 mA, V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain (Note 5)	1000			I_C = 100 mA, V_{CE} = 10 V, T_A = −55°C
$V_{CE(sat)}$	Collector Saturation Voltage		1.6	V	I_C = 100 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		1.8	V	I_C = 100 mA, I_B = 1.0 mA
C_{TE}	Emitter Transition Capacitance		10	pF	I_C = 0, V_{EB} = 0.5 V
C_{ob}	Output Capacitance		20	pF	I_E = 0, V_{CB} = 10 V
I_{CBO}	Collector Cutoff Current		10	nA	I_E = 0, V_{CB} = 60 V
I_{CBO}	Collector Cutoff Current		10	μA	I_E = 0, V_{CB} = 60 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10	nA	I_C = 0, V_{EB} = 10 V
BV_{CBO}	Collector to Base Breakdown Voltage	60		V	I_C = 100 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		V	I_C = 30 mA, I_B = 0 (pulsed)
BV_{EBO}	Emitter to Base Breakdown Voltage	15		V	I_C = 0, I_E = 100 μA

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 97.2°C/W (derating factor of 10.3 mW/°C); junction to ambient thermal resistance of 350°C/W (derating factor of 2.86 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

2N1893 • PN1893

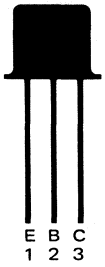
NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 800 mW (2N1893) 625 mW (PN1893) @ T_A = 25°C**
- **V_{CEO} . . . 80 V (MIN)**
- **h_{FE} . . . 40-120 @ 150 mA**
- **COMPLEMENTS . . . 2N4013 (TO 5), MPSA56 (TO 92)**

See Package Outlines

TO5-1



2N1893

TO92-1

PN1893

ABSOLUTE MAXIMUM RATINGS (Note 1)

	2N1893	PN1893
Maximum Temperatures		
Storage Temperature	−65°C to +300°C	−55°C to +150°C
Operating Junction Temperature	200°C	150°C
Lead Temperature (10 seconds)	300°C	260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature	3.0 W	1.0 W
at 100°C Case Temperature	1.7 W	
at 25°C Ambient Temperature	0.8 W	0.625 W
Maximum Voltages		
V_{CBO} Collector to Base Voltage		120 V
V_{CER} Collector to Emitter Voltage ($R_{BE} \leq 10\ \Omega$) (Note 4)		100 V
V_{CEO} Collector to Emitter Voltage (Note 4)		80 V
V_{EBO} Emitter to Base Voltage		7.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	40	120		I_C = 150 mA, V_{CE} = 10 V
		35			I_C = 10 mA, V_{CE} = 10 V
		20			I_C = 10 mA, V_{CE} = 10 V, T_A = −55°C
h_{FE}	DC Current Gain	20			I_C = 0.1 mA, V_{CE} = 10 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		0.9	V	I_C = 50 mA, I_B = 5.0 mA
			1.3	V	I_C = 150 mA, I_B = 15 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		1.2	V	I_C = 50 mA, I_B = 5.0 mA
			5.0	V	I_C = 150 mA, I_B = 15 mA
h_{fe}	High Frequency Current Gain	2.5			I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Output Capacitance		15	pF	I_E = 0, V_{CB} = 10 V
C_{ib}	Input Capacitance		85	pF	I_C = 0, V_{EB} = 0.5 V
I_{CBO}	Collector Cutoff Current		10	nA	I_E = 0, V_{CB} = 90 V
			15	μA	I_E = 0, V_{CB} = 90 V, T_A = 150°C
BV_{CBO}	Collector to Base Breakdown Voltage	120		V	I_C = 100 μA, I_E = 0
$V_{CER(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	100		V	I_C = 100 mA (pulsed), $R_{BE} \leq 10\ \Omega$
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	80		V	I_C = 30 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0		V	I_C = 0, I_E = 100 μA
I_{EBO}	Emitter Current		10	nA	I_C = 0, V_{EB} = 5.0 V
h_{ib}	Input Resistance	20	30	Ω	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
		4.0	8.0	Ω	I_C = 5.0 mA, V_{CB} = 10 V, f = 1.0 kHz
h_{rb}	Voltage Feedback Ratio		1.25	X10^{-4}	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
			1.50	X10^{-4}	I_C = 5.0 mA, V_{CB} = 10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	30	100		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
		45			I_C = 5.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{ob}	Output Conductance		0.5	μmho	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
			0.5	μmho	I_C = 5.0 mA, V_{CE} = 10 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 58.3°C/W (derating factor of 17.2 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C) for 2N1893. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN1893.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse Conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS17.

2N/PN2218/19 • 2N/PN2221/22

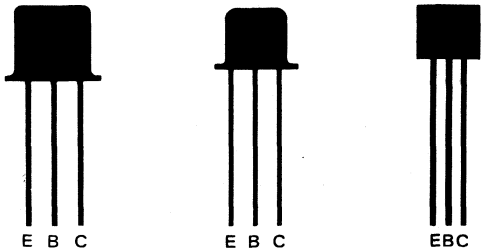
NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN DEVICES)
- V_{CEO} . . . 30 V (MIN)
- h_{FE} . . . 100-300 @ 150 mA (2N/PN2219, 2N/PN2222)
  30 (MIN) @ 500 mA (2N/PN2219, 2N/PN2222)

See Package Outlines

TO5-1 TO18-1 TO92-1



2N2218/9 2N2221/2 PN2218/9 PN2221/2

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	**2N2218, 2N2219 2N2221, 2N2222**	**PN2218, PN2219 PN2221, PN2222**
Storage Temperature	−65°C to 200°C	−55°C to +150°C
Operating Junction Temperature	175°C	150°C

Maximum Power Dissipation (Notes 2 & 3)

	2N2218/9	**2N2221/2**	**PN2218/9**
Total Dissipation at 25°C Case Temperature	3.0 W	1.8 W	1.0 W
at 25°C Ambient Temperature	0.8 W	0.5 W	0.625 W

Maximum Voltages and Current

V_{CBO}	Collector to Base Voltage	60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	800 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN2218 2N/PN2221 MIN.	MAX.	2N/PN2219 2N/PN2222 MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	40	120	100	300		I_C = 150 mA, V_{CE} = 10 V
		20		50			I_C = 150 mA, V_{CE} = 1.0 V
		35		75			I_C = 10 mA, V_{CE} = 10 V
		25		50			I_C = 1.0 mA, V_{CE} = 10 V
		20		35			I_C = 0.1 mA, V_{CE} = 10 V
		20		30			I_C = 500 mA, V_{CE} = 10 V
$V_{CE\ (sat)}$	Collector to Emitter Saturation Voltage		0.4		0.4	V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		1.6		1.6	V	I_C = 500 mA, I_B = 50 mA
$V_{BE\ (sat)}$	Base to Emitter Saturation Voltage		1.3		1.3	V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		2.6		2.6	V	I_C = 500 mA, I_B = 50 mA
h_{fe}	High Frequency Current Gain	2.5		2.5			I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz
I_{CBO}	Collector Cutoff Current		10		10	nA	I_E = 0, V_{CB} = 50 V
			10		10	μA	I_E = 0, V_{CB} = 50 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10		10	nA	I_C = 0, V_{EB} = 3.0 V
C_{ob}	Output Capacitance		8.0		8.0	pF	I_E = 0, V_{CB} = 10 V
Re (h_{ie})	Real Part of Common Emitter High Frequency Input Impedance		60		60	Ω	I_C = 20 mA, V_{CE} = 20 V, f = 300 MHz
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		V	I_C = 10 μA, I_E = 0
$V_{CEO\ (sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	30		30		V	I_C = 10 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		V	I_E = 10 μA, I_C = 0

*Planar is a patented Fairchild process

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 175°C, junction to case thermal resistance of 50°C/W (derating factor of 20 mW/°C), and junction to ambient thermal resistance of 188°C/W (derating factor of 5.33 mW/°C) for 2N2218, 2N2219; for 2N2221 and 2N2222, junction to case thermal resistance of 83.5°C/W (derating factor of 12 mW/°C); junction to ambient thermal resistance of 300°C/W (derating factor of 3.33 mW/°C). These ratings give a maximum junction temperature of 150°C, junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN2218, PN2219, PN2221, PN2222.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse Conditions: length = 300 μs; duty cycle ≤2%.
6. For product family characteristic curves, refer to Section 5-SS15.

2N/PN2218A/19A • 2N/PN2221A/22A

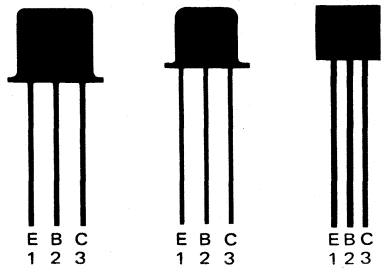
NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C (PN DEVICES)**
- **V_{CEO} . . . 40 V (MIN) @ 10 mA**
- **h_{FE} . . . 40-120 (2N/PN2218A, 2N/PN2221A) @ 150 mA**
  . . . 100-300 (2N/PN2219A, 2N/PN2222A) @ 150 mA
- **t_{on} . . . 35 ns (MAX) @ 150 mA, t_{off} . . . 285 ns (MAX) @ 150 mA**
- **COMPLEMENTS . . . 2N/PN2904A SERIES**

See Package Outlines

TO5-1 **TO18-1** **TO92-1**



2N2218A 2N2219A | **2N2221A 2N2222A** | **PN2218A PN2219A PN2221A PN2222A**

ABSOLUTE MAXIMUM RATINGS (Note 1)

	2N2218A/19A 2N2221A/22A	PN2218A/19A PN2221A/22A
Maximum Temperatures		
Storage Temperature	−65°C to +200°C	−55°C to +150°C
Operating Junction Temperature	175°C	150°C

	2N2218A 2N2219A	2N2221A 2N2222A	PN2218A/19A PN2221A/22A
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation			
at 25°C Case Temperature	3.0 W	1.8 W	1.0 W
at 25°C Ambient Temperature	0.8 W	0.5 W	0.625 W

Maximum Voltages and Currents		
V_{CBO}	Collector to Base Voltage	75 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	40 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	800 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN2218A 2N/PN2221A MIN.	MAX.	2N/PN2219A 2N/PN2222A MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	20		35			I_C = 100 μA, V_{CE} = 10 V
		25		50			I_C = 1.0 mA, V_{CE} = 10 V
	(Note 5)	35		75			I_C = 10 mA, V_{CE} = 10 V
	(Note 5)	40	120	100	300		I_C = 150 mA, V_{CE} = 10 V
	(Note 5)	25		40			I_C = 500 mA, V_{CE} = 10 V
	(Note 5)	15		35			I_C = 10 mA, V_{CE} = 10 V, T_A = −55°C
	(Note 5)	20		50			I_C = 150 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.3		0.3	V	I_C = 150 mA, I_B = 15 mA
			1.0		1.0	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.6	1.2	0.6	1.2	V	I_C = 150 mA, I_B = 15 mA
			2.0		2.0	V	I_C = 500 mA, I_B = 50 mA
h_{fe}	High Frequency Current Gain	2.5		3.0			I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz
I_{CEX}	Collector Reverse Current		10		10	nA	V_{EB} = 3.0 V, V_{CE} = 60 V
I_{CBO}	Collector Reverse Current		10		10	nA	I_E = 0, V_{CB} = 60 V
			10		10	μA	I_E = 0, V_{CB} = 60 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10		10	nA	I_C = 0, V_{EB} = 3.0 V
C_{ob}	Output Capacitance		8.0		8.0	pF	I_E = 0, V_{CB} = 10 V, f = 100 kHz
C_{ib}	Input Capacitance		25		25	pF	I_C = 0, V_{EB} = 0.5 V, f = 100 kHz
R_E (h_{ie})	Real Part of Common Emitter High Frequency Input Impedance		60		60	Ω	I_C = 20 mA, V_{CE} = 20 V, f = 300 MHz
BV_{CBO}	Collector to Base Breakdown Voltage	75		75		V	I_C = 10 μA, I_C = 0

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 175°C, junction to case thermal resistance of 50°C/W (derating factor of 20 mW/°C), and junction to ambient thermal resistance of 188 C/W (derating factor of 5.33 mW/°C) for 2N2218A, 2219A. For the 2N2221A and 2N2222A, junction to case thermal resistance of 83.5°C/W (derating factor of 12 mW/°C) junction to ambient thermal resistance of 300°C/W (derating factor of 3.33 mW/°C). These ratings give a maximum junction temperature of 150°C, junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN2218A, PN2219A, PN2221A, PN2222A.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS15.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N/PN2218A 2N/PN2221A MIN.	MAX.	2N/PN2219A 2N/PN2222A MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	40		40		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_C = 0, I_E = 10 μA
I_{BL}	Base Current		20		20	nA	V_{EB} = 3.0 V, V_{CE} = 60 V
t_d	Turn On Delay Time (see test circuit no. 231)		10		10	ns	I_{CS} = 150 mA, V_{CC} = 30 V, I_{B1} = 15 mA
t_r	Rise Time (see test circuit no. 231)		25		25	ns	I_{CS} = 150 mA, V_{CC} = 30 V, I_{B1} = 15 mA
t_s	Storage Time (see test circuit no. 232)		225		225	ns	V_{CC} = 30 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA
t_f	Fall Time (see test circuit no. 232)		60		60	ns	V_{CC} = 30 V, I_{CS} = 150 mA, I_{B1} = I_{B2} = 15 mA
T_A	Active Region Time Constant		2.5		2.5	ns	I_C = 150 mA, V_{CE} = 30 V
$r_{b'}C_c$	Collector to Base Time Constant		150		150	ps	I_C = 20 mA, V_{CE} = 20 V, f = 31.8 MHz
NF	Noise Figure				4.0	dB	I_C = 100 μA, V_{CE} = 10 V, R_G = 1.0 kΩ, BW = 1.0 Hz, f = 1.0 kHz
h_{ie}	Input Resistance	1.0	3.5	2.0	8.0	kΩ	I_C = 1.0 mA, V_{CB} = 10 V, f = 1.0 kHz
		0.2	1.0	0.25	1.25	kΩ	I_C = 10 mA, V_{CB} = 10 V, f = 1.0 kHz
h_{oe}	Output Conductance	3.0	15	5.0	35	μmho	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
		10	100	25	200	μmho	I_C = 10 mA, V_{VB} = 10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		500		800	$X10^{-6}$	I_C = 1.0 mA, V_{CB} = 10 V, f = 1.0 kHz
			250		400	$X10^{-6}$	I_C = 10 mA, V_{CB} = 10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	30	150	50	300		I_C = 1.0 mA, V_{CB} = 10 V, f = 1.0 kHz
		50	300	75	375		I_C = 10 mA, V_{CB} = 10 V, f = 1.0 kHz

2N2369 • 2N2369A • 2N5769 • MPS2369

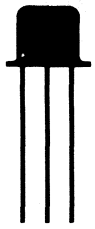
NPN HIGH SPEED SATURATED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (2N5760, MPS2369)
- V_{CEO} . . . 15 V (MIN)
- t_s . . . 13 ns (MAX) @ 10 mA
- t_{on} . . . 12 ns (MAX) @ 10 mA, t_{off} . . . 18 ns (MAX) @ 10 mA
- COMPLEMENTS . . . 2N4209 (TO18), 2N5771 (TO92)

See Package Outlines

TO18-1



2N2369
2N2369A

TO92-1

2N5769
MPS2369

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N2369, 2N2369A	2N5769, MPS2369
Maximum Temperatures			
Storage Temperature		−65°C to +200°C	−55°C to +150°C
Operating Junction Temperature		200°C	150°C
Lead Temperature (60 seconds)		300°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		1.2 W	1.0 W
at 100°C Case Temperature		0.68 W	0.260 W
at 25°C Ambient Temperature		0.36 W	0.625 W
Maximum Voltages and Currents			
V_{CBO}	Collector to Base Voltage		40 V
V_{CES}	Collector to Emitter Voltage		40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)		15 V
V_{EBO}	Emitter to Base Voltage		4.5 V
I_C	Collector Current (10 μs pulse)		500 mA
I_C	DC Collector Current		200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2369 MIN.	2N2369 MAX.	2N2369A 2N5769 MIN.	2N2369A 2N5769 MAX.	MPS2369 MIN.	MPS2369 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	40	120			40	120		I_C = 10 mA, V_{CE} = 1.0 V
		20				20			I_C = 100 mA, V_{CE} = 2.0 V
				40	120				I_C = 10 mA, V_{CE} = 0.35 V
				30					I_C = 30 mA, V_{CE} = 0.4 V
				20					I_C = 100 mA, V_{CE} = 1.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	20				20			I_C = 10 mA, V_{CE} = 1.0 V, T_A = −55°C
				20					I_C = 10 mA, V_{CE} = 0.35 V, T_A = −55°C
BV_{CES}	Collector to Emitter Breakdown Voltage	40		40		40		V	I_C = 10 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	40		40		40		V	I_C = 10 μA, V_{BE} = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	15		15		15		V	I_C = 10 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.5		4.5		4.5		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		400		400		400	nA	I_E = 0, V_{CB} = 20 V
I_{CES}	Collector Cutoff Current						30	μA	I_E = 0, V_{CB} = 20 V, T_A = 125°C
I_{CBO}	Collector Cutoff Current		30		30			μA	I_E = 0, V_{CB} = 20 V, T_A = 150°C
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.25				0.25	V	I_C = 10 mA, I_B = 1.0 mA
					0.2			V	I_C = 10 mA, I_B = 1.0 mA
					0.25			V	I_C = 30 mA, I_B = 3.0 mA
					0.5			V	I_C = 100 mA, I_B = 10 mA

Additional Electrical Characteristics on following page.

4

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 146°C/W (derating factor of 6.85 mW/°C); junction to ambient thermal resistance of 486°C/W (derating factor of 2.06 mW/°C) for 2N2369 & 2N2369A. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C (derating factor of 5.0 mW/°C) for MPS2369 & 2N5769.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse Conditions: length = 300 μs; duty cycle ≤ 2%.
6. For product family characteristic curves, refer to Section 5 — SS28.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N2369 MIN.	2N2369 MAX.	2N2369A 2N5769 MIN.	2N2369A 2N5769 MAX.	MPS2369 MIN.	MPS2369 MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)				0.3			V	I_C = 10 mA, I_B = 1.0 mA, T_A = 125°C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.70	0.85	0.70	0.85	0.70	0.85	V	I_C = 10 mA, I_B = 1.0 mA
					1.15			V	I_C = 30 mA, I_B = 3.0 mA
					1.6			V	I_C = 100 mA, I_B = 10 mA
				0.59	1.02				I_C = 10 mA, I_B = 1.0 mA T_A = −55°C to +125°C
C_{ob}	Output Capacitance		4.0		4.0		4.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 140 kHz
h_{fe}	High Frequency Current Gain	5.0		5.0		5.0			I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
τ_s	Charge Storage Time Constant (see test circuit no. 3111)		13		13		13	n	I_C = 10 mA, I_{B1} = I_{B2} = 10 mA, V_{CC} = 10 V
t_{on}	Turn On Time (see test circuit no. 210)		12		12		12	n	I_C = 10 mA, I_{B1} = 3.0 mA, V_{CC} = 3.0 V
t_{off}	Turn Off Time (see test circuit no. 210)		18		18		18	n	I_C = 10 mA, I_{B1} = 3.0 mA, I_{B2} = −1.5 mA, V_{CC} = 3.0 V

2N2484 • PN2484 • 2N3117

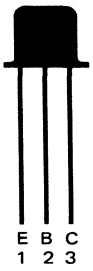
NPN LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN2484)
- V_{CEO} . . . 60 V (MIN)
- h_{FE} . . . 100-500 (2N/PN2484), 250-500 (2N3117) @ 10 μA
- NF . . . 3.0 dB (MAX) (2N/PN2484), 1.0 dB (MAX) (2N3117) @ 1.0 kHz
  . . . 2.0 dB (MAX) (2N/PN2484), 1.0 dB (MAX) (2N3117) @ 10 kHz

See Package Outlines

TO18-1



2N2484
2N3117

TO92-1

PN2484

ABSOLUTE MAXIMUM RATINGS (Note 1)

	2N2484	PN2484	2N3117
Maximum Temperatures			
Storage Temperature	−65°C to +300°C	−55°C to +150°C	−65°C to +200°C
Operating Junction Temperature	200°C	150°C	200°C
Lead Temperature (60 seconds)	300°C	260°C	300°C

	2N2484, 2N3117	PN2484
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature	1.2 W	1.0 W
at 25°C Ambient Temperature	0.36 W	0.625 W
Maximum Voltages and Current		
V_{CBO} Collector to Base Voltage	60 V	60 V
V_{CEO} Collector to Emitter Voltage (Note 4)	60 V	60 V
V_{EBO} Emitter to Base Voltage	6.0 V	6.0 V
I_C Collector Current	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN2484 MIN.	2N/PN2484 MAX.	2N3117 MIN.	2N3117 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)		800				I_C = 10 mA, V_{CE} = 5.0 V
		250		400			I_C = 1.0 mA, V_{CE} = 5.0 V
		200					I_C = 500 μA, V_{CE} = 5.0 V
		175		300			I_C = 100 μA, V_{CE} = 5.0 V
		100	500	250	500		I_C = 10 μA, V_{CE} = 5.0 V
		30		100			I_C = 1.0 μA, V_{CE} = 5.0 V
		20		50			I_C = 10 μA, V_{CE} = 5.0 V, T_A = −55°C
$V_{BE(ON)}$	Base to Emitter "On" Voltage	0.5	0.7		0.7	V	I_C = 100 μA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.35		0.35	V	I_C = 1.0 mA, I_B = 0.1 mA
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 0.5 mA, V_{CE} = 5.0 V, f = 30 MHz
		3.0					I_C = 50 μA, V_{CE} = 5.0 V, f = 5.0 MHz
I_{CBO}	Collector Cutoff Current		10		10	nA	I_E = 0, V_{CB} = 45 V
			10		10	μA	I_E = 0, V_{CB} = 45 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10		10	nA	V_{EB} = 5.0 V, I_C = 0
I_{CEO}	Collector to Emitter Cutoff Current		2.0			nA	I_B = 0, V_{CE} = 5.0 V
C_{ob}	Output Capacitance		6.0		4.5	pF	I_E = 0, V_{CB} = 5.0 V, f = 140 kHz
C_{ib}	Input Capacitance		6.0		6.0	pF	I_C = 0, V_{EB} = 0.5 V, f = 140 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		V	I_C = 10 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		60		V	I_C = 10 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_C = 0, I_E = 10 μA
h_{fe}	High Frequency Current Gain	150	900	400	900		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 147°C/W (derating factor of 6.85 mW/°C); junction to ambient thermal resistance of 485°C/W (derating factor of 2.06 mW/°C) for 2N2484 and 2N3117. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN2484.
4. These ratings refer to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS8.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N/PN2484 MIN.	2N/PN2484 MAX.	2N3117 MIN.	2N3117 MAX.	UNITS	TEST CONDITIONS
h_{ie}	Input Resistance	3.5	24	10	24	kΩ	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		800		800	$x10^{-6}$	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{oe}	Output Conductance		40		40	μmhos	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
NF	Wide Band Noise Figure		3.0			dB	I_C = 10 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, Power Bandwidth of 15.7 kHz with 3.0 dB pts at 10 Hz and 10 kHz
NF	Narrow Band Noise Figure		3.0			dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 10 kΩ Power Bandwidth of 200 Hz
			2.0			dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 10 kHz, R_S = 10 kΩ, Power Bandwidth of 2.0 kHz
			10			dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 100 Hz, R_S = 10 kΩ, Power Bandwidth of 20 Hz
					1.0	dB	I_C = 5.0 μA, V_{CE} = 5.0 V, R_S = 50 kΩ, f = 1.0 kHz, Power Bandwidth of 200 Hz
					1.0	dB	I_C = 5.0 μA, V_{CE} = 5.0 V, R_S = 50 kΩ, f = 10 kHz, Power Bandwidth of 1.0 kHz
					4.0	dB	I_C = 30 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, f = 100 kHz, Power Bandwidth of 20 Hz
					15	dB	I_C = 30 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, f = 10 Hz, Power Bandwidth = 2.0 Hz

2N2639 through 2N2644

DUAL NPN LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- V_{CEO} . . . 45 V (MIN)
- NF . . . 4.0 dB (MAX) WIDE BAND
- GUARANTEED BETA RATIO
- GUARANTEED V_{BE} MATCHING AND TRACKING

See TO5-9 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Lead Temperature (10 seconds)			300°C
Maximum Power Dissipation		**One Side**	**Both Sides**
Total Dissipation at or below 25°C Ambient Temperature		0.3 W	0.6 W
Linear Derating Factor		2.0 mW/°C	4.0 mW/°C
at or below 25°C Case Temperature		0.6 W	1.2 W
Linear Derating Factor		4.0 mW/°C	8.0 mW/°C
Maximum Voltages and Current			
V_{EBO}	Emitter to Base Voltage		5.0 V
V_{CBO}	Collector to Base Voltage		45 V
V_{CEO}	Collector to Emitter Voltage		45 V
I_C	Collector Current		30 mA

MATCHING CHARACTERISTICS (25°C Ambient Termperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2639/42 MIN.	2N2639/42 MAX.	2N2640/43 MIN.	2N2640/43 MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 3)	0.9	1.0	0.8	1.0		V_{CE} = 5.0 V, I_C = 10 μA
$\lvert V_{BE1}-V_{BE2}\rvert$	Base to Emitter Voltage Differential		5.0		10	mV	V_{CE} = 5.0 V, I_C = 10 μA
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential Temperature Coefficient		10		20	μV/°C	V_{CE} = 5.0 V, I_C = 10 μA @ T_A = −55°C to +25°C and T_A = +25°C to +125°C

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2639/40/41 MIN.	2N2639/40/41 MAX.	2N2642/43/44 MIN.	2N2642/43/44 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = 45 V, I_E = 0
			10		10	μA	V_{CB} = 45 V, I_E = 0, T_A = 150°C
I_{CEO}	Collector Cutoff Current		10		10	nA	V_{CE} = 5.0 V, I_B = 0
I_{EBO}	Emitter Cutoff Current		10		10	nA	V_{EB} = 5.0 V, I_C = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 2)	45		45		V	I_C = 10 mA, I_B = 0
h_{FE}	DC Current Gain	50	300	100	300		V_{CE} = 5.0 V, I_C = 10 μA
		55		110			V_{CE} = 5.0 V, I_C = 100 μA
		65		130			V_{CE} = 5.0 V, I_C = 1.0 mA
		10		20			V_{CE} = 5.0 V, I_C = 10 μA, T_A = −55°C
V_{BE}	Base to Emitter Voltage (Note 2)	0.6	1.0	0.6	1.0	V	I_C = 10 mA, I_B = 0.5 mA

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These parameters must be measured with a pulse duration = 300 μs; duty cycle ≤ 2%.
3. The lower of the two h_{FE} readings is taken as h_{FE1} for purposes of this ratio.
4. For product family characteristic curves, refer to Section 5 - SS8.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N2639/40/41 MIN.	2N2639/40/41 MAX.	2N2642/43/44 MIN.	2N2642/43/44 MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 2)		1.0		1.0	V	I_C = 10 mA, I_B = 0.5 mA
h_{ib}	Input Resistance	25	32	25	32	Ω	V_{CB} = 5.0 V, I_C = 1.0 mA, f = 1.0 kHz
h_{rb}	Reverse Voltage Feedback Ratio		600		600	x10^{-6}	V_{CB} = 5.0 V, I_C = 1.0 mA, f = 1.0 kHz
h_{ob}	Output Capacitance		1.0		1.0	μmho	V_{CB} = 5.0 V, I_C = 1.0 mA, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	65	600	130	600		V_{CE} = 5.0 V, I_C = 1.0 mA, f = 1.0 kHz
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	4.0		4.0			V_{CE} = 5.0 V, I_C = 1.0 mA, f = 20 MHz
C_{ob}	Output Capacitance		8.0		8.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 1.0 MHz
NF	Average Noise Figure		4.0		4.0	dB	V_{CB} = 5.0 V, I_E = 10 μA, R_G = 10 kΩ, BW of 10 Hz to 15.7 kHz

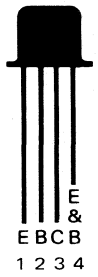
2N2723 • 2N2724 • 2N2725

NPN LOW LEVEL AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- **h_{fe} . . . 1500 @ 10 mA (2N2723)**
- **. . . 5000 @ 10 mA (2N2724)**
- **V_{CEO} . . . 45 V (MIN) (2N2725)**
- **NF . . . 6.0 dB (MAX) @ 1.0 kHz (2N2724)**

See TO18-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (10 seconds)	240°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.8 W
at 100°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.5 W

Maximum Voltages and Current		**2N2723, 2N2724**	**2N2725**
V_{B1C0}	Collector to Base Voltage	80 V	45 V
V_{CE_20}	Collector to Emitter Voltage (Note 4)	60 V	45 V
V_{E2B_10}	Emitter to Base Voltage	12 V	10 V
I_C	Collector Current	40 mA	30 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2723 MIN.	2N2723 MAX.	2N2724 MIN.	2N2724 MAX.	2N2725 MIN.	2N2725 MAX.	UNITS	TEST CONDITIONS
I_{CB1O}	Collector Cutoff Current		10		10			nA	V_{CB_1} = 60 V, I_{E_1} = 0
							2.0	nA	V_{CB_1} = 30 V, I_{E_1} = 0
			10		10			μA	V_{CB_1} = 60 V, I_{E_1} = 0, T_A = 150°C
							2.0	μA	V_{CB_1} = 30 V, I_{E_1} = 0, T_A = 150°C
I_{E2B1O}	Emitter Cutoff Current		10		10			nA	V_{E2B1} = 10 V, I_C = 0
							1.0	nA	V_{E2B1} = 6.0 V, I_C = 0
BV_{CB_1O}	Collector to Base Breakdown Voltage	80		80		45		V	I_C = 10 μA, I_{E2} = 0
$BV_{E_2B_1O}$	Emitter to Base Breakdown Voltage	12		12		10		V	I_C = 0, I_{E_2} = 10 μA
BV_{CE_2O}	Collector to Emitter Breakdown Voltage (Note 5)	60		60		45		V	I_C = 10 mA (pulsed), I_{B_1} = 0
$V_{CE_2(sat)}$	Collector to Emitter Saturation Voltage		1.0		1.0		1.0	V	I_C = 10 mA, I_{B_1} = 1.0 mA
$V_{BE_2(sat)}$	Base to Emitter Saturation Voltage		1.7		1.7		1.7	V	I_C = 10 mA, I_{B_1} = 1.0 mA
C_{ob_1}	Output Capacitance		10		10		10	pF	V_{CB_1} = 10 V, I_{E_2} = 0, f = 140 kHz
h_{fe_2}	Small Signal Current Gain	1,500	15,000	5,000	60,000				I_C = 10 mA, V_{CE_2} = 5.0 V, f = 1.0 kHz
						1,500	15,000		I_C = 10 μA, V_{CE_2} = 5.0 V, f = 1.0 kHz
h_{fe}	High Frequency Current Gain	5.0		5.0		5.0			V_{CE} = 10 V, I_C = 10 mA, f = 20 MHz
h_{FE_2}	DC Current Gain	2,000	10,000	7,000	50,000				I_C = 10 mA, V_{CE_2} = 5.0 V, I_{B_2} = 0
						2,000	10,000		I_C = 100 μA, V_{CE_2} = 5.0 V, I_{B_2} = 0
NF	Noise Figure		10					dB	I_C = 50 μA, V_{CE} = 5.0 V, R_G = 3.0 kΩ, Bandwidth = 100 Hz, f = 1.0 kHz
					6.0			dB	I_C = 10 μA, V_{CE} = 5.0 V, R_G = 10 kΩ, Bandwidth = 100 Hz, f = 1.0 kHz
							6.0	dB	I_C = 3.0 μA, V_{CE} = 5.0 V, R_G = 30 kΩ, Bandwidth = 100 Hz, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 95°C/W (derating factor of 10.5 mW/°C); junction to ambient thermal resistance of 345°C/W (derating factor of 2.9 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 12 ms; duty cycle = 2%.

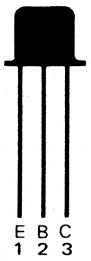
2N2894 • 2N2894A • 2N3012 • 2N3209

PNP HIGH SPEED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **V_{CEO} . . . 12 V (MIN) (2N2894/A, 2N3012), 20 V (MIN) (2N3209)**
- **t_{on} . . . 60 ns (MAX) @ 30 mA**
- **t_{off} . . . 35 ns (MAX) @ 30 mA (2N2894A)**
- **f_T . . . 400 MHz (MIN)**
  . . . 800 MHz (MIN) 2N2894A
- **COMPLEMENTS . . . 2N2396A, 2N4137**

See TO18-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65° C to +200° C
Operating Junction Temperature	200° C
Lead Temperature (60 seconds)	300° C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25° C Case Temperature	1.2 W
at 25° C Ambient Temperature	0.36 W

Maximum Voltages and Current		**2N2894, 2N3012**	**2N2894A**	**2N3209**
V_{CBO}	Collector to Base Voltage	−12 V	−12 V	−20 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−12 V	−12 V	−20 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.5 V	−4.0 V
V_{CES}	Collector to Emitter Voltage	−12 V	−12 V	−20 V
I_C	Collector Current	200 mA	200 mA	200 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2894 MIN.	2N2894 MAX.	2N2894A MIN.	2N2894A MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain	30		30			I_C = 10 mA, V_{CE} = −0.3 V
	(Note 5)	40	150	40	120		I_C = 30 mA, V_{CE} = −0.5 V
		25		30			I_C = 100 mA, V_{CE} = −1.0 V
				20			I_C = 1.0 mA, V_{CE} = −0.5 V
		17		20			I_C = 30 mA, V_{CE} = −0.5 V, T_A = −55° C
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.15		−0.13	V	I_C = 10 mA, I_B = 1.0 mA
			−0.2		−0.19	V	I_C = 30 mA, I_B = 3.0 mA
			−0.5		−0.45	V	I_C = 100 mA, I_B = 10 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)	−0.78	−0.98	−0.78	−0.92	V	I_C = 10 mA, I_B = 1.0 mA
		−0.85	−1.2	−0.85	−1.15	V	I_C = 30 mA, I_B = 3.0 mA
			−1.7	−1.0	−1.5	V	I_C = 100 mA, I_B = 10 mA
$V_{CEO(sus)}$	Collector Emitter Sustaining Voltage (Notes 4 & 5)	−12		−12		V	I_C = 10 mA (pulsed), I_B = 0
h_{fe}	High Frequency Current Gain	4.0		8.0			I_C = 30 mA, V_{CE} = −10 V, f = 100 MHz
I_{CES}	Collector Reverse Current		80			nA	V_{CE} = −6.0 V, V_{EB} = 0
					50	nA	V_{CE} = −10 V, V_{EB} = 0
I_{CBO}	Collector Cutoff Current		10			μA	V_{CB} = −6.0 V, I_E = 0, T_A = 125° C
					10	μA	V_{CB} = −10 V, I_E = 0, T_A = 125° C
C_{ob}	Output Capacitance		6.0		4.5	pF	V_{CB} = −5.0 V, I_E = 0, f = 140 kHz
C_{ib}	Emitter Transition Capacitance		6.0		6.0	pF	V_{EB} = −0.5 V, I_C = 0, f = 140 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	−12		−12		V	I_C = 10 μA, I_E = 0

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200° C and junction to case thermal resistance of 146° C/W (derating factor of 6.85 mW/° C); junction to ambient thermal resistance of 486° C/W (derating factor of 2.06 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS30.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N2894 MIN.	2N2894 MAX.	2N2894A MIN.	2N2894A MAX.	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	−12		−12		V	I_C = 10 μA, V_{EB} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.5		V	I_E = 100 μA, I_C = 0
t_{on}	Turn On Time (see test circuit no. 220)		60		60	ns	$I_C \approx$ 30 mA, $I_B \approx$ 1.5 mA, V_{CC} = −3.0 V
t_{off}	Turn Off Time (see test circuit no. 220)		90		35	ns	$I_C \approx$ 30 mA, $I_{B1} \approx I_{B2}$ = 1.5 mA, V_{CC} = −2.0 V
t_{on}	Turn On Time (see test circuit no. 378)				20	ns	$I_C \approx$ 30 mA, $I_{B1} \approx$ 3.0 mA, V_{CC} = −3.0 V
t_{off}	Turn Off Time (see test circuit no. 378)				25	ns	$I_C \approx$ 30 mA, $I_{B1} \approx I_{B2} \approx$ 3.0 mA, V_{CC} = −3.0 V
τ_s	Storage Time (see test circuit no. 384)				20	ns	$I_C \approx$ 10 mA, $I_{B1} \approx I_{B2} \approx$ 10 mA, V_{CC} = −3.0 V

SYMBOL	CHARACTERISTIC	2N3012 MIN.	2N3012 MAX.	2N3209 MIN.	2N3209 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain	25		25			I_C = 10 mA, V_{CE} = −0.3 V
	(Note 5)	30	120	30	120		I_C = 30 mA, V_{CE} = −0.5 V
		20		15			I_C = 100 mA, V_{CE} = −1.0 V
				12			I_C = 30 mA, V_{CE} = −0.5 V, T_A = −55°C
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.15		−0.15	V	I_C = 10 mA, I_B = 1.0 mA
			−0.2		−0.2	V	I_C = 30 mA, I_B = 3.0 mA
			−0.5		−0.6	V	I_C = 100 mA, I_B = 10 mA
			−0.4			V	I_C = 30 mA, I_B = 3.0 mA, T_A = 85°C
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)	−0.78	−0.98	−0.78	−0.98	V	I_C = 10 mA, I_B = 1.0 mA
		−0.85	−1.2	−0.85	−1.2	V	I_C = 30 mA, I_B = 3.0 mA
			−1.7		−1.7	V	I_C = 100 mA, I_B = 10 mA
$V_{CEO(sus)}$	Collector Emitter Sustaining Voltage (Note 4 & 5)	−12		−20		V	I_C = 10 mA (pulsed), I_B = 0
h_{fe}	High Frequency Current Gain	4.0		4.0			I_C = 30 mA, V_{CE} = −10 V, f = 100 MHz
I_{CES}	Collector Reverse Current		80			nA	V_{CE} = −6.0 V, V_{EB} = 0
					80	nA	V_{CE} = −10 V, V_{EB} = 0
			5.0			μA	V_{CE} = −6.0 V, V_{EB} = 0, T_A = 85°C
					10	μA	V_{CE} = −10 V, V_{EB} = 0, T_A = 125°C
C_{ob}	Output Capacitance		6.0		5.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 140 kHz
C_{ib}	Emitter Transition Capacitance		6.0		6.0	pF	V_{EB} = −0.5 V, I_C = 0, f = 140 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	−12		−20		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−12		−20		V	I_C = 10 μA, V_{EB} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_E = 100 μA, I_C = 0
t_{on}	Turn On Time (see test circuit no. 220)		60		60	ns	$I_C \approx$ 30 mA, $I_B \approx$ 1.5 mA
t_{off}	Turn Off Time (see test circuit no. 220)		75		90	ns	$I_C \approx$ 30 mA, $I_{B1} \approx I_{B2} \approx$ 1.5 mA, V_{CC} = −2.0 V

4

2N/PN2904/5/6/7 • 2N/PN2904A/5A/6A/7A

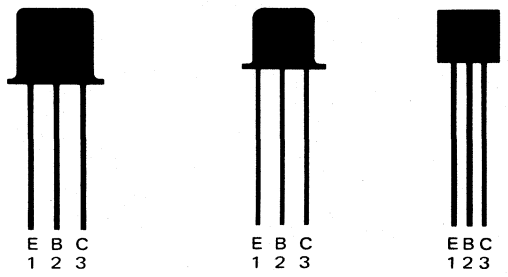
PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C (PN Series)**
- **V_{CEO} . . . 60 V (MIN) ("A" suffix devices), 40 V (MIN) (Non-suffix devices)**
- **h_{FE} . . . 40-120 (2N/PN2904/6), 100-300 (2N/PN2905/7)**
- **t_{on} . . . 45 ns (MAX) @ 150 mA, t_{off} . . . 100 ns (MAX) @ 150 mA**
- **COMPLEMENTS . . . 2N/PN2218 Series, 2N/PN2218A Series**

See Package Outline

TO5-1 **TO18-1** **TO92-1**



2N2904/A 2N2905/A **2N2906/A 2N2907/A** **PN Series**

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	**2N Series**	**PN Series**
Storage Temperature	−65°C to +200°C	−55°C to +150°C
Operating Junction Temperature	200°C	150°C

Maximum Power Dissipation (Notes 2 & 3)	**PN Series**	**2N2904/A 2N2905/A**	**2N2906/A 2N2907/A**
Total Dissipation			
at 25°C Case Temperature	1.0 W	3.0 W	1.8 W
at 25°C Ambient Temperature	0.625 W	0.6 W	0.4 W

Maximum Voltages and Current		**2N/PN2904 Series**	**2N/PN2904A Series**
V_{CBO}	Collector to Base Voltage	−60 V	−60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V	−60 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN2904 2N/PN2906 MIN.	MAX.	2N/PN2904A 2N/PN2906A MIN.	MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	40	120	40	120	I_C = 150 mA, V_{CE} = −10 V
		20		40		I_C = 500 mA, V_{CE} = −10 V
		35		40		I_C = 10 mA, V_{CE} = −10 V
		25		40		I_C = 1.0 mA, V_{CE} = −10 V
		20		40		I_C = 0.1 mA, V_{CE} = −10 V
SYMBOL	CHARACTERISTIC	2N/PN2905 2N/PN2907 MIN.	MAX.	2N/PN2905A 2N/PN2907A MIN.	MAX.	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	100	300	100	300	I_C = 150 mA, V_{CE} = −10 V
		30		50		I_C = 500 mA, V_{CE} = −10 V
		75		100		I_C = 10 mA, V_{CE} = −10 V
		50		100		I_C = 1.0 mA, V_{CE} = −10 V
		35		75		I_C = 0.1 mA, V_{CE} = −10 V

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 58.3°C/W (derating factor of 17.2 mW/°C); junction to ambient thermal resistance of 292°C/W (derating factor of 3.42 mW/°C) for 2N2904, 2N2904A, 2N2905 and 2N2905A; junction to case thermal resistance of 97.3°C/W (derating factor of 10.3 mW/°C); junction to ambient thermal resistance of 437°C/W (derating factor of 2.28 mW/°C) for the 2N2906, 2N2906A, 2N2907 and 2N2907A. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN2904/A, PN2905/A, PN2906/A, and PN2907/A.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse Conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS22.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature for all "A" Suffix Devices unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N/PN2904/5 2N/PN2906/7 MIN.	2N/PN2904/5 2N/PN2906/7 MAX.	2N/PN2904A 2N/PN2905A 2N/PN2906A 2N/PN2907A MIN.	2N/PN2904A 2N/PN2905A 2N/PN2906A 2N/PN2907A MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.4		−0.4	V	I_C = 150 mA, I_B = 15 mA
			−1.6		−1.6	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		−1.3		−1.3	V	I_C = 150 mA, I_B = 15 mA
			−2.6		−2.6	V	I_C = 500 mA, I_B = 50 mA
I_{CEX}	Collector Reverse Current		50		50	nA	V_{CE} = −30 V, V_{EB} = −0.5 V
I_B	Base Current		50		50	nA	V_{CE} = −30 V, V_{EB} = −0.5 V
C_{ob}	Output Capacitance		8.0		8.0	pF	I_E = 0, V_{CB} = −10 V, f = 100 kHz
C_{ib}	Emitter Transition Capacitance		30		30	pF	I_C = 0, V_{EB} = −2.0 V, f = 100 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		V	I_C = 10 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−60		−40		V	I_C = 10 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
t_d	Turn On Delay Time (see test circuit no. 224)		10		10	ns	I_C = 150 mA, I_{B1} = 15 mA, V_{CC} = 30 V
t_r	Rise Time (see test circuit no. 224)		40		40	ns	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA, V_{CC} = 30 V
t_s	Storage Time (see test circuit no. 225)		80		80	ns	I_C = 150 mA, I_{B1} = 15 mA, V_{CC} = 6.0 V
t_f	Fall Time (see test circuit no. 225)		30		30	ns	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA V_{CC} = 6.0 V
t_{on}	Turn On Time (see test circuit no. 224)				45	ns	I_C = 150 mA, I_{B1} = 15 mA, V_{CC} = 3.0 V
t_{off}	Turn Off Time (see test circuit no. 225)				100	ns	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA, V_{CC} = 6.0 V
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 50 mA, V_{CE} = 20 V, f = 100 MHz
I_{CBO}	Collector Cutoff Current		20		10	nA	I_E = 0, V_{CB} = −50 V
			20		10	μA	I_E = 0, V_{CB} = −50 V, T_A = 150°C

4

2N2913 • 2N2914 • 2N2972 • 2N2973

DUAL NPN LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- **NF . . . 4.0 dB (MAX) (2N2913/2N2972)**
- **V_{CEO} . . . 45 V (MIN)**

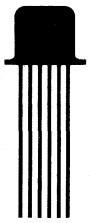
See Package Outlines

TO5-9

CBEEBC
123456

2N2913
2N2914

TO18-5



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2N2972
2N2973

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)

	2N2913 2N2914 One Side	2N2913 2N2914 Both Sides	2N2972 2N2973 One Side	2N2972 2N2973 Both Sides
Total Dissipation				
at 25°C Case Temperature	0.75 W	1.5 W	0.5 W	0.75 W
at 100°C Case Temperature	0.43 W	0.86 W	0.29 W	0.43 W
at 25°C Ambient Temperature	0.3 W	0.5 W	0.25 W	0.30 W

Maximum Voltages and Current

V_{CBO}	Collector to Base Voltage	45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	30 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2913 2N2972 MIN.	2N2913 2N2972 MAX.	2N2914 2N2973 MIN.	2N2914 2N2973 MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector Saturation Voltage		0.35		0.35	V	I_C = 1.0 mA, I_B = 0.1 mA
I_{CBO}	Collector Cutoff Current		10		10	nA	I_E = 0, V_{CB} = 45 V
			10		10	μA	I_E = 0, V_{CB} = 45 V, T_A = 150°C
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	45		45		V	I_C = 10 mA, I_B = 0 (pulsed)
NF	Narrow Band Noise Figure		4.0		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 1 kHz, R_S = 10 kΩ, Bandwidth = 200 Hz
NF	Wide Band Noise Figure		4.0		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, f = 10 Hz to 10 kHz, Bandwidth of 15.7 kHz
h_{FE}	DC Current Gain	60	240	150	600		I_C = 10 μA, V_{CE} = 5.0 V
		150		300			I_C = 1.0 mA, V_{CE} = 5.0 V
		100		225			I_C = 100 μA, V_{CE} = 5.0 V
		15		30			I_C = 10 μA, V_{CE} = 5.0 V, T_A = −55°C
$V_{BE(ON)}$	Emitter to Base "On" Voltage		0.7		0.7	V	I_C = 0.1 mA, V_{CE} = 5.0 V
I_{CEO}	Collector Cutoff Current		2.0		2.0	nA	I_B = 0, V_{CE} = 5.0 V
I_{EBO}	Emitter Cutoff Current		2.0		2.0	nA	I_C = 0, V_{EB} = 5.0 V
h_{fe}	High Frequency Current Gain	3.0		3.0			I_C = 0.5 mA, V_{CE} = 5.0 V, f = 20 MHz
C_{ob}	Output Capacitance		6.0		6.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 140 kHz
h_{ib}	Input Resistance	25	32	25	32	Ω	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{ob}	Output Conductance		1.0		1.0	μmhos	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	45		45		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 10 μA, I_C = 0

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 584°C/W (derating factor of 1.71 mW/°C) for one side; 350°C/W (derating factor of 2.86 mW/°C) for both sides for the 2N2913 and 2N2914. For the 2N2972 and 2N2973, junction to ambient thermal resistance is 700°C/W (derating factor of 1.43 mW/°C) for one side; 584°C/W (derating factor of 1.71 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS8.

2N2915/A • 2N2919/A • 2N2974 • 2N2978

DUAL NPN LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- LV_{CEO} . . . 60 V (MIN)
- h_{FE} . . . 60 (MIN) @ I_C = 10 μA
- $|V_{BE1} - V_{BE2}|$ . . . 1.5 mV (MAX) @ 100 μA
- ΔV_{BE} . . . 5.0 μV/°C (MAX) @ 100 μA, T_A = −55°C to +125°C
- NF . . . 4.0 dB (MAX) @ f = 1.0 kHz

See Package Outlines

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2N2915/A
2N2919/A

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2N2974
2N2978

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 second)	300°C

Maximum Power Dissipation (Notes 2 & 3)	**2N2915/A, 2N2919/A**		**2N2974, 2N2978**	
	One Side	**Both Sides**	**One Side**	**Both Sides**
Total Dissipation at 25°C Case Temperature	0.75 W	1.5 W	0.5 W	0.75 W
at 100°C Case Temperature	0.43 W	0.86 W	0.29 W	0.43 W
at 25°C Ambient Temperature	0.30 W	0.50 W	0.25 W	0.30 W

Maximum Voltages and Current for each Transistor		**2N2915/A, 2N2974**	**2N2919/A, 2N2978**
V_{CBO}	Collector to Base Voltage	45 V	60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V	60 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current	30 mA	30 mA

MATCHING CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2915A 2N2919A MIN.	2N2915A 2N2919A MAX.	2N2915, 2N2919 2N2974, 2N2978 MIN.	2N2915, 2N2919 2N2974, 2N2978 MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.9	1.0	0.9	1.0		I_C = 100 μA, V_{CE} = 5.0 V
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5) (T_A = −55°C to +125°C)	0.85	1.0				V_{CE} = 5.0 V, I_C = 100 μA to 1.0 mA
$\lvert V_{BE1}-V_{BE2}\rvert$	Base to Emitter Voltage Differential (Note 6)		2.0		5.0	mV	I_C = 10 μA to 1.0 mA, V_{CE} = 5.0 V
			1.5		3.0	mV	I_C = 100 μA, V_{CE} = 5.0 V
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential Change (T_A = −55°C to +25°C)		0.4 (5 μV/°C)		0.8 (10 μV/°C)	mV	I_C = 100 μA, V_{CE} = 5.0 V
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential Change (T_A = +25°C to +125°C)		0.5 (5 μV/°C)		1.0 (10 μV/°C)	mV	I_C = 100 μA, V_{CE} = 5.0 V

Additional Electrical Characteristics on following page.

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NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 584°C/W (derating factor of 1.71 mW/°C) for one side; 350°C/W (derating factor of 2.86 mW/°C) for both sides for the 2N2915, 2N2915A, 2N2919 and 2N2919A. For the 2N2974, 2N2978, junction to ambient thermal resistance of 700°C/W (derating factor of 1.43 mW/°C) for one side; 584°C/W (derating factor of 1.71 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Lowest of two h_{FE} readings is taken as h_{FE1} for purposes of this ratio.
6. Absolute values.
7. Pulse conditions: length = 300 μs; duty cycle = 1%.
8. For product family characteristic curves, refer to Section 5 - SS8.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N2915/A 2N2974 MIN.	2N2915/A 2N2974 MAX.	2N2919/A 2N2978 MIN.	2N2919/A 2N2978 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	150		150			I_C = 1.0 mA, V_{CE} = 5.0 V
		100		100			I_C = 100 μA, V_{CE} = 5.0 V
		60	240	60	240		I_C = 10 μA, V_{CE} = 5.0 V
		15		15			I_C = 10 μA, V_{CE} = 5.0 V, T_A = −55°C
$V_{CE(sat)}$	Collector Saturation Voltage		0.35		0.35	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(ON)}$	Emitter to Base "On" Voltage		0.7		0.7	V	I_C = 0.1 mA, V_{CE} = 5.0 V
I_{CBO}	Collector Cutoff Current		10		2.0	nA	I_E = 0, V_{CB} = 45 V
			10		10	μA	I_E = 0, V_{CB} = 45 V, T_A = 150°C
I_{CEO}	Collector Cutoff Current		2.0		2.0	nA	I_B = 0, V_{CE} = 5.0 V
I_{EBO}	Emitter Cutoff Current		2.0		2.0	nA	I_C = 0, V_{EB} = 5.0 V
C_{ob}	Output Capacitance		6.0		6.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 140 kHz
h_{ib}	Input Resistance	25	32	25	32	Ω	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
h_{ob}	Output Conductance		1.0		1.0	μmhos	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
h_{fe}	High Frequency Current Gain	3.0	8.0	3.0			I_C = 0.5 mA, V_{CE} = 5.0 V, f = 20 MHz
BV_{CBO}	Collector to Base Breakdown Voltage	45		60		V	I_C = 10 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (pulsed) (Notes 4 & 7)	45		60		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 10 μA, I_C = 0
NF	Narrow Band Noise Figure		4.0		4.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 10 kΩ, PBW = 200 Hz
NF	Wide Band Noise Figure		4.0		4.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 10 Hz to 10 kHz, R_S = 10 kΩ, PBW = 15.7 kHz
C_{ib}	Input Capacitance						
	2N2915A		10			pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz
	2N2919A				10	pF	

2N2916/A • 2N2920/A • 2N2975 • 2N2979

DUAL NPN LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- **V_{CEO} . . . 60 V (MIN) (2N2920/20A/79)**
- **h_{FE} . . . 150 (MIN) @ 10 μA**
- **TIGHT V_{CE} MATCHING . . . 1.5 mV (MAX) @ 100 μA (2N2916A/20A)**
- **TIGHT V_{BE} TRACKING . . . 5.0 μV/°C (MAX) @ 100 μA, –55°C TO +125°C**
- **BETA MATCH GUARANTEED OVER TEMPERATURE . . . 15% (MAX) FROM 100 μA TO 1.0 mA, –55°C TO +125°C**
- **NF . . . 3.0 dB (MAX) @ 1.0 kHz**

See Package Outlines

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2N2916
2N2916A
2N2920
2N2920A

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CBEEBC
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2N2975
2N2979

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	–65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)

	2N2916/A, 2N2920/A		2N2975, 2N2979	
	One Side	Both Sides	One Side	Both Sides
Total Dissipation at 25°C Case Temperature	0.75 W	1.5 W	0.5 W	0.75 W
at 100°C Case Temperature	0.43 W	0.86 W	0.29 W	0.43 W
at 25°C Ambient Temperature	0.3 W	0.5 W	0.25 W	0.3 W

Maximum Voltages and Current

		2N2916/16A/75	2N2920/20A/79
V_{CBO}	Collector to Base Voltage	45 V	60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V	60 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current	30 mA	30 mA

MATCHING AND ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2916A 2N2920A MIN.	2N2916A 2N2920A MAX.	2N2916, 2N2920 2N2975, 2N2979 MIN.	2N2916, 2N2920 2N2975, 2N2979 MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.9	1.0	0.9	1.0		I_C = 100 μA, V_{CE} = 5.0 V
		0.85	1.0				I_C = 100 μA to 1.0 mA, V_{CE} = 5.0 V, T_A = 55°C to +125°C
$\lvert V_{BE1}-V_{BE2} \rvert$	Base to Emitter Voltage Differential (Note 6)		2.0		5.0	mV	I_C = 10 μA to 1.0 mA, V_{CE} = 5.0 V
			1.5		3.0	mV	I_C = 100 μA, V_{CE} = 5.0 V
$\lvert \Delta(V_{BE1}-V_{BE2}) \rvert$	Base to Emitter Voltage Differential Change		0.4 (5 μV/°C)		0.8 (10 μV/°C)	mV	I_C = 100 μA, V_{CE} = 5.0 V, T_A = –55°C to +25°C
			0.5 (5 μV/°C)		1.0 (10 μV/°C)	mV	I_C = 100 μA, V_{CE} = 5.0 V, T_A = 25°C to +125°C
h_{fe}	High Frequency Current Gain	3.0	8.0	3.0			I_C = 0.5 mA, V_{CE} = 5.0 V, f = 20 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 584°C/W (derating factor of 1.71 mW/°C) for one side; 350°C/W (derating factor of 2.86 mW/°C) for both sides for the 2N2916, 2N2916A, 2N2920, and 2N2920A. For the 2N2975 and 2N2979, junction to ambient thermal resistance of 700°C/W (derating factor of 1.43 mW/°C) for one side; 584°C/W (derating factor of 1.71 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Lowest of two h_{FE} readings is taken as h_{FE1} for purposes of this ratio.
6. Absolute values.
7. Pulse conditions: length = 300 μs; duty cycle = 1%.
8. For product family characteristic curves, refer to Section 5 - SS8.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N2916/16A/75 MIN.	2N2916/16A/75 MAX.	2N2920/20A/79 MIN.	2N2920/20A/79 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	300		300			I_C = 1.0 mA, V_{CE} = 5.0 V
		225		225			I_C = 100 μA, V_{CE} = 5.0 V
		150	600	150	600		I_C = 10 μA, V_{CE} = 5.0 V
	2N2916A, 2N2920A only	40		40			I_C = 10 μA, V_{CE} = 5.0 V T_A = −55°C
		30					I_C = 10 μA, V_{CE} = 5.0 V, T_A = −55°C
$V_{CE(sat)}$	Collector Saturation Voltage		0.35		0.35	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(ON)}$	Emitter to Base "On" Voltage		0.7		0.7	V	I_C = 0.1 mA, V_{CE} = 5.0 V
I_{CBO}	Collector Cutoff Current		10		2.0	nA	I_E = 0, V_{CB} = 45 V
			10		10	μA	I_E = 0, V_{CB} = 45 V, T_A = 150°C
I_{CEO}	Collector Cutoff Current		2.0		2.0	nA	I_B = 0, V_{CE} = 5.0 V
I_{EBO}	Emitter Cutoff Current		2.0		2.0	nA	I_C = 0, V_{EB} = 5.0 V
C_{ob}	Output Capacitance		6.0		6.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 140 kHz
h_{ib}	Input Resistance	25	32	25	32	Ω	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
h_{ob}	Output Conductance		1.0		1.0	μmhos	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1.0 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	45		60		V	I_C = 10 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Pulsed) (Notes 4 & 7)	45		60		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 10 μA, I_C = 0
NF	Wide Band Noise Figure		3.0		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 10 Hz to 10 kHz, PBW = 15.7 Hz, R_S = 10 kΩ
NF	Narrow Band Noise Figure		3.0		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 1.0 kHz, PBW = 200 Hz, R_S = 10 kΩ
C_{ib}	Input Capacitance						
	2N1916A, 2N2920A only		10		10	pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz

2N2917 • 2N2918 • 2N2976 • 2N2977

NPN LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- h_{FE1}/h_{FE2} . . . 25% (MAX) @ 100 μA
- V_{BE1}-V_{BE2} . . . 5.0 mV (MAX) @ 100 μA, 10 mV (MAX) FROM 10 μA TO 1.0 mA
- ΔV_{BE} . . . 20 μV/°C (MAX) @ 100 μA
- V_{CEO} . . . 45 V (MIN)
- NF . . . 3.0 dB (MAX) WIDE BAND AND AT 1.0 kHz (2N2977, 2N2918)

See Package Outlines

TO5-9

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2N2917
2N2918

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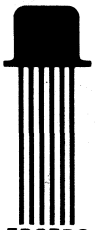

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2N2976
2N2977

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)	**2N2917/18 ONE SIDE**	**2N2917/18 BOTH SIDES**	**2N2976/77 ONE SIDE**	**2N2976/77 BOTH SIDES**
Total Dissipation				
at 25°C Case Temperature	0.75 W	1.5 W	0.5 W	0.75 W
at 100°C Case Temperature	0.43 W	0.86 W	0.29 W	0.43 W
at 25°C Ambient Temperature	0.3 W	0.50 W	0.25 W	0.30 W

Maximum Voltages and Currents for Each Transistor

V_{CBO}	Collector to Base Voltage	45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	30 mA

MATCHING AND ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N2917 2N2976 MIN.	2N2917 2N2976 MAX.	2N2918 2N2977 MIN.	2N2918 2N2977 MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.8	1.0	0.8	1.0		I_C = 100 μA, V_{CE} = 5.0 V
$\lvert V_{BE1}-V_{BE2}\rvert$	Base to Emitter Voltage Differential (Note 6)		10		10	mV	I_C = 10 μA to 1.0 mA, V_{CE} = 5.0 V
			5.0		5.0	mV	I_C = 100 μA, V_{CE} = 5.0 V
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential Change		1.6		1.6	mV	I_C = 100 μA, V_{CE} = 5.0 V, T_A = −55°C to +25°C (20 μV/°C)
			2.0		2.0	mV	I_C = 100 μA, V_{CE} = 5.0 V, T_A = +25°C to +125°C (20 μV/°C)
NF	Narrow Band Noise Figure		4.0		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, BW = 200 Hz, R_S = 10 kΩ, f = 1 kHz
NF	Wide Band Noise Figure		4.0		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, 3.0 dB pts. @ 25 Hz & 10 Hz, R_S = 10 kΩ, f = 15.7 kHz

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 584°C/W (derating factor of 1.71 mW/°C) for one side; 292°C/W (derating factor of 2.86 mW/°C) for both sides for the 2N2917 and 2N2918. For the 2N2976 and 2N2977 junction to ambient thermal resistance of 700°C/W (derating factor of 1.43 mW/°C) for one side; 584°C/W (derating factor of 1.71 mW/°C) for both sides.
4. Ratings refers to a high current point where collector to emitter voltage is lowest.
5. Lowest of two h_{FE} readings is taken as h_{FE1} for purposes of this ratio.
6. Absolute values.
7. Pulse conditions: length = 300 μs; duty cycle = 1%.
8. For product family characteristic curves, refer to Section 5 — SS8.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N2917 2N2976 MIN.	2N2917 2N2976 MAX.	2N2918 2N2977 MIN.	2N2918 2N2977 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	150		300			I_C = 1.0 mA, V_{CE} = 5.0 V
		100		225			I_C = 100 μA, V_{CE} = 5.0 V
		60	240	150	600		I_C = 10 μA, V_{CE} = 5.0 V
		15		30			I_C = 10 μA, V_{CE} = 5.0 V, T_A = −55°C
$V_{CE(sat)}$	Collector Saturation Voltage		0.35		0.35	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.7		0.7	V	I_C = 0.1 mA, V_{CE} = 5.0 V
I_{CBO}	Collector Cutoff Current		10		10	nA	I_E = 0, V_{CB} = 45 V
			10		10	μA	I_E = 0, V_{CB} = 45 V, T_A = +150°C
I_{CEO}	Collector Cutoff Current		2.0		2.0	nA	I_B = 0, V_{CE} = 5.0 V
I_{EBO}	Emitter Cutoff Current		2.0		2.0	nA	I_C = 0, V_{EB} = 5.0 V
C_{ob}	Output Capacitance		6.0		6.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 140 kHz
h_{fe}	High Frequency Current Gain	3.0		3.0			I_C = 0.5 mA, V_{CE} = 5.0 V, f = 20 MHz
h_{ib}	Input Resistance	25	32	25	32	Ω	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1 kHz
h_{ob}	Output Conductance		1.0		1.0	μmho	I_C = 1.0 mA, V_{CB} = 5.0 V, f = 1 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	45		45		V	I_C = 10 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 7)	45		45		V	I_C = 10 mA, (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 10 μA, I_C = 0

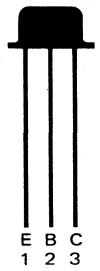
2N3009 • 2N3013 • 2N3014

NPN HIGH SPEED SATURATED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 20 V (MIN) (2N3014), 15 V (MIN) (2N3009, 2N3013)
- τ_s . . . 18 ns (MAX) @ 10 mA
- t_{on} . . . 15 ns (MAX) @ 300 mA (2N3009, 2N3013), 16 ns (MAX) @ 30 mA (2N3014)
- t_{off} . . . 25 ns (MAX) @ 300 mA (2N3009, 2N3013), @ 30 mA (2N3014)
- COMPLEMENTS . . . 2N5455, 2N5456

See TO18-2 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−55°C to +200°C
Operating Junction Temperature				200°C
Lead Temperature (60 seconds)				300°C
Maximum Power Dissipation (Notes 2 & 3)				
Total Dissipation at 25°C Ambient Temperature				0.36 W
at 25°C Case Temperature				1.2 W
Maximum Voltages and Current		**2N3009**	**2N3013**	**2N3014**
V_{CBO}	Collector to Base Voltage	40 V	40 V	40 V
V_{CES}	Collector to Emitter Voltage	40 V	40 V	40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	15 V	15 V	20 V
V_{EBO}	Emitter to Base Voltage	4.0 V	5.0 V	5.0 V
I_C	Collector Current	200 mA	200 mA	200 mA
	Pulse = 10 μs	500 mA	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3009 MIN.	2N3009 MAX.	2N3013 MIN.	2N3013 MAX.	2N3014 MIN.	2N3014 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	30	120	30	120	30	120		I_C = 30 mA, V_{CE} = 0.4 V
						25			I_C = 10 mA, V_{CE} = 0.4 V
		25		25					I_C = 100 mA, V_{CE} = 0.5 V
						25			I_C = 100 mA, V_{CE} = 1.0 V
		15		15					I_C = 300 mA, V_{CE} = 1.0 V
				12		12			I_C = 30 mA, V_{CE} = 0.4 V
									T_A = −55°C
$V_{CE(sat)}$	Collector to Emitter Saturation						0.18	V	I_C = 10 mA, I_B = 1.0 mA
	Voltage (Note 5)		0.18		0.18		0.18	V	I_C = 30 mA, I_B = 3.0 mA
			0.28		0.28		0.35	V	I_C = 100 mA, I_B = 10 mA
			0.5		0.5			V	I_C = 300 mA, I_B = 30 mA
			0.3					V	I_C = 30 mA, I_B = 3.0 mA,
									T_A = 85°C
					0.25		0.25	V	I_C = 30 mA, I_B = 3.0 mA,
									T_A = 125°C
$V_{BE(sat)}$	Base to Emitter Saturation	0.75	0.95	0.75	0.95	0.75	0.95	V	I_C = 30 mA, I_B = 3.0 mA
	Voltage (Note 5)		1.2		1.2		1.2	V	I_C = 100 mA, I_B = 10 mA
			1.7		1.7			V	I_C = 300 mA, I_B = 30 mA
						0.7	0.8	V	I_C = 10 mA, I_B = 1.0 mA
h_{fe}	High Frequency Current Gain	3.5		3.5		3.5			I_C = 30 mA, V_{CE} = 10 V,
									f = 100 MHz
C_{ob}	Output Capacitance		5.0		5.0		5.0	pF	I_E = 0, V_{CB} = 5.0 V
C_{ib}	Input Capacitance		8.0		8.0		8.0	pF	I_C = 0, V_{BE} = 0.5 V

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 146°C/W (derating factor of 6.85 mW/°C); junction to ambient thermal resistance of 486°C/W (derating factor of 2.06 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS5.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

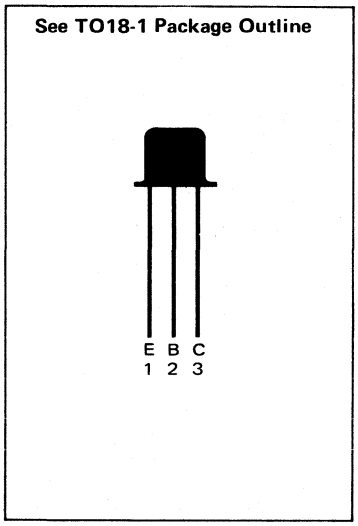
SYMBOL	CHARACTERISTIC	2N3009 MIN.	2N3009 MAX.	2N3013 MIN.	2N3013 MAX.	2N3014 MIN.	2N3014 MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Reverse Current		0.5		0.3		0.3	μA	V_{CE} = 20 V, V_{BE} = 0
			15					μA	V_{CE} = 20 V, V_{BE} = 0, T_A = 85°C
					40		40	μA	V_{CE} = 20 V, V_{BE} = 0, T_A = 125°C
BV_{CBO}	Collector to Base Breakdown Voltage	40		40		40		V	I_C = 100 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	40		40		40		V	I_C = 100 μA, V_{BE} = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	15		15		20		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		5.0		5.0		V	I_E = 100 μA, I_C = 0
τ_s	Charge Storage Time Constant (see test circuit no. 3111)		18		18		18	ns	$I_C \approx I_{B1} \approx = I_{B2} \approx$ 10 mA
t_{on}	Turn On Time (see test circuit no. 233)		15		15			ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA
	(see test circuit no. 268)						16	ns	$I_C \approx$ 30 mA, $I_{B1} \approx$ 3.0 mA
t_{off}	Turn Off Time (see test circuit no. 233)		25		25			ns	$I_C \approx$ 300 mA, $I_{B1} \approx -I_{B2} \approx$ 3.0 mA
	(see test circuit no. 286)						25	ns	$I_C \approx$ 30 mA, $I_{B1} \approx -I_{B2} \approx$ 3.0 mA

2N3011

NPN HIGH SPEED SATURATED LOGIC SWITCH

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . . 12 V (MIN)
- τ_s . . . 13 ns (MAX) @ 10 mA
- t_{on} . . . 15 ns (MAX) @ 30 mA
- t_{off} . . . 20 ns (MAX) @ 30 mA
- COMPLEMENTS . . . 2N4208



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		200°C
Lead Temperature (60 seconds)		300°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.2 W
at 100°C Case Temperature		0.68 W
at 25°C Ambient Temperature		0.36 W
Maximum Voltages and Currents		
V_{CBO}	Collector to Base Voltage	30 V
V_{CES}	Collector to Emitter Voltage	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	12 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current (Pulse Width = 10 μs)	500 mA
I_C	DC Collector Current	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	30	120		I_C = 10 mA, V_{CE} = 0.35 V
		25			I_C = 30 mA, V_{CE} = 0.4 V
		12			I_C = 100 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.2	V	I_C = 10 mA, I_B = 1.0 mA
			0.25	V	I_C = 30 mA, I_B = 3.0 mA
			0.5	V	I_C = 100 mA, I_B = 10 mA
			0.3		I_C = 10 mA, I_B = 1.0 mA, T_A = 85°C
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)	0.72	0.87	V	I_C = 10 mA, I_B = 1.0 mA
			1.15	V	I_C = 30 mA, I_B = 3.0 mA
			1.6	V	I_C = 100 mA, I_B = 10 mA
h_{fe}	High Frequency Current Gain	4.0			I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		4.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 140 kHz
I_{CES}	Collector Reverse Current		400	nA	V_{CE} = 20 V, V_{BE} = 0
			10	μA	V_{CE} = 20 V, V_{BE} = 0, T_A = 85°C
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	30		V	I_C = 10 μA, V_{EB} = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	12		V	I_C = 10 mA, (pulsed) I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector to Base Cutoff Current		4.0	μA	V_{CB} = 20 V
τ_s	Charge Storage Time Constant (see test circuit no. 3111)		13	ns	$I_C \cong I_{B1} \cong I_{B2} \cong$ 10 mA
t_{on}	Turn On Time (see test circuit no. 286)		15	ns	$I_C \approx$ 30 mA, $I_{B1} \approx$ 3.0 mA, V_{CC} = 2.0 V
t_{off}	Turn Off Time (see test circuit no. 286)		20	ns	$I_C \approx$ 30 mA, $I_{B1} \approx$ 3.0 mA, V_{CC} = 2.0 V, $I_{B2} \approx$ 3.0 mA

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 146°C/W (derating factor of 6.85 mW/°C); junction to ambient thermal resistance of 486°C/W (derating factor of 2.06 mW/°C) for 2N3011.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5-SS28.

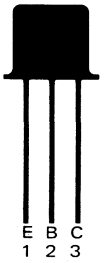
2N3019 • 2N3020

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 80 V (MIN)
- h_{FE} . . . 100-300 @ 150 mA (2N3019)
- . . . 50 (MIN) @ 100 μA & 500 mA (2N3019)
- $V_{CE(sat)}$ . . . 0.5 V (MAX) @ 500 mA
- COMPLEMENTS . . . 2N4031, 2N4033

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65° C to +200° C
Operating Junction Temperature	200° C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25° C Ambient Temperature	0.8 W
at 25° C Case Temperature	5.0 W

Maximum Voltages and Current

V_{CEO}	Collector to Emitter Voltage	80 V
V_{CB}	Collector to Base Voltage	140 V
V_{EB}	Emitter to Base Voltage	7.0 V
I_C	Collector Current	1.0 A

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3019 MIN.	2N3019 MAX.	2N3020 MIN.	2N3020 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	80		80		V	I_C = 30 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	140		140		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0		7.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = 90 V, I_E = 0
			10		10	μA	V_{CB} = 90 V, I_E = 0, T_A = 150° C
I_{EBO}	Emitter Cutoff Current		10		10	nA	V_{EB} = 5.0 V, I_C = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		0.2		0.2	V	I_C = 150 mA, I_B = 15 mA
			0.5		0.5	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		1.1		1.1	V	I_C = 150 mA, I_B = 15 mA
h_{FE}	DC Current Gain (Note 4)	50		30	100		I_C = 0.1 mA, V_{CE} = 10 V
		90		40	120		I_C = 10 mA, V_{CE} = 10 V
		100	300	40	120		I_C = 150 mA, V_{CE} = 10 V
		40					I_C = 150 mA, V_{CE} = 10 V, T_A = −55° C
		50		30	100		I_C = 500 mA, V_{CE} = 10 V,
		15		15			I_C = 1.0 A, V_{CE} = 10 V
h_{fe}	Current Gain Bandwidth Product	5.0		5.0			I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Output Capacitance		12		12	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
C_{ib}	Input Capacitance		60		60	pF	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	80	400	30	200		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
$r_b'C_c$	Collector Base Time Constant		400		400	ps	I_C = 10 mA, V_{CE} = 10 V, f = 4.0 MHz
NF	Noise Figure		4.0			dB	I_C = 100 μA, V_{CE} = 10 V, f = 1.0 kHz, R_S = 1.0 kΩ

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200° C and junction to case thermal resistance of 35° C/W (derating factor of 28.6 mW/° C); junction to ambient thermal resistance of 217° C/W (derating factor of 4.6 mW/° C).
4. Pulse conditions: length ≤300 μs; duty cycle ≤1%.
5. For product family characteristic curves, refer to Section 5 — SS17.

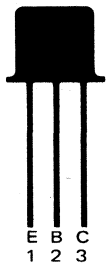
2N3053

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 40 V (MIN)
- h_{FE} . . . 50-250 @ 150 mA
- f_T . . . 100 MHz (MIN) @ 50 mA

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	5.0 W
Linear Derating Factor	28.6 mW/°C

Maximum Voltages and Current

V_{CEO}	Collector to Emitter Voltage	40 V
V_{CBO}	Collector to Base Voltage	60 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current (Continuous)	700 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	40		V	I_C = 100 μA, I_E = 0
BV_{CER}	Collector to Emitter Breakdown Voltage	50		V	I_C = 100 μA, R_{BE} = 10 Ω
BV_{CBO}	Collector to Base Breakdown Voltage	60		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 100 μA, I_C = 0
I_{CEX}	Collector Cutoff Current		0.25	μA	V_{CE} = 30 V, $V_{EB(OFF)}$ = 1.5 V
I_{EBO}	Base Cutoff Current		0.25	μA	I_C = 0, V_{EB} = 4.0 V
h_{FE}	DC Current Gain (Note 4)	25			I_C = 150 mA, V_{CE} = 2.5 V
		50	250		I_C = 150 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		1.4	V	I_C = 150 mA, I_B = 15 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		1.7	V	I_C = 150 mA, I_B = 15 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		1.7	V	I_C = 150 mA, V_{CE} = 2.5 V
h_{fe}	Current Gain Bandwidth Product	5.0			I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Output Capacitance		15	pF	V_{CB} = 10 V, I_E = 0, f = 140 kHz
C_{ib}	Input Capacitance		80	pF	V_{EB} = 0.5 V, I_C = 0, f = 140 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 35°C/W (derating factor of 28.6 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 2%.

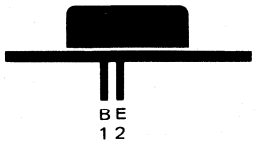
2N3054

25 WATT NPN POWER TRANSISTOR

DIFFUSED SILICON BI-MESAR™ TRANSISTOR

- LV_{CEO} . . . 55 V (MIN)
- h_{FE} . . . 25-100 @ I_C = 500 mA, V_{CE} = 4.0 V

See TO66-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65° C to +200° C
Operating Junction Temperature		200° C
Maximum Power Dissipation		
Total Dissipation at 25° C Case Temperature		25 W
Linear Derating Factor		0.142 W/°C
Maximum Voltages and Currents		
V_{CBO}	Collector to Base Voltage	90 V
V_{CEO}	Collector to Emitter Voltage	55 V
V_{EBO}	Emitter to Base Voltage	7.0 V
I_C	Collector Current	4.0 A
I_B	Base Current	2.0 A

ELECTRICAL CHARACTERISTICS (25° C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		1.0	mA	V_{CE} = 90 V, V_{EB} = 1.5 V
			6.0	mA	V_{CE} = 90 V, V_{EB} = 1.5 V, T_C = 150° C
I_{EBO}	Emitter Cutoff Current		1.0	mA	V_{EB} = 7.0 V, I_C = 0
I_{CEO}	Collector Cutoff Current		0.5	mA	V_{CE} = 30 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	55		V	I_C = 100 mA, I_B = 0
$V_{CER(sus)}$	Collector Sustaining Voltage (Note 2)	60		V	I_C = 100 mA, R_{BE} = 100 Ω
h_{FE}	DC Current Gain (Note 2)	5.0			I_C = 3.0 A, V_{CE} = 4.0 V
		25	100		I_C = 500 mA, V_{CE} = 4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		1.0	V	I_C = 500 mA, I_B = 50 mA
			6.0	V	I_C = 3.0 A, I_B = 1.0 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.7	V	I_C = 500 mA, V_{CE} = 4.0 V
f_{hfe}	Small Signal Cutoff Frequency	30		kHz	V_{CE} = 4.0 V, I_C = 100 mA
h_{fe}	Small Signal Current Gain	25	180		V_{CE} = 4.0 V, I_C = 100 mA, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5-PWR5.

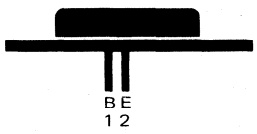
2N3055

115 WATT NPN POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTOR

- V_{CEO} . . . 60 V (MIN)
- h_{FE} . . . 20-70 @ I_C = 4.0 A, V_{CE} = 4.0 V
- $V_{CE(sat)}$ . . . 1.0 V (MAX) @ I_C = 4.0 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	−65°C to +200°C
Lead Temperature (10 seconds)	235°C

Maximum Power Dissipation

Total Dissipation at 25°C Case Temperature	115 W
Linear Derating Factor	0.66 W/°C

Maximum Voltages and Currents

V_{CBO}	Collector to Base Voltage	100 V
V_{CEO}	Collector to Emitter Voltage	60 V
V_{EBO}	Emitter to Base Voltage	7.0 V
I_C	Collector Current	15 A
I_B	Base Current	7.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		5.0	mA	V_{CE} = 100 V, V_{EB} = 1.5 V
I_{CEX}	Collector Cutoff Current		30	mA	V_{CE} = 100 V, V_{EB} = 1.5 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		5.0	mA	V_{EB} = 7.0 V, I_C = 0
I_{CEO}	Collector Cutoff Current		700	μA	V_{CE} = 30 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	60		V	I_C = 200 mA, I_B = 0
$V_{CER(sus)}$	Collector Sustaining Voltage (Note 2)	70		V	I_C = 200 mA, R_{BE} = 100 Ω
h_{FE}	DC Current Gain (Note 2)	5.0			I_C = 10 A, V_{CE} = 4.0 V
h_{FE}	DC Current Gain (Note 2)	20	70		I_C = 4.0 A, V_{CE} = 4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		1.1	V	I_C = 4.0 A, I_B = 400 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		8.0	V	I_C = 10 A, I_B = 3.3 A
$V_{BE(ON)}$	Base "On" Voltage (Note 2)		1.8	V	I_C = 4.0 A, V_{CE} = 4.0 V
fh_{fe}	Small Signal Current Gain Frequency	10		kHz	I_C = 1.0 A, V_{CE} = 4.0 V
h_{fe}	Small Signal Current Gain	15	120		I_C = 1.0 A, V_{CE} = 4.0 V, f = 1.0 kHz

4

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 1%.
3. For product family characteristic curves, refer to Section 5 — PWR 6.

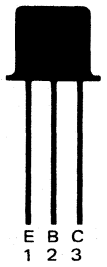
2N3107 • 2N3108 • 2N3109 • 2N3110

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SATURATED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 40 V (MIN) (2N3109/10)
  . . . 60 V (MIN) (2N3107/8)
- $V_{CE(sat)}$ . . . 1.0 V (MAX) @ 1.0 A
- NF . . . 7.0 dB (MAX) @ 1.0 kHz
- t_{on} . . . 200 ns (MAX) @ 150 mA
- t_{off} . . . 600 ns (MAX) (2N3108/10), 1.0 μs (MAX) (2N3107/9) @ 150 mA
- h_{FE} . . . 100-300 @ 150 mA (2N3107/9)
  . . . 40 (MIN) @ 500 mA (2N3107/9)

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to 200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	5.0 W
at 25°C Ambient Temperature	0.8 W

Maximum Voltages

		2N3107 2N3108	2N3109 2N3110
V_{CBO}	Collector to Base Voltage	100 V	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	40 V
V_{EBO}	Emitter to Base Voltage	7.0 V	7.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3107 2N3109 MIN.	2N3107 2N3109 MAX.	2N3108 2N3110 MIN.	2N3108 2N3110 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	100	300	40	120		I_C = 150 mA, V_{CE} = 1.0 V
		40		25			I_C = 500 mA, V_{CE} = 10 V
		35		20			I_C = 0.1 mA, V_{CE} = 10 V
		30		15			I_C = 150 mA, V_{CE} = 10 V, T_A = −55°C
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		1.1		1.1	V	I_C = 150 mA, I_B = 15 mA
	(Notes 5 & 6)		2.0		2.0	V	I_C = 1.0 A, I_B = 100 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.25		0.25	V	I_C = 150 mA, I_B = 15 mA
	(Notes 5 & 6)		1.0		1.0	V	I_C = 1.0 A, I_B = 100 mA
h_{fe}	High Frequency Current Gain	3.5		3.0			I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
C_{ob}	Open Circuit Output Capacitance						
	(2N3107 only)		20			pF	I_E = 0, V_{CB} = 10 V, f = 140 kHz
	(2N3108 only)				20	pF	I_E = 0, V_{CB} = 10 V, f = 140 kHz
	(2N3109 only)		25			pF	I_E = 0, V_{CB} = 10 V, f = 140 kHz
	(2N3110 only)				25	pF	I_E = 0, V_{CB} = 10 V, f = 140 kHz
C_{ib}	Open Circuit Input Capacitance		80		80	pF	I_E = 0, V_{EB} = 0.5 V, f = 140 kHz
I_{CES}	Collector Reverse Current		10		10	nA	V_{CE} = 60 V, V_{EB} = 0
I_{CBO}	Collector Cutoff Current		10		10	μA	V_{CB} = 60 V, I_E = 0, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10		10	nA	I_C = 0, V_{EB} = 5.0 V

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 35°C/W (derating factor of 28.6 mW/°C); junction to ambient thermal resistance of 218°C/W (derating factor of 4.5 mW/°C).
4. The rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. Saturation voltage measured with 1/4" lead length.
7. For product family characteristic curves, refer to Section 5 - SS17.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3107 2N3109 MIN.	2N3107 2N3109 MAX.	2N3108 2N3110 MIN.	2N3108 2N3110 MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage						
	(2N3107 only)	100				V	$I_E = 0, I_C = 100\ \mu A$
	(2N3108 only)			100		V	$I_E = 0, I_C = 100\ \mu A$
	(2N3109 only)	80				V	$I_E = 0, I_C = 100\ \mu A$
	(2N3110 only)			80		V	$I_E = 0, I_C = 100\ \mu A$
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)						
	(2N3107 only)	60				V	$I_B = 0, I_C = 30$ mA
	(2N3108 only)			60		V	$I_B = 0, I_C = 30$ mA
	(2N3109 only)	40				V	$I_B = 0, I_C = 30$ mA
	(2N3110 only)			40		V	$I_B = 0, I_C = 30$ mA
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0		7.0		V	$I_C = 0, I_E = 100\ \mu A$
NF	Noise Figure		7.0		7.0	dB	$I_C = 30\ \mu A$, $V_{CE} = 10$ V, f = 1.0 kHz, BW = 200 Hz, $R_S = 1.0\ k\Omega$
t_{on}	Turn On Time (see test circuit no. 288)		200		200	ns	$I_C \approx 150$ mA, $I_{B1} \approx 7.5$ mA, $I_{B2} \approx 7.5$ mA
t_{off}	Turn Off Time (see test circuit no. 288)		1000		600	ns	$I_C \approx 150$ mA, $I_{B1} \approx 7.5$ mA, $I_{B2} \approx 7.5$ mA

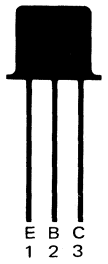
2N3137

NPN CLASS C RF AMPLIFIER

DIFFUSED NPN SILICON PLANAR* EPITAXIAL TRANSISTOR

- **G_{PE} . . . 6.0 dB (MIN) @ 250 MHz**
- **η . . . 40% (MIN) @ 250 MHz**
- **V_{CEO} . . . 20 V (MIN)**

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		200°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 25°C Ambient Temperature		0.6 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	40 V
V_{CEO}	Collector to Emitter Voltage	20 V
V_{EBO}	Emitter to Base Voltage	4.0 V
I_C	Collector Current (Continuous)	150 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V_{CBO}	Collector to Base Breakdown Voltage	40		V	I_C = 0.1 mA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	20		V	I_C = 15 mA, I_B = 0
I_{CBO}	Collector Cutoff Current		0.05	μA	V_{CB} = 20 V, I_E = 0
			50	μA	V_{CB} = 20 V, I_E = 0, T_A = 150°C
V_{EBO}	Emitter to Base Breakdown Voltage	4.0		V	I_E = 100 μA, I_C = 0
h_{FE}	DC Current Gain (Note 4)	20	120		V_{CE} = 5.0 V, I_C = 50 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.3	V	I_C = 50 mA, I_B = 5.0 mA
$\|h_{fe}\|$	High Frequency Current Gain	5.0			V_{CE} = 10 V, I_C = 50 mA, f = 100 MHz
C_{ob}	Common Base Output Capacitance		3.5	pF	V_{CB} = 10 V, I_C = 0, f = 100 kHz
G_{PE}	Power Gain (see test circuit no. 230)	6.0		dB	Pin = 100 mW, V_{CE} = 20 V, f_o = 250 MHz
η	Collector Efficiency (see test circuit no. 230)	40		%	V_{CE} = 20 V, f_o = 250 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 175°C/W (derating factor of 5.71 mW/°C); junction to ambient thermal resistance of 292°C/W (derating factor of 3.42 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 — SS2.

2N/PN3250 • 2N/PN3250A • 2N/PN3251 • 2N/PN3251A

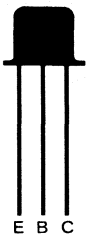
PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN SERIES)
- V_{CEO} . . . 40 V (MIN) (2N/PN3250/1), 60 V (MIN) ("A" SUFFIX DEVICES)
- NF . . . 6.0 dB @ I_C = 100 μA, V_{CE} = 5.0 V
- h_{FE} . . . 100-300 @ 10 mA (2N/PN3251/A)
- f_T . . . 250 MHz (MIN) @ 10 mA (2N/PN3250/A)
- COMPLEMENTS . . . 2N3946, 2N3947 (40 V); 2N870, 2N871 (60 V) – (TO18)
  2N3903, 2N3904 (40 V); PN1893, PE6022 (60 V) – (TO92)

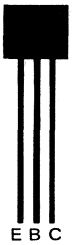
See Package Outlines

TO18-1



2N3250
2N3251
2N3250A
2N3251A

TO92-1



PN3250
PN3251
PN3250A
PN3251A

ABSOLUTE MAXIMUM RATINGS (Note 1)

		PN3250/51/50A/51A	2N/PN3250/51/50A/51A
Maximum Temperatures			
Storage Temperature		−55°C to +150°C	−65°C to +200°C
Operating Junction Temperature		150°C	200°C
Lead Temperature (60 seconds)		260°C	300°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		1.0 W	1.2 W
at 25°C Ambient Temperature		0.625 W	0.36 W
Maximum Voltage and Current		**2N/PN3250/51**	**2N/PN3250A/51A**
V_{CBO}	Collector Base Voltage	−50 V	−60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V	−60 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	200 mA	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3250/A PN3250/A MIN.	2N3250/A PN3250/A MAX.	2N3251/A PN3251/A MIN.	2N3251/A PN3251/A MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	40		80			I_C = 100 μA, V_{CE} = −1.0 V
		45		90			I_C = 1.0 mA, V_{CE} = −1.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	50	150	100	300		I_C = 10 mA, V_{CE} = −1.0 V
		15		30			I_C = 50 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.25		−0.25	V	I_C = 10 mA, I_B = 1.0 mA
			−0.50		−0.50	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)	−0.6	−0.9	−0.6	−0.9	V	I_C = 10 mA, I_B = 1.0 mA
			−1.2		−1.2	V	I_C = 50 mA, I_B = 5.0 mA
h_{fe}	High Frequency Current Gain	2.5		3.0			I_C = 10 mA, V_{CE} = −20 V, f = 100 MHz
$r_b'C_c$	Collector Base Time Constant		250		250	ps	I_C = 10 mA, V_{CE} = −20 V, f = 31.8 MHz
NF	Noise Figure		6.0		6.0	dB	I_C = 100 μA, V_{CE} = −5.0 V, f = 100 Hz, RG = 1 kΩ
t_d	Delay Time (see test circuit no. 333)		35		35	ns	I_C = 10 mA, I_{B1} = 1.0 mA, V_{CC} = 3.0 V
t_r	Rise Time (see test circuit no. 333)		35		35	ns	I_C = 10 mA, I_{B1} = 1.0 mA, V_{CC} = 3.0 V
t_s	Storage Time (see test circuit no. 239)		175		200	ns	I_C = 10 mA, I_{B1} = I_{B2} = 1.0 mA V_{CC} = 3.0 V
t_f	Fall Time (see test circuit no. 239)		50		50	ns	I_C = 10 mA, I_{B1} = I_{B2} = 1.0 mA V_{CC} = 3.0 V
I_{CEX}	Collector Reverse Current (Note 5)		20		20	nA	V_{CE} = −40 V, V_{EB} = −3.0 V

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 145°C/W (derating factor of 6.9 mW/°C); junction to ambient thermal resistance of 486°C/W (derating factor of 2.1 mW/°C) for 2N series. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for P/N series.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves refer to Section 5 – SS23.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3250/A PN3250/A MIN.	MAX.	2N3251/A PN3251/A MIN.	MAX.	UNITS	TEST CONDITIONS
I_{BL}	Base Current		50		50	nA	V_{CE} = –40 V, V_{EB} = –3.0 V
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		8.0		8.0	pF	V_{EB} = 1.0 V, I_C = 0, f = 100 kHz
h_{fe}	Small Signal Current Gain	50	200	100	400		I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		10		20	$X10^{-4}$	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{ie}	Input Impedance	1.0	6.0	2.0	12	kΩ	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{oe}	Output Admittance	4.0	40	10	60	μmhos	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz

SYMBOL	CHARACTERISTIC	2N3250 PN3250 2N3251 PN3251 MIN.	MAX.	2N3250A PN3250A 2N3251A PN3251A MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	–50		–60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	–5.0		–5.0		V	I_C = 0, I_E = 10 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage (Notes 4 & 5)	–40		–60		V	I_C = 10 mA, I_B = 0

2N3409 • 2N3410 • 2N3411

DUAL NPN LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{BE} . . . 10 mV (2N3409/10), 5.0 mV (2N3411) @ 100 μA
- $\frac{h_{FE1}}{h_{FE2}}$ . . . 0.8-1.0 (2N3409), 0.9-1.0 (2N3410/11) @ 100 μA

See TO5-9 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Lead Temperature (10 seconds)			230°C
Maximum Power Dissipation		**One Side**	**Both Sides**
Total Dissipation at 25°C Case Temperature		500 mW	600 mW
Linear Derating Factor		2.9 mW/°C	3.4 mW/°C
Maximum Voltages and Current			
V_{EBO}	Emitter to Base Voltage		5.0 V
V_{CBO}	Collector to Base Voltage		60 V
V_{CEO}	Collector to Emitter Voltage		30 V
V_{C1C2}	$Collector_1$ to $Collector_2$		±100 V
	Voltage Rating any Lead to Case		±100 V
I_C	Collector Current		500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Note 2)

SYMBOL	CHARACTERISTIC	2N3409 MIN.	2N3409 MAX.	2N3410 MIN.	2N3410 MAX.	2N3411 MIN.	2N3411 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10		10		10	nA	V_{CB} = 50 V
			10		10		10	μA	V_{CB} = 50 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10		10		10	nA	V_{EB} = 3.0 V
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		5.0		V	I_C = 0, I_E = 10 μA
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		60		V	I_E = 0, I_C = 10 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 3)	30		30		30		V	I_C = 10 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.15		0.15		0.15	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		0.85		0.85		0.85	V	I_C = 10 mA, I_B = 1.0 mA
h_{fe}	Static Forward Current Transfer Ratio	30	120	30	120	30	120		I_C = 100 μA, V_{CE} = 10 V
		40	160	40	160	40	160		I_C = 1.0 mA, V_{CE} = 10 V
		50	200	50	200	50	200		I_C = 10 mA, V_{CE} = 10 V
				20	100	20	100		I_C = 10 μA, V_{CE} = 10 V
$\frac{h_{FE1}}{h_{FE2}}$	Static Forward Current Transfer Ratio	0.8	1.0	0.9	1.0	0.9	1.0		I_C = 100 μA, V_{CE} = 10 V
						0.9	1.0		I_C = 1.0 mA, V_{CE} = 10 V
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential		10		10		5.0	mV	I_C = 100 μA, V_{CE} = 10 V
							5.0	mV	I_C = 1.0 mA, V_{CE} = 10 V

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. Unit not under test open circuit unless otherwise specified.
3. Pulse conditions: width ≤ 300 μs; duty cycle ≤ 2%.
4. For product family characteristic curves, refer to Section 5-SS15.

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) Note 2. (Cont'd.)

SYMBOL	CHARACTERISTIC	2N3409 MIN.	2N3409 MAX.	2N3410 MIN.	2N3410 MAX.	2N3411 MIN.	2N3411 MAX.	UNITS	TEST CONDITIONS
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential Gradient		2.0		1.0		1.0	mV	V_{CE} = 10 V, I_C = 100 μA, T_A = +25° C to +125° C
			1.6		0.8		0.8	mV	V_{CE} = 10 V, I_C = 100 μA, T_A = −55° C to +25° C
C_{ob}	Output Capacitance		8.0		8.0		8.0	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		20		20		20	pF	V_{EB} = 0.5 V, I_C = 0, f = 100 kHz
h_{fe}	Magnitude of Small Signal, Short Circuit Forward Current Transfer Ratio	2.5	8.0	2.5	8.0	2.5	8.0		V_{CE} = 20 V, I_C = 20 mA, f = 100 MHz
NF	Noise Figure		4.0		4.0		4.0	dB	V_{CE} = 5.0 V, I_C = 100 μA f = 1.0 kHz, R_G = 1.0 kΩ, BW = 1.0 Hz

2N3423 • 2N3424

DUAL NPN LOW NOISE SENSE AND HIGH FREQUENCY DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- $\frac{h_{FE1}}{h_{FE2}}$ . . . 10% @ 3.0 mA
- $|V_{BE1}\text{-}V_{BE2}|$ . . . 5.0 mV (MAX) @ 3.0 mA
- $|\Delta(V_{BE1}\text{-}V_{BE2})|$ . . . 20 μV/°C (MAX) @ 3.0 mA, −55°C to +125°C
- f_T . . . 600 MHz (MIN) @ 4.0 mA
- NF . . . 3.5 dB (TPY) @ 60 Hz

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (60 seconds)			300°C
Maximum Power Dissipation (Notes 2 & 3)		**One Side**	**Both Sides**
Total Dissipation at 25°C Case Temperature		0.6 W	1.2 W
at 100°C Case Temperature		0.25 W	0.5 W
at 25°C Ambient Temperature		0.3 W	0.45 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage		30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)		15 V
V_{EBO}	Emitter to Base Voltage		3.0 V
I_C	Collector Current		50 mA
V_{C1C2}	$Collector_1$ to $Collector_2$ Voltage		±200 V
	Voltage Rating Any Lead to Case		±200 V

MATCHING CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3423 MIN.	2N3423 MAX.	2N3424 MIN.	2N3424 MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.8	1.0	0.9	1.0		I_C = 3.0 mA, V_{CE} = 3.0 V
$\lvert V_{BE1}\text{-}V_{BE2}\rvert$	Base to Emitter Voltage Differential		10		5.0	mV	I_C = 3.0 mA, V_{CE} = 3.0 V
$\lvert\Delta(V_{BE1}\text{-}V_{BE2})\rvert$	Base to Emitter Voltage Differential Change		3.2 (40 μV/°C)		1.6 (20 μV/°C)	mV	I_C = 3.0 mA, V_{CE} = 3.0 V, T_A = −55°C to +25°C
$\lvert\Delta(V_{BE1}\text{-}V_{BE2})\rvert$	Base to Emitter Voltage Differential Change		4.0 (40 μV/°C)		2.0 (20 μV/°C)	mV	I_C = 3.0 mA, V_{CE} = 3.0 V, T_A = +25°C to +125°C

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	20			I_C = 3.0 mA, V_{CE} = 1.0 V
		20	200		I_C = 3.0 mA, V_{CE} = 3.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	I_C = 1.0 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	I_C = 0, I_E = 10 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 6)	15		V	I_C = 3.0 mA, I_B = 0

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 584°C/W (derating factor of 1.72 mW/°C) for one side; 389°C/W (derating factor of 2.57 mW/°C) for both sides; junction to case thermal resistance 290°C/W (derating factor of 3.44 mW/°C) for one side; 145°C/W (derating factor of 6.85 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Lowest of two h_{FE} readings is taken as h_{FE1} for purpose of this ratio.
6. Pulse conditions: length = 300 μs; duty cycle = 1%.
7. For product family characteristic curves, refer to Section 5 - SS27.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector Saturation Voltage		0.4	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		1.0	V	I_C = 10 mA, I_B = 1.0 mA
I_{CBO}	Collector Cutoff Current		10	nA	I_E = 0, V_{CB} = 15 V
			1.0	μA	I_E = 0, V_{CB} = 15 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10	μA	I_C = 0, V_{EB} = 3.0 V
h_{fe}	High Frequency Current Gain	6.0	12		I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Common to Base Output Capacitance		1.7	pF	I_E = 0, V_{CB} = 10 V, f = 140 kHz
			3.0	pF	I_E = 0, V_{CB} = 0, f = 140 kHz
C_{ib}	Common to Base Input Capacitance		2.0	pF	I_C = 0, V_{EB} = 0.5 V, f = 140 kHz
$RE_{(hie)}$	Real Part of Common Emitter Input Impedance		45	Ω	I_C = 3.0 mA, V_{CE} = 3.0 V, f = 350 MHz
NF	Noise Figure (see test circuit no. 568)	3.5 (TYP)		dB	I_C = 1.0 mA, V_{CE} = 6.0 V, f = 60 MHz, R_G = 400 Ω

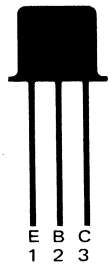
2N3439 • 2N3440

NPN POWER

DIFFUSED SILICON PLANAR* TRANSISTORS

- P_D . . . 10 W @ T_C = 25°C
- V_{CEO} . . . 250-350 V (MIN)

See TO5-2 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature		−65°C to +200°C	
Operating Junction Temperature		−65°C to +200°C	
Maximum Power Dissipation			
Total Dissipation at 25°C Case Temperature		10 W	
at 25°C Ambient Temperature		1.0 W	
Maximum Voltages and Currents		**2N3439**	**2N3440**
V_{CBO}	Collector to Base Voltage	450 V	300 V
V_{CEO}	Collector to Emitter Voltage (Applicable from 0 to 50 mA)	350 V	250 V
V_{EBO}	Emitter to Base Voltage	7.0 V	7.0 V
I_C	Collector Current (Continuous)	1.0 A	1.0 A
I_B	Base Current (Continuous)	0.5 A	0.5 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current	2N3439		20	μA	I_E = 0, V_{CB} = 360 V
		2N3440		20	μA	I_E = 0, V_{CB} = 250 V
I_{EBO}	Emitter Cutoff Current			20	μA	I_C = 0, V_{EB} = 6.0 V
h_{FE}	DC Pulse Current Gain (Note 2)		40	160		I_C = 20 mA, V_{CE} = 10 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain		3.0			I_C = 10 mA, V_{CE} = 10 V, f = 5.0 MHz
h_{fe}	Low Frequency Current Gain		25			I_C = 5.0 mA, V_{CE} = 10 V, f = 1.0 kHz
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 2)			0.5	V	I_C = 50 mA, I_B = 4.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 2)			1.3	V	I_C = 50 mA, I_B = 4.0 mA
C_{ob}	Common Base Open Circuit Output Capacitance			10	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
C_{ib}	Common Base Short Circuit Input Capacitance			75	pF	I_C = 0, V_{EB} = 5.0 V, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 1%.
3. For product family characteristic curves, refer to Section 5 — PWR8.

2N/PN3567 • 2N/PN3568 • 2N/PN3569

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . .
- h_{FE} . . .
- V_{CEO} .

ABSOLUTE

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V_{CB}
V_{CE}
V_{EB}
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ELECTRICA

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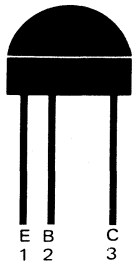
†I_{CBO}
C_{ob}
BV_{CBO}
V_{CEO}
BV_{EBO}
h_{ie}
h_{oe}
h_{fe}

- P_D . . . 625 mW @ T_A = 25°C (PN Series)
- V_{CEO} . . . 40 V (MIN) (2N/PN3567, 2N/PN3569); 60 V (MIN) (2N/PN3568)
- h_{FE} . . . 100-300 @ 150 mA (2N/PN3569); 40-120 @ 150 mA (2N/PN3567, 2N/PN3568)
- COMPLEMENTS . . . 2N4354, 2N4355 (TO5)
  . . . MPS4354, MPS4355 (TO92)

See Package Outlir

TO5-4



2N3567
2N3568
2N3569

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N3567/8/9	PN3567/8/9
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.8 W	1.0 W
at 25°C Ambient Temperature		0.3 W	0.625 W
Maximum Voltages and Currents		**2N/PN3568**	**2N/PN3567/9**
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
V_{CBO}	Collector to Base Voltage	80 V	80 V
V_{CEO}	Collector to Emitter Voltage (Notes 4 & 6)	60 V	40 V
I_C	Collector Current	500 mA	500 mA
I_B	Base Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN3567 MIN.	2N/PN3567 MAX.	2N/PN3568 MIN.	2N/PN3568 MAX.	2N/PN3569 MIN.	2N/PN3569 MAX.	UNITS	TEST CONDI
I_{CBO}	Collector Cutoff Current		50		50		50	nA	V_{CB} = 40 V, I_E = 0
			5.0		5.0		5.0	μA	V_{CB} = 40 V, I_E = 0, T_A
I_{EBO}	Emitter Cutoff Current		25		25		25	nA	V_{EB} = 4.0 V, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	80		80		80		V	I_E = 0, I_C = 100 μA
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		5.0		V	I_C = 0, I_E = 10 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	40		60		40		V	I_B = 0, I_C = 30 mA
h_{FE}	DC Current Gain (Note 5)	40	120	40	120	100	300		V_{CE} = 1.0 V, I_C = 150 m
		40		40		100			V_{CE} = 1.0 V, I_C = 30 m
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		1.1		1.1		1.1	V	V_{CE} = 1.0 V, I_C = 150 m
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25		0.25		0.25	V	I_C = 150 mA, I_B = 15 m
C_{cb}	Collector to Base Capacitance		20		20		20	pF	I_E = 0, V_{CB} = 10 V, f =
C_{eb}	Emitter to Base Capacitance		80		80		80	pF	I_C = 0, V_{EB} = 0.5 V, f =
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	3.0	30	3.0	30	3.0	30		V_{CE} = 10 V, I_C = 50 mA f = 20 MHz

*Planar is a patented Fa

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 125°C/W (derating factor c junction to ambient thermal resistance of 333°C/W (derating factor of 3.0 mW/°C) for 2N3567, 2N3568, and 2N3569. These ratir mum junction temperature of 150°C/W and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junct thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN3567, PN3568, and PN3569.
4. This rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse Conditions: length = 300 μs; duty cycle = 1%.
6. Applicable 0 to 30 mA.

NOTES:
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2. These ra
5.0 mW/
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2N3638 • 2N3638A • MPS3638 • MPS3638A

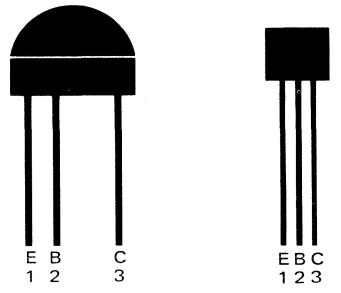
PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C (MPS3638, MPS3638A)**
- **V_{CEO} . . . −25 V (MIN)**
- **h_{FE} . . . 30 (MIN) (2N/MPS3638), 100 (MIN) (2N/MPS3638A) @ 50 mA**
- **t_{on} . . . 75 ns (MAX) @ 300 mA**
- **t_{off} . . . 170 ns (MAX) @ 300 mA**
- **COMPLEMENTS . . . 2N/PN3641, 2N/PN3643**

See Package Outlines

TO 5-4 TO 92-1



2N3638 2N3638A **MPS3638 MPS3638A**

ABSOLUTE MAXIMUM TEMPERATURES (Note 1)	**2N3638 2N3638A**	**MPS3638 MPS3638A**
Maximum Temperatures		
Storage Temperature	−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature	125°C	150°C
Lead Temperature (10 seconds)	260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature	0.3 W	0.625 W
at 25°C Case Temperature	0.7 W	1.0 W
Maximum Voltages and Current		
V_{CBO} Collector to Base Voltage	−25 V	−25 V
V_{CES} Collector to Emitter Voltage	−25 V	−25 V
V_{CEO} Collector to Emitter Voltage (Note 4)	−25 V	−25 V
V_{EBO} Emitter to Base Voltage	−4.0 V	−4.0 V
I_C Collector Current (Note 2)	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3638 MPS3638 MIN.	2N3638 MPS3638 MAX.	2N3638A MPS3638A MIN.	2N3638A MPS3638A MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5) (MPS3638)	20					I_C = 10 mA, V_{CE} = −10 V
				100			I_C = 10 mA, V_{CE} = −10 V
				80			I_C = 1.0 mA, V_{CE} = −10 V
		30		100			I_C = 50 mA, V_{CE} = −1.0 V
		20		20			I_C = 300 mA, V_{CE} = −2.0 V
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 5)		−0.25		−0.25	V	I_C = 50 mA, I_B = 2.5 mA
			−1.0		−1.0	V	I_C = 300 mA, I_B = 30 mA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−25		−25		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−25		−25		V	I_C = 100 μA, V_{BE} = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−25		−25		V	I_C = 100 μA, V_{BE} = 0
t_{on}	Turn On Time (see test circuit no. 536)		75		75	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA, V_{CC} = 10 V
t_{off}	Turn Off Time (see test circuit no. 536)		170		170	ns	$I_C \approx$ 300 mA, $I_{B1} \approx I_{B2} \approx$ 30 mA, V_{CC} = 10 V
h_{fe}	Magnitude of small signal Current Gain	1.0		1.5			I_C = 50 mA, V_{CE} = −3.0 V, f = 100 MHz
C_{ob}	Common Base Open Circuit, Output Capacitance		20		10	pF	V_{CB} = −10 V, I_E = 0, f = 140 kHz
C_{ib}	Common Base Open Circuit, Input Capacitance			(2N3638A)	35	pF	I_C = 0, V_{EB} = −0.5 V, f = 140 kHz
			65	(MPS3638A)	25	pF	I_C = 0, V_{EB} = −0.5 V, f = 140 kHz
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−1.1		−1.1	V	I_C = 50 mA, I_B = 2.5 mA,
		−0.8	−2.0	−0.8	−2.0	V	I_C = 300 mA, I_B = 30 mA
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_E = 100 μA, I_C = 0

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 143°C/W (derating factor of 7.0 mW/°C); junction to ambient thermal resistance of 333°C/W (derating factor of 3.0 mW/°C) for 2N3638 & 2N3638A. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for MPS3638 & MPS3638A.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse Conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS22.

ELECTRIC CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3638 MPS3638 MIN.	2N3638 MPS3638 MAX.	2N3638A MPS3638A MIN.	2N3638A MPS3638A MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Reverse Current		35		35	nA	V_{CE} = –15 V, V_{BE} = 0
			2.0		2.0	μA	V_{CE} = –15 V, V_{BE} = 0, T_A = 65°C
h_{fe}	Small Signal Current Gain						
	2N3638	25					I_C = 10 mA, V_{CE} = –10 V, f = 1.0 kHz
	MPS3638	25	180				I_C = 10 mA, V_{CE} = –10 V, f = 1.0 kHz
				100			I_C = 10 mA, V_{CE} = –10 V, f = 1.0 kHz
h_{ie}	Input Resistance		2000		2000	Ω	I_C = 10 mA, V_{CE} = 10 V, f = 1.0 kHz
	MPS3638		1500			Ω	
h_{oe}	Output Conductance		1200		1200	μmhos	I_C = 10 mA, V_{CE} = –10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		2600		1500	$X10^{-6}$	I_C = 10 mA, V_{CE} = –10 V, f = 1.0 kHz

2N3639 • 2N3640 • MPS3639 • MPS3640

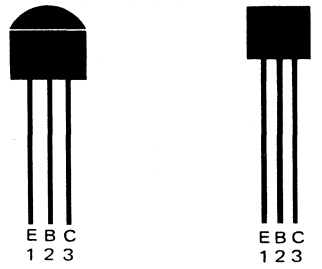
PNP HIGH SPEED SATURATED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (MPS3639/40)
- V_{CEO} . . . 12 V (MIN) (2N/MPS3640)
- t_{on} . . . 25 ns (MAX) @ 50 mA, 60 ns (MAX) @ 10 mA
- t_{off} . . . 35 ns (MAX) @ 50 mA, 75 ns (MAX) @ 10 mA
- COMPLEMENTS . . . 2N4274 (TO18), 2N5769 (TO92)

See Package Outlines

TO18-4 TO92-1



2N3639 2N3640 MPS3639 MPS3640

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N3639/40	MPS3639/40
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.5 W	1.0 W
at 25°C Ambient Temperature		0.2 W	0.625 W
Maximum Voltages and Current		**2N/MPS3639**	**2N/MPS3640**
V_{CBO}	Collector to Base Voltage	−6.0 V	−12 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−6.0 V	−12 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.0 V
I_C	Collector Current	80 mA	80 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3639 MIN.	2N3639 MAX.	2N3640 MIN.	2N3640 MAX.	UNITS	TEST CONDITIONS
τ_s	Storage Time						$I_C \simeq 10$ mA, $I_{B1} \simeq I_{B2} \simeq 10$ mA,
	(see test circuit no. 234)		30		50	ns	$V_{CC} = 3.0$ V
t_{on}	Turn On Time						$I_C \simeq 50$ mA, $I_{B1} \simeq 5.0$ mA,
	(see test circuit no. 235		25		25	ns	$V_{CC} = 6.0$ V
	(see test circuit no. 219)		60		60	ns	$I_C \simeq 10$ mA, $I_{B1} \simeq 0.5$ mA, $V_{CC} = -1.5$ V
t_{off}	Turn Off Time						$I_C \simeq 50$ mA, $I_{B1} \simeq I_{B2} \simeq 5.0$ mA,
	(see test circuit no. 235)		25		35	ns	$V_{CC} = 6.0$ V
	(see test circuit no. 219)		60		75	ns	$I_C \simeq 10$ mA, $I_{B1} \simeq I_{B2} \simeq 0.5$ mA, $V_{CC} = 1.5$ V
h_{fe}	High Frequency Current Gain	3.0		3.0			$I_C = 10$ mA, $V_{CB} = 0$, f = 100 MHz
		5.0		5.0			$I_C = 10$ mA, $V_{CE} = -5.0$ V, f = 100 MHz
h_{FE}	DC Pulse Current Gain (Note 4)	30	120	30	120		$I_C = 10$ mA, $V_{CE} = -0.3$ V
		20		20			$I_C = 50$ mA, $V_{CE} = -1.0$ V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		−0.16		−0.2	V	$I_C = 10$ mA, $I_B = 1.0$ mA
			−0.5		−0.6	V	$I_C = 50$ mA, $I_B = 5.0$ mA
			−0.25		−0.3	V	$I_C = 10$ mA, $I_B = 0.5$ mA
			−0.23		−0.25	V	$I_C = 10$ mA, $I_B = 1.0$ mA, $T_A = 65°C$
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)	−0.75	−0.95	−0.75	−0.95	V	$I_C = 10$ mA, $I_B = 0.5$ mA
		−0.8	−1.0	−0.8	−1.0	V	$I_C = 10$ mA, $I_B = 1.0$ mA
			1.5		1.5	V	$I_C = 50$ mA, $I_B = 5.0$ mA
I_{CES}	Collector Reverse Current		50			nA	$V_{CE} = -3.0$ V, $V_{BE} = 0$
					50	nA	$V_{CE} = -6.0$ V, $V_{BE} = 0$
			1.0			μA	$V_{CE} = -3.0$ V, $V_{BE} = 0$, $T_A = 65°C$
					1.0	μA	$V_{CE} = -6.0$ V, $V_{BE} = 0$, $T_A = 65°C$

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N3639, 2N3640. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for MPS3639, MPS3640.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 — SS31.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3639 MIN.	2N3639 MAX.	2N3640 MIN.	2N3640 MAX.	UNITS	TEST CONDITIONS
C_{ob}	Output Capacitance		3.5		3.5	pF	$I_E = 0, V_{CB} = -5.0$ V, f = 140 kHz
			5.5		5.5	pF	$I_E = 0, V_{CB} = 0$, f = 140 kHz
C_{ib}	Input Capacitance		3.5		3.5	pF	$I_C = 0, V_{EB} = -0.5$ V, f = 140 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	−6.0		−12		V	$I_C = 100\ \mu A, I_E = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	−6.0		−12		V	$I_C = 100\ \mu A, V_{BE} = 0$
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	−6.0		−12		V	$I_C = 10$ mA, $I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	$I_E = 100\ \mu A, I_C = 0$

SYMBOL	CHARACTERISTIC	MPS3639 MIN.	MPS3639 MAX.	MPS3640 MIN.	MPS3640 MAX.	UNITS	TEST CONDITIONS
t_{on}	Turn on Time						$I_C \simeq 50$ mA, $I_{B1} \simeq 5.0$ mA,
	(see test circuit no. 235)		25		25	ns	$V_{CC} = 6.0$ V
	(see test circuit no. 219)		60		60	ns	$I_C \simeq 10$ mA, $I_{B1} \simeq 0.5$ mA, $V_{CC} = -1.5$ V
t_{off}	Turn Off Time						$I_C \simeq 50$ mA, $I_{B1} \simeq I_{B2} \simeq 5.0$ mA,
	(see test circuit no. 235)		25		35	ns	$V_{CC} = -6.0$ V
	(see test circuit no. 219)		60		75	ns	$I_C \simeq 10$ mA, $I_{B1} \simeq I_{B2} \simeq 0.5$ mA, $V_{CC} = 1.5$ V
h_{fe}	High Frequency Current Gain	3.0					$I_C = 10$ mA, $V_{CB} = 0$, f = 100 MHz
		5.0		5.0			$I_C = 10$ mA, $V_{CE} = -5.0$ V, f = 100 MHz
h_{FE}	DC Pulse Current Gain (Note 4)	30	120	30	120		$I_C = 10$ mA, $V_{CE} = -0.3$ V
		20		20			$I_C = 50$ mA, $V_{CE} = -1.0$ V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		−0.16		−0.2	V	$I_C = 10$ mA, $I_B = 1.0$ mA
			−0.5		−0.6	V	$I_C = 50$ mA, $I_B = 5.0$ mA
			−0.23		−0.25	V	$I_C = 10$ mA, $I_B = 1.0$ mA, $T_A = 65°C$
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)	−0.75	−0.95	−0.75	−0.95	V	$I_C = 10$ mA, $I_B = 0.5$ mA
		−0.8	−1.0	−0.8	−1.0	V	$I_C = 10$ mA, $I_B = 1.0$ mA
			1.5		1.5	V	$I_C = 50$ mA, $I_B = 5.0$ mA
I_{CES}	Collector Reverse Current		10			nA	$V_{CE} = -3.0$ V, $V_{BE} = 0$
					10	nA	$V_{CE} = -6.0$ V, $V_{BE} = 0$
			1.0			μA	$V_{CE} = -3.0$ V, $V_{BE} = 0$, $T_A = 65°C$
					1.0	μA	$V_{CE} = -6.0$ V, $V_{BE} = 0$, $T_A = 65°C$
C_{ob}	Output Capacitance		3.5		3.5	pF	$I_E = 0, V_{CB} = -5.0$ V, f = 140 kHz
C_{ib}	Input Capacitance		3.5		3.5	pF	$I_C = 0, V_{EB} = -0.5$ V, f = 140 kHz
BV_{CBO}	Collector to Base Breakdown Voltage	−6.0		−12		V	$I_C = 100\ \mu A, I_E = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	−6.0		−12		V	$I_C = 100\ \mu A, V_{BE} = 0$
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	−6.0		−12		V	$I_C = 10$ mA, $I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	$I_E = 100\ \mu A, I_C = 0$

2N/PN3641 • 2N/PN3642 • 2N/PN3643

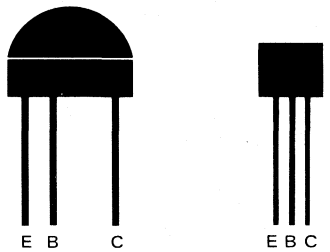
NPN GENERAL PURPOSE SMALL SIGNAL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN SERIES)
- P_G . . . 400 mW RF POWER OUT AT 30 MHz
- V_{CEO} . . . 30 V (MIN) (2N/PN3641 • 2N/PN3643), 45 V (MIN) (2N/PN3642)
- h_{FE} . . . 100 (MIN) @ 150 mA, 25 (MIN) @ 500 mA (2N/PN3643)
- f_T . . . 250 MHz (MIN) (2N/PN3643)
- t_{on} . . . = 60 ns (MAX) @ 300 mA, t_{off} . . . = 150 ns (MAX) @ 300 mA
- COMPLEMENTS . . . 2N3638/A • 2N3644 (TO5), MPS3638/A • PN3644 (TO92)

See Package Outlines

TO5-4 TO92-1



2N3641
2N3642
2N3643

PN3641
PN3642
PN3643

ABSOLUTE MAXIMUM RATINGS (Note 1)

		PN Series	2N Series
Maximum Temperatures			
Storage Temperature		−55°C to +150°C	−55°C to +125°C
Operating Junction Temperature		150°C	125°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		1.0 W	0.7 W
at 25°C Ambient Temperature		0.625 W	0.35 W
Maximum Voltages and Current		**2N/PN3641/43**	**2N/PN3642**
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
V_{CBO}	Collector to Base Voltage	60 V	60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	45 V
I_C	Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3641 PN3641 MIN.	2N3641 PN3641 MAX.	2N3642 PN3642 MIN.	2N3642 PN3642 MAX.	2N3643 PN3643 MIN.	2N3643 PN3643 MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Cutoff Current		50		50		50	nA	V_{CE} = 50 V, V_{BE} = 0
			1.0		1.0		1.0	μA	V_{CE} = 50 V, V_{BE} = 0, T_A = 65°C
BV_{CES}	Collector to Emitter Breakdown Voltage	60		60		60		V	I_C = 10 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		5.0		V	I_E = 10 μA, I_C = 0
$BV_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	30		45		30		V	I_C = 10 mA, I_B = 0
h_{FE}	DC Current Gain (Note 5)	40	120	40	120	100	300		V_{CE} = 10 V, I_C = 150 mA
		15		15		25			V_{CE} = 10 V, I_C = 500 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.22		0.22		0.22	V	I_C = 150 mA, I_B = 15 mA
h_{fe}	Magnitude of Common Emitter, Short Circuit Small Signal Current Gain	1.5		1.5		2.5			V_{CE} = 5.0 V, I_C = 50 mA, f = 100 MHz
C_{ob}	Output Capacitance		8.0		8.0		8.0	pF	V_{CB} = 10 V, I_E = 0, f = 140 kHz
G_{PE}	Amplifier Power Gain (see test circuit no. 238)	10		10		10		dB	(Zero Signal) V_{CE} = 15 V, I_C = 0, R_G = 140 Ω, R_L = 260 Ω, f = 30 MHz, P_{IN} = 40 mW
η	Collector Efficiency (see test circuit no. 238)	60		60		60		%	(Zero Signal) V_{CE} = 15 V, I_C = 0, R_G = 140 Ω, R_L = 260 Ω, f = 30 MHz, P_{IN} = 40 mW
†t_{on}	Turn On Time (see test circuit no. 241)		60		60		60	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA
†t_{off}	Turn Off Time (see test circuit no. 242)		150		150		150	ns	$I_C \approx$ 300 mA, $I_{B1} \approx I_{B2} \approx$ 30 mA

†Fairchild exceeds JEDEC registered Values.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 143°C/W (derating factor of 7.0 mW/°C); junction to ambient thermal resistance of 28.6°C/W (derating factor of 3.5 mW/°C) for 2N3641, 2N3642, 2N3643. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C. Junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN3641, PN3642, PN3643.
4. This rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS15.

4

2N3644 • 2N3645 • PN3644 • PN3645

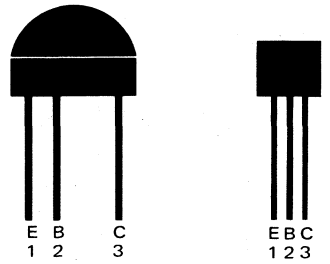
PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN3644, PN3645)
- V_{CEO} . . . −45 V (MIN) (2N/PN3644), 60 V (MIN) (2N/PN3645)
- h_{FE} . . . 80-240 @ 50 mA
- t_{on} . . . 40 ns (MAX) @ 300 mA
- t_{off} . . . 100 ns (MAX) @ 300 mA
- COMPLEMENTS . . . 2N/PN3569, PE/SE6020

See Package Outlines

TO5-4 TO92-1



2N3644 2N3645 PN3644 PN3645

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N3644/45	PN3644/45
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.07 W	1.0 W
at 25°C Ambient Temperature		0.3 W	0.625 W
Maximum Voltages and Current		**2N/PN3645**	**2N/PN3644**
V_{CBO}	Collector to Base Voltage	−60 V	−45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V	−45 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3644 PN3644 MIN.	2N3644 PN3644 MAX.	2N3645 PN3645 MIN.	2N3645 PN3645 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	40		40			I_C = 100 μA, V_{CE} = −10 V
		80		80			I_C = 1.0 mA, V_{CE} = −10 V
h_{FE}	DC Pulse Current Gain (Note 5)	100		100			I_C = 10 mA, V_{CE} = −10 V
		80	240	80	240		I_C = 50 mA, V_{CE} = 1.0 V
		100	300	100	300		I_C = 150 mA, V_{CE} = −10 V
		20		20			I_C = 300 mA, V_{CE} = −2.0 V
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 20 mA, V_{CE} = −20 V, f = 100 MHz
C_{ob}	Output Capacitance		8.0		8.0	pF	I_E = 0, V_{CB} = −10 V, f = 140 kHz
C_{ib}	Input Capacitance		35		35	pF	I_C = 0, V_{EB} = −0.5 V, f = 140 kHz
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 5)		−0.25		−0.25	V	I_C = 50 mA, I_B = 2.5 mA
			−0.4		−0.4	V	I_C = 150 mA, I_B = 15 mA
			−1.0		−1.0	V	I_C = 300 mA, I_B = 30 mA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−45		−60		V	I_C = 10 mA (pulsed), I_B = 0
$V_{BE(sat)}$	Pulsed Base		−1.0		−1.0	V	I_C = 50 mA, I_B = 2.5 mA
			−1.3		−1.3	V	I_C = 150 mA, I_B = 15 mA
		−0.8	−2.0	−0.8	−2.0	V	I_C = 300 mA, I_B = 30 mA
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0			−5.0	V	I_C = 0, I_E = 10 μA
BV_{CBO}	Collector to Base Breakdown Voltage	−45		−60		V	I_C = 100 μA, I_E = 0
t_{on}	Turn On Time (see test circuit no. 246)		40		40	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA, V_{CC} = −30 V
t_{off}	Turn Off Time (see test circuit no. 246)		100		100	ns	$I_C \approx$ 300 mA, $I_{B1} \approx I_{B2} \approx$ 30 mA, V_{CE} = −30 V
I_{CES}	Collector Reverse Current		35			nA	V_{CE} = −30 V, V_{BE} = 0
					35	nA	V_{CE} = −50 V, V_{BE} = 0
			2.0			μA	V_{CE} = −30 V, V_{BE} = 0, T_A = 65°C
					2.0	μA	V_{CE} = −50 V, V_{BE} = 0, T_A = 65°C

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 143°C/W (derating factor of 7.0 mW/°C); junction to ambient thermal resistance of 333°C/W (derating factor of 3.0 mW/°C) for 2N3644 & 2N3645. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN3644 & PN3645.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS22.

2N3646 • MPS3646 • 2N5772

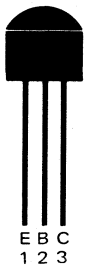
NPN HIGH SPEED SATURATED LOGIC SWITCHES

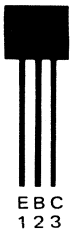
DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (MPS3646, 2N5772)
- V_{CEO} . . . 15 V (MIN)
- τ_s . . . 18 ns (MAX) @ 10 mA
- t_{on} . . . 18 ns (MAX) @ 300 mA
- t_{off} . . . 28 ns (MAX) @ 300 mA

See Package Outlines

TO18-4 TO92-1





2N3646 MPS3646 2N5772

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N3646	2N5772 MPS3646
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature		0.2 W	0.625 W
at 25°C Case Temperature		0.5 W	1.0 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage	40 V	40 V
V_{CES}	Collector to Emitter Voltage	40 V	40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	15 V	15 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
I_C	Collector Current	200 mA	200 mA
	Pulse = 10 μs	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)	30	120		I_C = 30 mA, V_{CE} = 0.4 V
		25			I_C = 100 mA, V_{CE} = 0.5 V
		15			I_C = 300 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.20	V	I_C = 30 mA, I_B = 3.0 mA
			0.28	V	I_C = 100 mA, I_B = 10 mA
			0.5	V	I_C = 300 mA, I_B = 30 mA
			0.3	V	I_C = 30 mA, I_B = 3.0 mA, T_A = 65°C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.75	0.95	V	I_C = 30 mA, I_B = 3.0 mA
			1.2	V	I_C = 100 mA, I_B = 10 mA
			1.7	V	I_C = 300 mA, I_B = 30 mA
h_{fe}	High Frequency Current Gain	3.5			I_C = 30 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		5.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 140 kHz
C_{TE}	Emitter Transition Capacitance		8.0	pF	I_C = 0, V_{BE} = 0.5 V, f = 140 kHz
I_{CES}	Collector Reverse Current		0.5	μA	V_{CE} = 20 V, V_{BE} = 0
			3.0	μA	V_{CE} = 20 V, V_{BE} = 0, T_A = 65°C
BV_{CBO}	Collector to Base Breakdown Voltage	40		V	I_C = 100 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	40		V	I_C = 10 μA, V_{BE} = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	15		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 100 μA, I_C = 0
τ_s	Charge Storage Time Constant (see test circuit no. 3111)		18	ns	$I_C \approx I_{B1} \approx -I_{B2} \approx$ 10 mA, V_{CC} = 10 V
t_{on}	Turn On Time (see test circuit no. 233)		18	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA, V_{CC} = 10 V
t_{off}	Turn Off Time (see test circuit no. 233)		28	ns	$I_C \approx$ 300 mA, $I_{B1} \approx -I_{B2}$ = 30 mA, V_{CC} = 10 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N3646. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for 2N5772 and MPS3646.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS5.

2N/PN3688 • 2N/PN3689 • 2N/PN3690 • SE5006

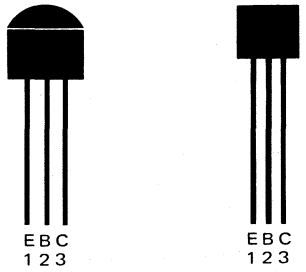
NPN RF AGC AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C (PN Series)**
- **FORWARD AGC CAPABILITY**
- **CHARACTERIZED FOR FREQUENCIES FROM 455 kHz TO 200 MHz**

See Package Outlines

TO18-4 TO92-1



2N3688/89/90
SE5006

PN3688/89/90

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N3688/89/90	PN3688/89/90
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Soldering Temperature		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.5 W	1.0 W
at 65°C Case Temperature		0.3 W	
at 25°C Ambient Temperature		0.2 W	0.625 W
Maximum Voltages			
V_{CBO}	Collector to Base Voltage	40 V	40 V
V_{CEO}	Collector to Emitter Voltage (Note 3)	40 V	40 V
V_{EBO}	Emitter to Base Voltage	4.0 V	4.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3688/89/90 PN3688/89/90 MIN.	MAX.	SE5006 MIN.	MAX.	UNITS	TEST CONDITIONS
C_{ob}	Output Capacitance	0.5	1.6		1.6	pF	I_E = 0, V_{CB} = 10 V
NF	Noise Figure 2N/PN3690 (see test circuit no. 226A)		5.5			dB	I_C = 4.0 mA, V_{CC} = 10 V, f = 200 MHz, R_S = 100 Ω
h_{fe}	High Frequency Current Gain	4.0	9.0	4.0			I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz
PG	Power Gain 2N/PN3688/89 (see test circuit no. 228A)	29				dB	I_C = 4.0 mA, V_{CE} = 10 V, f = 45 MHz
	2N/PN3690 (see test circuit no. 226A)	15				dB	I_C = 4.0 mA, V_{CE} = 10 V, f = 200 MHz
	(see test circuit no. 354)			35		dB	I_C = 4.0 mA, V_{CC} = 12 V, f = 455 kHz
	(see test circuit no. 352)			28		dB	I_C = 4.0 mA, V_{CC} = 12 V, f = 10.7 MHz
	(see test circuit no. 353)			20		dB	I_C = 4.0 mA, V_{CC} = 15 V, f = 100 MHz
AGC	Automatic Gain Control (see test circuit no. 228A)						
	2N/PN3688	8.0	10.5			mA	f = 45 MHz, I_C for which $P_G = P_{G1}$ −30 dB in 45 MHz test circuit
	2N/PN3689	9.5	12			mA	f = 45 MHz, I_C for which $P_G = P_{G1}$ −30 dB in 45 MHz test circuit
	(see test circuit no. 226A) 2N/PN3690	9.0	14			mA	f = 200 MHz, I_C for which $P_G = P_{G1}$ −30 dB in 200 MHz test circuit
	(see test circuit no. 353)			6.0	10.5	mA	f = 100 MHz, I_C for which PG_{AGC} = PG −30 dB

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N3688, 2N3689, 2N3690 and SE5006. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN3688, PN3689, and PN3690.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS1.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

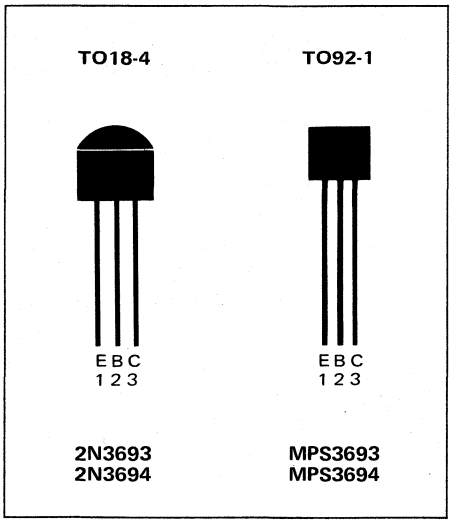
SYMBOL	CHARACTERISTIC	2N3688/89/90 PN3688/89/90 MIN.	2N3688/89/90 PN3688/89/90 MAX.	SE5006 MIN.	SE5006 MAX.	UNITS	TEST CONDITIONS
$r_b'C_c$	Collector to Base Time Constant		15			ps	I_C = 4.0 mA, V_{CE} = 10 V, f = 80 MHz
h_{FE}	DC Current Gain (Note 5)	30		30			I_C = 4.0 mA, V_{CE} = 10 V
I_{EBO}	Emitter Cutoff Current		100				I_C = 0, V_{EB} = 4.0 V
I_{CBO}	Collector Cutoff Current		50		50	nA	I_E = 0, V_{CB} = 20 V
			5.0		5.0	μA	I_E = 0, V_{CB} = 20 V, T_A = 65°C
BV_{CBO}	Collector to Base Breakdown Voltage	40		40		V	I_C = 100 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	40		40		V	I_C = 3.0 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	I_E = 100 μA, I_C = 0
$V_{CE(sat)}$	Collector Saturation Voltage				2.0	V	I_C = 10 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 5)				0.98	V	I_C = 10 mA, I_B = 5.0 mA

2N3693 • 2N3694 • MPS3693 • MPS3694

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (MPS3693/4)
- V_{CEO} . . . 45 V (MIN)
- h_{FE} . . . 100-400 (2N/MPS3694)
- NF . . . 4.0 dB (TYP) @ 1.0 MHz
- A_{PG} . . . 55 dB (TYP) @ 455 kHz
- G_C . . . 20 dB (TYP) FROM 108 MHz TO 10.7 MHz
- COMPLEMENTS . . . 2N4121, 2N4122 (TO18); 2N3905, 2N3906 (TO92)



ABSOLUTE MAXIMUM RATINGS (Note 1)

	2N3693/4	MPS3693/4
Maximum Temperatures		
Storage Temperature	−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature	125°C	150°C
Soldering Temperature (10 seconds)	260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature	0.5 W	1.0 W
at 65°C Case Temperature	0.3 W	—
at 25°C Ambient Temperature	0.2 W	0.625 W
Maximum Voltages and Current		
V_{CBO} Collector to Base Voltage		45 V
V_{CEO} Collector to Emitter Voltage (Note 4)		45 V
V_{EBO} Emitter to Base Voltage		4.0 V
I_C Collector Current		30 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3693 MIN.	2N3693 MAX.	2N3694 MIN.	2N3694 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	40	160	100	400		I_C = 10 mA, V_{CE} = 10 V
I_{CBO}	Collector Cutoff Current		50		50	nA	I_E = 0, V_{CB} = 30 V
			5.0		5.0	μA	I_E = 0, V_{CB} = 30 V, T_A = 65°C
C_{ob}	Output Capacitance	0.5	6.0	0.5	6.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
$r_b'C_c$	Collector Base Time Constant		55		55	ps	I_C = 10 mA, V_{CE} = 15 V, f = 80 MHz
BV_{CBO}	Collector to Base Breakdown Voltage	45		45		V	I_C = 0.1 mA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	45		45		V	I_B = 0, I_C = 10 mA (pulsed)
I_{EBO}	Emitter Cutoff Current		100		100	μA	V_{EB} = 4.0 V, I_C = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	I_E = 100 μA, I_C = 0
h_{fe}	High Frequency Current Gain	2.0	5.0	2.0	5.0		I_C = 10 mA, V_{CE} = 15 V, f = 100 MHz

SYMBOL	CHARACTERISTIC	MPS3693 MIN.	MPS3693 MAX.	MPS3694 MIN.	MPS3694 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	40	160	100	400		I_C = 10 mA, V_{CE} = 10 V
I_{CBO}	Collector Cutoff Current		50		50	nA	I_E = 0, V_{CB} = 35 V
			5.0		5.0	μA	I_E = 0, V_{CB} = 35 V, T_A = 65°C
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
$r_b'C_c$	Collector Base Time Constant		55		55	ps	I_C = 10 mA, V_{CE} = 15 V, f = 31.8 MHz
BV_{CBO}	Collector to Base Breakdown Voltage	45		45		V	I_C = 0.1 mA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	45		45		V	I_B = 0, I_C = 10 mA (pulsed)
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	I_E = 10 μA, I_C = 0
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 10 mA, V_{CE} = 15 V, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N2693, 2N3694. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for MPS3693, MPS3694.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

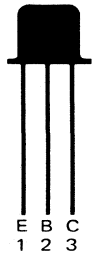
2N3700 • 2N3701

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 80 V (MIN) @ 30 mA
- $V_{CE(sat)}$ . . . 0.5 V (MAX)@ 500 mA

See TO18-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C
Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Case Temperature	1.8 W
at 100°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.5 W
Maximum Voltages and Current	
V_{CBO} Collector to Base Voltage	140 V
V_{CEO} Collector to Emitter Voltage (Note 4)	80 V
V_{EBO} Emitter to Base Voltage	7.0 V
I_C Collector Current	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3700 MIN.	2N3700 MAX.	2N3701 MIN.	2N3701 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	100	300	40	120		I_C = 150 mA, V_{CE} = 10 V
		90		40	120		I_C = 10 mA, V_{CE} = 10 V
		50		30	100		I_C = 0.1 mA, V_{CE} = 10 V
		50		30	100		I_C = 500 mA, V_{CE} = 10 V
		15		15			I_C = 1.0 A, V_{CE} = 10 V
		40					I_C = 150 mA, V_{CE} = 10 V, T_A = −55°C
$V_{BE(sat)}$	Pulsed Base Saturation Voltage		1.1		1.1	V	I_C = 150 mA, I_B = 15 mA
$V_{CE(sat)}$	Pulsed Collector Saturation		0.2		0.2	V	I_C = 150 mA, I_B = 15 mA
	Voltage (Note 5)		0.5		0.5	V	I_C = 500 mA, I_B = 50 mA
h_{fe}	High Frequency Current Gain	5.0	10	4.0	10		I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz
h_{fe}	Small Signal Current Gain	80	400	30	200		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
C_{ob}	Output Capacitance		12		12	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
C_{ib}	Input Capacitance		60		60	pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz
$r_b'C_c$	Collector to Base Time Constant	25	400	25	400	ps	I_C = 10 mA, V_{CB} = 10 V, f = 4.0 MHz
I_{CBO}	Collector Cutoff Current		10		10	nA	I_E = 0, V_{CB} = 90 V
			10		10	μA	I_E = 0, V_{CB} = 90 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10		10	nA	I_C = 0, V_{EB} = 5.0 V
BV_{CBO}	Collector to Base Breakdown	140		140		V	I_C = 100 μA, I_E = 0
	Voltage						
$V_{CEO(sus)}$	Collector to Emitter Sustaining	80		80		V	I_C = 30 mA, I_B = 0
	Voltage (Notes 4 & 5)						
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0		7.0		V	I_C = 0, I_E = 100 μA
NF	Noise Figure		4.0			dB	I_C = 100 μA, V_{CE} = 10 V, f = 1.0 kHz, R_G = 1.0 kΩ

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 97°C/W (derating factor of 10.3 mW/°C); junction to ambient thermal resistance of 350°C/W (derating factor of 2.85 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle ≤1%.
6. For product family characteristic curves, refer to Section 5 — SS17.

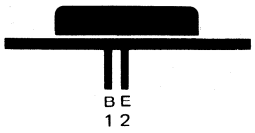
2N3713 • 2N3714 • 2N3715 • 2N3716

150 WATT NPN POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- T_C . . . 150 W @ 25°C
- I_C . . . 10 A
- COMPLEMENTS . . . 2N3789 THROUGH 2N3792

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature		−65°C to +200°C	
Operating Junction Temperature		−65°C to +200°C	
Maximum Power Dissipation			
Total Dissipation at 25°C Case Temperature		150 W	
Linear Derating Factor		0.855 W/°C	
Maximum Voltages and Currents		**2N3713 2N3715**	**2N3714 2N3716**
V_{CBO}	Collector to Base Voltage	80 V	100 V
V_{CEO}	Collector to Emitter Voltage	60 V	80 V
V_{EBO}	Emitter to Base Voltage	7.0 V	7.0 V
I_C	Collector Current	10 A	10 A
I_B	Base Current	4.0 A	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3713 2N3715 MIN.	2N3713 2N3715 MAX.	2N3714 2N3716 MIN.	2N3714 2N3716 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		10			mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150°C
I_{CEX}	Collector Cutoff Current				10	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150°C
I_{CEX}	Collector Cutoff Current		1.0			mA	V_{CE} = 80 V, V_{EB} = 1.5 V
I_{CEX}	Collector Cutoff Current				1.0	mA	V_{CE} = 100 V, V_{EB} = 1.5 V
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = 7.0 V, I_C = 0
V_{CEO}	Collector to Emitter Sustaining Voltage (Note 2)	60		80		V	I_C = 200 mA, I_B = 0
I_{CEO}	Collector Cutoff Current		0.7			mA	V_{CE} = 30 V, I_B = 0
I_{CEO}	Collector Cutoff Current				0.7	mA	V_{CE} = 40 V, I_B = 0

SYMBOL	CHARACTERISTIC	2N3713 2N3714 MIN.	2N3713 2N3714 MAX.	2N3715 2N3716 MIN.	2N3715 2N3716 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 2)	5.0		5.0			I_C = 10 A, V_{CE} = 4.0 V
h_{FE}	DC Current Gain (Note 2)	25	75	50	150		I_C = 1.0 A, V_{CE} = 2.0 V
h_{FE}	DC Current Gain (Note 2)	15		30			I_C = 3.0 A, V_{CE} = 2.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 2)		1.0		0.8	V	I_C = 5.0 A, I_B = 500 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 2)		4.0		4.0	V	I_C = 10 A, I_B = 2.0 A
V_{BE}	Base to Emitter Voltage (Note 2)		2.0		1.8	V	I_C = 5.0 A, V_{CE} = 2.0 V
V_{BE}	Base to Emitter Voltage (Note 2)		4.0		4.0	V	I_C = 10 A, V_{CE} = 4.0 V
f_{hfe}	Small Signal Cutoff Frequency	30		30		kHz	I_C = 500 mA, V_{CE} = 10 V
h_{fe}	Small Signal Current Gain	25	250	25	250		I_C = 500 mA, V_{CE} = 10 V, f = 1.0 kHz
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			I_C = 500 mA, V_{CE} = 10 V, f = 1.0 MHz
C_{ob}	Output Capacitance		250		250	pF	V_{CB} = 10 V, I_C = 0, f = 0.1 MHz

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For family characteristic curves, refer to Section 5 — PWR 6.

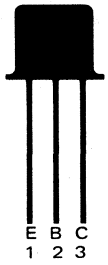
2N3722 • FT3723

NPN SMALL SIGNAL HIGH VOLTAGE HIGH CURRENT SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 60 V (MIN) (2N3722) 70 V (MIN) (FT3723)
- h_{FE} . . . 40 – 150 @ 100 mA
  . . . 12 (MIN) @ 800 mA
- t_{on} . . . 50 ns (MAX) @ 500 mA (2N3722)
- t_{off} . . . 100 ns (MAX) @ 500 mA (2N3722)

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C
Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Case Temperature	4.0 W
at 25°C Ambient Temperature	0.8 W

Maximum Voltages and Current		**2N3722**	**FT3723**
V_{CBO}	Collector to Base Voltage	80 V	100 V
V_{CES}	Collector to Emitter Voltage	80 V	100 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	70 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current (Note 5)	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3722 MIN.	2N3722 MAX.	FT3723 MIN.	FT3723 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		70		V	I_C = 10 mA (pulsed), I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25		0.25	V	I_C = 10 mA, I_B = 1.0 mA
			0.22		0.28	V	I_C = 100 mA, I_B = 10 mA
			0.37		0.44	V	I_C = 300 mA, I_B = 30 mA
			0.50		0.75	V	I_C = 500 mA, I_B = 50 mA
			2.0			V	I_C = 800 mA, I_B = 80 mA
t_{on}	Turn On Time (see test circuit no. 265)		50		70	ns	$I_C \approx$ 500 mA, $I_{B1} \approx$ 50 mA
t_{off}	Turn Off Time (see test circuit no. 265)		100		130	ns	$I_C \approx$ 500 mA, $I_{B1} \approx I_{B2} \approx$ 50 mA
C_{ob}	Output Capacitance		10		9.0	pF	I_E = 0, V_{CB} = 10 V
C_{ib}	Input Capacitance		65		65	pF	V_{EB} = 0.5 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	25		25			I_C = 10 mA, V_{CE} = 1.0 V
		40	150	40	150		I_C = 100 mA, V_{CE} = 1.0 V
		20		15			I_C = 300 mA, V_{CE} = 2.0 V
		15					I_C = 500 mA, V_{CE} = 2.0 V
				15			I_C = 500 mA, V_{CE} = 3.0 V
		12		12			I_C = 800 mA, V_{CE} = 5.0 V
		15		15			I_C = 100 mA, V_{CE} = 1.0 V, T_A = −55°C
		20		20			I_C = 200 mA, V_{CE} = 2.0 V, T_A = −55°C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		0.75		0.75	V	I_C = 10 mA, I_B = 1.0 mA
			0.85		0.85	V	I_C = 100 mA, I_B = 10 mA
			1.1		1.1	V	I_C = 300 mA, I_B = 30 mA
		0.86	1.2	0.86	1.2	V	I_C = 500 mA, I_B = 50 mA
			1.5			V	I_C = 800 mA, I_B = 80 mA
h_{fe}	High Frequency Current Gain	3.0		3.0			I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 43.8°C/W (derating factor of 22.8 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS9.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3722 MIN.	2N3722 MAX.	FT3723 MIN.	FT3723 MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Reverse Current		500			nA	V_{CE} = 40 V, V_{EB} = 0
					500	nA	V_{CE} = 50 V, V_{EB} = 0
			70			μA	V_{CE} = 40 V, V_{EB} = 0, T_A = 125°C
					70	μA	V_{CE} = 50 V, V_{EB} = 0, T_A = 125°C
BV_{CBO}	Collector to Base Breakdown Voltage	80		100		V	I_C = 100 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	80		100		V	I_C = 100 μA, V_{EB} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 100 μA, I_C = 0

2N3724/3725 • 2N4013/4014 • 2N4046/4047

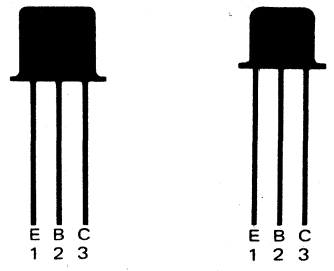
NPN SMALL SIGNAL HIGH CURRENT HIGH SPEED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- t_{on} . . . 35 ns (MAX), t_{off} . . . 60 ns (MAX) @ 500 mA
- V_{CEO} . . . 30 V (MIN) (2N3724, 2N4013, 2N4046), 50 V (MIN) (2N3725, 2N4014, 2N4047)
- $V_{CE(sat)}$ . . . 0.65 V (MAX) @ 800 mA, 0.75 V (MAX) @ 1.0 A (2N3724, 2N4013, 2N4046)
- h_{FE} . . . 40-150 @ 100 mA (2N4046/7), 60-150 @ 100 mA (2N3724/5, 2N4013/4)

See Package Outlines

TO5-1 TO18-1



2N3724/5 2N4046/7 **2N4013 2N4014**

ABSOLUTE MAXIMUM TEMPERATURES (Note 1)

Maximum Temperatures	
Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)	**2N4013/4**	**2N3724/5, 2N4046/7**
Total Dissipation at 25°C Case Temperature	1.2 W	3.5 W
at 25°C Ambient Temperature	0.36 W	0.8 W

Maximum Voltages and Currents		**2N3724, 2N4013 2N4046**	**2N3725, 2N4014 2N4047**
V_{CBO}	Collector to Base Voltage	50 V	80 V
V_{CES}	Collector to Emitter Voltage	50 V	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	50 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current (Note 5)	1.0 A	1.0 A
I_C	DC Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3724 2N4013 2N4046 MIN.	2N3724 2N4013 2N4046 MAX.	2N3725 2N4014 2N4047 MIN.	2N3725 2N4014 2N4047 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	30		50		V	I_C = 10 mA, I_B = 0
t_{on}	Turn On Time (see test circuit no. 265)		35		35	ns	I_C = 500 mA, I_{B1} = 50 mA
t_{off}	Turn Off time (see test circuit no. 265)		60		60	ns	I_C = 500 mA, I_{B1} = 50 mA, I_{B2} = −50 mA
C_{ob}	Output Capacitance		12		10	pF	I_E = 0, V_{CB} = 10 V
C_{ib}	Input Capacitance		55		55	pF	I_C = 0, V_{BE} = 0.5 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.25		0.25	V	I_C = 10 mA, I_B = 1.0 mA
			0.2		0.26	V	I_C = 100 mA, I_B = 10 mA
			0.32		0.4	V	I_C = 300 mA, I_B = 30 mA
			0.42		0.52	V	I_C = 500 mA, I_B = 50 mA
			0.65		0.8	V	I_C = 800 mA, I_B = 80 mA
			0.75		0.95	V	I_C = 1.0 A, I_B = 100 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		0.76		0.76	V	I_C = 10 mA, I_B = 1.0 mA
			0.86		0.86	V	I_C = 100 mA, I_B = 10 mA
			1.1		1.1	V	I_C = 300 mA, I_B = 30 mA
			1.5		1.5	V	I_C = 800 mA, I_B = 80 mA
			1.7		1.7	V	I_C = 1.0 A, I_B = 100 mA
BV_{CBO}	Collector to Base Breakdown Voltage	50		80		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	50		80		V	I_C = 10 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_C = 0, I_E = 10 μA

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 50°C/W (derating factor of 20 mW/°C) for 2N3724, 2N3725, 2N4046 and 2N4047; and 146°C/W (derating factor of 6.85 mW/°C) for the 2N4013 and 2N4014; junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C) for the 2N3724, 2N3725, 2N4046, and 2N4047, and 485°C/W (derating factor of 2.06 mW/°C) for the 2N4013, and 2N4014.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS13.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3724, 2N4013 MIN.	2N3724, 2N4013 MAX.	2N3725, 2N4014 MIN.	2N3725, 2N4014 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		1.7			μA	$I_E = 0$, $V_{CB} = 40$ V
					1.7	μA	$I_E = 0$, $V_{CB} = 60$ V
			120			μA	$I_E = 0$, $V_{CB} = 40$ V, $T_A = 100°C$
					120	μA	$I_E = 0$, $V_{CB} = 60$ V, $T_A = 100°C$
I_{CES}	Collector Reverse Current		10			μA	$I_E = 0$, $V_{CE} = 50$ V
					10	μA	$I_E = 0$, $V_{CE} = 80$ V
h_{FE}	DC Pulse Current Gain (Note 5)	60	150	60	150		$I_C = 100$ mA, $V_{CE} = 1.0$ V
		35		35			$I_C = 500$ mA, $V_{CE} = 1.0$ V
		40		40			$I_C = 300$ mA, $V_{CE} = 1.0$ V
		30		25			$I_C = 1.0$ A, $V_{CE} = 5.0$ V
		30		30			$I_C = 10$ mA, $V_{CE} = 1.0$ V
		25		20			$I_C = 800$ mA, $V_{CE} = 2.0$ V
		30		30			$I_C = 100$ mA, $V_{CE} = 1.0$ V, $T_A = -55°C$
		20		20			$I_C = 500$ mA, $V_{CE} = 1.0$ V, $T_A = -55°C$
$V_{BE(sat)}$	Base Saturation Voltage	0.8	1.1	0.8	1.1	V	$I_C = 500$ mA, $I_B = 50$ mA
h_{fe}	High Frequency Current Gain	3.0		3.0			$I_C = 50$ mA, $V_{CE} = 10$ V, f = 100 MHz

SYMBOL	CHARACTERISTIC	2N4046 MIN.	2N4046 MAX.	2N4047 MIN.	2N4047 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		1.7			μA	$I_E = 0$, $V_{CB} = 40$ V
					1.7	μA	$I_E = 0$, $V_{CB} = 60$ V
			120			μA	$I_E = 0$, $V_{CB} = 40$ V, $T_A = 85°C$
					120	μA	$I_E = 0$, $V_{CB} = 60$ V, $T_A = 85°C$
I_{CES}	Collector Reverse Current		10			μA	$I_E = 0$, $V_{CE} = 50$ V
					10	μA	$I_E = 0$, $V_{CE} = 80$ V
h_{FE}	DC Pulse Current Gain (Note 5)	40	150	40	150		$I_C = 100$ mA, $V_{CE} = 1.0$ V
		30		20			$I_C = 500$ mA, $V_{CE} = 1.0$ V
		30		30			$I_C = 300$ mA, $V_{CE} = 1.0$ V
		25		15			$I_C = 1.0$ A, $V_{CE} = 5.0$ V
		20		20			$I_C = 10$ mA, $V_{CE} = 1.0$ V
		20		15			$I_C = 800$ mA, $V_{CE} = 2.0$ V
$V_{BE(sat)}$	Base Saturation Voltage	0.9	1.2	0.9	1.2	V	$I_C = 500$ mA, $I_B = 50$ mA
h_{fe}	High Frequency Current Gain	2.5		2.5			$I_C = 50$ mA, $V_{CE} = 10$ V, f = 100 MHz

2N3726 • 2N3727 • 2N4015 • 2N4016

PNP LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- $\frac{h_{FE1}}{h_{FE2}}$ . . . 0.9-1.0 @ I_C = 100 μA TO 1.0 mA
- h_{FE} . . . 135-350 @ I_C = 1.0 mA
- NF . . . 4.0 dB (MAX) @ I_C = 30 μA, f = 1.0 kHz

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (60 seconds)			300°C
Maximum Power Dissipation (Notes 2 & 3)		**One Side**	**Both Sides**
Total Dissipation at 25°C Case Temperature		0.85 W	1.4 W
at 100°C Case Temperature		0.48 W	0.80 W
at 25°C Ambient Temperature		0.40 W	0.50 W
Maximum Voltages and Current		**2N4015, 2N4016**	**2N3726, 2N3727**
V_{CBO}	Collector to Base Voltage	−60 V	−45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V	−45 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	300 mA	300 mA

MATCHING CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3726/4015 MIN.	2N3726/4015 MAX.	2N3727/4016 MIN.	2N3727/4016 MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.9	1.0	0.9	1.0		I_C = 100 μA to 1.0 mA, V_{CE} = −5.0 V
$\lvert V_{BE1}-V_{BE2}\rvert$	Base to Emitter Voltage Differential		5.0		2.5	mV	I_C = 100 μA to 1.0 mA, V_{CE} = −5.0 V
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential Change		1.6		0.8	mV	I_C = 100 μA to 1.0 mA, V_{CE} = −5.0 V, T_A = −55°C to +125°C
			2.0		1.0	mV	I_C = 100 μA to 1.0 mA, V_{CE} = −5.0 V, T_A = +25°C to +125°C

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3726/27 MIN.	2N3726/27 MAX.	2N4015/16 MIN.	2N4015/16 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	80		80			I_C = 10 μA, V_{CE} = −5.0 V
		120		120			I_C = 100 μA, V_{CE} = −5.0 V
		135	350	135	350		I_C = 1.0 mA, V_{CE} = −5.0 V
h_{FE}	DC Current Gain (Note 6)	115		115			I_C = 50 mA, V_{CE} = −5.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	45		60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		V	I_E = −10 μA, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 6)	45		60		V	I_C = 10 mA, I_B = 0

Additional Electrical Characteristics are on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on application involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 431°C/W (derating factor of 2.29 mW/°C) for one side; 350°C/W (derating factor of 2.86 mW/°C) for both sides; junction to case thermal resistance of 206°C/W (derating factor of 4.85 mW/°C) for one side; 125°C/W (derating factor of 8.0 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Lowest of two h_{FE} reading is taken as h_{FE1} for purposes of this ratio.
6. Pulse conditions: 300 μs; duty cycle = 1%.
7. For product family characteristic curves, refer to Section 5 - SS22.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3726/27 MIN.	2N3726/27 MAX.	2N4015/16 MIN.	2N4015/16 MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector Saturation Voltage (Note 6)		0.25		0.25	V	I_C = 50 mA, I_B = 2.5 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 6)		1.0		1.0	V	I_C = 50 mA, I_B = 2.5 mA
I_{CBO}	Collector Cutoff Current		10			nA	I_E = 0, V_{CB} = −30 V
					10	nA	I_E = 0, V_{CB} = −50 V
			10			μA	I_E = 0, V_{CB} = −30 V, T_A = 150°C
					10	μA	I_E = 0, V_{CB} = −50 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		100		100	nA	I_C = 0, V_{EB} = −3.0 V
$\|h_{fe}\|$	Magnitude of Small Signal	3.0		3.0			I_C = 1.0 mA, V_{CE} = −10 V, f = 20 MHz
	Current Gain	2.0	6.0	2.0	6.0		I_C = 50 mA, V_{CE} = −20 V, f = 100 MHz
C_{ob}	Output Capacitance		8.0		8.0	pF	I_E = 0, V_{CB} = −10 V, f = 1.0 MHz
C_{ib}	Input Capacitance		30		25	pF	I_E = 0, V_{EB} = −0.5 V, f = 1.0 MHz
NF	Noise Figure		4.0		4.0	dB	I_C = 30 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 10 kΩ, BW = 200 Hz
h_{ie}	Input Impedance		11.5		11.5	kΩ	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		1.5		1.5	$x10^{-3}$	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{oe}	Output Conductance		80		80	μmho	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	135	420	135	420		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz

2N3728 • 2N3729

NPN HIGH PERFORMANCE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- $\frac{h_{FE1}}{h_{FE2}}$ . . . 0.9-1.0 FROM 100 μA to 1.0 mA @ 25°C, 0.8-1.0 FROM 100 μA to 1.0 mA, −55°C to +125°C
- $|V_{BE1}\text{-}V_{BE2}|$ . . . 3.0 mV (MAX) FROM 100 μA to 1.0 mA
- $|\Delta V_{BE}|$ . . . 10 μV/°C (MAX) FROM 100 μA to 1.0 mA, −55°C to +125°C

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (60 seconds)			300°C
Maximum Power Dissipation (Notes 2 & 3)		**One Side**	**Both Sides**
Total Dissipation at 25°C Case Temperature		1.0 W	1.6 W
at 100°C Case Temperature		0.57 W	0.91 W
at 25°C Ambient Temperature		0.45 W	0.55 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage		60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)		30 V
V_{EBO}	Emitter to Base Voltage		5.0 V
I_C	Collector Current		500 mA
V_{C1C2}	$Collector_1$ to $Collector_2$ Voltage		±200 V
	Voltage Rating any Lead to Case		±200 V

MATCHING CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	2N3728	0.8	1.0		I_C = 100 μA to 1.0 mA, V_{CE} = 5.0 V
		2N3729	0.9	1.0		
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	2N3729	0.8	1.0		I_C = 100 μA to 1.0 mA, V_{CE} = 5.0 V, T_A = −55°C to +125°C
$\|V_{BE1}\text{-}V_{BE2}\|$	Base to Emitter Voltage Differential	2N3728		5.0	mV	I_C = 100 μA to 1.0 mA, V_{CE} = 5.0 V
		2N3729		3.0	mV	
$\|\Delta(V_{BE1}\text{-}V_{BE2})\|$	Base to Emitter Voltage Differential	2N3728		1.6 (20 μV/°C)	mV	I_C = 100 μA to 1.0 mA, V_{CE} = 5.0 V, T_A = −55°C to +25°C
		2N3729		0.8 (10 μV/°C)	mV	I_C = 100 μA to 1.0 mA, V_{CE} = 5.0 V, T_A = −55°C to +25°C
$\|\Delta(V_{BE1}\text{-}V_{BE2})\|$	Base to Emitter Voltage Differential	2N3728		2.0 (20 μV/°C)	mV	I_C = 100 μA to 1.0 mA, V_{CE} = 5.0 V, T_A = +25°C to +125°C
		2N3729		1.0 (10 μV/°C)	mV	I_C = 100 μA to 1.0 mA, V_{CE} = 5.0 V, T_A = +25°C to +125°C

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 384°C/W (derating factor of 2.57 mW/°C) for one side; 318°C/W (derating factor of 3.14 mW/°C) for both sides; junction to case thermal resistance of 175°C/W (derating factor of 5.71 mW/°C) for one side; 109°C/W (derating factor of 9.15 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Lowest of two h_{FE} readings is taken as h_{FE1} for purposes of this ratio.
6. Pulse conditions: length = 300 μs; duty cycle = 1%.
7. For product family characteristic curves, refer to Section 5-SS15.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd.)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	30			I_C = 0.1 mA, V_{CE} = 5.0 V
		45	180		I_C = 1.0 mA, V_{CE} = 5.0 V
		80	280		I_C = 150 mA, V_{CE} = 5.0 V (Note 6)
BV_{CBO}	Collector to Base Breakdown Voltage	60			I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0			I_C = 0, I_E = 10 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 6)	30			I_C = 10 mA, I_B = 0
$V_{CE(sat)}$	Collector Saturation Voltage (Note 6)		0.22	V	I_C = 150 mA, I_B = 15 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 6)		1.1	V	I_C = 150 mA, I_B = 15 mA
I_{CBO}	Collector Cutoff Current		10	nA	I_E = 0, V_{CB} = 50 V
			10	μA	I_E = 0, V_{CB} = 50 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10	nA	I_C = 0, V_{EB} = 3.0 V
h_{fe}	High Frequency Current Gain	4.0			I_C = 1.0 mA, V_{CE} = 10 V, f = 20 MHz
		2.5	6.0		I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Common Base, Open Circuit, Output Capacitance		8.0	pF	I_E = 0, V_{CB} = 10 V, f = 140 kHz
C_{ib}	Common Base, Open Circuit, Input Capacitance		20	pF	I_C = 0, V_{EB} = 2.0 V, f = 140 kHz
h_{ie}	Input Impedance	1.2	6.0	kΩ	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		300	x10^{-6}	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{oe}	Output Conductance		20		I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{fe}	Forward Current Transfer Ratio	50	200		I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
NF	Wide Band Noise Figure		7.0	dB	I_C = 0.1 mA, V_{CE} = 5.0 V, f = 15.7 kHz, 3.0 dB pts. @ 25 Hz and 10 kHz, R_S = 1.0 kΩ

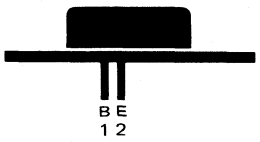
2N3740 • 2N3741 • 2N4898 • 2N4899 • 2N4900

25 WATT PNP POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . –0.6 V @ 1.0 A
- f_T . . . 3.0 MHz @ V_{CE} = 10 V, I_C = 250 mA (2N4898, 2N4899, 2N4900)
- COMPLEMENTS . . . 2N3766 (2N3740); 2N3767 (2N3741); 2N4190 (2N4898); 2N4911 (2N4899); 2N4912 (2N4900)

See TO66-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	–65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (10 seconds)	235°C

Maximum Power Dissipation

Total Dissipation at 25°C Case Temperature	25 W
Linear Derating Factor	0.143 W/°C

Maximum Voltages and Currents		2N4898	2N4899	2N4900	2N3740	2N3741
V_{CBO}	Collector to Base Voltage	–40 V	–60 V	–80 V	–60 V	–80 V
V_{CEO}	Collector to Emitter Voltage	–40 V	–60 V	–80 V	–60 V	–80 V
V_{EBO}	Emitter to Base Voltage	–5.0 V	–5.0 V	–5.0 V	–7.0 V	–7.0 V
I_C	Collector Current	1.0 A	1.0 A	1.0 A	1.0 A	1.0 A
I_B	Base Current	1.0 A	1.0 A	1.0 A	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4898 MIN.	2N4898 MAX.	2N4899 MIN.	2N4899 MAX.	2N4900 MIN.	2N4900 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		1.0					mA	V_{CE} = –40 V, V_{EB} = –1.5 V, T_C = 150°C
					1.0			mA	V_{CE} = –60 V, V_{EB} = –1.5 V, T_C = 150°C
							1.0	mA	V_{CE} = –80 V, V_{EB} = –1.5 V, T_C = 150°C
			0.1					mA	V_{CE} = –40 V, V_{EB} = –1.5 V
					0.1			mA	V_{CE} = –60 V, V_{EB} = –1.5 V
							0.1	mA	V_{CE} = –80 V, V_{EB} = –1.5 V
I_{CBO}	Collector Cutoff Current		0.1					mA	V_{CB} = –40 V, I_E = 0
					0.1			mA	V_{CB} = –60 V, I_E = 0
							0.1	mA	V_{CB} = –80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0		1.0	mA	V_{EB} = –5.0 V
I_{CEO}	Collector Cutoff Current		0.5					mA	V_{CE} = –20 V, I_B = 0
					0.5			mA	V_{CE} = –30 V, I_B = 0
							0.5	mA	V_{CE} = –40 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	–40		–60		–80		V	I_C = 100 mA, I_B = 0
h_{FE}	DC Current Gain (Note 2)	10		10		10			I_C = 1.0 A, V_{CE} = –1.0 V
		20	100	20	100	20	100		I_C = 500 mA, V_{CE} = –1.0 V
		40		40		40			I_C = 50 mA, V_{CE} = –1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		–0.6		–0.6		–0.6	V	I_C = 1.0 A, I_B = 100 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 2)		–1.3		–1.3		–1.3	V	I_C = 1.0 A, I_B = 100 mA
V_{BE}	Base to Emitter Voltage (Note 2)		–1.3		–1.3		–1.3	V	I_C = 1.0 A, V_{CE} = 1.0 V
h_{fe}	Small Signal Current Gain	25		25		25			V_{CE} = –10 V, I_C = 250 mA, f = 1.0 kHz
fh_{fe}	Small Signal Current Gain Frequency	3.0		3.0		3.0		MHz	V_{CE} = –10 V, I_C = 250 mA
C_{ob}	Output Capacitance		100		100		100	pF	V_{CB} = –10 V, I_E = 0, f = 100 kHz

Additional Electrical Characteristics are on the following page.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5 – PWR 14.

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3740 MIN.	2N3740 MAX.	2N3741 MIN.	2N3741 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		1.0			mA	V_{CE} = –40 V, V_{EB} = –1.5 V, T_C = 150°C
					1.0	mA	V_{CE} = –60 V, V_{EB} = –1.5 V, T_C = 150°C
			0.1			mA	V_{CE} = –60 V, V_{EB} = –1.5 V
					0.1	mA	V_{CE} = –80 V, V_{EB} = –1.5 V
I_{CBO}	Collector Cutoff Current		0.1			mA	V_{CB} = –60 V, I_E = 0
					0.1	mA	V_{CB} = –80 V, I_E = 0
I_{EBO}	Emitter to Cutoff Current		0.5		0.5	mA	V_{EB} = –7.0 V
I_{CEO}	Collector Cutoff Current		1.0			mA	V_{CE} = –40 V, I_B = 0
					1.0	mA	V_{CE} = –60 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	–60		–80			I_C = 100 mA, I_B = 0
h_{FE}	DC Current Gain (Note 2)	10		10			I_C = 1.0 A, V_{CE} = –1.0 V
		20		20			V_{CE} = –1.0 V, I_C = 500 mA
		30	100	30	100		V_{CE} = –1.0 V, I_C = 250 mA
		40		40			V_{CE} = –1.0 V, I_C = 100 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		–0.6		–0.6	V	I_C = 1.0 A, I_B = 125 mA
V_{BE}	Base to Emitter Voltage (Note 2)		–1.0		–1.0	V	I_C = 250 mA, V_{CE} = 1.0 V
h_{fe}	Small Signal Current Gain	25		25			V_{CE} = –10 V, I_C = 50 mA, f = 1.0 kHz
h_{fe}	High Frequency Small Signal Current Gain	4.0		4.0			V_{CE} = –10 V, I_C = 0.1 A, f = 1.0 MHz
C_{ob}	Output Capacitance		100		100	pF	V_{CB} = –10 V, I_C = 0, f = 1.0 MHz

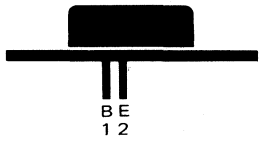
2N3766 • 2N3767

20 WATT NPN POWER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- $V_{CE(sat)}$ . . . 1.0 V @ I_C = 0.5 A
- h_{FE} . . . 40-160 @ I_C = 500 mA, V_{CE} = 10 V
- COMPLEMENTS . . . 2N3740 (2N3766); 2N3741 (2N3767)

See TO66-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N3766	2N3767
Maximum Temperatures			
Storage Temperature		−65°C to +175°C	
Operating Junction Temperature		−65°C to +175°C	
Lead Temperature (10 seconds)		240°C	
Maximum Power Dissipation			
Continuous Power Dissipation at 25°C Case Temperature		20 W	
Linear Derating Factor		0.133 W/°C	
Maximum Voltages and Currents			
V_{CBO}	Collector to Base Voltage	80 V	100 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
V_{CEO}	Collector to Emitter Voltage	60 V	80 V
I_C	Operating Collector Current (Continuous)	4.0 A	4.0 A
I_B	Base Current (Continuous)	2.5 A	2.5 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current	2N3766		1.0	mA	V_{CE} = 50 V, V_{EB} = 1.5 V, T_C = 150°C
		2N3767		1.0	mA	V_{CE} = 70 V, V_{EB} = 1.5 V, T_C = 150°C
I_{CEX}	Collector Cutoff Current	2N3766		0.1	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
		2N3767		0.1	mA	V_{CE} = 100 V, V_{EB} = 1.5 V
I_{CBO}	Collector Cutoff Current	2N3766		0.1	mA	V_{CB} = 80 V, I_E = 0
		2N3767		0.1	mA	V_{CB} = 100 V, I_E = 0
I_{EBO}	Emitter Cutoff Current			0.75	mA	V_{EB} = 6.0 V, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 2)	2N3766	60		V	I_B = 0, I_C = 100 mA
		2N3767	80		V	I_B = 0, I_C = 100 mA
I_{CEO}	Collector Cutoff Current	2N3766		0.7	mA	I_B = 0, V_{CE} = 40 V
		2N3767		0.7	mA	I_B = 0, V_{CE} = 60 V
h_{FE}	DC Forward Current Gain (Note 2)		30			I_C = 50 mA, V_{CE} = 10 V
			40	160		I_C = 500 mA, V_{CE} = 10 V
			20			I_C = 1.0 A, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	2N3766		2.5	V	I_C = 1.0 A, I_B = 0.1 A
		2N3767		1.0	V	I_C = 0.5 A, I_B = 0.05 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage			1.5	V	I_C = 1.0 A, V_{CE} = 10 V
h_{fe}	Small Signal Current Gain		40			V_{CE} = 10 V, I_C = 0.1 A, f = 1.0 kHz
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain		1.0			V_{CE} = 10 V, I_C = 0.5 A, f = 10 MHz
C_{ob}	Common Base Output Capacitance			30	pF	V_{CB} = 10 V, I_C = 0

*Planar is a Fairchild patented process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5-PWR 18.

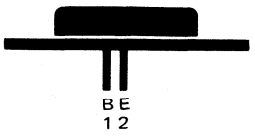
2N3789 • 2N3790 • 2N3791 • 2N3792

150 WATT PNP POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- T_C . . . 150 W @ 25°C
- I_C . . . 10 A
- COMPLEMENTS . . . 2N3713 THROUGH 2N3716

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature		−65°C to +200°C	
Operating Junction Temperature		−65°C to +200°C	
Maximum Power Dissipation			
Total Dissipation at 25°C Case Temperature		150 W	
Linear Derating Factor		0.855 W/°C	
Maximum Voltages and Currents		**2N3789 2N3791**	**2N3790 2N3792**
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{CEO}	Collector to Emitter Voltage	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−7.0 V	−7.0 V
I_C	Collector Current (Continuous)	10 A	10 A
I_B	Base Current (Continuous)	4.0 A	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3789 2N3791 MIN.	2N3789 2N3791 MAX.	2N3790 2N3792 MIN.	2N3790 2N3792 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 2)	−60		−80		V	I_C = 200 mA, I_B = 0
I_{EBO}	Emitter Cutoff Current		5.0		5.0	mA	V_{EB} = −7.0 V, I_C = 0
fh_{fe}	Small Signal Cutoff Frequency	30		30		kHz	V_{CE} = −10 V, I_C = 0.5 A
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = −10 V, I_C = 0.5 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	25	250	25	250		V_{CE} = −10 V, I_C = 0.5 A, f = 1.0 kHz
C_{ob}	Common Base Output Capacitance		500		500	pF	V_{CB} = −10 V, I_C = 0, f = 100 kHz
I_{CEX}	Collector Cutoff Current		1.0			mA	V_{CE} = −60 V, V_{EB} = −1.5 V
I_{CEX}	Collector Cutoff Current				1.0	mA	V_{CE} = −80 V, V_{EB} = −1.5 V
I_{CEX}	Collector Cutoff Current		5.0			mA	V_{CE} = −60 V, V_{EB} = −1.5 V, T_C = 150°C
I_{CEX}	Collector Cutoff Current				5.0	mA	V_{CE} = −80 V, V_{EB} = −1.5 V, T_C = 150°C
I_{CEO}	Collector Cutoff Current		10			mA	V_{CE} = −30 V, I_B = 0
I_{CEO}	Collector Cutoff Current				10	mA	V_{CE} = −40 V, I_B = 0
SYMBOL	CHARACTERISTIC	2N3789 2N3790 MIN.	2N3789 2N3790 MAX.	2N3791 2N3792 MIN.	2N3791 2N3792 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 2)	25	90	50	180		V_{CE} = −2.0 V, I_C = 1.0 A
h_{FE}		15		30			V_{CE} = −2.0 V, I_C = 3.0 A
h_{FE}		4.0		4.0			V_{CE} = −4.0 V, I_C = 10 A
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 2)		−1.0		−1.0	V	I_C = 5.0 A, I_B = 0.5 A
$V_{CE(sat)}$			−4.0		−4.0	V	I_C = 10 A, I_B = 2.0 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		−2.0		−1.8	V	I_C = 5.0 A, V_{CE} = −2.0 V
$V_{BE(ON)}$			−4.0		−4.0	V	I_C = 10 A, V_{CE} = −4.0 V

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5 — PWR 15.

*Planar is a Fairchild patented process.

2N3800 through 2N3803 • 2N3806 through 2N3809

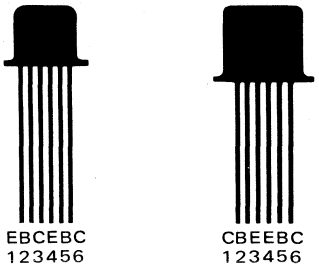
DUAL PNP LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- V_{CEO} . . . 60 V
- NF . . . . . 1.5 dB (MAX) @ 1.0 kHz AND 10 kHz

See Package Outlines

TO18-5 **TO5-9**



EBCEBC 123456 CBEEBC 123456

2N3800/1 2N3802/3 **2N3806/7 2N3808/9**

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature (Note 2)	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (10 seconds)	230°C

Maximum Power Dissipation

	2N3800/2N3801 2N3802/2N3803		2N3806/2N3807 2N3808/2N3809	
Total Dissipation at	**One Side**	**Both Sides**	**One Side**	**Both Sides**
25°C Ambient Temperature	250 mW	360 mW	500 mW	600 mW
Linear Derating Factor	1.43 mW/°C	2.06 mW/°C	2.9 mW/°C	3.4 mW/°C

Maximum Voltage and Current (One side)

V_{EBO}	Emitter to Base Voltage	−5.0 V
V_{CBO}	Collector to Base Voltage	−60 V
V_{CEO}	Collector to Emitter Voltage	−60 V
I_C	DC Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3800 2N3806 MIN.	2N3800 2N3806 MAX.	2N3801 2N3807 MIN.	2N3801 2N3807 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = −50 V, I_E = 0
			10		10	μA	V_{CB} = −50 V, I_E = 0, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		20		20	nA	V_{EB} = −4.0 V
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		V	I_E = 0, I_C = 10 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 3)	−60		−60		V	I_C = 10 mA
h_{FE}	DC Current Gain	100		225			I_C = 10 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 100 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 500 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 1.0 mA, V_{CE} = −5.0 V
		125		250			I_C = 10 mA, V_{CE} = −5.0 V
		75		150			I_C = 100 μA, V_{CE} = −5.0 V, T_A = −55°C
$V_{BE(On)}$	Base to Emitter "On" Voltage		−0.7		−0.7	V	I_C = 100 μA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.2		−0.2	V	I_C = 100 μA, I_B = 10 μA
			−0.25		−0.25	V	I_C = 1.0 mA, I_B = 100 μA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		−0.7		−0.7	V	I_C = 100 μA, I_B = 10 μA
			−0.8		−0.8	V	I_C = 1.0 mA, I_B = 100 μA
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		8.0		8.0	pF	V_{EB} = −0.5 V, I_C = 0, f = 100 kHz
$\|h_{fe}\|$	Magnitude of High Frequency Current Gain	1.0		1.0			I_C = 500 μA, V_{CE} = −5.0 V, f = 30 MHz
		1.0	5.0	1.0	5.0		I_C = 1.0 mA, V_{CE} = −5.0 V, f = 100 MHz
h_{ie}	Input Impedance	3.0	30	10	40	kΩ	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		25		25	x 10^{-4}	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	60	5.0	60	μmho	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. Emitter Base Termination open.
4. For product family characteristic curves, refer to Section 5-SS33.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3800 2N3806 MIN.	2N3800 2N3806 MAX.	2N3801 2N3807 MIN.	2N3801 2N3807 MAX.	UNITS	TEST CONDITIONS
h_{fe}	Small Signal Current Gain	150	600	300	900		V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
$RE(h_{ie})$	Real Part of Common Emitter Small Signal Input Impedance	3.0	30	10	40	kΩ	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
NF	Noise Figure		3.0		1.5	dB	I_C = 100 μA, V_{CE} = −10 V, f = 1.0 kHz PBW = 200 Hz, R_G = 3.0 kΩ
			2.5		1.5	dB	I_C = 100 μA, V_{CE} = −10 V, f = 10 kHz, PBW = 2.0 kHz, R_G = 3.0 kΩ
			3.5		2.5	dB	I_C = 100 μA, V_{CE} = 10 V, R_G = 3.0 kΩ, 3.0 dB down at 10 Hz and 10 kHz PBW = 15.7 kHz
			7.0		4.0	dB	I_C = 100 μA, V_{CE} = 10 V, R_G = 3.0 kΩ, f = 100 Hz, PBW = 20 Hz

SYMBOL	CHARACTERISTIC	2N3802 2N3808 MIN.	2N3802 2N3808 MAX.	2N3803 2N3809 MIN.	2N3803 2N3809 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = −50 V, I_E = 0
			10		10	μA	V_{CB} = −50 V, I_E = 0, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		20		20	nA	V_{EB} = −4.0 V
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		V	I_E = 0, I_C = 10 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 3)	−60		−60		V	I_C = 10 mA
h_{FE}	DC Current Gain	100		225			I_C = 10 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 100 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 500 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 1.0 mA, V_{CE} = −5.0 V
		125		250			I_C = 10 mA, V_{CE} = −5.0 V
		75		150			I_C = 100 μA, V_{CE} = −5.0 V, T_A = −55°C
$V_{BE(ON)}$	Base to Emitter "On" Voltage		−0.7		−0.7	V	I_C = 100 μA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.2		−0.2	V	I_C = 100 μA, I_B = 10 μA
			−0.25		−0.25	V	I_C = 1.0 mA, I_B = 100 μA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		−0.7		−0.7	V	I_C = 100 μA, I_B = 10 μA
			−0.8		−0.8	V	I_C = 1.0 mA, I_B = 100 μA
$\frac{h_{FE1}}{h_{FE2}}$	Static Forward Current Transfer Ratio	0.8	1.0	0.8	1.0		V_{CE} = −5.0 V, I_C = 0.1 mA
$\lvert V_{BE1}-V_{BE2}\rvert$	Base to Emitter Voltage Differential		−8.0		−8.0	mV	V_{CE} = −5.0 V, I_C = 10 μA to 10 mA
			−5.0		−5.0	mV	V_{CE} = −5.0 V, I_C = 100 μA
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential Gradient		−2.0		−2.0	mV	V_{CE} = −5.0 V, I_C = 0.1 mA, T_A = +25°C to +125°C
			−1.6		−1.6	mV	V_{CE} = −5.0 V, I_C = 0.1 mA, T_A = −55°C to +25°C
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 100 kHz

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3802 2N3808 MIN.	2N3802 2N3808 MAX.	2N3803 2N3809 MIN.	2N3803 2N3809 MAX.	UNITS	TEST CONDITIONS
C_{ib}	Input Capacitance		8.0		8.0	pF	V_{EB} = −0.5 V, I_C = 0, f = 100 kHz
h_{fe}	Magnitude of High Frequency	1.0		1.0			I_C = 500 μA, V_{CE} = −5.0 V, f = 30 MHz
	Current Gain	1.0	5.0	1.0	5.0		I_C = 1.0 mA, V_{CE} = −5.0 V, f = 100 MHz
h_{ie}	Input Impedance	3.0	30	10	40	kΩ	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		25		25	x 10^{-4}	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	60	5.0	60	μmho	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	150	600	300	900		V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
RE(h_{ie})	Real Part of Common Emitter Small Signal Input Impedance	3.0	30	10	40	kΩ	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
NF	Noise Figure		3.0		1.5	dB	I_C = 100 μA, V_{CE} = −10 V, f = 1.0 kHz PBW = 200 Hz, R_G = 3.0 kΩ
			2.5		1.5	dB	I_C = 100 μA, V_{CE} = −10 V, f = 10 kHz, PBW = 2.0 kHz, R_G = 3.0 kΩ
			7.0		4.0	dB	I_C = 100 μA, V_{CE} = 10 V, f = 100 Hz, PBW = 20 Hz, R_G = 3.0 kΩ
			3.5		2.5	dB	I_C = 100 μA, V_{CE} = 10 V, R_G = 3.0 kΩ, 3.0 dB down at 10 Hz and 10 kHz PBW = 15.7 kHz

2N3804/A • 2N3805/A • 2N3810/A • 2N3811/A

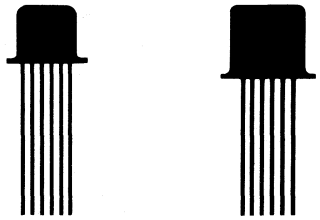
DUAL PNP LOW LEVEL LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- **V_{CEO} . . . 60 V (MIN)**
- **NF . . . 1.5 dB (MAX) @ 1.0 kHz AND 10 kHz (2N3805/A, 2N3811/A)**

See Package Outlines

TO18-5 **TO5-9**



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2N3804/A 2N3805/A **2N3810/A 2N3811/A**

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature (Note 2)	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (10 seconds)	230°C

Maximum Power Dissipation

	2N3804/A 2N3805/A		2N3810/A 2N3811/A	
Total Dissipation at	**One Side**	**Both Sides**	**One Side**	**Both Sides**
25°C Ambient Temperature	250 mW	360 mW	500 mW	600 mW
Linear Derating Factor	1.43 mW/°C	2.06 mW/°C	2.9 mW/°C	3.4 mW/°C

Maximum Voltage and Current (One side)

V_{EBO}	Emitter to Base Voltage	−5.0 V
V_{CBO}	Collector to Base Voltage	−60 V
V_{CEO}	Collector to Emitter Voltage	−60 V
I_C	DC Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3804 2N3810 MIN.	2N3804 2N3810 MAX.	2N3805 2N3811 MIN.	2N3805 2N3811 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = −50 V, I_C = 0
			10		10	μA	V_{CB} = −50 V, I_E = 0, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		20		20	nA	V_{EB} = −4.0 V
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		V	I_E = 0, I_C = 10 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 3)	−60		−60		V	I_C = 10 mA
h_{FE}	DC Current Gain	100		225			I_C = 10 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 100 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 500 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 1.0 mA, V_{CE} = −5.0 V
		125		250			I_C = 10 mA, V_{CE} = −5.0 V
		75		150			I_C = 100 μA, V_{CE} = −5.0 V, T_A = −55°C
$V_{BE(ON)}$	Base to Emitter "On" Voltage		−0.7		−0.7	V	I_C = 100 μA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.2		−0.2	V	I_C = 100 μA, I_B = 10 μA
			−0.25		−0.25	V	I_C = 1.0 mA, I_B = 100 μA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		−0.7		−0.7	V	I_C = 100 μA, I_B = 10 μA
			−0.8		−0.8	V	I_C = 1.0 mA, I_B = 100 μA
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio	0.9	1.0	0.9	1.0		V_{CE} = −5.0 V, I_C = 0.1 mA
$\lvert V_{BE1}-V_{BE2}\rvert$	Base to Emitter Voltage		−5.0		−5.0	mV	V_{CE} = −5.0 V, I_C = 10 μA to 10 mA
	Differential		−3.0		−3.0	mV	V_{CE} = −5.0 V, I_C = 100 μA
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage		−1.0		−1.0	mV	V_{CE} = −5.0 V, I_C = 0.1 mA
	Differential Gradient						T_A = 25°C to 125°C
			−0.8		−0.8	mV	V_{CE} = −5.0 V, I_C = 0.1 mA
							T_A = −55°C to +25°C

Additional Electrical Characteristics on following pages.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. Emitter Base Termination open.
4. For product family characteristic curves, refer to Section 5-SS33.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3804 2N3810 MIN.	2N3804 2N3810 MAX.	2N3805 2N3811 MIN.	2N3805 2N3811 MAX.	UNITS	TEST CONDITIONS
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		8.0		8.0	pF	V_{EB} = 0.5 V, I_C = 0, f = 100 kHz
$\|h_{fe}\|$	Magnitude of Common Emitter	1.0		1.0			I_C = 500 μA, V_{CE} = −5.0 V, f = 30 MHz
	Small Signal Current Gain	1.0	5.0	1.0	5.0		I_C = 1.0 mA, V_{CE} = −5.0 V, f = 100 MHz
h_{ie}	Input Impedance	3.0	30	10	40	kΩ	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		25		25	x 10^{-4}	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	60	5.0	60	μmho	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	150	600	300	900		V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
$RE(h_{ie})$	Real Part of Common Emitter Small Signal Input Impedance	3.0	30	10	40	kΩ	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
NF	Noise Figure		3.0		1.5	dB	I_C = 100 μA, V_{CE} = −10 V, f = 1.0 kHz, PBW = 200 Hz, R_G = 3.0 kΩ
			2.5		1.5	dB	I_C = 100 μA, V_{CE} = −10 V, f = 10 kHz, PBW = 2.0 kHz, R_G = 3.0 kΩ
			7.0		4.0	dB	I_C = 100 μA, V_{CE} = −10 V, f = 100 Hz, PBW = 20 Hz, R_G = 3.0 kΩ
			3.5		2.5	dB	I_C = 100 μA, V_{CE} = −10 V, R_G = 3.0 kΩ 3.0 dB down at 10 Hz and 10 kHz PBW = 15.7 kHz

SYMBOL	CHARACTERISTIC	2N3804A 2N3810A MIN.	2N3804A 2N3810A MAX.	2N3805A 2N3811A MIN.	2N3805A 2N3811A MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = −50 V, I_C = 0
			10		10	μA	V_{CB} = −50 V, I_E = 0, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		20		20	nA	V_{EB} = −4.0 V
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		V	I_E = 0, I_C = 10 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 3)	−60		−60		V	I_C = 10 mA
h_{FE}	DC Current Gain	100		225			I_C = 10 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 100 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 500 μA, V_{CE} = −5.0 V
		150	450	300	900		I_C = 1.0 mA, V_{CE} = −5.0 V
		125		250			I_C = 10 mA, V_{CE} = −5.0 V
		75		150			I_C = 100 μA, V_{CE} = −5.0 V, T_A = −55°C
$V_{BE(ON)}$	Base to Emitter "On" Voltage		−0.7		−0.7	V	I_C = 100 μA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		−0.2		−0.2	V	I_C = 100 μA, I_B = 10 μA
			−0.25		−0.25	V	I_C = 1.0 mA, I_B = 100 μA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		−0.7		−0.7	V	I_C = 100 μA, I_B = 10 μA
			−0.8		−0.8	V	I_C = 1.0 mA, I_B = 100 μA
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio	0.95	1.0	0.95	1.0		V_{CE} = −5.0 V, I_C = 0.1 mA
		0.85	1.0	0.85	1.0		V_{CE} = −5.0 V, I_C = 0.1 mA, T_A = −55°C to +125°C

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3804A 2N3810A MIN.	2N3804A 2N3810A MAX.	2N3805A 2N3811A MIN.	2N3805A 2N3811A MAX.	UNITS	TEST CONDITIONS
$\|V_{BE1}-V_{BE2}\|$	Base to Emitter Voltage Differential		−5.0		−5.0	mV	V_{CE} = −5.0 V, I_C = 10 μA to 10 mA
			−1.5		−1.5	mV	V_{CE} = −5.0 V, I_C = 100 μA
$\|\Delta(V_{BE1}-V_{BE2})\|$	Base to Emitter Voltage Differential Gradient		−0.5		−0.5	mV	V_{CE} = −5.0 V, I_C = 0.1 mA, T_A = 25°C to 125°C
			−0.4		−0.4	mV	V_{CE} = −5.0 V, I_C = 0.1 mA, T_A = −55°C to +25°C
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 100 kHz
C_{ib}	Input Capacitance		8.0		8.0	pF	V_{EB} = 0.5 V, I_C = 0, f = 100 kHz
$\|h_{fe}\|$	Magnitude of Common Emitter	1.0		1.0			I_C = 500 μA, V_{CE} = −5.0 V, f = 30 mHz
	Small Signal Current Gain	1.0	5.0	1.0	5.0		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 100 MHz
h_{ie}	Input Impedance	3.0	30	10	40	kΩ	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		25		25	x 10^{-4}	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	60	5.0	60	μmho	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	150	600	300	900		V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
RE(h_{ie})	Real Part of Common Emitter Small Signal Input Impedance	3.0	30	10	40	kΩ	V_{CE} = −10 V, I_C = 1.0 mA, f = 1.0 kHz
NF	Noise Figure		3.0		1.5	dB	I_C = 100 μA, V_{CE} = −10 V, f = 1.0 kHz, PBW = 200 Hz, R_G = 3.0 kΩ
			2.5		1.5	dB	I_C = 100 μA, V_{CE} = −10 V, f = 10 kHz, PBW = 2.0 kHz, R_G = 3.0 kΩ
			7.0		4.0	dB	I_C = 100 μA, V_{CE} = −10 V, f = 100 Hz, PBW = 20 Hz, R_G = 3.0 kΩ
			3.5		2.5	dB	I_C = 100 μA, V_{CE} = −10 V, R_G = 3.0 kΩ, 3 dB down at 10 Hz and 10 kHz, PBW = 15.7 kHz

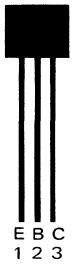
2N3903 • 2N3904

NPN GENERAL PURPOSE SMALL SIGNAL AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 40 V (MIN)
- h_{FE} . . . 100-300 @ 10 mA (2N3904)
- NF . . . 5.0 dB (MAX) WIDE BAND (2N3904)
- COMPLEMENTS . . . 2N3905, 2N3906

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
†Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W
at 25°C Case Temperature	1.0 W
Maximum Voltages and Current	
V_{CEO} Collector to Emitter Voltage	40 V
V_{CBO} Collector to Base Voltage	60 V
V_{EBO} Emitter to Base Voltage	6.0 V
I_C Collector Current	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3903 MIN.	2N3903 MAX.	2N3904 MIN.	2N3904 MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	40		40		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 10 μA, I_C = 0
I_{CEX}	Collector Cutoff Current		50		50	nA	V_{CE} = 30 V, V_{EB} = 3.0 V
I_{BL}	Base Cutoff Current		50		50	nA	V_{CE} = 30 V, V_{EB} = 3.0 V
h_{FE}	DC Current Gain (Note 4)	20		40			I_C = 0.1 mA, V_{CE} = 1.0 V
		35		70			I_C = 1.0 mA, V_{CE} = 1.0 V
		50	150	100	300		I_C = 10 mA, V_{CE} = 1.0 V
		30		60			I_C = 50 mA, V_{CE} = 1.0 V
		15		30			I_C = 100 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		0.2		0.2	V	I_C = 10 mA, I_B = 1.0 mA
			0.3		0.3	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)	0.65	0.85	0.65	0.85	V	I_C = 10 mA, I_B = 1.0 mA
			0.95		0.95	V	I_C = 50 mA, I_B = 5.0 mA
f_T	Current Gain Bandwidth Product	250		300		MHz	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz
C_{ob}	Output Capacitance		4.0		4.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 100 kHz
C_{ib}	Input Capacitance		8.0		8.0	pF	V_{BE} = 0.5 V, I_C = 0, f = 100 kHz
h_{ie}	Input Impedance	1.0	8.0	1.0	10	kΩ	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio	0.1	5.0	0.5	8.0	x10−4	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	50	200	100	400		I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{oe}	Output Admittance	1.0	40	1.0	40	μmho	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
NF	Noise Figure		6.0		5.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, R_G = 1.0 kΩ, f = 10 Hz to 15.7 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered value for this parameter.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 2%.
5. For product family characteristic curves, refer to Section 5-SS14.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3903 MIN.	2N3903 MAX.	2N3904 MIN.	2N3904 MAX.	UNITS	TEST CONDITIONS
t_d	Delay Time (see test circuit no. 526)		35		35	ns	V_{CC} = 3.0 V, $V_{BE(OFF)}$ = 0.5 V, I_C = 10 mA, I_{B1} = 1.0 mA
t_r	Rise Time (see test circuit no. 526)		35		35	ns	V_{CC} = 3.0 V, $V_{BE(OFF)}$ = 0.5 V, I_C = 10 mA, I_{B1} = 1.0 mA
t_s	Storage Time (see test circuit no. 527)		175		200	ns	V_{CC} = 3.0 V, I_C = 10 mA, I_{B1} = I_{B2} = 1.0 mA
t_f	Fall Time (see test circuit no. 527)		50		50	ns	V_{CC} = 3.0 V, I_C = 10 mA, I_{B1} = I_{B2} = 1.0 mA

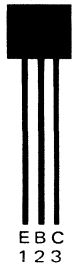
2N3905 • 2N3906

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −40 V (MIN)
- h_{FE} . . . 100-300 @ 10 mA (2N3906)
- NF . . . 4.0 dB (MAX) WIDEBAND (2N3906)
- COMPLEMENTS . . . 2N3903, 2N3904

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (60 seconds)	260°C
†Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W
at 25°C Case Temperature	1.0 W
Maximum Voltages and Current	
V_{CBO} Collector to Base Voltage	−40 V
V_{CEO} Collector to Emitter Voltage (Note 4)	−40 V
V_{EBO} Emitter to Base Voltage	−5.0 V
I_C Collector Current	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3905 MIN.	2N3905 MAX.	2N3906 MIN.	2N3906 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	30		60			I_C = 0.1 mA, V_{CE} = −1.0 V
		40		80			I_C = 1.0 mA, V_{CE} = −1.0 V
		50	150	100	300		I_C = 10 mA, V_{CE} = −1.0 V
		30		60			I_C = 50 mA, V_{CE} = −1.0 V
		15		30			I_C = 100 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		−0.25		−0.25	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		−0.4		−0.4		I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage	−0.65	−0.85	−0.65	−0.85	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		−0.95		−0.95	V	I_C = 50 mA, I_B = 5.0 mA
I_{CEX}	Collector Cutoff Current		50		50	nA	V_{CE} = −30 V, V_{EB} = −3.0 V
I_{BL}	Base Cutoff Current		50		50	nA	V_{CE} = −30 V, V_{EB} = −3.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−40		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	−40		−40		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Base to Emitter Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
C_{ob}	Output Capacitance		4.5		4.5	pF	I_E = 0, V_{CB} = −5.0 V, f = 100 kHz
C_{ib}	Input Capacitance		10		10	pF	I_C = 0, V_{EB} = −0.5 V, f = 100 kHz
f_T	Current Gain Bandwidth Product	200		250		MHz	I_C = 10 mA, V_{CE} = −20 V, f = 100 MHz
t_d	Delay Time		35		35	ns	$I_C \cong$ 10 mA, $I_{B1} \cong$ 1.0 mA,
	(see test circuit no. 333)						V_{CC} = −3.0 V
t_r	Rise Time		35		35	ns	$I_C \cong$ 10 mA, $I_{B1} \cong$ 1.0 mA,
	(see test circuit no. 333)						V_{CC} = −3.0 V
t_s	Storage Time		200		225	ns	$I_C \cong$ 10 mA, $I_{B1} \cong$ 1.0 mA,
	(see test circuit no. 239)						$I_{B2} \cong$ −1.0 mA, V_{CC} = −3.0 V

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered value for this parameter.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5 — SS23.

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) **(Cont'd)**

SYMBOL	CHARACTERISTIC	2N3905 MIN.	2N3905 MAX.	2N3906 MIN.	2N3906 MAX.	UNITS	TEST CONDITIONS
t_f	Fall Time (see test circuit no. 239)		60		75	ns	$I_C \cong 10$ mA, $I_{B1} \cong 1.0$ mA, $I_{B2} \cong -1.0$ mA, $V_{CC} = -3.0$ V
h_{ie}	Input Impedance	0.5	8.0	2.0	12	kΩ	$I_C = 1.0$ mA, $V_{CE} = -10$ V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio	0.1	5.0	0.1	10	$x10^{-4}$	$I_C = 1.0$ mA, $V_{CE} = -10$ V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	50	200	100	400		$I_C = 1.0$ mA, $V_{CE} = -10$ V, f = 1.0 kHz
h_{oe}	Output Admittance	1.0	40	3.0	60	μmho	$I_C = 1.0$ mA, $V_{CE} = -10$ V, f = 1.0 kHz
NF	Noise Figure (Wide Band)		5.0		4.0	dB	$I_C = 100$ μA, $V_{CE} = -5.0$ V, $R_S = 1.0$ kΩ, f = 10 Hz to 15.7 kHz

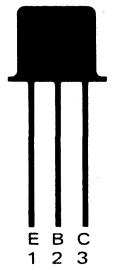
2N3923

NPN SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- V_{CEO} . . . 150V (MIN)
- h_{FE} . . . 30-120 @ 25 mA
- f_T . . . 40 MHz (MIN)
- C_{ob} . . . 3.5 pF (MAX)

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		-65°C to +200°C
Operating Junction Temperature		200°C
Lead Temperature (60 seconds)		300°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		3.0 W
at 25°C Ambient Temperature		0.8 W
Maximum Voltages and Current		
V_{CES}	Collector to Emitter Voltage	150 V
V_{CBO}	Collector to Base Voltage	150 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	150 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	30	120		I_C = 25 mA, V_{CE} = 10 V
		15			I_C = 25 mA, V_{CE} = 10 V, T_A = -55°C
h_{FE}	DC Current Gain	15			I_C = 100 μA, V_{CE} = 10 V
$V_{CEO\ (sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	150		V	I_C = 10 mA (pulsed), I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	150		V	I_C = 100 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	150		V	I_C = 100 μA, V_{EB} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		V	I_E = 100 μA, I_C = 0
$V_{BE\ (sat)}$	Base Saturation Voltage (Note 5)		0.9	V	I_C = 25 mA, I_B = 2.5 mA
$V_{CE\ (sat)}$	Collector Saturation Voltage (Note 5)		1.0	V	I_C = 25 mA, I_B = 2.5 mA
I_{CBO}	Collector Cutoff Current		10	nA	I_E = 0, V_{CB} = 100 V
			10	μA	I_E = 0, V_{CB} = 100 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		50	nA	I_C = 0, V_{EB} = 4.0 V
h_{fe}	High Frequency Current Gain	2.0			I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz
h_{fe}	Small Signal Current Gain	20			I_C = 25 mA, V_{CE} = 10 V, f = 1.0 kHz
C_{ob}	Output Capacitance		3.5	pF	I_E = 0, V_{CB} = 20 V, f = 1.0 MHz
C_{ib}	Input Capacitance		25	pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz
RE (h_{ie})	Real Part of Input Impedance		50	Ω	I_C = 10 mA, V_{CE} = 10 V, f = 300 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 58°C/W (derating factor of 17.2 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS16.

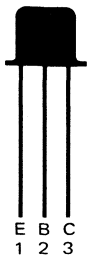
2N3962 • 2N3964 • 2N3965

PNP LOW LEVEL LOW NOISE AMPLIFIERS

SILICON PLANAR* EPITAXIAL TRANSISTORS

- **V_{CEO} . . . −60 V (MIN) (2N3962, 2N3965), 45 V (MIN) (2N3964)**
- **NF . . . 2.0 dB (MAX) @ 1.0 kHz (2N3964, 2N3965)**
  . . . 4.0 dB (MAX) @ 100 Hz (2N3964, 2N3965)
- **h_{FE} . . . 180 (MIN) @ 1.0 μA (2N3964, 2N3965)**
  . . . 250 – 500 @ 10 μA (2N3964, 2N3965)
  . . . 250 – 600 @ 1.0 mA (2N3964, 2N3965)
- **EXCELLENT BETA LINEARITY FROM 1.0 μA TO 50 mA**

See TO18-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature		−65°C to +200°C	
Operating Junction Temperature		200°C	
Lead Temperature (60 seconds)		300°C	
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		1.2 W	
at 25°C Ambient Temperature		0.36 W	
Maximum Voltages and Current		**2N3962, 2N3965**	**2N3964**
V_{CBO}	Collector to Base Voltage	−60 V	−45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V	−45 V
V_{EBO}	Emitter to Base Voltage	−6.0 V	−6.0 V
I_C	Collector Current	200 mA	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3962 MIN.	2N3962 MAX.	2N3964 MIN.	2N3964 MAX.	2N3965 MIN.	2N3965 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	60		180		180			I_C = 1.0 μA, V_{CE} = −5.0 V
		100	300	250	500	250	500		I_C = 10 μA, V_{CE} = −5.0 V
		100		250		250			I_C = 100 μA, V_{CE} = −5.0 V
		100	450	250	600	250	600		I_C = 1.0 mA, V_{CE} = −5.0 V
		40		100		100			I_C = 10 μA, V_{CE} = −5.0 V, T_A = −55°C
			600		800		800		I_C = 1.0 mA, V_{CE} = −5.0 V, T_A = 100°C
h_{FE}	DC Pulse Current Gain (Note 5)	100		200		200			I_C = 10 mA, V_{CE} = −5.0 V
		90		180		180			I_C = 50 mA, V_{CE} = −5.0 V
		45		90		90			I_C = 50 mA, V_{CE} = −5.0 V, T_A = −55°C
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		−6.0		−6.0		V	I_C = 0, I_E = 10 μA
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−45		−60		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−60		−45		−60		V	I_C = 10 μA, I_B = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−60		−45		−60		V	I_C = 5.0 mA, I_B = 0
NF	Wide Band Noise Figure		3.0		2.0		2.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, BW = 15.7 kHz, f = 10 Hz to 10 kHz
NF	Narrow Band Noise Figure		3.0		2.0		2.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, BW = 1.5 kHz, f = 10 kHz
			3.0		2.0		2.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, BW = 150 Hz, f = 1.0 kHz
			10		4.0		4.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, BW = 15 Hz, f = 100 Hz
					8.0		8.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, BW = 2.0 Hz, f = 10 Hz
I_{CES}	Collector Reverse Current		10				10	nA	V_{CE} = −50 V, V_{EB} = 0
					10			nA	V_{CE} = −40 V, V_{EB} = 0
			10				10	μA	V_{CE} = −50 V, V_{EB} = 0 T_A = 150°C
					10			μA	V_{CE} = −40 V, V_{EB} = 0, T_A = 150°C

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 146°C/W (derating factor of 6.85 mW/°C); junction to ambient thermal resistance of 486°C/W (derating factor of 2.06 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves refer to Section 5-SS33.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont.)

SYMBOL	CHARACTERISTIC	2N3962 MIN.	2N3962 MAX.	2N3964 MIN.	2N3964 MAX.	2N3965 MIN.	2N3965 MAX.	UNITS	TEST CONDITIONS
I_{EBO}	Emitter Cutoff Current		10		10		10	nA	$I_C = 0$, $V_{EB} = -4.0$ V
$V_{CE(sat)}$	Collector Saturation Voltage		−0.25		−0.25		−0.25	V	$I_C = 10$ mA, $I_B = 0.5$ mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.4		−0.4		−0.4	V	$I_C = 50$ mA, $I_B = 5.0$ mA
$V_{BE(sat)}$	Base Saturation Voltage		−0.9		−0.9		−0.9	V	$I_C = 10$ mA, $I_B = 0.5$ mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		−0.95		−0.95		−0.95	V	$I_C = 50$ mA, $I_B = 5.0$ mA
h_{ie}	Input Resistance	2.5	17	6.0	20	6.0	20	kΩ	$I_C = 1.0$ mA, $V_{CE} = -5.0$ V, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	40	5.0	50	5.0	50	μmho	$I_C = 1.0$ mA, $V_{CE} = -5.0$ V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		10		10		10	$x10^{-4}$	$I_C = 1.0$ mA, $V_{CE} = -5.0$ V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	100	550	250	700	250	700		$I_C = 1.0$ mA, $V_{CE} = -5.0$ V, f = 1.0 kHz
h_{fe}	High Frequency Current Gain	2.0	8.0	2.5	8.0	2.5	8.0		$I_C = 0.5$ mA, $V_{CE} = -5.0$ V, f = 20 MHz
C_{ob}	Open Circuit Output Capacitance		6.0		6.0		6.0	pF	$I_E = 0$, $V_{CB} = -5.0$ V, f = 1.0 MHz
C_{ib}	Open Circuit Input Capacitance		15		15		15	pF	$I_C = 0$, $V_{EB} = -0.5$ V, f = 1.0 MHz

4

2N4017 • 2N4018 • 2N4019

DUAL PNP HIGH GAIN LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **LV_{CEO} . . . 80 V (MIN), 2N4017**
- **h_{FE} . . . 250 (MIN) @ 10 μA, 2N4019**
- **NF . . . 4.0 dB (MAX) @ 100 Hz; 8.0 dB (MAX) @ 10 Hz, 2N4019**

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (60 seconds)			300°C
Maximum Power Dissipation (Notes 2 & 3)		**One Side**	**Both Sides**
Total Dissipation at 25°C Case Temperature		0.80 W	1.3 W
at 25°C Ambient Temperature		0.40 W	0.60 W

Maximum Voltages and Current for each Transistor		**2N4017**	**2N4018**	**2N4019**
V_{CBO}	Collector to Base Voltage	−80 V	−60 V	−45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−80 V	−60 V	−45 V
V_{EBO}	Emitter to Base Voltage	−6.0 V	−6.0 V	−6.0 V
I_C	Collector Current	200 mA	200 mA	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4017 MIN.	2N4017 MAX.	2N4018 MIN.	2N4018 MAX.	2N4019 MIN.	2N4019 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	60		60		180			I_C = 1.0 μA, V_{CE} = −5.0 V
		100	350	100	500	250	500		I_C = 10 μA, V_{CE} = −5.0 V
		100		100		250			I_C = 100 μA, V_{CE} = −5.0 V
		100	500	100	600	250	600		I_C = 1.0 mA, V_{CE} = −5.0 V
			600		800		800		I_C = 1.0 mA, V_{CE} = −5.0 V, T_A = 100°C
h_{FE}	DC Pulse Current Gain (Note 5)	100		100		200			I_C = 10 mA, V_{CE} = −5.0 V
		90		90		180			I_C = 50 mA, V_{CE} = −5.0 V
		40		40		80			I_C = 50 mA, V_{CE} = −5.0 V, T_A = −55°C
		40		40		100			I_C = 10 μA, V_{CE} = −5.0 V, T_A = −55°C
NF	Noise Figure						8.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 10 Hz, BW = 2.0 Hz, R_S = 10 kΩ
			3.0		3.0		2.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 1.0 kHz, BW = 150 Hz, R_S = 10 kΩ
			10		10		4.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 100 Hz, BW = 15 Hz, R_S = 10 kΩ
BV_{CBO}	Collector to Base Breakdown Voltage	−80		−60		−45		V	I_C = 10 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−80		−60		−45		V	I_C = 5.0 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		−6.0		−6.0		V	I_E = 10 μA, I_C = 0
$V_{CE(sat)}$	Collector Saturation Breakdown Voltage (pulsed) (Note 5)		−0.25		−0.25		−0.25	V	I_C = 10 mA, I_B = 0.5 mA
			−0.4		−0.4		−0.4	V	I_C = 50 mA, I_B = 5.0 mA

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 437°C/W (derating factor of 2.3 mW/°C) for one side; 292°C/W (derating factor of 3.4 mW/°C) for both sides; junction to case thermal resistance of 219°C/W (derating factor of 4.57 mW/°C) for one side; 135 C/W (derating factor of 7.4 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS33.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4017 MIN.	2N4017 MAX.	2N4018 MIN.	2N4018 MAX.	2N4019 MIN.	2N4019 MAX.	UNITS	TEST CONDITIONS
$V_{BE(sat)}$	Base Saturation Voltage (pulsed) (Note 5)		–0.9		–0.9		–0.9	V	I_C = 10 mA, I_B = 0.5 mA
			–0.95		–0.95		–0.95	V	I_C = 50 mA, I_B = 5.0 mA
I_{CBO}	Collector Cutoff Current		10					nA	I_E = 0, V_{CB} = –70 V
					10			nA	I_E = 0, V_{CB} = –50 V
							10	nA	I_E = 0, V_{CB} = –30 V
			10					μA	I_E = 0, V_{CB} = –70 V, T_A = 125°C
					10			μA	I_E = 0, V_{CB} = –50 V, T_A = 125°C
							10	μA	I_E = 0, V_{CB} = –30 V, T_A = 125°C
I_{EBO}	Emitter Cutoff Current		10		10		10	nA	I_C = 0, V_{EB} = –4.0 V
h_{fe}	High Frequency Current Gain	2.0	8.0	2.0	8.0	2.5	8.0		I_C = 0.5 mA, V_{CE} = –5.0 V f = 20 MHz
C_{ob}	Output Capacitance		6.0		6.0		6.0	pF	I_E = 0, V_{CB} = –5.0 V, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	100	550	100	700	250	700		I_C = 1.0 mA, V_{CE} = –5.0 V, f = 1.0 kHz
h_{ie}	Input Resistance	2.5	17	2.5	20	6.0	20	kΩ	I_C = 1.0 mA, V_{CE} = –5.0 V, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	40	5.0	50	5.0	50	μmhos	I_C = 1.0 mA, V_{CE} = –5.0 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		10		10		10	$x10^{-4}$	I_C = 1.0 mA, V_{CE} = –5.0 V, f = 1.0 kHz

2N4020 through 2N4025

DUAL PNP HIGH GAIN LOW NOISE DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **V_{CEO} . . . 45 V AND 60 V (MIN)**
- **NF . . . 4.0 dB (MAX) @ 100 Hz**

See TO5-9 Package Outline

CBEEBC
123456

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (60 seconds)			300°C
Maximum Power Dissipation (Notes 2 & 3)		**One Side**	**Both Sides**
Total Dissipation at 25°C Case Temperature		0.80 W	1.3 W
at 25°C Ambient Temperature		0.40 W	0.60 W
Maximum Voltages and Current		**2N4021, 2N4022 2N4024, 2N4025**	**2N4020 2N4023**
V_{CBO}	Collector to Base Voltage	−60 V	−45 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V	−45 V
V_{EBO}	Emitter to Base Voltage	−6.0 V	−6.0 V
I_C	Collector Current	200 mA	200 mA

MATCHING CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4020/1/2 MIN.	2N4020/1/2 MAX.	2N4023/4/5 MIN.	2N4023/4/5 MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.8	1.0	0.9	1.0		I_C = 100 μA to 1.0 mA, V_{CE} = −5.0 V
$\lvert V_{BE1}-V_{BE2}\rvert$	Base to Emitter Voltage Differential		5.0		3.0	mV	I_C = 100 μA, V_{CE} = −5.0 V
			10		5.0	mV	I_C = 100 μA to 1.0 mA, V_{CE} = −5.0 V
$\lvert\Delta(V_{BE1}-V_{BE2})\rvert$	Base to Emitter Voltage Differential Change		1.6		0.8	mV	I_C = 100 μA, V_{CE} = −5.0 V, T_A = −55°C to +25°C
			2.0		1.0	mV	I_C = 100 μA, V_{CE} = −5.0 V, T_A = +25°C to +125°C

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4021 2N4024 MIN.	2N4021 2N4024 MAX.	2N4020/2 2N4023/5 MIN.	2N4020/2 2N4023/5 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	60		180			I_C = 1.0 μA, V_{CE} = −5.0 V
		100	350	250	500		I_C = 10 μA, V_{CE} −5.0 V
		40		100			I_C = 10 μA, V_{CE} = −5.0 V, T_A = −55°C
		100	400	250	550		I_C = 100 μA, V_{CE} = −5.0 V
		100	500	250	600		I_C = 1.0 mA, V_{CE} = −5.0 V,
			600		800		I_C = 1.0 mA, V_{CE} = −5.0 V, T_A = 100°C
h_{FE}	DC Pulse Current Gain (Note 6)	100		200			I_C = 10 mA, V_{CE} = −5.0 V
		90		180			I_C = 50 mA, V_{CE} = −5.0 V
		40		80			I_C = 50 mA, V_{CE} = 5.0 V, T_A = −55°C

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 437°C/W (derating factor of 2.3 mW/°C) for one side; 292°C/W (derating factor of 3.4 mW/°C) for both sides; junction to case thermal resistance of 2.9°C/W (derating factor of 4.56 mW/°C) for one side; 135°C/W (derating factor of 7.4 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Lowest of two h_{FE} ratings is taken as h_{FE1} for purpose of this ratio.
6. Pulse conditions: length = 300 μs; duty cycle = 1%.
7. For product family characteristic curves, refer to Section 5 - SS33.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4021 2N4024 MIN.	2N4021 2N4024 MAX.	2N4020/2 2N4023/5 MIN.	2N4020/2 2N4023/5 MAX.	UNITS	TEST CONDITIONS
NF	Noise Figure		3.0		2.0	dB	I_C = 20 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 10 kΩ, BW = 150 Hz
					8.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 10 Hz, R_S = 10 kΩ, BW = 2.0 Hz
			10		4.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 100 Hz, R_S = 10 kΩ, BW = 15 Hz
$V_{CE(sat)}$	Collector Saturation Voltage		−0.25		−0.25	V	I_C = 10 mA, I_B = 0.5 mA
	(Note 6)		−0.4		−0.4	V	I_C = 50 mA, I_B = 5.0 mA
V_{BE}	Base Saturation Voltage		−0.9		−0.9	V	I_C = 10 mA, I_B = 0.5 mA
	(Note 6)		−0.95		−0.95	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Common Base, Open Circuit Output Capacitance		6.0		6.0	pF	I_E = 0, V_{CB} = −5.0 V, f = 1.0 MHz
C_{ib}	Common Base, Open Circuit Input Capacitance		15		15	pF	I_C = 0, V_{EB} = −0.5 V, f = 1.0 MHz
h_{fe}	High Frequency Current Gain	2.0	8.0	2.5	8.0		I_C = 0.5 mA, V_{CE} = −5.0 V, f = 20 MHz
h_{ie}	Input Resistance	2.5	17	6.0	20	kΩ	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	40	5.0	50	μmho	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		10		10	$x10^{-4}$	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	100	550	250	700		I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz

SYMBOL	CHARACTERISTIC	2N4020 2N4023 MIN.	2N4020 2N4023 MAX.	2N4021/2 2N4024/5 MIN.	2N4021/2 2N4024/5 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10			nA	I_E = 0, V_{CB} = −30 V
					10	nA	I_E = 0, V_{CB} = −50 V
			10			μA	I_E = 0, V_{CB} = −30 V, T_A = 125°C
					10	μA	I_E = 0, V_{CB} = −50 V, T_A = 125°C
I_{EBO}	Emitter Cutoff Current		10		10	nA	I_C = 0, V_{CB} = −40 V
BV_{CBO}	Collector to Base Breakdown Voltage	−45		−60		V	I_E = 0, I_C = 10 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 6)	−45		−60		V	I_C = 5.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		−6.0		V	I_C = 0, I_E = 10 μA

4

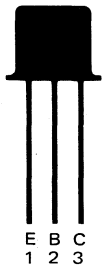
2N4030 • 2N4031 • 2N4032 • 2N4033

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 60 V (MIN) (2N4030, 2N4032), 80 V (MIN) (2N4031, 2N4033)
- h_{FE} . . . 100-300 @ 100 mA, (2N4032, 2N4033), 40 (MIN) (2N4032) 25 (MIN) (2N4033) @ 1.0 A
- COMPLEMENTS . . . 2N3107, 2N3108, 2N3109, 2N3020

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	4.0 W
at 25°C Ambient Temperature	0.8 W

Maximum Voltages and Current

		2N4030 2N4032	2N4031 2N4033
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	1.0	1.0

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4030 MIN.	2N4030 MAX.	2N4031 MIN.	2N4031 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	30		30			I_C = 100 μA, V_{CE} = −5.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	40	120	40	120		I_C = 100 mA, V_{CE} = −5.0 V
		25		25			I_C = 500 mA, V_{CE} = −5.0 V
		15		10			I_C = 1.0 A, V_{CE} = −5.0 V
		15		15			I_C = 100 mA, V_{CE} = −5.0 V, T_A = −55°C
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	1.0	4.0	1.0	4.0		I_C = 50 mA, V_{CE} = −10 V, f = 100 MHz
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
C_{cb}	Collector to Base Capacitance		20		20	pF	I_E = 0, V_{CB} = −10 V, f = 1.0 MHz
C_{ib}	Input Capacitance		110		110	pF	I_C = 0, V_{EB} = −0.5 V, f = 1.0 MHz
t_{on}	Turn On Time (see test circuit no. 341)		100		100	ns	$I_C \approx$ 500 mA, $I_{B1} \approx$ 50 mA
t_s	Storage Time (see test circuit no. 341)		350		350	ns	$I_C \approx$ 500 mA, $I_{B1} \approx -I_{B2} \approx$ 50 mA
t_f	Fall Time (see test circuit no. 341)		50		50	ns	$I_C \approx$ 500 mA, $I_{B1} \approx -I_{B2} \approx$ 50 mA
$V_{CE\ (sat)}$	Collector Saturation Voltage (Note 5)		−0.15		−0.15	V	I_C = 150 mA, I_B = 15 mA
			−0.5		−0.5	V	I_C = 500 mA, I_B = 50 mA
			−1.0			V	I_C = 1.0 A, I_B = 100 mA
$V_{BE\ (sat)}$	Base Saturation Voltage (Note 5)		−0.9		−0.9	V	I_C = 150 mA, I_B = 15 mA
$V_{BE\ (ON)}$	Base to Emitter Voltage (Note 5)		−1.1		−1.1	V	I_C = 500 mA, V_{CE} = −0.5 V
			−1.2			V	I_C = 1.0 A, V_{CE} = −1.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−80		V	I_E = 0, I_C = 10 μA
V_{CEO}	Collector to Emitter Sustaining Voltage (Note 5)	−60		−80		V	I_C = 10 mA (pulsed), I_B = 0
I_{EBO}	Emitter Current		10		10	μA	I_C = 0, V_{EB} = −5.0 V
I_{CBO}	Collector Cutoff Current		50			nA	I_E = 0, V_{CB} = −50 V
					50	nA	I_E = 0, V_{CB} = −60 V
			50			μA	I_E = 0, V_{CB} = −50 V, T_A = 150°C
					50	μA	I_E = 0, V_{CB} = −60 V, T_A = 150°C

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 43.7°C/W (derating factor of 22.8 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.56 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic vurves, refer to Section 5-SS24.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4032 MIN.	2N4032 MAX.	2N4033 MIN.	2N4033 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	75		75			I_C = 100 μA, V_{CE} = −5.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	100	300	100	300		I_C = 100 mA, V_{CE} = −5.0 V
		70		70			I_C = 500 mA, V_{CE} = −5.0 V
		40		25			I_C = 1.0 A, V_{CE} = −5.0 V
		40		40			I_C = 100 mA, V_{CE} = −5.0 V, T_A = −55°C
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	1.5	5.0	1.5	5.0		I_C = 50 mA, V_{CE} = −10 V, f = 100 MHz
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
C_{cb}	Collector to Base Capacitance		20		20	pF	I_E = 0, V_{CB} = −10 V, f = 1.0 MHz
C_{ib}	Input Capacitance		110		110	pF	I_C = 0, V_{EB} = −0.5 V, f = 1.0 MHz
t_{on}	Turn On Time (see test circuit no. 341)		100		100	ns	$I_C \approx$ 500 mA, $I_{B1} \approx$ 50 mA
t_s	Storage Time (see test circuit no. 341)		350		350	ns	$I_C \approx$ 500 mA, $I_{B1} \approx I_{B2} \approx$ 50 mA
t_f	Fall Time (see test circuit no. 341)		50		50	ns	$I_C \approx$ 500 mA, $I_{B1} \approx I_{B2} \approx$ 50 mA
$V_{CE\ (sat)}$	Collector Saturation Voltage (Note 5)		−0.15		−0.15	V	I_C = 150 mA, I_B = 15 mA
			−0.5		−0.5	V	I_C = 500 mA, I_B = 50 mA
					−1.0	V	I_C = 1.0 A, I_B = 100 mA
$V_{BE\ (sat)}$	Base Saturation Voltage (Note 5)		−0.9		−0.9	V	I_C = 150 mA, I_B = 15 mA
$V_{BE\ (ON)}$	Base to Emitter Voltage (Note 5)		−1.1		−1.1	V	I_C = 500 mA, V_{CE} = −0.5 V
			−1.2			V	I_C = 1.0 A, V_{CE} = −1.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−80		V	I_E = 0, I_C = 10 μA
V_{CEO}	Collector to Emitter Sustraining Voltage (Note 5)	−60		−80		V	I_C = 10 mA (pulsed), I_B = 0
I_{EBO}	Emitter Current		10		10	μA	I_C = 0, V_{EB} = −5.0 V
I_{CBO}	Collector Cutoff Current		50			nA	I_E = 0, V_{CB} = −50 V
					50	nA	I_E = 0, V_{CB} = −60 V
			50			μA	I_E = 0, V_{CB} = −50 V, T_A = 150°C
					50	μA	I_E = 0, V_{CB} = −60 V, T_A = 150°C

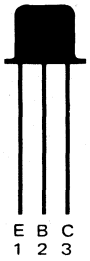
2N4034 • 2N4035

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . −40 V (MIN)
- h_{FE} . . . 150-300 @ 10 mA (2N4035)
- NF . . . 6.0 dB (MAX) @ 15 MHz
- f_T . . . 400 MHz (MIN) (2N4034) 450 MHz (MIN) (2N4035)
- COMPLEMENTS . . . 2N3946 AND 2N3947

See TO18-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65° C to 200° C
Operating Junction Temperature		200° C
Lead Temperature (60 seconds)		300° C
Maximum Power Disisipation (Notes 2 & 3)		
Total Dissipation at 25° C Case Temperature		1.0 W
at 25° C Ambient Temperature		0.36 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	−40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V
V_{EBO}	Emitter to Base Voltage	−5.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4034 MIN.	2N4034 MAX.	2N4035 MIN.	2N4035 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	20		70			I_C = 10 μA, V_{CE} = −1.0 V
		50		140			I_C = 100 μA, V_{CE} = −1.0 V
h_{FE}	DC Pulse Current Gain	70	200	150	300		I_C = 10 mA, V_{CE} = −1.0 V
	(Note 5)	15		30			I_C = 50 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		−0.3		−0.3	V	I_C = 50 mA, I_B = 5.0 mA
	(Pulsed, Note 5)		−0.14		−0.14	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base Saturation Voltage	−0.7	−0.9	−0.7	−0.9	V	I_C = 10 mA, I_B = 1.0 mA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−40		−40		V	I_C = 10 mA, I_B = 0 (Pulsed)
h_{fe}	High Frequency Current Gain	4.0		4.5			I_C = 10 mA, V_{CE} = −20 V, f = 100 MHz
C_{cb}	Collector to Base Output Capacitance		3.5		3.5	pF	I_E = 0, V_{CB} = −10 V
C_{ib}	Input Capacitance		5.5		5.5	pF	I_C = 0, V_{EB} = −0.5 V
NF	Noise Figure		6.0		6.0	dB	I_C = 1.0 mA, V_{CE} = −5.0 V, R_S = 100 Ω, BW = 15 MHz, f = 100 MHz
$r_b'C_c$	Collector Base Time Constant		40		40	ps	I_C = 10 mA, V_{CE} = −20 V, f = 80 MHz
t_{on}	Turn On Time (see test circuit no. 342)		40		40	ns	I_C = 50 mA, I_{B1} = 5.0 mA
t_{off}	Turn Off Time (see test circuit no. 342)		150		150	ns	I_C = 50 mA, I_{B1} = I_{B2} = 5.0 mA
h_{FE}	DC Current Gain	60		150			I_C = 1.0 mA, V_{CE} = −1.0 V
h_{FE}	Pulse Current Gain (Note 5)	30		70			I_C = 10 mA, V_{CE} = −1.0 V, T_A = −55° C
$V_{CE(sat)}$	Collector Saturation Voltage		−0.13		−0.13	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(sat)}$	Base Saturation Voltage (Pulsed, Note 5)		−1.1		−1.1	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		−0.75		−0.75	V	I_C = 1.0 mA, I_B = 0.1 mA
I_{CES}	Collector Reverse Current		15		15	nA	V_{CE} = −30 V, V_{BE} = 0
			15		15	μA	V_{CE} = −30 V, V_{BE} = 0, T_A = 125° C

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200° C and junction to case thermal resistance of 175° C/W (derating factor of 5.71 mW/° C); junction to ambient thermal resistance of 500° C/W (derating factor of 2.06 mW/° C).
4. This rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4034 MIN.	2N4034 MAX.	2N4035 MIN.	2N4035 MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−40		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−40		−40		V	I_C = 10 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
h_{ie}	Input Resistance	1.0	8.0	4.0	12	kΩ	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{oe}	Output Conductance	2.0	24	8.0	40	μmho	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		3.0		4.0		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{fe}	Forward Current Transfer Ratio	50	300	150	450		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz

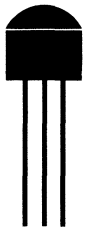
2N4121 • 2N4122

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- h_{FE} . . . 150-300 @ 10 mA (2N4122)
- f_T . . . 450 MHz (MIN) @ 10 mA (2N4122)
- $r_b'C_c$ . . . 50 ps (MAX)
- C_{cb} . . . 4.5 pF (MAX)
- NF . . . 6.0 dB (MAX) @ 100 MHz
- V_{CEO} . . . 40 V (MIN)

See TO18-4 Package Outline



E B C
1 2 3

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−55°C to +125°C
Operating Junction Temperature		125°C
Lead Temperature (10 seconds)		260°C
Maximum Power Dissipation		
Total Dissipation at 25°C Case Temperature (Notes 2 & 3)		0.5 W
at 25°C Ambient Temperature (Notes 2 & 3)		0.2 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	−40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V
V_{EBO}	Emitter to Base Voltage	−5.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4121 MIN.	2N4121 MAX.	2N4122 MIN.	2N4122 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	40		100			I_C = 100 μA, V_{CE} −1.0 V
		60		150			I_C = 1.0 mA, V_{CE} = −1.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	70	200	150	300		I_C = 10 mA, V_{CE} = −1.0 V
		15		30			I_C = 50 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		−0.13		−0.13	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{CE(sat)}$	Collector Saturation		−0.14		−0.14	V	I_C = 10 mA, I_B = 1.0 mA
	Voltage (Note 5)		−0.3		−0.3	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		−0.75		−0.75	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(sat)}$	Base Saturation Voltage	−0.7	−0.9	−0.7	−0.9	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 5)		−1.1		−1.1	V	I_C = 50 mA, I_B = 5.0 mA
t_{on}	Turn On Time		40		40	ns	I_C = 50 mA, I_{B1} = 5.0 mA
	(see test circuit no. 342)						
t_{off}	Turn Off Time		150		150	ns	I_C = 50 mA, I_{B1} = 5.0 mA
	(see test circuit no. 342)						I_{B2} = 5.0 mA
$\|h_{fe}\|$	Magnitude of Small Signal	4.0		4.5			I_C = 10 mA, V_{CE} = −20 V, f = 100 MHz
	Current Gain						
$V_{CEO(sus)}$	Collector to Emitter Sustaining	−40		−40		V	I_C = 10 mA, I_B = 0
	Voltage (Note 5)						(Pulsed)
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−40		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown	−40		−40		V	I_C = 10 μA, V_{BE} = 0
	Voltage						
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
I_{CES}	Collector Reverse Current		25		25	nA	V_{CE} = −30 V, V_{BE} = 0
I_{CES}	Collector Reverse Current		25		25	μA	V_{CE} = −30 V, V_{BE} = 0, T_A = 65°C
C_{cb}	Collector to Base Capacitance		4.5		4.5	pF	I_E = 0, V_{CB} = −10 V
C_{ib}	Open Circuit Input Capacitance		8.0		8.0	pF	I_C = 0, V_{EB} = −0.5 V
$r_b'C_c$	Collector to Base Time Constant		50		50	ps	I_C = 10 mA, V_{CE} = −20 V, f = 80 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS23.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4121 MIN.	2N4121 MAX.	2N4122 MIN.	2N4122 MAX.	UNITS	TEST CONDITIONS
NF	Noise Figure		6.0		6.0	dB	I_C = 1.0 mA, V_{CE} = −5.0 V, R_S = 100 Ω, BW = 15 MHz, f = 100 MHz
			4.0		4.0	dB	I_C = 100 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, f = 10 Hz to 10 kHz, BW = 15.7 kHz
h_{ie}	Input Resistance	1.0	8.0	4.0	12	kΩ	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{oe}	Output Conductance	2.0	24	8.0	40	μmho	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		3.0		4.0	x10^{-4}	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{fe}	Forward Current Transfer Ratio	50	300	150	450		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz

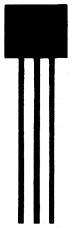
2N4123 • 2N4124

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 25 V (MIN) (2N4124)
- h_{FE} . . . 120-360 @ 2.0 mA (2N4124)
- NF . . . 5.0 dB (MAX) WIDE BAND (2N4124)
- COMPLEMENTS . . . 2N4125, 2N4126

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperature		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Lead Temperature (60 seconds)		260°C
†Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 25°C Ambient Temperature		0.625 W
at 70°C Ambient Temperature		0.400 W
Maximum Voltages and Current	**2N4123**	**2N4124**
V_{CBO} Collector to Base Voltage	40 V	30 V
V_{CEO} Collector to Emitter Voltage (Note 4)	30 V	25 V
V_{EBO} Emitter to Base Voltage	5.0 V	5.0 V
I_C Collector Current	200 mA	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4123 MIN.	2N4123 MAX.	2N4124 MIN.	2N4124 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain	50	150	120	360		I_C = 2.0 mA, V_{CE} = 1.0 V
	(Note 5)	25		60			I_C = 50 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.3		0.3	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		0.95		0.95	V	I_C = 50 mA, I_B = 5.0 mA
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = 20 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = 3.0 V, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	40		30		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	30		25		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Base to Emitter Breakdown Voltage	5.0		5.0		V	I_C = 0, I_E = 10 μA
C_{cb}	Collector to Base Capacitance		4.0		4.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 100 kHz
C_{ib}	Input Capacitance		8.0		8.0	pF	I_C = 0, V_{EB} = 0.5 V, f = 100 kHz
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	2.5		3.0			I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz
h_{fe}	Small Signal Current Gain	50	200	120	480		I_C = 2.0 mA, V_{CE} = 10 V, f = 1.0 kHz
NF	Noise Figure		6.0		5.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, R_S = 1.0 kΩ, f = 10 Hz to 15.7 kHz

†Fairchild exceeds JEDEC registered values.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5 — SS14.

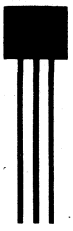
2N4125 • 2N4126

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −25 V (MIN) (2N4126)
- h_{FE} . . . 120-360 @ 2.0 mA (2N4126)
- NF . . . 4.0 dB (MAX) WIDEBAND (2N4126)
- COMPLEMENTS . . . 2N4123, 2N4124

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Lead Temperature (60 seconds)			230°C
†Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			1.0 W
at 25°C Ambient Temperature			0.625 W
at 70°C Ambient Temperature			0.400 W
Maximum Voltages and Current		**2N4125**	**2N4126**
V_{CBO}	Collector to Base Voltage	−30 V	−25 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−30 V	−25 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.0 V
I_C	Collector Current	200 mA	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4125 MIN.	2N4125 MAX.	2N4126 MIN.	2N4126 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain	50	150	120	360		I_C = 2.0 mA, V_{CE} = −1.0 V
	(Note 5)	25		60			I_C = 50 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.4		−0.4	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		−0.95		−0.95	V	I_C = 50 mA, I_B = 5.0 mA
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = −20 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = −3.0 V, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−30		−25		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	−30		−25		V	I_C = 1.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_C = 0, I_E = 10 μA
C_{cb}	Collector to Base Capacitance		4.5		4.5	pF	I_E = 0, V_{CB} = −5.0 V, f = 100 kHz
C_{ib}	Input Capacitance		10		10	pF	I_C = 0, V_{EB} = −0.5 V, f = 100 kHz
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	2.0		2.0			I_C = 10 mA, V_{CE} = −20 V, f = 100 MHz
h_{fe}	Small Signal Current Gain	50	200	120	480		I_C = 2.0 mA, V_{CE} = −1.0 V, f = 1.0 kHz
NF	Noise Figure		5.0		4.0	dB	I_C = 100 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, f = 10 Hz to 15.7 kHz

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered value for this parameter.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5 — SS23.

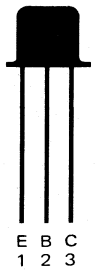
2N4208 • 2N4209

PNP SMALL SIGNAL ULTRA HIGH SPEED SATURATED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- τ_s . . . 20 ns (MAX)
- t_{on} . . . 15 ns (MAX), t_{off} . . . 20 ns (MAX)
- C_{ob} . . . 3.0 pF (MAX)
- C_{ib} . . . 3.5 pF (MAX)
- f_T . . . 850 MHz (MIN) (2N4209)
- V_{CE} . . . 0.18 V (MAX) @ I_C = 10 mA (2N4209)
- V_{CEO} . . . 15 V (MIN) 2N4209
- COMPLEMENTS . . . 2N2369A

See TO18-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature		−65°C to +200°C	
Operating Temperature		200°C	
Lead Temperature (60 seconds)		300°C	
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.7 W	
at 25°C Ambient Temperature		0.3 W	
Maximum Voltages and Current		**2N4208**	**2N4209**
V_{CBO}	Collector to Base Voltage	−12 V	−15 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−12 V	−15 V
V_{EBO}	Emitter to Base Voltage	−4.5 V	−4.5 V
I_C	Collector Current	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4208 MIN.	2N4208 MAX.	2N4209 MIN.	2N4209 MAX.	UNITS	TEST CONDITIONS
τ_s	Charge Storage Time						
	(see test circuit no. 234)		20		20	ns	I_C = 10 mA, $I_{B1} = I_{B2} \approx$ 10 mA, V_{CC} = −3.0 V
t_{on}	Turn On Time						
	(see test circuit no. 348)		15		15	ns	I_C = 10 mA, $I_{B1} \approx$ 1.0 mA, V_{CC} = −1.5 V
t_{off}	Turn Off Time						
	(see test circuit no. 348)		20		20	ns	I_C = 10 mA, $I_{B1} = I_{B2} \approx$ 1.0 mA, V_{CC} = −1.5 V
C_{ob}	Output Capacitance		3.0		3.0	pF	I_E = 0, V_{CB} = −5.0 V
C_{ib}	Input Capacitance		3.5		3.5	pF	I_C = 0, V_{EB} = −0.5 V
h_{fe}	High Frequency Current Gain	7.0		8.5			I_C = 10 mA, f = 100 MHz, V_{CE} = −10 V
h_{FE}	DC Current Gain	15		35			I_C = 1.0 mA, V_{CE} = −0.5 V
h_{FE}	DC Pulse Current Gain	30	120	50	120		I_C = 10 mA, V_{CE} = −0.3 V
	(Note 5)	30		40			I_C = 50 mA, V_{CE} = −1.0 V
		12		20			I_C = 10 mA, V_{CE} = −0.3 V, T_A = −55°C
$V_{CE(sat)}$	Collector Saturation Voltage		−0.13		−0.15	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{CE(sat)}$	Pulsed Collector Saturation		−0.15		−0.18	V	I_C = 10 mA, I_B = 1.0 mA
	Voltage (Note 5)		−0.5		−0.6	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		−0.8		−0.8	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(sat)}$	Pulsed Base Saturation	−0.8	−0.95	−0.8	−0.95	V	I_C = 10 mA, I_B = 1.0 mA
	Voltage (Note 5)		−1.5		−1.5	V	I_C = 50 mA, I_B = 5.0 mA

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 250°C/W (derating factor of 4.0 mW/°C); junction to ambient thermal resistance of 583°C/W (derating factor of 1.72 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS31.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4208 MIN.	2N4208 MAX.	2N4209 MIN.	2N4209 MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Reverse Current		10			nA	V_{CE} = –6.0 V, V_{BE} = 0
					10	nA	V_{CE} = –8.0 V, V_{BE} = 0
			5.0			μA	V_{CE} = –6.0 V, V_{BE} = 0, T_A = 125°C
					5.0	μA	V_{CE} = –8.0 V, V_{BE} = 0, T_A = 125°C
BV_{EBO}	Emitter to Base Breakdown Voltage	–4.5		–4.5		V	I_C = 0, I_E = 100 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	–12		–15		V	I_C = 3.0 mA, I_B = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	–12		–15		V	I_C = 100 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	–12		–15		V	I_C = 100 μA, I_E = 0

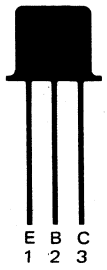
2N4234 • 2N4235 • 2N4236

6 WATT PNP POWER

DIFFUSED SILICON BI-MESAR ™ TRANSISTORS

- $V_{CE(sat)}$ . . . 0.6 V @ I_C = 1.0 A
- COMPLEMENTS . . . 2N4237 THROUGH 2N4239

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−65°C to +200°C
Operating Junction Temperature				−65°C to +200°C
Maximum Power Dissipation				
Total Dissipation at 25°C Case Temperature				6.0 W
Linear Derating Factor				34 mW/°C
Maximum Voltages and Currents		**2N4234**	**2N4235**	**2N4236**
V_{CBO}	Collector to Base Voltage	−40 V	−60 V	−80 V
V_{CEO}	Collector to Emitter Voltage	−40 V	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−7.0 V	−7.0 V	−7.0 V
I_C	Collector Current (Continuous)	1.0 A	1.0 A	1.0 A
I_B	Base Current (Continuous)	0.2 A	0.2 A	0.2 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 2)	2N4234	−40		V	I_C = 100 mA, I_B = 0
		2N4235	−60		V	I_C = 100 mA, I_B = 0
		2N4236	−80		V	I_C = 100 mA, I_B = 0
I_{CEX}	Collector Cutoff Current	2N4234		100	μA	V_{CE} = −40 V, V_{EB} = −1.5 V
		2N4235		100	μA	V_{CE} = −60 V, V_{EB} = −1.5 V
		2N4236		100	μA	V_{CE} = −80 V, V_{EB} = −1.5 V
I_{CEX}	Collector Cutoff Current	2N4234		1.0	mA	V_{CE} = −30 V, V_{EB} = −1.5 V, T_C = 150°C
		2N4235		1.0	mA	V_{CE} = −40 V, V_{EB} = −1.5 V, T_C = 150°C
		2N4236		1.0	mA	V_{CE} = −60 V, V_{EB} = −1.5 V, T_C = 150°C
I_{CBO}	Collector Cutoff Current	2N4234		100	μA	V_{CB} = −40 V, I_E = 0
		2N4235		100	μA	V_{CB} = −60 V, I_E = 0
		2N4236		100	μA	V_{CB} = −80 V, I_E = 0
I_{CEO}	Collector Cutoff Current	2N4234		1.0	mA	V_{CE} = −30 V, I_B = 0
		2N4235		1.0	mA	V_{CE} = −40 V, I_B = 0
		2N4236		1.0	mA	V_{CE} = −60 V, I_B = 0
I_{EBO}	Emitter Cutoff Current			500	μA	V_{EB} = −7.0 V, I_C = 0
h_{FE}	DC Pulsed Current Gain (Note 2)		40			I_C = 100 mA, V_{CE} = −1.0 V
			30	150		I_C = 250 mA, V_{CE} = −1.0 V
			20			I_C = 500 mA, V_{CE} = −1.0 V
			10			I_C = 1.0 A, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 2)			−0.6	V	I_C = 1.0 A, I_B = 125 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage	(Note 2)		−1.5	V	I_C = 1.0 A, I_B = 100 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage			−1.0	V	V_{CE} = −1.0 V, I_C = 250 mA
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain		3.0			V_{CE} = −10 V, I_C = 100 mA, f = 1.0 MHz
h_{fe}	Small Signal Current Gain		25			V_{CE} = −10 V, I_C = 50 mA, f = 1.0 kHz
C_{ob}	Common Base Output Capacitance			100	pF	V_{CB} = −10 V, I_E = 0, f = 100 kHz

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5 - PWR 14.

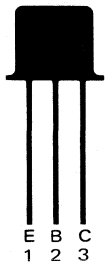
2N4237 • 2N4238 • 2N4239

5 WATT NPN POWER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- $V_{CE(sat)}$ . . . 0.6 V @ I_C = 1.0 A
- COMPLEMENTS . . . 2N4234 THROUGH 2N4236

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +200°C
Operating Junction Temperature	−55°C to +200°C
Lead Temperature (2 seconds)	230°C

Maximum Power Dissipation

Total Dissipation at 25°C Case Temperature (Note 3)	5.0 W
at 25°C Ambient Temperature (Note 3)	0.8 W

Maximum Voltages and Current		**2N4237**	**2N4238**	**2N4239**
V_{CBO}	Collector to Base Voltage	50 V	80 V	100 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V	6.0 V
V_{CEO}	Collector to Emitter Voltage	40 V	60 V	80 V
I_C	Collector Current (Note 2)	1.0 A	1.0 A	1.0 A
I_B	Base Current (Note 2)	0.5 A	0.5 A	0.5 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current	2N4237		0.1	mA	V_{CE} = 50 V, V_{EB} = 1.5 V
		2N4238		0.1	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
		2N4239		0.1	mA	V_{CE} = 100 V, V_{EB} = 1.5 V
I_{CEX}	Collector Cutoff Current	2N4237		1.0	mA	V_{CE} = 30 V, V_{EB} = 1.5 V, T_C = 150°C
		2N4238		1.0	mA	V_{CE} = 50 V, V_{EB} = 1.5 V, T_C = 150°C
		2N4239		1.0	mA	V_{CE} = 70 V, V_{EB} = 1.5 V, T_C = 150°C
I_{CBO}	Collector Cutoff Current	2N4237		0.1	mA	V_{CB} = 50 V, I_E = 0
		2N4238		0.1	mA	V_{CB} = 80 V, I_E = 0
		2N4239		0.1	mA	V_{CB} = 100 V, I_E = 0
I_{EBO}	Emitter Cutoff Current			0.5	mA	V_{EB} = 6.0 V, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	2N4237	40		V	I_C = 100 mA, I_B = 0
		2N4238	60		V	I_C = 100 mA, I_B = 0
		2N4239	80		V	I_C = 100 mA, I_B = 0
I_{CEO}	Collector Cutoff Current	2N4237		1.0	mA	V_{CE} = 30 V, I_B = 0
		2N4238		1.0	mA	V_{CE} = 40 V, I_B = 0
		2N4239		1.0	mA	V_{CE} = 60 V, I_B = 0
h_{FE}	DC Pulse Current Gain (Note 4)	2N4237	30	150		I_C = 250 mA, V_{CE} = 1.0 V
		2N4238	30			I_C = 500 mA, V_{CE} = 4.0 V
		2N4239	15			I_C = 1.0 A, V_{CE} = 1.0 V
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 4)			0.6	V	I_C = 1.0 A, I_B = 100 mA
				0.3	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 4)			1.5	V	I_C = 1.0 A, I_B = 100 mA
$V_{BE(ON)}$	Pulsed Base to Emitter "On" Voltage (Note 4)			1.0	V	I_C = 250 mA, V_{CE} = 1.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain		1.0			I_C = 100 mA, V_{CE} = 10 V, f = 1.0 MHz
h_{fe}	Small Signal Current Gain		30			I_C = 100 mA, V_{CE} = 10 V, f = 1.0 kHz
C_{ob}	Common Base Output Capacitance			100	pF	I_C = 0, V_{CB} = 10 V, f = 0.1 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 35°C/W (derating factor of 28.5 mW/°C); junction to ambient thermal resistance of 218.8°C/W (derating factor of 4.5 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 2%.
5. For product family characteristic curves, refer to Section 5 - PWR 5.

2N4248/9/50 • 2N4250A • PN4248/9/50 • PN4250A

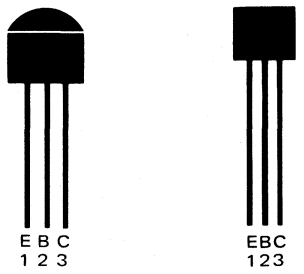
PNP LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN SERIES)
- NF . . . 2.0 dB (MAX) @ 1.0 kHz (2N/PN4250/A)
- h_{FE} . . . 250-700 @ 100 μA (2N/PN4250/A)
- V_{CEO} . . . 40 V (MIN) 2N4248, 2N4250; 60 V (MIN) 2N4249, 2N4250A
- EXCELLENT BETA LINEARITY FROM 1.0 μA to 50 mA

See Package Outlines

TO18-4 TO92-1



2N4248/9 2N4250/A PN4248/9 PN4250/A

ABSOLUTE MAXIMUM RATINGS (Note 1)

	2N4248/9 2N4250/A	PN4248/9 PN4250/A
Maximum Temperatures		
Storage Temperature	−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature	125°C	150°C
Lead Temperature (10 seconds)	260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature	0.5 W	1.0 W
at 25°C Ambient Temperature	0.2 W	0.625 W
Maximum Voltages	2N/PN4248 2N/PN4250	2N/PN4249 2N/PN4250A
V_{CBO} Collector to Base Voltage	−40 V	−60 V
V_{CEO} Collector to Emitter Voltage	−40 V	−60 V
V_{CES} Collector to Emitter Voltage	−40 V	−60 V
V_{EBO} Emitter to Base Voltage	−5.0 V	−5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4248 PN4248 MIN.	2N4248 PN4248 MAX.	2N4249 PN4249 MIN.	2N4249 PN4249 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = −40 V, I_E = 0
†I_{CBO}	Collector Cutoff Current		3.0		3.0	μA	V_{CB} = −40 V, I_E = 0, T_A = 65°C
I_{EBO}	Emitter Cutoff Current		20		20	nA	V_{EB} = −3.0 V, I_C = 0
h_{FE}	DC Current Gain	50		100	300		I_C = 100 μA, V_{CE} = −5.0 V
†h_{FE}	DC Current Gain	50		100			I_C = 1.0 mA, V_{CE} = −5.0 V
†h_{FE}	DC Pulse Current Gain (Note 5)	50		100			I_C = 10 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.25		−0.25	V	I_C = 10 mA, I_B = 0.5 mA
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−40		−60		V	I_C = 10 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−40		−60		V	I_C = 5.0 mA (pulsed), I_B = 0
h_{fe}	Small Signal Current Gain	50	1000	100	550		I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
C_{ob}	Output Capacitance		6.0		6.0	pF	I_E = 0, V_{CB} = −5.0 V, f = 1.0 MHz
NF	Wide Band Noise Figure				3.0	dB	V_{CE} = −5.0 V, I_C = 20 μA, R_S = 10 kΩ, PBW = 15.7 kHz, f = 10Hz to 10 kHz
NF	Narrow Band Noise Figure				3.0	dB	V_{CE} = −5.0 V, I_C = 20 μA, R_S = 10 kΩ, f = 1.0 kHz, PBW = 150 Hz
					3.0	dB	V_{CE} = −5.0 V, I_C = 250 μA, R_S = 1.0 kΩ, f = 1.0 kHz, PBW = 150 Hz
h_{ie}	Input Resistance			2.5	17	kΩ	V_{CE} = −5.0 V, I_C = 1.0 mA, f = 1.0 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered values.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N4848 thru 4850A. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN4848 thru PN4850A.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS33.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4248 PN4248 MIN.	2N4248 PN4248 MAX.	2N4249 PN4249 MIN.	2N4249 PN4249 MAX.	UNITS	TEST CONDITIONS
h_{oe}	Output Conductance			5.0	40	μmhos	$V_{CE} = -5.0$ V, $I_C = 1.0$ mA, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio				10	x 10^{-4}	$V_{CE} = -5.0$ V, $I_C = 1.0$ mA, f = 1.0 kHz
†h_{fe}	High Frequency Current Gain	2.0		2.0			$I_C = 0.5$ mA, $V_{CE} = -5.0$ V, f = 20 MHz
†$V_{BE(sat)}$	Base to Emitter Saturation Voltage		−0.9		−0.9	V	$I_C = 10$ mA, $I_B = 0.5$ mA
†C_{ib}	Input Capacitance		16		16	pF	$I_C = 0$, $V_{EB} = -0.5$ V, f = 1.0 MHz

SYMBOL	CHARACTERISTIC	2N4250 PN4250 MIN.	2N4250 PN4250 MAX.	2N4250A PN4250A MIN.	2N4250A PN4250A MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10			nA	$V_{CB} = -40$ V, $I_E = 0$
					10	nA	$V_{CB} = -50$ V, $I_E = 0$
†I_{CBO}	Collector Cutoff Current		3.0			μA	$V_{CB} = -40$ V, $I_E = 0$, $T_A = 65°C$
I_{EBO}	Emitter Cutoff Current		20		20	nA	$V_{EB} = -3.0$ V, $I_C = 0$
h_{FE}	DC Current Gain	250	700	250	700		$I_C = 100$ μA, $V_{CE} = -5.0$ V
†h_{FE}	DC Pulse Current	250					$I_C = 1.0$ mA, $V_{CE} = -5.0$ V
†h_{FE}	DC Pulse Current Gain (Note 5)	250					$I_C = 10$ mA, $V_{CE} = -5.0$ V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.25		−0.25	V	$I_C = 10$ mA, $I_B = 0.5$ mA
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−60		V	$I_C = 10$ μA, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	$I_E = 10$ μA, $I_C = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	−40		−60		V	$I_C = 10$ μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−40		−60		V	$I_C = 5.0$ mA (pulsed), $I_B = 0$
h_{fe}	Small Signal Current Gain	250	800	250	800		$I_C = 1.0$ mA, $V_{CE} = -5.0$ V, f = 1.0 kHz
C_{ob}	Output Capacitance		6.0		6.0	pF	$I_E = 0$, $V_{CB} = -5.0$ V, f = 1.0 MHz
NF	Wide Band Noise Figure		2.0		2.0	dB	$V_{CE} = -5.0$ V, $I_C = 20$ μA, $R_S = 10$ kΩ PBW = 15.7 kHz, f = 10 Hz to 10 kHz
NF	Narrow Band Noise Figure		2.0		2.0	dB	$V_{CE} = -5.0$ V, $I_C = 20$ μA, $R_S = 10$ kΩ f = 1.0 kHz, PBW = 150 Hz
			2.0		2.0	dB	$V_{CE} = -5.0$ V, $I_C = 250$ μA, $R_S = 1.0$ kΩ f = 1.0 kHz, PBW = 150 Hz
h_{ie}	Input Resistance	6.0	20	6.0	20	kΩ	$V_{CE} = -5.0$ V, $I_C = 1.0$ mA, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	50	5.0	50	μmhos	$V_{CE} = -5.0$ V, $I_C = 1.0$ mA, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		10		10	x 10^{-4}	$V_{CE} = -5.0$ V, $I_C = 1.0$ mA, f = 1.0 kHz
†h_{fe}	High Frequency Current Gain	2.5					$I_C = 0.5$ mA, $V_{CE} = -5.0$ V, f = 20 MHz
†$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−0.9			V	$I_C = 10$ mA, $I_B = 0.5$ mA
†C_{ib}	Input Capacitance		16			pF	$I_C = 0$, $V_{EB} = -0.5$ V, f = 1.0 MHz

4

2N4258 • 2N4258A • PN4258 • PN4258A

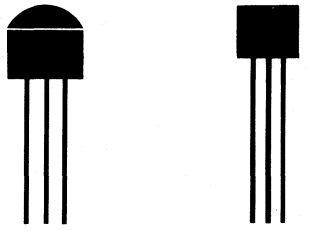
PNP SMALL SIGNAL ULTRA HIGH SPEED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN4258/A)
- V_{CEO} . . . 12 V (MIN)
- h_{FE} . . . 30-120 @ 10 mA
- t_{on} . . . 15 ns (MAX) @ 10 mA
- t_{off} . . . 18 ns (MAX) @ 10 mA (2N/PN4258A)
- COMPLEMENTS . . . 2N4274, (TO18), 2N5769 (TO92)

See Package Outlines

TO18-4 TO92-1



2N4258 2N4258A PN4258 PN4258A

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N4258/A	PN4258/A
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.5 W	1.0 W
at 25°C Ambient Temperature		0.2 W	0.625 W
Maximum Voltages and Current		**2N/PN4258**	**2N/PN4258A**
V_{CBO}	Collector to Base Voltage	−12 V	−12 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−12 V	−12 V
V_{EBO}	Emitter to Base Voltage	−4.5 V	−4.5 V
I_C	Collector Current	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN4258 MIN.	2N/PN4258 MAX.	2N/PN4258A MIN.	2N/PN4258A MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Reverse Current		10		10	nA	V_{CE} = −6.0 V, V_{BE} = 0
			5.0		5.0	μA	V_{CE} = −6.0 V, V_{BE} = 0, T_A = 65°C
I_B	Base Current				1.0	nA	V_{CE} = −6.0 V, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−12		−12		V	I_E = 0, I_C = 100 μA
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.5		−4.5		V	I_E = 100 μA, I_C = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−12		−12		V	I_C = 100 μA, V_{CE} = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−12		−12		V	I_C = 3.0 mA, I_B = 0
h_{FE}	DC Current Gain (Note 5)	30	120	30	120		I_C = 10 mA, V_{CE} = −3.0 V
		15		15			I_C = 1.0 mA, V_{CE} = −0.5 V
		30		30			I_C = 50 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.15		−0.15	V	I_C = 10 mA, I_B = 1.0 mA
			−0.5		−0.5	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	−0.75	−0.95	−0.75	−0.95	V	I_C = 10 mA, I_B = 1.0 mA
			−1.5		−1.5	V	I_C = 50 mA, I_B = 5.0 mA
τ_s	Charge Storage Time (see test circuit no. 234)		20		15	ns	$I_C \approx 10$ mA, $I_{B1} \approx -I_{B2} \approx 10$ mA
t_{on}	Turn On Time (see test circuit no. 348)		15		15	ns	$I_C \approx 10$ mA, $I_{B1} \approx 1.0$ mA
t_{off}	Turn Off Time (see test circuit no. 348)		20		18	ns	$I_C \approx 10$ mA, $I_{B1} \approx -I_{B2} \approx 1.0$ mA
C_{cb}	Collector to Base Capacitance		3.0		3.0	pF	I_E = 0, V_{CB} = −5.0 V
C_{ib}	Input Capacitance		3.5		3.5	pF	I_C = 0, V_{EB} = −0.5 V
$\lvert h_{fe} \rvert$	Magnitude of Small Signal Current Gain	7.0		7.0			I_C = 10 mA, V_{CE} = −10 V, f = 100 MHz
		5.0		5.0			I_C = 10 mA, V_{CE} = −5.0 V, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N4258, 2N4258A. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN4258, PN4258A.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS31.

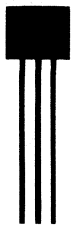
2N4264 • 2N4265

NPN SMALL SIGNAL HIGH SPEED SATURATED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- f_T . . . 300 MHz (MIN) @ 10 mA
- C_{cb} . . . 4.0 pF (MAX)
- τ_s . . . 20 ns (MAX) @ 10 mA
- $V_{CE\ (sat)}$ . . . 0.22 V (MAX) @ 10 mA
- COMPLEMENTS . . . MPS3640, 2N5771

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (60 seconds)	260°C
†Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W
at 25°C Case Temperature	1.00 W

Maximum Voltages and Current		**2N4264**	**2N4265**
V_{CBO}	Collector to Base Voltage	30 V	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	15 V	12 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current	200 mA	200 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4264 MIN.	2N4264 MAX.	2N4265 MIN.	2N4265 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	25		50			I_C = 1.0 mA, V_{CE} = 1.0 V
		40	160	100	400		I_C = 10 mA, V_{CE} = 1.0 V
		20		45			I_C = 10 mA, V_{CE} = 1.0 V, T_A = 55°C
		40		90			I_C = 30 mA, V_{CE} = 1.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	30		55			I_C = 100 mA, V_{CE} = 1.0 V
		20		35			I_C = 200 mA, V_{CE} = 1.0 V
$V_{CE\ (sat)}$	Collector Saturation Voltage (Note 5)		0.22		0.22	V	I_C = 10 mA, I_B = 1.0 mA
			0.35		0.35	V	I_C = 100 mA, I_B = 10 mA
$V_{BE\ (sat)}$	Base Saturation Voltage (Note 5)	0.65	0.80	0.65	0.80	V	I_C = 10 mA, I_B = 1.0 mA
		0.75	0.95	0.75	0.95	V	I_C = 100 mA, I_B = 10 mA
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	3.0		3.0			V_{CE} = 10 V, I_C = 10 mA, f = 100 MHz
C_{cb}	Collector Base Capacitance		4.0		4.0	pF	I_E = 0, V_{CB} = 5.0 V, f = 100 kHz
C_{ib}	Input Capacitance		8.0		8.0	pF	V_{BE} = 0.5 V, I_C = 0, f = 100 kHz
I_{CEX}	Collector Cutoff Current		100		100	nA	V_{CE} = 12 V, V_{EB} = 0.25 V
I_{BL}	Base Cutoff Current		100		100	nA	V_{CE} = 12 V, V_{EB} = 0.25 V
			10		10	μA	V_{CE} = 12 V, V_{EB} = 0.25 V, T_A = 100°C
BV_{CBO}	Collector to Base Breakdown Voltage	30		30		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage	15		12		V	I_C = 1.0 mA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_C = 0, I_E = 10 μA
τ_s	Storage Time (see test circuit no. 561)		20		20	ns	$I_C \cong I_{B1} \cong I_{B2}$ = 10 mA

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered values.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C, and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C) and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5-SS5.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4264 MIN.	2N4264 MAX.	2N4265 MIN.	2N4265 MAX.	UNITS	TEST CONDITIONS
t_{on}	Turn On Time (see test circuit no. 531)		25		25	ns	$I_C \cong 10$ mA, $I_B = 3.0$ mA, $V_{CC} = 3.0$ V
t_{off}	Turn Off Time (see test circuit no. 531)		35		35	ns	$I_C \cong 10$ mA, $I_{B1} \cong 3.0$ mA, $I_{B2} \cong 1.5$ mA, $V_{CC} = 3.0$ V
t_d	Delay Time (see test circuit no. 562)		8.0		8.0	ns	$I_C = 100$ mA, $I_{B1} = 10$ mA, $V_{CC} = 10$ V
t_r	Rise Time (see test circuit no. 562)		15		15	ns	$I_C = 100$ mA, $I_{B1} = 10$ mA, $V_{CC} = 10$ V
t_s	Storage Time (see test circuit no. 562)		20		20	ns	$I_C = 100$ mA, $I_{B1} = I_{B2} = 10$ mA, $V_{CC} = 10$ V
t_f	Fall Time (see test circuit no. 562)		15		15	ns	$I_C = 100$ mA, $I_{B1} = I_{B2} = 10$ mA, $V_{CC} = 10$ V
Q_T	Total Charge Control (see test circuit no. 563)		80		80	pC	$I_C = 10$ mA, $I_B = 1.0$ mA, $V_{CC} = 3.0$ V

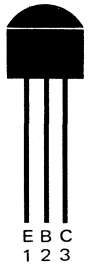
2N4274 • 2N4275

NPN SMALL SIGNAL HIGH SPEED SATURATED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 12 V (MIN) (2N4274), 15 V (MIN) (2N4275)
- f_T . . . 400 MHz (MIN)
- C_{cb} . . . 4.0 pF (MAX) @ 5.0 V
- τ_s . . . 13 ns (MAX) @ 10 mA
- $V_{CE(sat)}$ . . . 0.2 V (MAX) @ 10 mA
- t_{on} and t_{off} . . . 12 ns (MAX) @ 10 mA
- COMPLEMENTS . . . 2N3640, 2N5910

See TO18-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +125°C
Operating Junction Temperature	125°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	0.5 W
at 25°C Ambient Temperature	0.2 W

Maximum Voltages and Currents

		2N4274	2N4275
V_{CBO}	Collector to Base Voltage	30 V	40 V
V_{CES}	Collector to Emitter Voltage	30 V	40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	12 V	15 V
V_{EBO}	Emitter to Base Voltage	4.5 V	4.5 V
I_C	Collector Current (10 μs pulse)	500 mA	500 mA
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4274 MIN.	2N4274 MAX.	2N4275 MIN.	2N4275 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain	35	120	35	120		I_C = 10 mA, V_{CE} = 1.0 V
		30		30			I_C = 30 mA, V_{CE} = 0.4 V
		18		18			I_C = 100 mA, V_{CE} = 1.0 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)	0.72	0.85	0.72	0.85	V	I_C = 10 mA, I_B = 1.0 mA
		0.74	1.00	0.74	1.00	V	I_C = 10 mA, I_B = 3.3 mA
			1.15		1.15	V	I_C = 30 mA, I_B = 3.0 mA
			1.60		1.60	V	I_C = 100 mA, I_B = 10 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.20		0.20	V	I_C = 10 mA, I_B = 1.0 mA
			0.18		0.18	V	I_C = 10 mA, I_B = 3.3 mA
			0.25		0.25	V	I_C = 30 mA, I_B = 3.0 mA
			0.50		0.50	V	I_C = 100 mA, I_B = 10 mA
			0.30		0.30	V	I_C = 10 mA, I_B = 1.0 mA, T_A = 65°C
h_{fe}	High Frequency Current Gain	4.0		4.0			I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		4.0		4.0	pF	I_E = 0, V_{CB} = 5.0 V
I_{CES}	Collector Reverse Current		400		400	nA	V_{CE} = 20 V, V_{BE} = 0
I_{CBO}	Collector Cutoff Current		10		10	μA	I_E = 0, V_{CB} = 20 V, T_A = 65°C
BV_{CES}	Collector to Emitter Breakdown Voltage	30		40		V	I_C = 10 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	30		40		V	I_C = 10 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	12		15		V	I_C = 10 mA (pulsed) I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.5		4.5		V	I_C = 0, I_E = 10 μA
τ_s	Charge Storage Time Constant (see test circuit no. 3111)		13		13	ns	I_C = I_{B1} = −I_{B2} = 10 mA
t_{on}	Turn On Time (see test circuit no. 381)		12		12	ns	I_C = 10 mA, I_{B1} = 3.3 mA
t_{off}	Turn Off Time (see test circuit no. 381)		12		12	ns	I_C = 10 mA, I_{B1} = I_{B2} = 3.3 mA

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C). Junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS28.

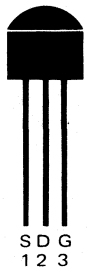
2N4342 • 2N4343 • 2N4360

P-CHANNEL FIELD EFFECT

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **NOISE VOLTAGE . . . 0.08 $\mu V/\sqrt{Hz}$ (MAX) @ 100 Hz (2N4342/3)**
- **y_{fs} . . . 4000 μmhos (MIN) (2N4343)**
- **$r_{DS\ (on)}$ . . . 350Ω (MAX) (2N4343)**

See TO18-4 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +125°C
Operating Junction Temperature	125°C
Soldering Temperature (10 seconds)	260°C

Maximum Power Dissipation (Note 2)

Total Dissipation at 25°C Case Temperature	0.5 W
at 65°C Case Temperature	0.3 W
at 25°C Ambient Temperature	0.2 W

Maximum Voltages

		2N4360	2N4342 2N4343
BV_{SGO}	Source to Gate Breakdown Voltage	20 V	25 V
BV_{DSO}	Drain to Source Breakdown Voltage	−20 V	−25 V
BV_{DGO}	Drain to Gate Breakdown Voltage	−20 V	−25 V

ELECTRICAL CHARACTERISTICS: (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4360 MIN.	2N4360 MAX.	2N4342 MIN.	2N4342 MAX.	2N4343 MIN.	2N4343 MAX.	UNITS	TEST CONDITIONS
e_n	Equivalent Input Noise Voltage		0.19					$\mu V/\sqrt{Hz}$	V_{DS} = −10 V, I_D = 1.0 mA, f = 100 Hz, BW = 15 Hz
				0.08				$\mu V/\sqrt{Hz}$	V_{DS} = −10 V, V_{GS} = 0, f = 100 Hz, BW = 15 Hz
							0.08	$\mu V/\sqrt{Hz}$	V_{DS} = −10 V, V_{GS} = 2.0 V, f = 100 Hz, BW = 15 Hz
NF	Noise Figure Common Source Configuration		5.0					dB	V_{DS} = −10 V, I_D = 1.0 mA, f = 100 Hz, R_G = 1 MΩ, BW = 15 Hz
					1.5			dB	V_{DS} = −10 V, V_{GS} = 0, f = 100 Hz, R_G = 1.0 MΩ, BW = 15 Hz
							1.5	dB	V_{DS} = −10 V, V_{GS} = 2.0 V, f = 100 Hz, R_G = 1.0 MΩ, BW = 15 Hz
$\lvert y_{fs}\rvert$	Forward Transadmittance	2,000	8,000	2,000	6,000	4,000	8,000	μmhos	V_{DS} = −10 V, V_{GS} = 0, f = 1.0 kHz
$\lvert y_{os}\rvert$	Output Admittance		100		75		100	μmhos	V_{DS} = −10 V, V_{GS} = 0, f = 1.0 kHz
BV_{GSS}	Gate to Source Breakdown Voltage	20		25		25		V	I_G = 10 μA, V_{DS} = 0
I_{DSS}	Drain Current	3.0	30	4.0	12	10	30	mA	V_{DS} = −10 V, V_{GS} = 0
V_{GS}	Gate to Source Voltage	0.4	9.0					V	V_{DS} = −10 V, I_D = 0.3 mA
				0.7	5.0			V	V_{DS} = −10 V, I_D = 0.4 mA
						1.8	9.0	V	V_{DS} = −10 V, I_D = 1.0 mA
$V_{GS(OFF)}$	Gate to Source Cutoff Voltage	0.7	10	1.0	5.5	2.0	10	V	V_{DS} = −10 V, I_D = 1.0 μA
I_{GSS}	Gate Reverse Current		10		10		10	nA	V_{GS} = 15 V, V_{DS} = 0
			0.5		0.5		0.5	μA	V_{GS} = 15 V, V_{DS} = 0, T_A = 65°C
C_{iss}	Input Capacitance		20		20		20	pF	V_{DS} = −10 V, V_{GS} = 0, f = 1.0 MHz
C_{rss}	Reverse Transfer Capacitance		5.0		5.0		5.0	pF	V_{DS} = −10 V, V_{GS} = 0, f = 1.0 MHz
$r_{DS(ON)}$	Drain "On" Resistance		700		700		350	Ω	I_D = 0, V_{GS} = 0, f = 1.0 kHz
$Re(y_{fs})$	Forward Transconductance	1,500		1,500		3,000		μmhos	V_{DS} = −10 V, V_{GS} = 0, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C).
3. For product family characteristic curves, refer to Section 5-SS34.

2N/MPS4354 • 2N/MPS4355 • 2N/MPS4356

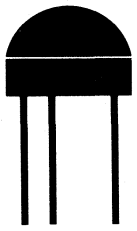
PNP GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (MPS SERIES)
- V_{CEO} . . . −60 V (MIN) (2N/MPS4354, 2N/MPS4355)
  . . . −80 V (MIN) (2N/MPS4356)
- NF . . . 3.0 dB (MAX) AT 1.0 kHz
- $V_{CE(sat)}$ . . . −1.0 V (MAX) AT I_C = 1.0 A (2N/MPS4355)
- COMPLEMENTS . . . 2N3567, 2N3568, 2N3569 (TO5)
  PN3567, PN3568, PN3569 (TO92)

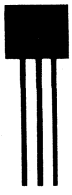
See Package Outlines

TO 5-4



2N4354
2N4355
2N4356

TO 92-1



MPS4354
MPS4355
MPS4356

ABSOLUTE MAXIMUM RATINGS (Note 1)

		MPS4354/55/56	2N4354/55/56
Maximum Temperatures			
Storage Temperature		−55°C to +150°C	−55°C to +125°C
Operating Junction Temperature		150°C	125°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		1.0 W	0.8 W
at 25°C Ambient Temperature		0.625 W	0.35 W
Maximum Voltages and Current		**2N/MPS4354/55**	**2N/MPS4356**
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4354 MPS4354 MIN.	2N4354 MPS4354 MAX.	2N4355 MPS4355 MIN.	2N4355 MPS4355 MAX.	2N4356 MPS4356 MIN.	2N4356 MPS4356 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	25		60		25			I_C = 100 μA, V_{CE} = −10 V
		40		75		40			I_C = 1.0 mA, V_{CE} = −10 V
		50	500	100	400	50	250		I_C = 10 mA, V_{CE} = −10 V
		40		75		40			I_C = 100 mA, V_{CE} = −10 V
		30		75		30			I_C = 500 mA, V_{CE} = −10 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	1.0	5.0	1.0	5.0	1.0	5.0		I_C = 50 mA, V_{CE} = −10 V, f = 100 MHz
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		−80		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		−5.0		V	I_C = 0, I_E = 10 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−60		−60		−80		V	I_C = 10 mA (pulsed), I_B = 0
$V_{CE(sat)}$	Collector Saturation Voltage		−0.15		−0.15		−0.15	V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		−0.5		−0.5		−0.5	V	I_C = 500 mA, I_B = 50 mA
					−1.0			V	I_C = 1.0 A, I_B = 100 mA
$V_{BE(sat)}$	Base Saturation Voltage		−0.9		−0.9		−0.9	V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		−1.1		−1.1		−1.1	V	I_C = 500 mA, I_B = 50 mA
					−1.2			V	I_C = 1.0 A, I_B = 100 mA
$V_{BE(ON)}$	Base to Emitter "On"		−1.1		−1.1		−1.1	V	I_C = 500 mA, V_{CE} = −0.5 V
	Voltage (Note 5)				−1.2			V	I_C = 1.0 A, V_{CE} = −1.0 V

Additional Electrical Characteristics on following page.

NOTES;

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 286°C/W (derating factor of 3.5 mW/°C) for 2N4354, 2N4355, 2N4356. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for MPS4354, MPS4355, MPS4356.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS24.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4354 MPS4354 MIN.	2N4354 MPS4354 MAX.	2N4355 MPS4355 MIN.	2N4355 MPS4355 MAX.	2N4356 MPS4356 MIN.	2N4356 MPS4356 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		50		50		50	nA	$I_E = 0$, $V_{CB} = -50$ V
			5.0		5.0		5.0	μA	$I_E = 0$, $V_{CB} = -50$ V, $T_A = 75°C$
I_{EBO}	Emitter to Base Current		100		100		100	nA	$I_C = 0$, $V_{EB} = -4.0$ V
C_{cb}	Collector to Base Capacitance		30		30		30	pF	$I_E = 0$, $V_{CB} = -10$ V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		110		110		110	pF	$I_C = 0$, $V_{EB} = -0.5$ V, f = 1.0 MHz
t_{on}	Turn On Time (see test circuit no. 341)		100		100		100	ns	$I_C \approx 500$ mA, $I_{B1} \approx 50$ mA, $V_{CC} = -30$ V
t_{off}	Turn Off Time (see test circuit no. 341)		400		400		400	ns	$I_C \approx 500$ mA, $I_{B1} \approx I_{B2} \approx 50$ mA, $V_{CC} = -30$ V
NF	Noise Figure		3.0		3.0		3.0	dB	$I_C = 100$ μA, $V_{CE} = -10$ V, $R_S = 1.0$ kΩ, f = 1.0 kHz, BW = 1.0 Hz

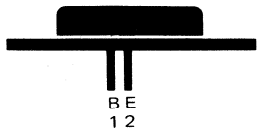
2N4398 • 2N4399

200 WATT PNP POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- P_D . . . 200 W
- I_C . . . 30 A (MAX)

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			−65°C to +200°C
Maximum Power Dissipation			
Total Dissipation at 25°C Case Temperature			200 W
Linear Derating Factor			1.15 W/°C
Maximum Voltage and Currents		**2N4398**	**2N4399**
V_{CBO}	Collector to Base Voltage	−40 V	−60 V
V_{CEO}	Collector to Emitter Voltage	−40 V	−60 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current (Continuous)	30 A	30 A
I_B	Base Current (Continuous)	7.5 A	7.5 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining	2N4398	−40		V	I_C = 200 mA, I_B = 0
	Voltage (Note 2)	2N4399	−60		V	I_C = 200 mA, I_B = 0
I_{CEX}	Collector Cutoff Current	2N4398		5.0	mA	V_{CE} = −40 V, V_{EB} = −1.5 V
		2N4399		5.0	mA	V_{CE} = −60 V, V_{EB} = −1.5 V
I_{CEX}	Collector Cutoff Current	2N4398		10	mA	V_{CE} = −30 V, V_{EB} = −1.5 V, T_C = 150°C
I_{CBO}	Collector Cutoff Current	2N4398		1.0	mA	V_{CB} = −40 V, I_E = 0
		2N4399		1.0	mA	V_{CB} = −60 V, I_E = 0
I_{EBO}	Emitter Cutoff Current			5.0	mA	V_{EB} = −5.0 V, I_C = 0
I_{CEO}	Collector Cutoff Current	2N4398		5.0	mA	V_{CE} = −40 V, I_B = 0
		2N4399		5.0	mA	V_{CE} = −60 V, I_B = 0
h_{FE}	DC Pulse Current Gain (Note 2)		5.0			V_{CE} = −4.0 V, I_C = 30 A
			15	60		V_{CE} = −4.0 V, I_C = 15 A
			40			V_{CE} = −2.0 V, I_C = 1.0 A
$V_{CE(sat)}$	Collector to Emitter Saturation			−4.0	V	I_C = 30 A, I_B = 6.0 A
	Voltage (Note 2)			−1.0	V	I_C = 15 A, I_B = 1.5 A
				−0.75	V	I_C = 10 A, I_B = 1.0 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage			−3.0	V	I_C = 30 A, V_{CE} = −4.0 V
	(Note 2)			−1.8	V	I_C = 15 A, V_{CE} = −2.0 V
$V_{BE(sat)}$	Base to Emitter Saturation			−1.85	V	I_C = 15 A, I_B = 1.5 A
	Voltage (Note 2)					
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain		4.0			V_{CE} = −10 V, I_C = 1.0 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain		40			V_{CE} = −10 V, I_C = 1.0 A, f = 1.0 kHz
t_r	Rise Time			0.4	μs	V_{CC} = −30 V, I_C = 10 A I_{B1} = I_{B2} = 1.0 A
t_s	Storage Time			1.5	μs	
t_f	Fall Time			0.6	μs	

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5 - PWR 16.

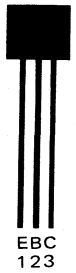
2N4400 • 2N4401

SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_C = 25°C
- V_{CEO} . . . 40 V (MIN)
- h_{FE} . . . 100-300 @ 150 mA (2N4401)
- . . . 40 (MIN) @ 500 mA (2N4401)
- t_{on} . . . 35 ns (MAX) @ 150 mA
- t_{off} . . . 255 ns (MAX) @ 150 mA
- COMPLEMENTS . . . 2N4402, 2N4403

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Lead Temperature (10 seconds)		260°C
†Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 25°C Ambient Temperature		0.625 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	60 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	40 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4400 MIN.	2N4400 MAX.	2N4401 MIN.	2N4401 MAX.	UNITS	TEST CONDITIONS
$BV_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	40		40		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 100 μA, I_C = 0
I_{CEX}	Collector Cutoff Current		100		100	nA	V_{CE} = 35 V, V_{EB} = 0.4 V
I_{BL}	Base Reverse Current		100		100	nA	V_{CE} = 35 V, V_{EB} = 0.4 V
h_{FE}	DC Current Gain			20			I_C = 100 μA, V_{CE} = 1.0 V
		20		40			I_C = 1.0 mA, V_{CE} = 1.0 V
		40		80			I_C = 10 mA, V_{CE} = 1.0 V
h_{FE}	DC Pulse Current Gain	50	150	100	300		I_C = 150 mA, V_{CE} = 1.0 V
	(Note 5)	20		40			I_C = 500 mA, V_{CE} = 2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		0.4		0.4	V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		0.75		0.75	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Base Saturation Voltage	0.75	0.95	0.75	0.95	V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		1.2		1.2	V	I_C = 500 mA, I_B = 50 mA
f_T	Current Gain Bandwidth Product	200		250		MHz	I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		6.5		6.5	pF	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz
C_{eb}	Emitter to Base Capacitance		30		30	pF	V_{EB} = 0.5 V, I_C = 0, f = 100 kHz
h_{ie}	Input Impedance	0.5	7.5	1.0	15	kΩ	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio	0.1	8.0	0.1	8.0	x10^{-4}	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	20	250	40	500		I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{oe}	Output Admittance	1.0	30	1.0	30	μmhos	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered value for this parameter.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = ≤2%.
6. For product family characteristic curves, refer to Section 5 — SS15.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4400 MIN.	2N4400 MAX.	2N4401 MIN.	2N4401 MAX.	UNITS	TEST CONDITIONS
t_d	Delay Time (see test circuit no. 559)		15		15	ns	I_C = 150 mA, I_{B1} = 15 mA, V_{CC} = 30 V
t_r	Rise Time (see test circuit no. 559)		20		20	ns	I_C = 150 mA, I_{B1} = 15 mA V_{CC} = 30 V
t_s	Storage Time (see test circuit no. 560)		225		225	ns	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA, V_{CC} = 30 V
t_f	Fall Time (see test circuit no. 560)		30		30	ns	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA, V_{CC} = 30 V

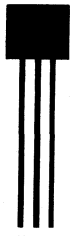
2N4402 • 2N4403

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −40 V (MIN)
- h_{FE} . . . 100-300 @ 150 mA (2N4403)
- . . . 20 (MIN) @ 500 mA (2N4403)
- t_{on} . . . 35 ns (MAX) @ 150 mA
- t_{off} . . . 255 ns (MAX) @ 150 mA
- COMPLEMENTS . . . 2N4400, 2N4401

See TO92-1 Package Outline



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ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Lead Temperature (10 seconds)		260°C
†Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature		1.0 W
at 25°C Ambient Temperature		0.625 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	−40 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−40 V
V_{EBO}	Emitter to Base Voltage	−5.0 V
I_C	Collector Current	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4402 MIN.	2N4402 MAX.	2N4403 MIN.	2N4403 MAX.	UNITS	TEST CONDITIONS
$BV_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−40		−40		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−40		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 100 μA, I_C = 0
I_{CEX}	Collector Reverse Current		100		100	nA	V_{CE} = −35 V, V_{EB} = −0.4 V
I_{BL}	Base Reverse Current		100		100	nA	V_{CE} = −35 V, V_{EB} = −0.4 V
h_{FE}	DC Current Gain			30			I_C = 100 μA, V_{CE} = 1.0 V
		30		60			I_C = 1.0 mA, V_{CE} = −1.0 V
		50		100			I_C = 10 mA, V_{CE} = −1.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	50	150	100	300		I_C = 150 mA, V_{CE} = −2.0 V
		20		20			I_C = 500 mA, V_{CE} = −2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		−0.4		−0.4	V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		−0.75		−0.75	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Base Saturation Voltage	−0.75	−0.95	−0.75	−0.95	V	I_C = 150 mA, I_B = 15 mA
	(Note 5)		−1.3		−1.3	V	I_C = 500 mA, I_B = 50 mA
f_T	Current Gain Bandwidth Product	150		200		MHz	I_C = 20 mA, V_{CE} = −10 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		8.5		8.5	pF	V_{CB} = −10 V, I_E = 0, f = 140 kHz
C_{eb}	Emitter to Base Capacitance		30		30	pF	V_{EB} = −0.5 V, I_C = 0, f = 140 kHz
h_{ie}	Input Impedance	0.75	7.5	1.5	15	kΩ	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio	0.1	8.0	0.1	8.0	x10−4	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	30	250	60	500		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{oe}	Output Admittance	1.0	100	1.0	100	μmhos	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered value for this parameter.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle <2%.
6. For product family characteristic curves, refer to Section 5 — SS22.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4402 MIN.	2N4402 MAX.	2N4403 MIN.	2N4403 MAX.	UNITS	TEST CONDITIONS
t_d	Delay Time (see test circuit no. 557)		15		15	ns	I_C = 150 mA, I_{B1} = 15 mA, V_{CC} = −30 V
t_r	Rise Time (see test circuit no. 557)		20		20	ns	I_C = 150 mA, I_{B1} = 15 mA, V_{CC} = −30 V
t_s	Storage Time (see test circuit no. 558)		225		225	ns	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA V_{CC} = −30 V
t_f	Fall Time (see test circuit no. 558)		30		30	ns	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA, V_{CC} = −30 V

2N4409 • 2N4410

NPN NEON DISPLAY TUBE DRIVERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 80 V (MIN) (2N4410)
- h_{FE} . . . 60 V (MIN) @ 1.0 AND 10 mA
- COMPLEMENTS . . . MPSA55, MPSA56

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
†Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature			0.625 W
at 25°C Case Temperature			1.0 W
Maximum Voltages and Current		**2N4409**	**2N4410**
V_{CBO}	Collector to Base Voltage	80 V	120 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	50 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
I_C	Collector Current	250 mA	250 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4409 MIN.	2N4409 MAX.	2N4410 MIN.	2N4410 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	50		80		V	I_C = 1.0 mA, I_B = 0
BV_{CEX}	Collector to Emitter Breakdown Voltage	80		120		V	I_C = 500 μA, V_{BB} = −5.0 V, R_{BE} = 8.2 kΩ
BV_{CBO}	Collector to Base Breakdown Voltage	80		120		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		10			nA	V_{CB} = 60 V, I_E = 0
					10	nA	V_{CB} = 100 V, I_E = 0
			1.0			μA	V_{CB} = 60 V, I_E = 0, T_A = 100°C
					1.0	μA	V_{CB} = 100 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Current Gain	60		60			I_C = 1.0 mA, V_{CE} = 1.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	60	400	60	400		I_C = 10 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		0.2		0.2	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(sat)}$	Base Saturation Voltage		0.8		0.8	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.8		0.8	V	I_C = 1.0 mA, V_{CE} = 5.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	2.0	10	2.0	10		I_C = 10 mA, V_{CE} = 10 V, f = 30 MHz
C_{cb}	Collector to Base Capacitance		12		12	pF	V_{CB} = 10 V, I_E = 0, f = 140 kHz
†C_{eb}	Emitter to Base Capacitance		50		50	pF	V_{EB} = 0.5 V, I_C = 0, f = 100 kHz

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered values.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS16.

2N4888 • 2N4889 • PN4888 • PN4889

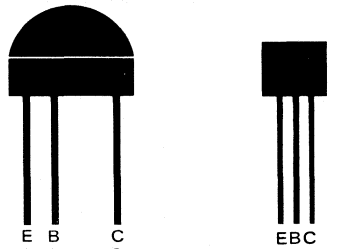
PNP LOW NOISE HIGH VOLTAGE AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN4888/9)
- V_{CEO} . . . 150 V (MIN)
- NF . . . 3.0 dB (MAX) @ 1.0 kHz (2N/PN4889)
- C_{ob} . . . 4.0 pF (MAX)
- h_{FE} . . . 80-300 @ 10 mA (2N/PN4889)
- EXCELLENT BETA LINEARITY FROM 10 μA to 50 mA

See Package Outlines

TO5-4 TO92-1



2N4888/9 PN488/9

ABSOLUTE MAXIMUM RATINGS (Note 1)

		PN4888/9	2N4888/9
Maximum Temperatures			
Storage Temperature		−55°C to +150°C	−55°C to +125°C
Operating Junction Temperature		150°C	125°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		1.0 W	0.8 W
at 25°C Ambient Temperature		0.625 W	0.3 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage	−150 V	−150 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−150 V	−150 V
V_{EBO}	Emitter to Base Voltage	−6.0 V	−6.0 V
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN4888 MIN.	2N/PN4888 MAX.	2N/PN4889 MIN.	2N/PN4889 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	−150		−150		V	I_C = 2.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−150		−150		V	I_C = 100 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−150		−150		V	I_C = 100 μA, I_B = 0
NF	Narrow Band Noise Figure				10	dB	I_C = 250 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, BW = 15 Hz, f = 100 Hz
					3.0	dB	I_C = 30 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, BW = 150 Hz, f = 1.0 kHz
					3.0	dB	I_C = 250 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, BW = 1.5 kHz, f = 10 kHz
					4.0	dB	I_C = 1.0 mA, V_{CE} = −10 V, R_S = 1.0 kΩ, BW = 2.0 kHz, f = 1.0 MHz
NF	Wide Band Noise Figure				4.0	dB	I_C = 250 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, BW = 15.7 kHz, f = 10 Hz to 10 kHz
h_{FE}	DC Pulse Current Gain (Note 5)			60			I_C = 100 μA, V_{CE} = −10 V
		30		70			I_C = 1.0 mA, V_{CE} = −10 V
		40	400	80	300		I_C = 10 mA, V_{CE} = −10 V
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = −20 V, I_E = 0, f = 1.0 MHz
I_{CBO}	Collector Cutoff Current		50		10	nA	V_{CB} = −100 V, I_E = 0
			2.5		0.5	μA	V_{CB} = −100 V, I_E = 0, T_A = 65°C

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 333°C/W (derating factor of 3.0 mW/°C) for 2N4888 and 2N4889. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN4888 and PN4889.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N/PN4888 MIN.	2N/PN4888 MAX.	2N/PN4889 MIN.	2N/PN4889 MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 5)		−0.5		−0.5	V	I_C = 10 mA, I_B = 1.0 mA
BV_{EBO}	Emitter to Base Breakdown Voltage	−6.0		−6.0		V	I_E = 10 μA, I_C = 0
I_{EBO}	Emitter Cutoff Current		50		10	nA	V_{EB} = −4.0 V, I_C = 0
$V_{BE(ON)}$	Pulsed Base to Emitter "On" Voltage (Note 5)		−0.8		−0.7	V	I_C = 1.0 mA, V_{CE} = −10 V
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 5)		−0.9		−0.9	V	I_C = 10 mA, I_B = 1.0 mA
C_{ib}	Input Capacitance		30		25	pF	V_{EB} = −0.5 V, I_C = 0, f = 1.0 MHz
h_{fe}	High Frequency Current Gain	1.5	8.0	2.0	8.0		I_C = 1.0 mA, V_{CE} = −10 V, f = 20 MHz
h_{ie}	Small Signal Short Circuit, Input Resistance	0.75	20	1.7	12	kΩ	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{oe}	Small Signal Open Circuit Output Conductance	1.4	40	3.0	25	μmhos	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{re}	Small Signal Open Circuit Reverse Voltage Feedback Ratio				5	$x10^{-4}$	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{fe}	Common Emitter Small Signal Short Circuit Forward Current Transfer Ratio	30	500	65	400		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz

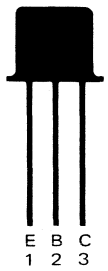
2N4895 • 2N4896 • 2N4897 • 2N5334 • 2N5335

NPN POWER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- $V_{CE(sat)}$ . . . 0.7 V @ I_C = 2.0 A
- LOW LEAKAGE . . . I_{CES} (MAX) = 100 μA @ T_C = 150°C

See TO5-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures					
Storage Temperature					−65°C to +200°C
Operating Junction Temperature					200°C
Lead Temperature (60 seconds)					300°C
Maximum Power Dissipation			**2N5334/5**		**2N4895/6/7**
Total Dissipation at 25°C Case Temperature			6.0 W		
at 100°C Case Temperature					4.0 W
Linear Derating Factor			34 mW/°C		40 mW/°C
Total Dissipation at 25°C Ambient Temperature			1.0 W		0.8 W
Linear Derating Factor			5.71 mW/°C		4.57 mW/°C
Maximum Voltage and Current		**2N4895/6**	**2N4897**	**2N5334**	**2N5335**
V_{CBO}	Collector to Base Voltage	120 V	150 V	60 V	80 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V	8.0 V	8.0 V
V_{CEO}	Collector to Emitter Voltage	60 V	80 V	60 V	80 V
I_C	Collector Current	5.0 A	5.0 A	3.0 A	3.0 A
I_B	Base Current	1.0 A	1.0 A	0.5 A	0.5 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4895 MIN.	2N4895 MAX.	2N4896 MIN.	2N4896 MAX.	2N4897 MIN.	2N4897 MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Cutoff Current		0.1		0.1			mA	V_{CE} = 60 V, V_{BE} = 0, T_A = 150°C
							0.1	mA	V_{CE} = 100 V, V_{BE} = 0, T_A = 150°C
			1.0		1.0			mA	V_{CE} = 120 V, V_{BE} = 0
							1.0	mA	V_{CE} = 150 V, V_{BE} = 0
			1.0		1.0			μA	V_{CE} = 60 V, V_{BE} = 0
							1.0	μA	V_{CE} = 100 V, V_{BE} = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0		1.0	μA	V_{EB} = 4.0 V, I_E = 0
			1.0		1.0		1.0	mA	V_{EB} = 6.0 V, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		60		80		V	I_C = 50 mA, I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Notes 5 & 6)		1.0		1.0		1.0	V	I_C = 5.0 A, I_B = 0.5 A
$V_{BE(sat)}$	Base to Emitter Voltage (Notes 5 & 6)		1.6		1.6		1.6	V	I_C = 5.0 A, I_B = 0.5 A
h_{FE}	DC Current Gain (Note 5)	40	120	100	300	40	120		I_C = 2.0 A, V_{CE} = 2.0 V
		15		35		15			I_C = 2.0 A, V_{CE} = 2.0 V, T_A = −55°C
t_r	Rise Time		300		300		300	ns	I_C = 5.0 A, I_{B1} = 0.5 A
t_d	Delay Time		50		50		50	ns	I_C = 5.0 A, I_{B1} = 0.5 A
t_s	Storage Time		350		350		350	ns	I_C = 5.0 A, I_{B1} = I_{B2} = 0.5 A
t_f	Fall Time		300		300		300	ns	I_C = 5.0 A, I_{B1} = I_{B2} = 0.5 A
C_{ob}	Output Capacitance		80		80		80	pF	I_E = 0, V_{CB} = 10 V, f = 0.14 MHz
C_{ib}	Input Capacitance		500		500		500	pF	V_{EB} = 0.5 V, I_C = 0, f = 0.14 MHz
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	2.5		4.0		2.5			V_{CE} = 5.0 V, I_C = 0.5 A, f = 20 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 25°C/W (derating factor of 40 mW/°C); junction to ambient thermal resistance of 219°C/W (derating factor of 4.57 mW/°C) for 2N4895/6/7.
4. This rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs ; duty cycle = 1%.
6. Point of measurement: 1/4" from header.
7. For product family characteristic curves, refer to Section 5 - PWR 1.

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N5334 MIN.	2N5334 MAX.	2N5335 MIN.	2N5335 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		0.5			mA	V_{CE} = 55 V, V_{EB} = 1.5 V, T_A = 150°C
					0.5	mA	V_{CE} = 75 V, V_{EB} = 1.5 V, T_A = 150°C
			5.0			μA	V_{CE} = 55 V, V_{EB} = 1.5 V
					5.0	μA	V_{CE} = 75 V, V_{EB} = 1.5 V
I_{CBO}	Collector Cutoff Current		5.0			μA	V_{CB} = 60 V, I_E = 0
					5.0	μA	V_{CB} = 80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		0.1		0.1	mA	V_{EB} = 8.0 V, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		80		V	I_C = 50 mA, I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Notes 5 & 6)		0.7		0.7	V	I_C = 2.0 A, I_B = 200 mA
$V_{BE(sat)}$	Base to Emitter Voltage (Notes 5 & 6)		1.5		1.5	V	I_C = 2.0 A, I_B = 200 mA
h_{FE}	DC Current Gain (Note 5)	30	150	30	150		V_{CE} = 2.0 V, I_C = 1.0 A
		15		15			V_{CE} = 2.0 V, I_C = 2.0 A
t_r	Rise Time		50		50	ns	I_C = 1.0 A, I_{B1} = 100 mA
t_s	Storage Time		950		950	ns	I_C = 1.0 A, I_{B1} = I_{B2} = 100 mA
t_f	Fall Time		100		100	ns	I_C = 1.0 A, I_{B1} = I_{B2} = 100 mA
C_{ob}	Output Capacitance		75		75	pF	I_E = 0, V_{CB} = 10 V, f = 100 kHz
C_{ib}	Input Capacitance		250		250	pF	V_{EB} = 2.0 V, I_C = 0, f = 100 kHz
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = 10 V, I_C = 100 mA, f = 10 MHz

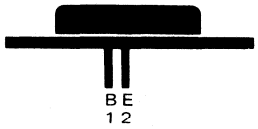
2N4901/2/3 • 2N4904/5/6

87.5 WATT PNP POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- h_{FE} . . . 25-100 @ V_{CE} = −2.0 V, I_C = 2.5 A (2N4904/5/6)
  20-80 @ V_{CE} = −2.0 V, I_C = 1.0 A (2N4901/2/3)

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	+200°C

Maximum Power Dissipation

Total Dissipation at 25°C Case Temperature	87.5 W
Linear Derating Factor	0.5 W/°C

Maximum Voltages and Currents	2N4901/4	2N4902/5	2N4903/6
V_{CBO} Collector to Base Voltage	−40 V	−60 V	−80 V
V_{EBO} Emitter to Base Voltage	−5.0 V	−5.0 V	−5.0 V
V_{CEO} Collector to Emitter Voltage	−40 V	−60 V	−80 V
I_C Collector Current	5.0 A	5.0 A	5.0 A
I_B Base Current	1.0 A	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4901/4 MIN.	2N4901/4 MAX.	2N4902/5 MIN.	2N4902/5 MAX.	2N4903/6 MIN.	2N4903/6 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		2.0						V_{CE} = −40 V, V_{EB} = −1.5 V, T_A = 150°C
					2.0				V_{CE} = −60 V, V_{EB} = −1.5 V, T_A = 150°C
							2.0	mA	V_{CE} = −80 V, V_{EB} = −1.5 V, T_A = 150°C
			0.1					mA	V_{CE} = −40 V, V_{EB} = −1.5 V
					0.1			mA	V_{CE} = −60 V, V_{EB} = −1.5 V
							0.1	mA	V_{CE} = −80 V, V_{EB} = −1.5 V
I_{EBO}	Emitter Cutoff Current		1.0		1.0		1.0	mA	V_{EB} = −5.0 V
I_{CEO}	Collector Cutoff Current		1.0					mA	V_{CE} = −40 V, I_B = 0
					1.0			mA	V_{CE} = −60 V, I_B = 0
							1.0	mA	V_{CE} = −80 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	−40		−60		−80		V	I_C = 200 mA, I_B = 0

SYMBOL	CHARACTERISTIC	2N4901/2/3 MIN.	2N4901/2/3 MAX.	2N4904/5/6 MIN.	2N4904/5/6 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 2)	7.0		7.0			I_C = 5.0 A, V_{CE} = −2.0 V
		20	80				I_C = 1.0 A, V_{CE} = −2.0 V
				25	100		I_C = 2.5 A, V_{CE} = −2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		−1.5		−1.5	V	I_C = 5.0 A, I_B = 1.0 A
	(Note 2)		−0.4			V	I_C = 1.0 A, I_B = 0.1 A
					−1.0	V	I_C = 2.5 A, I_B = 0.25 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage		−1.2			V	I_C = 1.0 A, V_{CE} = −2.0 V
	(Note 2)				−1.4	V	I_C = 2.5 A, V_{CE} = −2.0 V
h_{fe}	Small Signal Current Gain	4.0					V_{CE} = −10 V, I_C = 1.0 A, f = 1.0 MHz
				4.0			V_{CE} = −10 V, I_C = 0.5 A, f = 1.0 MHz
		20		40			V_{CE} = −10 V, I_C = 0.5 A, f = 1.0 kHz

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ⩽ 2%.
3. For product family characteristic curves, refer to Section 5-PWR15.

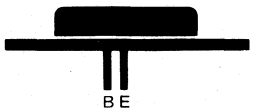
2N4907 • 2N4908 • 2N4909

150 WATT PNP POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- h_{FE} . . . 20-80 @ V_{CE} = −4.0 V, I_C = 4.0 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−65°C to +200°C
Operating Junction Temperature				+200°C
Maximum Power Dissipation				
Total Dissipation at 25°C Case Temperature				150 W
Linear Derating Factor				0.86 W/°C
Maximum Voltages and Currents		**2N4907**	**2N4908**	**2N4909**
V_{CBO}	Collector to Base Voltage	−40 V	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V	−5.0 V
V_{CEO}	Collector to Emitter Voltage	−40 V	−60 V	−80 V
I_C	Collector Current	10 A	10 A	10 A
I_B	Base Current	7.0 A	7.0 A	7.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4907 MIN.	2N4907 MAX.	2N4908 MIN.	2N4908 MAX.	2N4909 MIN.	2N4909 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		30					mA	V_{CE} = −40 V, V_{EB} = −1.5 V, T_A = 150°C
					30			mA	V_{CE} = −60 V, V_{EB} = −1.5 V, T_A = 150°C
							30	mA	V_{CE} = −80 V, V_{EB} = −1.5 V, T_A = 150°C
			2.0					mA	V_{CE} = −40 V, V_{EB} = −1.5 V
					2.0			mA	V_{CE} = −60 V, V_{EB} = −1.5 V
							2.0	mA	V_{CE} = −80 V, V_{EB} = −1.5 V
I_{EBO}	Emitter Cutoff Current		5.0		5.0		5.0	mA	V_{EB} = −5.0 V
I_{CEO}	Collector Cutoff Current		0.7					mA	V_{CE} = −20 V, I_B = 0
					0.7			mA	V_{CE} = −30 V, I_B = 0
							0.7	mA	V_{CE} = −40 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	−40		−60		−80		V	I_C = 200 mA, I_B = 0
h_{FE}	DC Current Gain (Note 2)	5.0		5.0		5.0			I_C = 10 A, V_{CE} = −4.0 V
		20	80	20	80	20	80		I_C = 4.0 A, V_{CE} = −4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		−2.0		−2.0		−2.0	V	I_C = 10 A, I_B = 2.0 A
	(Note 2)		−0.75		−0.75		−0.75	V	I_C = 4.0 A, I_B = 400 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		−1.5		−1.5		−1.5	V	I_C = 4.0 A, V_{CE} = −4.0 V
h_{fe}	Small Signal Current Gain	4.0		4.0		4.0			V_{CE} = −10 V, I_C = 1.0 A, f = 1.0 MHz
		15		15		15			V_{CE} = −4.0 V, I_C = 1.0 A, f = 1.0 kHz
C_{ob}	Output Capacitance		600		600		600	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ≤ 2%.
3. For product family characteristic curves, refer to Section 5-PWR15.

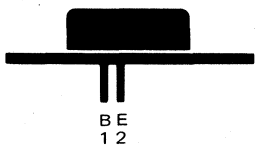
2N4910 • 2N4911 • 2N4912 • 2N4231 • 2N4232 • 2N4233

NPN POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . 0.7 V @ I_C = 1.5 A (2N4231/2/3)
- h_{FE} . . . 25-100 @ I_C = 1.5 A, V_{CE} = 2.0 V (2N4231/2/3)
- COMPLEMENTS . . . 2N4898 SERIES (2N4910 SERIES)

See TO66-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−65°C to +200°C
Operating Junction Temperature				200°C
Maximum Power Dissipation		**2N4910/1/2**		**2N4231/2/3**
Total Dissipation at 25°C Case Temperature		25 W		35 W
Linear Derating Factor		0.143 W/°C		0.2 W/°C
Maximum Voltages and Currents		**2N4910, 2N4231**	**2N4911, 2N4232**	**2N4912, 2N4233**
V_{CBO}	Collector to Base Voltage	40 V	60 V	80 V
V_{CEO}	Collector to Emitter Voltage	40 V	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
		2N4910/1/2		**2N4231/2/3**
I_C	Collector Current	1.0 A		3.0 A
I_B	Base Current	1.0 A		1.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4910 2N4231 MIN.	2N4910 2N4231 MAX.	2N4911 2N4232 MIN.	2N4911 2N4232 MAX.	2N4912 2N4233 MIN.	2N4912 2N4233 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		1.0					mA	V_{CE} = 40 V, V_{EB} = 1.5 V, T_C = 150°C
					1.0			mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150°C
							1.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150°C
			0.1					mA	V_{CE} = 40 V, V_{EB} = 1.5 V
					0.1			mA	V_{CE} = 60 V, V_{EB} = 1.5 V
							0.1	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	40						V	I_B = 0, I_C = 100 mA
				60				V	I_B = 0, I_C = 100 mA
						80		V	I_B = 0, I_C = 100 mA

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current	2N4910		100	μA	V_{CB} = 40 V, I_E = 0
		2N4231		50	μA	V_{CB} = 40 V, I_E = 0
		2N4911		100	μA	V_{CB} = 60 V, I_E = 0
		2N4232		50	μA	V_{CB} = 60 V, I_E = 0
		2N4912		100	μA	V_{CB} = 80 V, I_E = 0
		2N4233		50	μA	V_{CB} = 80 V, I_E = 0
I_{CEO}	Collector Cutoff Current	2N4910		0.5	mA	V_{CE} = 20 V, I_B = 0
		2N4911		0.5	mA	V_{CE} = 30 V, I_B = 0
		2N4912		0.5	mA	V_{CE} = 40 V, I_B = 0
		2N4231		1.0	mA	V_{CE} = 30 V, I_B = 0
		2N4232		1.0	mA	V_{CE} = 50 V, I_B = 0
		2N4233		1.0	mA	V_{CE} = 70 V, I_B = 0

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5-PWR 5.

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4910/1/2 MIN.	2N4910/1/2 MAX.	2N4231/2/3 MIN.	2N4231/2/3 MAX.	UNITS	TEST CONDITIONS
I_{EBO}	Emitter Cutoff Current				500	μA	V_{EB} = 5.0 V, I_C = 0
			1.0			mA	V_{EB} = 5.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 2)	10					I_C = 1.0 A, V_{CE} = 1.0 V
		20	100				I_C = 500 mA, V_{CE} = 1.0 V
		40					I_C = 50 mA, V_{CE} = 1.0 V
				10			I_C = 3.0 A, V_{CE} = 2.0 V
				25	100		I_C = 1.5 A, V_{CE} = 2.0 V
				40			I_C = 0.5 A, V_{CE} = 2.0 V
C_{ob}	Output Capacitance		100		200	pF	V_{CB} = 10 V, I_C = 0, f = 100 kHz
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		0.6			V	I_C = 1.0 A, I_B = 0.1 A
					2.0	V	I_C = 3.0 A, I_B = 0.3 A
					0.7	V	I_C = 1.5 A, I_B = 0.15 A
$V_{BE(sat)}$	Base Saturation Voltage (Note 2)		1.3			V	I_C = 1.0 A, I_B = 0.1 A
V_{BE}	Base to Emitter Voltage (Note 2)		1.3			V	I_C = 1.0 A, V_{CE} = 1.0 V
					1.4	V	I_C = 1.5 A, V_{CE} = 2.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	3.0					V_{CE} = 10 V, I_C = 250 mA, f = 1.0 MHz
				4.0			V_{CE} = 10 V, I_C = 0.5 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	25					V_{CE} = 10 V, I_C = 250 mA, f = 1.0 kHz
				20			V_{CE} = 10 V, I_C = 0.5 A, f = 1.0 kHz

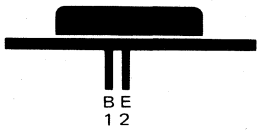
2N4913 • 2N4914 • 2N4915

87.5 WATT NPN POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . 0.75 @ I_C = 2.5 A
- h_{fe} . . . 25-100 @ I_C = 2.5 A, V_{CE} = 2.0 V
- COMPLEMENTS . . . 2N4904 THROUGH 2N4906

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65° C to +200° C
Operating Junction Temperature	−65° C to +200° C

Maximum Power Dissipation

Total Dissipation at 25° C Case Temperature	87.5 W
Linear Derating Factor	0.5 W/° C

Maximum Voltages and Currents		**2N4913**	**2N4914**	**2N4915**
V_{CBO}	Collector to Base Voltage	40 V	60 V	80 V
V_{CEO}	Collector to Emitter Voltage	40 V	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
I_C	Collector Current	5.0 A	5.0 A	5.0 A
I_B	Base Current	1.0 A	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25° C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current	2N4913		0.1	mA	V_{CE} = 40 V, V_{EB} = 1.5 V
		2N4914		0.1	mA	V_{CE} = 60 V, V_{EB} = 1.5 V
		2N4915		0.1	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
I_{CEX}	Collector Cutoff Current	2N4913		2.0	mA	V_{CE} = 40 V, V_{EB} = 1.5 V, T_C = 150° C
		2N4914		2.0	mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150° C
		2N4915		2.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150° C
I_{EBO}	Emitter Cutoff Current			1.0	mA	V_{EB} = 5.0 V, I_C = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage	2N4913	40		V	I_C = 200 mA, I_B = 0
	(Note 2)	2N4914	60		V	I_C = 200 mA, I_B = 0
		2N4915	80		V	I_C = 200 mA, I_B = 0
I_{CEO}	Collector Cutoff Current	2N4913		1.0	mA	V_{CE} = 40 V, I_B = 0
		2N4914		1.0	mA	V_{CE} = 60 V, I_B = 0
		2N4915		1.0	mA	V_{CE} = 80 V, I_B = 0
h_{FE}	DC Current Gain (Note 2)		7.0			I_C = 5.0 A, V_{CE} = 2.0 V
			25	100		I_C = 2.5 A, V_{CE} = 2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage			1.5	V	I_C = 5.0 A, I_B = 1.0 A
	(Note 2)			0.75	V	I_C = 2.5 A, I_B = 0.25 A
V_{BE}	Base to Emitter "On" Voltage (Note 2)			1.4	V	I_C = 2.5 A, V_{CE} = 2.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain		4.0			V_{CE} = 10 V, I_C = 1.0 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain		20			V_{CE} = 10 V, I_C = 0.5 A, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5 - PWR 6.

2N4916 • 2N4917 • PN4916 • PN4917

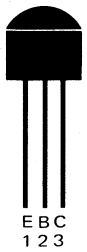
PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C (PN4916/7)**
- **V_{CEO} . . . 30 V (MIN)**
- **h_{FE} . . . 150 to 300 @ 10 mA**
- **f_T . . . 450 MHz (MIN) @ 10 mA**
- **$r_b'C_c$ . . . 50 ps (MAX)**
- **C_{cb} . . . 4.5 pF (MAX)**
- **COMPLEMENTS . . . 2N3693, 2N3694 (TO18), 2N3903, 2N3904 (TO92)**

See Package Outlines

TO18-4



2N4916
2N4917

TO92-1

PN4916
PN4917

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N4916/7	PN4916/7
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.5 W	1.0 W
at 25°C Ambient Temperature		0.2 W	0.625 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage	−30 V	−30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−30 V	−30 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4916, PN4916 MIN.	2N4916, PN4916 MAX.	2N4917, PN4917 MIN.	2N4917, PN4917 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	40		100			I_C = 100 μA, V_{CE} = −1.0 V
		60		150			I_C = 1.0 mA, V_{CE} = −1.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	70	200	150	300		I_C = 10 mA, V_{CE} = −1.0 V
		15		30			I_C = 50 mA, V_{CE} = −1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage		−0.13		−0.13	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 5)		−0.14		−0.14	V	I_C = 10 mA, I_B = 1.0 mA
			−0.3		−0.3	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		−0.75		−0.75	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 5)	−0.7	−0.9	−0.7	−0.9	V	I_C = 10 mA, I_B = 1.0 mA
		−0.75	−1.1	−0.75	−1.1	V	I_C = 50 mA, I_B = 5.0 mA
t_{on}	Turn On Time (see test circuit no. 407)		40		40	ns	I_C = 50 mA, I_{B1} = 5.0 mA
t_{off}	Turn Off Time (see test circuit no. 407)		150		150	ns	I_C = 50 mA, I_{B1} = 5.0 mA, I_{B2} = 5.0 mA
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	4.0		4.5			I_C = 10 mA, V_{CE} = −20 V, f = 100 MHz
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−30		−30		V	I_C = 10 mA, I_B = 0 (pulsed)
BV_{CBO}	Collector to Base Breakdown Voltage	−30		−30		V	I_C = 10 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−30		−30		V	I_C = 10 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_C = 0, I_E = 10 μA
I_{CES}	Collector Reverse Current		25		25	nA	V_{CE} = −15 V, V_{EB} = 0
			25		25	μA	V_{CE} = −15 V, V_{EB} = 0, T_A = 65°C

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N4916 and 2N4917. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN4916 and PN4917.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4916, PN4916 MIN.	2N4916, PN4916 MAX.	2N4917, PN4917 MIN.	2N4917, PN4917 MAX.	UNITS	TEST CONDITIONS
C_{cb}	Collector to Base Capacitance		4.5		4.5	pF	$I_E = 0$, $V_{CE} = -10$ V
C_{eb}	Emitter to Base Capacitance		8.0		8.0	pF	$I_C = 0$, $V_{EB} = -0.5$ V
$r_b'C_c$	Collector to Base Time Constant		50		50	ps	$I_C = 10$ mA, $V_{CE} = -20$ V, f = 80 MHz
NF	Noise Figure		6.0		6.0	dB	$I_C = 1.0$ mA, $V_{CE} = -5.0$ V, $R_S = 100\ \Omega$, BW = 15 MHz, f = 100 MHz
			4.0		4.0	dB	$I_C = 100\ \mu$A, $V_{CE} = -5.0$ V, $R_S = 1.0$ kΩ, BW = 15.7 kHz, 3.0 dB Points @ 10 Hz & 10 kHz

2N4960 • 2N4961 • 2N4962 • 2N4963

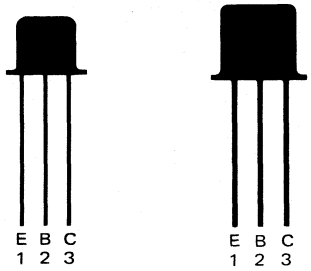
NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 80 V (MIN) 2N4916/63
- h_{FE} . . . 12 SPECIFICATIONS FROM 100 μA TO 500 mA, −55°C to +125°C
- $V_{CE(sat)}$ . . . 0.5 V (MAX) @ 500 mA; 0.18 V (MAX) @ 150 mA
- f_T . . . 250 MHz (MIN) @ 50 mA

See Package Outlines

TO18-1 TO5-1



2N4962 2N4963 2N4960 2N4961

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (60 seconds)			300°C
Maximum Power Dissipation (Notes 2 & 3)		**2N4960/2**	**2N4961/3**
Total Dissipation at 25°C Case Temperature		3.5 W	1.5 W
at 25°C Ambient Temperature		0.8 W	0.5 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage	60 V	80 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	80 V
V_{EBO}	Emitter to Base Voltage	6.5 V	6.5 V
I_C	Collector Current	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N4960, 2N4962 MIN.	2N4960, 2N4962 MAX.	2N4960, 2N4962 MIN.	2N4960, 2N4962 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	30		30			I_C = 100 μA, V_{CE} = 10 V
		60		60			I_C = 1.0 mA, V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain (Note 5)	90		90			I_C = 10 mA, V_{CE} = 10 V
		100		100			I_C = 50 mA, V_{CE} = 10 V
		10		10			I_C = 150 mA, V_{CE} = 1.0 V, T_A = −55°C
		40		40			I_C = 150 mA, V_{CE} = 1.0 V
			500		500		I_C = 150 mA, V_{CE} = 1.0 V, T_A = 125°C
		25		25			I_C = 150 mA, V_{CE} = 10 V, T_A = −55°C
		100	300	100	300		I_C = 150 mA, V_{CE} = 10 V
			650		650		I_C = 150 mA, V_{CE} = 10 V, T_A = 125°C
		70		70			I_C = 300 mA, V_{CE} = 10 V
		45		45			I_C = 500 mA, V_{CE} = 10 V
$\|h_{fe}\|$	Magnitude of Common Emitter, Small Signal, Current Gain	2.5	6.0	2.5	6.0		I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 5)		0.07		0.07	V	I_C = 10 mA, I_B = 1.0 mA
			0.18		0.18	V	I_C = 150 mA, I_B = 15 mA
			0.36		0.36	V	I_C = 150 mA, I_B = 15 mA, T_A = 125°C
			0.31		0.31	V	I_C = 300 mA, I_B = 30 mA
			0.50		0.50	V	I_C = 500 mA, I_B = 50 mA

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered value.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 50°C/W (derating factor of 20 mW/°C) for the 2N4960 and 2N4961; 117°C/W (derating factor of 8.6 mW/°C) for 2N4962 and 2N4963. Junction to ambient thermal resistance of 219°C/W (derating factor of 4.6 mW/°C) for the 2N4960 and 2N4961; 350° C/W (derating factor of 2.9 mW/°C for the 2N4962 and 2N4963.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS17.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N4961, 2N4963 MIN.	2N4961, 2N4963 MAX.	2N4961, 2N4963 MIN.	2N4961, 2N4963 MAX.	UNITS	TEST CONDITIONS
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 5)		0.72		0.72	V	I_C = 10 mA, I_B = 1.0 mA
			1.10		1.10	V	I_C = 150 mA, I_B = 15 mA, T_A = –55°C
		0.78	0.90	0.78	0.90	V	I_C = 150 mA, I_B = 15 mA
		0.63		0.63		V	I_C = 150 mA, I_B = 15 mA, T_A = 125°C
			1.05		1.05	V	I_C = 300 mA, I_B = 30 mA
			1.30		1.30	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(ON)}$	Pulsed Base Emitter "On" Voltage (Note 5)		0.88		0.88	V	I_C = 150 mA, V_{CE} = 10 V
†$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		80		V	I_C = 10 mA, I_B = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	60		80		V	I_C = 10 μA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	60		80		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.5		6.5		V	I_C = 0, I_E = 10 μA
I_{CBO}	Collector Cutoff Current		10		10	nA	I_E = 0, V_{CB} = 50 V
			10		10	μA	I_E = 0, V_{CB} = 50 V, T_A = 125 C
I_{EBO}	Emitter Cutoff Current		10		10	nA	I_C = 0, V_{EB} = 4.0 V
C_{cb}	Collector to Base Capacitance		15		15	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		75		75	pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz
t_{on}	Turn On Time (see test circuit no. 417)		150		150	ns	$I_C \approx$ 150 mA, $I_{B1} \approx$ 15 mA, V_{CC} = 50 V
t_{off}	Turn Off Time (see test circuit no. 417)		1.0		1.0	μs	$I_C \approx$ 150 mA, $I_{B1} \approx$ 15 mA, $I_{B2} \approx$ 15 mA, V_{CE} = 50 V

4

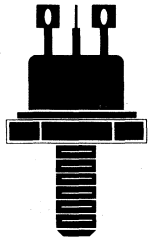
2N5002 • 2N5003 • 2N5004 • 2N5005

50 WATT NPN-PNP POWER

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 50 W @ T_C = 50°C, V_{CE} = 40 V
- LV_{CEO} . . . 80 V (MIN)
- f_T . . . 60 AND 70 MHz (MIN)
- COMPLEMENTS . . . 2N5002, 2N5004 (NPN) 2N5003, 2N5005 (PNP)

See TO59-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation

Total Dissipation at 50°C Case Temperature, V_{CE} = 40 V (Note 4)	50 W

Maximum Voltages and Current

		2N5003 2N5005	2N5002 2N5004
V_{CES}	Collector to Emitter Voltage	−100 V	100 V
V_{CEO}	Collector to Emitter Voltage (Note 2)	−80 V	80 V
V_{EBO}	Emitter to Base Voltage	−5.5 V	6.0 V
I_C	Collector Current	5.0 A	5.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5002 2N5004 MIN.	2N5002 2N5004 MAX.	2N5003 2N5005 MIN.	2N5003 2N5005 MAX.	UNITS	TEST CONDITIONS Reverse Voltage Polarity for PNP
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 3)	80		−80		V	I_C = 100 mA, I_B = 0
$V_{CE(sat)}$	Collector Saturation Voltage (Note 3)		0.75		−0.75	V	I_C = 2.5 A, I_B = 0.25 A
			1.5		−1.5	V	I_C = 5.0 A, I_B = 0.5 A
$V_{BE(sat)}$	Base Saturation Voltage (Note 3)		1.45		−1.45	V	I_C = 2.5 A, I_B = 0.25 A
			2.2		−2.2	V	I_C = 5.0 A, I_B = 0.5 A
I_{CEO}	Collector Cutoff Current Base Open		50		50	μA	I_B = 0, V_{CE} = 40 V
I_{CES}	Collector Cutoff Current		1.0		1.0	μA	V_{CE} = 60 V, V_{BE} = 0
I_{CES}	Collector Cutoff Current		1.0		1.0	mA	V_{CE} = 100 V, V_{BE} = 0
I_{CEX}	Collector Reverse Current		500		500	μA	V_{CE} = 60 V, V_{EB} = 2.0 V, T_C = 150°C
I_{EBO}	Emitter Cutoff Current		1.0			mA	V_{EB} = 6.0 V, I_C = 0
					1.0	mA	V_{EB} = 5.5 V, I_C = 0
			1.0			μA	V_{EB} = 5.0 V, I_C = 0
					1.0	μA	V_{EB} = 4.0 V, I_C = 0
C_{cb}	Collector to Base Capacitance		250		250	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 3)		1.45		−1.45	V	I_C = 2.5 A, V_{CE} = 5.0 V

SYMBOL	CHARACTERISTIC	2N5002 2N5003 MIN.	2N5002 2N5003 MAX.	2N5004 2N5005 MIN.	2N5004 2N5005 MAX.	TEST CONDITIONS Reverse Voltage Polarity for PNP
h_{FE}	DC Pulse Current Gain (Note 3)	20		50		I_C = 50 mA, V_{CE} = 5.0 V
		30	90	70	200	I_C = 2.5 A, V_{CE} = 5.0 V
		20		40		I_C = 5.0 A, V_{CE} = 5.0 V
h_{FE}	DC Pulse Current Gain (Note 3)	15		35		I_C = 2.5 A, V_{CE} = 5.0 V, T_A = −55°C
h_{fe}	High Frequency Current Gain	3.0		3.5		I_C = 0.5 A, V_{CE} = 5.0 V, f = 20 MHz
h_{fe}	High Frequency Current Gain	20		50		I_C = 100 mA, V_{CE} = 5.0 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. This rating refers to a high current point where collector to emitter voltage is lowest.
3. Pulse conditions: length = 300 μs; duty cycle = 1%.
4. Contact factory for maximum permissible power under pulsed or reverse biased operating conditions.
5. For additional product family characteristics, refer to P19 for 2N5002, 2N5004, P11 for 2N5003, 2N5005.

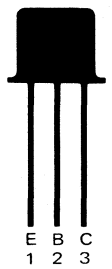
2N5022 • 2N5023

PNP SMALL SIGNAL HIGH VOLTAGE HIGH CURRENT SATURATED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- t_{on} . . . 25 ns (TYP), 40 ns (MAX) @ 500 mA, t_{off} . . . 65 ns (TYP), 90 ns (MAX) @ 500 mA
- $V_{CE(sat)}$ . . . 0.7 V (MAX) (2N5023) @ 1.0 A, 0.8 V (MAX) (2N5022) @ 1.0 A
- h_{FE} . . . 25-100 (2N5022), 40-100 (2N5023) @ 500 mA, 25 (MIN) (2N5022), 40 (MIN) (2N5023) @ 1.0 A
- V_{CEO} . . . 50 V (MIN) (2N5022), 30 V (MIN) (2N5023)
- COMPLEMENTS . . . 2N3724, 2N3725

See TO5-2 Package outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	1.0 W
at 25°C Case Temperature	4.0 W

Maximum Voltages and Current		**2N5022**	**2N5023**
V_{CBO}	Collector to Base Voltage	−50 V	−30 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−50 V	−30 V
V_{CES}	Collector to Emitter Voltage	−50 V	−30 V
I_C	Collector Current (Note 5)	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5022 MIN.	2N5022 MAX.	2N5023 MIN.	2N5023 MAX.	UNITS	TEST CONDITIONS
t_{on}	Turn On Time (see test circuit no. 386)		40		40	ns	$I_C \approx 500$ mA, $I_{B1} \approx 50$ mA
t_{off}	Turn Off Time (see test circuit no. 387)		90		90	ns	$I_C \approx 500$ mA, $I_{B1} \approx 50$ mA, $I_{B2} \approx -50$ mA
h_{FE}	DC Current Gain (Note 5)	15		30			$I_C = 100$ mA, $V_{CE} = -1.0$ V
		25	100	40	100		$I_C = 500$ mA, $V_{CE} = -1.0$ V
		25		40			$I_C = 1.0$ A, $V_{CE} = -5.0$ V
		10		20			$I_C = 500$ mA, $V_{CE} = -1.0$ V, $T_A = -55°C$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.2		−0.17	V	$I_C = 100$ mA, $I_B = 10$ mA
			−0.4		−0.35	V	$I_C = 500$ mA, $I_B = 50$ mA
			−0.8		−0.70	V	$I_C = 1.0$ A, $I_B = 100$ mA
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	1.7		2.0			$I_C = 50$ mA, $V_{CE} = -10$ V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		25		25	pF	$V_{CB} = -10$ V, $I_E = 0$, f = 100 kHz
C_{eb}	Emitter to Base Capacitance		100		100	pF	$V_{EB} = -0.5$ V, $I_C = 0$, f = 100 kHz
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−50		−30		V	$I_C = 10$ mA, $I_B = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	−50		−30		V	$I_C = 100\ \mu$A, $I_E = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	−50		−30		V	$I_C = 100\ \mu$A, $V_{BE} = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	$I_E = 100\ \mu$A, $I_C = 0$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−1.0		−1.0	V	$I_C = 100$ mA, $I_B = 10$ mA
		−0.8	−1.4	−0.8	−1.4	V	$I_C = 500$ mA, $I_B = 50$ mA
			−1.75		−1.75	V	$I_C = 1.0$ A, $I_B = 100$ mA
I_{CES}	Collector Reverse Current		100			nA	$V_{CE} = -30$ V, $V_{BE} = 0$
					100	nA	$V_{CE} = -20$ V, $V_{BE} = 0$
			15			μA	$V_{CE} = -30$ V, $V_{BE} = 0$, $T_A = 100°C$
					15	μA	$V_{CE} = -20$ V, $V_{BE} = 0$, $T_A = 100°C$

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 43.8°C/W (derating factor of 22.8 mW/°C); junction to ambient thermal resistance of 175°C/W (derating factor of 5.72 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS7.

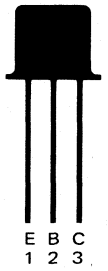
2N5058 • 2N5059

NPN SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- V_{CEO} . . . 250 V (MIN) (2N5059), 300 V (MIN) (2N5058)
- C_{cb} . . . 10 pF (MAX)
- h_{FE} . . . 30-150 @ 30 mA (2N5059)

See TO5-2 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperature			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			175°C
Lead Temperature (10 seconds)			300°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			5.0 W
at 25°C Ambient Temperature			1.0 W
Maximum Voltages and Current		**2N5058**	**2N5059**
V_{CBO}	Collector to Base Voltage	300 V	250 V
V_{CEO}	Collector to Emitter Voltage (Note 3) (Applicable from 0 to 30 mA)	300 V	250 V
V_{EBO}	Emitter to Base Voltage	7.0 V	6.0 V
I_C	Collector Current (Continuous)	150 mA	150 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5058 MIN.	2N5058 MAX.	2N5059 MIN.	2N5059 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		50		50	nA	$I_E = 0$, $V_{CB} = 100$ V
			20		20	μA	$I_E = 0$, $V_{CB} = 100$ V, $T_A = 125°C$
I_{EBO}	Emitter Cutoff Current		10		10	nA	$I_C = 0$, $V_{EB} = 5.0$ V
BV_{CBO}	Collector to Base Breakdown Voltage	300		250		V	$I_C = 100$ μA, $I_E = 0$
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	300		250		V	$I_C = 30$ mA, $I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0		6.0		V	$I_E = 100$ μA, $I_C = 0$
h_{FE}	DC Current Gain	10		10			$I_C = 5.0$ mA, $V_{CE} = 25$ V
h_{FE}	DC Pulse Current Gain (Note 4)	35	150	30	150		$I_C = 30$ mA, $V_{CE} = 25$ V
		10					$I_C = 30$ mA, $V_{CE} = 25$ V, $T_A = -55°C$
		35		30			$I_C = 100$ mA, $V_{CE} = 25$ V
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 4)		0.82		0.82	V	$I_C = 30$ mA, $V_{CE} = 25$ V
$V_{BE(sat)}$	Base Saturation Voltage Voltage (Note 4)		0.85		0.85	V	$I_C = 30$ mA, $I_B = 3.0$ mA
$V_{CE(sat)}$	Collector Saturation Voltage Voltage (Note 4)		1.0		1.0	V	$I_C = 30$ mA, $I_B = 3.0$ mA
C_{cb}	Collector to Base Capacitance		10		10	pF	$I_E = 0$, $V_{CB} = 10$ V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		75		75	pF	$I_C = 0$, $V_{EB} = 0.5$ V, f = 1.0 MHz
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	1.5	8.0	1.5	8.0		$I_C = 10$ mA, $V_{CE} = 25$ V, f = 20 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings based on maximum junction temperature of 175°C and junction to case thermal resistance of 30°C/W (derating factor of 33.3 mW/°C); junction to ambient thermal resistance of 150°C/W (derating factor of 6.67 mW/°C).
3. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 — SS11.

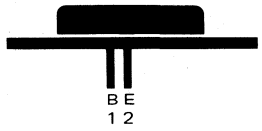
2N5067 • 2N5068 • 2N5069

87.5 WATT NPN POWER

DIFFUSED SILICON BI-MESAR ™ TRANSISTORS

- $V_{CE(sat)}$ . . . 0.4 V @ I_C = 1.0 A
- h_{fe} . . . 20-80 @ I_C = 1.0 A, V_{CE} = 2.0 V
- COMPLEMENTS . . . 2N4901 THROUGH 2N4903

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	−65°C to +200°C

Maximum Power Dissipation

Total Dissipation at 25°C Case Temperature	87.5 W
Linear Derating Factor	0.5 W/°C

Maximum Voltages and Currents		**2N5067**	**2N5068**	**2N5069**
V_{CBO}	Collector to Base Voltage	40 V	60 V	80 V
V_{CEO}	Collector to Emitter Voltage	40 V	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
I_C	Collector Current	5.0 A	5.0 A	5.0 A
I_B	Base Current	1.0 A	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current	2N5067		1.0	mA	V_{CE} = 40 V, V_{EB} = 1.5 V
		2N5068		1.0	mA	V_{CE} = 60 V, V_{EB} = 1.5 V
		2N5069		1.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
I_{CEX}	Collector Cutoff Current	2N5067		2.0	mA	V_{CE} = 40 V, V_{EB} = 1.5 V, T_C = 150°C
		2N5068		2.0	mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150°C
		2N5069		2.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150°C
I_{EBO}	Emitter Cutoff Current			1.0	mA	V_{EB} = 5.0 V, I_C = 0
I_{CEO}	Collector Cutoff Current	2N5067		1.0	mA	V_{CE} = 40 V, I_B = 0
		2N5068		1.0	mA	V_{CE} = 60 V, I_B = 0
		2N5069		1.0	mA	V_{CE} = 80 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage	2N5067	40		V	I_C = 200 mA, I_B = 0
		2N5068	60		V	I_C = 200 mA, I_B = 0
		2N5069	80		V	I_C = 200 mA, I_B = 0
h_{FE}	DC Current Gain (Note 2)		7.0			I_C = 5.0 A, V_{CE} = 2.0 V
			20	80		I_C = 1.0 A, V_{CE} = 2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage			0.4	V	I_C = 1.0 A, I_B = 0.1 A
	(Note 2)			1.5	V	I_C = 5.0 A, I_B = 1.0 A
V_{BE}	Base Emitter Voltage			1.2	V	I_C = 1.0 A, V_{CE} = 2.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain		4.0			V_{CE} = 10 V, I_C = 1.0 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain		20			V_{CE} = 10 V, I_C = 0.5 A, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5 - PWR 6.

2N5086 • 2N5087

PNP LOW LEVEL LOW NOISE HIGH GAIN AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −50 V (MIN)
- h_{FE} . . . 250 (MIN) FROM 100 μA to 10 mA (2N5087)
- NF . . . 2.0 dB (MAX) WIDE BAND and 1.0 kHz (2N5087)
- COMPLEMENTS . . . 2N5209, 2N5210

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	260°C
†Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Case Temperature	0.625 W
at 25°C Ambient Temperature	1.0 W
at 70°C Ambient Temperature	0.400 W
Maximum Voltages and Currents	
V_{CBO} Collector to Base Voltage	−50 V
V_{CEO} Collector to Emitter Voltage (Note 4)	−50 V
V_{EBO} Emitter to Base Voltage	−3.0 V
I_C Collector Current (Peak)	100 mA
I_C Collector Current (Continuous)	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5086 MIN.	2N5086 MAX.	2N5087 MIN.	2N5087 MAX.	UNITS	TEST CONDITIONS
$BV_{CEO(sat)}$	Collector to Emitter Sustaining Voltage	−50		−50		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−50		−50		V	I_C = 100 μA, I_E = 0
†I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = −10 V, I_E = 0
			50		50	nA	V_{CB} = −35 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = −3.0 V, I_C = 0
h_{FE}	DC Current Gain	150	500	250	800		I_C = 100 μA, V_{CE} = −5.0 V
		150		250			I_C = 1.0 mA, V_{CE} = −5.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	150		250			I_C = 10 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.3		−0.3	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Emitter to Base "On" Voltage (Note 5)		−0.85		−0.85	V	I_C = 1.0 mA, V_{CE} = −5.0 V
f_T	Current Gain Bandwidth Product	40		40		MHz	I_C = 500 μA, V_{CE} = −5.0 V, f = 20 MHz
C_{cb}	Output Capacitance		4.0		4.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 100 kHz
h_{fe}	Small Signal Current Gain	150	600	250	900		I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
NF	Noise Figure		3.0		2.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, R_S = 10 kΩ, f = 10 Hz to 15.7 kHz
			3.0		2.0	dB	I_C = 100 μA, V_{CE} = −5.0 V, R_S = 3.0 kΩ f = 1.0 kHz

†Fairchild exceeds JEDEC registered value for this parameter.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The facotry should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 — SS33.

2N5088 • 2N5089

NPN LOW LEVEL LOW NOISE HIGH GAIN AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 25 V (MIN) (2N5089)
- h_{FE} . . . 400 (MIN) FROM 100 μA to 10 mA (2N5089)
- NF . . . 2.0 dB (MAX) WIDE BAND
- COMPLEMENTS . . . 2N5086, 2N5087

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperature		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Lead Temperature (10 seconds)		260°C
†Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature		0.625 W
at 25°C Case Temperature		1.0 W
Maximum Voltages and Current	**2N5088**	**2N5089**
V_{CBO} Collector to Base Voltage	35 V	30 V
V_{CEO} Collector to Emitter Voltage (Note 4)	30 V	25 V
†V_{EBO} Emitter to Base Voltage	4.5 V	4.5 V
I_C Collector Current	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5088 MIN.	2N5088 MAX.	2N5089 MIN.	2N5089 MAX.	UNITS	TEST CONDITIONS
$BV_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	30		25		V	I_C = 1.0 mA, I_E = 0
BV_{CBO}	Collector to Base Breakdown Voltage	35		30		V	I_C = 100 μA, I_E = 0
I_{CBO}	Collector Cutoff Current		50			nA	V_{CB} = 20 V, I_E = 0
					50	nA	V_{CB} = 15 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = 3.0 V, I_C = 0
			100		100	nA	V_{EB} = 4.5 V, I_C = 0
h_{FE}	DC Current Gain	300	900	400	1200		I_C = 100 μA, V_{CE} = 5.0 V
	(Note 5)	350		450			I_C = 1.0 mA, V_{CE} = 5.0 V
		300		400			I_C = 10 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.5		0.5	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		0.8		0.8	V	I_C = 10 mA, V_{CE} = 5.0 V
†f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 500 μA, V_{CE} = 5.0 V, f = 20 MHz
C_{cb}	Collector to Base Capacitance		4.0		4.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz
†C_{eb}	Emitter to Base Capacitance		10		10	pF	V_{BE} = 0.5 V, I_C = 0, f = 100 kHz
h_{fe}	Small Signal Current Gain	350	1400	450	1800		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
NF	Noise Figure		3.0		2.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, f = 10 Hz to 15.7 kHz

†Fairchild exceeds JEDEC registered values.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions' length = 300 μs; duty cycle = 1%.

2N5126 • PN5126

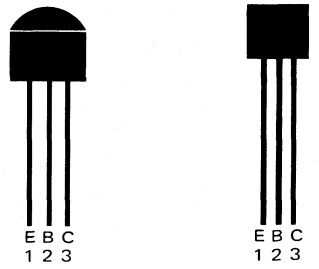
NPN RF AMPLIFIERS

DIFFUSED SILICON PLANAR* TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN5126)
- C_{cb} . . . 1.6 pF (MAX)
- PG . . . 26 dB (TYP) @ 100 MHz
- LV_{CEO} . . . 20 V (MIN)
- NF . . . 5.5 dB (TYP) @ 100 MHz
- FORWARD AGC CHARACTERISTIC

See Package Outlines

TO18-4 TO92-1



2N5126 PN5126

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5126	PN5126
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.5 W	1.0 W
at 25°C Ambient Temperature		0.2 W	0.625 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage	20 V	20 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	20 V	20 V
V_{EBO}	Emitter to Base Voltage	3.0 V	3.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
C_{cb}	Collector to Base Capacitance		1.1	1.6	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
NF	Noise Figure		5.5		dB	I_C = 4.0 mA, V_{CC} = 15 V, f = 100 MHz, R_S = 100 Ω
h_{fe}	High Frequency Current Gain	3.0	6.0			I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz
A_V	Voltage Gain (see test circuit no. 354)		37		dB	f = 455 kHz, I_C = 4.0 mA, V_{CC} = 12 V
PG	Power Gain (see test circuit no. 352)		30		dB	I_C = 4.0 mA, V_{CC} = 12 V, f = 10.7 MHz
			26		dB	I_C = 4.0 mA, V_{CC} = 15 V, f = 100 MHz
AGC	Automatic Gain Control (see test circuit no. 353)		9.0		mA	I_C for which PG_{AGC} = PG−30 dB, f = 100 MHz
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)			2.0	V	I_C = 10 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)			0.98	V	I_C = 10 mA, I_B = 1.0 mA
h_{FE}	DC Current Gain (Note 5)	20	70	350		I_C = 4.0 mA, V_{CE} = 10 V
I_{CBO}	Collector Cutoff Current		1.0	50	nA	I_E = 0, V_{CB} = 10 V
				5.0	μA	I_E = 0, V_{CB} = 10 V, T_A = 65°C
I_{EBO}	Emitter Cutoff Current			100	μA	I_C = 0, V_{EB} = 3.0 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	20			V	I_C = 3.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	20			V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0			V	I_C = 0, I_E = 0.1 mA
h_{fe}	Small Signal Current Gain	15		400		I_C = 4.0 mA, V_{CE} = 10 V, f = 1.0 kHz
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)			0.98	V	I_C = 10 mA, V_{CE} = 10 V

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N5126. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5126.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS1.

2N5128 • 2N5129 • PN5128 • PN5129

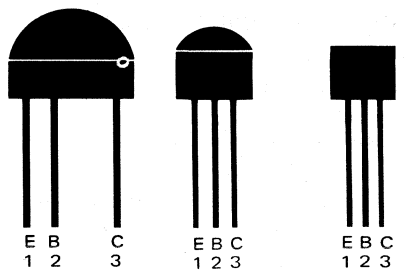
NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN5128/9)
- h_{FE} . . . 35 (MIN) @ 50 mA, 20 (MIN) @ 10 mA
- f_T . . . 150 MHz (MIN) @ 50 mA
- t_{on} . . . 14 ns (TYP) @ 300 mA, t_{off} . . . 80 ns (TYP) @ 300 mA
- $V_{CE\ (sat)}$ . . . −0.25 V (MAX) @ 150 mA, −0.35 V (TYP) @ 500 mA

See Package Outlines

TO5-4 TO18-4 TO92-1



2N5128 2N5129 PN5128 PN5129

ABSOLUTE MAXIMUM RATINGS (Note 1)

	PN5128/9	2N5128/9
Maximum Temperature		
Storage Temperature	−55°C to +150°C	−55°C to +125°C
Operating Junction Temperature	150°C	125°C
Lead Temperature (10 seconds)	260°C	260°C

Maximum Power Dissipation (Notes 2 & 3)	PN5128/9	2N5128	2N5129
Total Dissipation at 25°C Case Temperature	1.0 W	0.5 W	0.7 W
at 25°C Ambient Temperature	0.625 W	0.2 W	0.3 W

Maximum Voltages		
V_{CBO}	Collector to Base Voltage	15 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	12 V
V_{EBO}	Emitter to Base Voltage	3.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{fe}	High Frequency Current Gain	1.5	8.0		I_C = 50 mA, V_{CE} = 5.0 V, f = 100 MHz
h_{FE}	DC Pulse Current Gain (Note 5)	20			I_C = 10 mA, V_{CE} = 10 V
		35	350		I_C = 50 mA, V_{CE} = 10 V
BV_{CES}	Collector to Emitter Breakdown Voltage	15		V	I_C = 10 μA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	15		V	I_C = 10 μA, I_E = 0
$V_{CEO\ (sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	12		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	I_C = 0, I_E = 10 μA
C_{cb}	Collector to Base Capacitance		10	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
$V_{CE\ (sat)}$	Pulsed Collector Saturation Voltage (Note 5)		0.25	V	I_C = 150 mA, I_B = 15 mA
$V_{BE\ (sat)}$	Pulsed Emitter Saturation Voltage (Note 5)		1.10	V	I_C = 150 mA, I_B = 15 mA
I_{CBO}	Collector Cutoff Current		50	nA	V_{CE} = 10 V, I_E = 0
			1.0	μA	V_{CE} = 10 V, I_E = 0, T_A = 65°C
I_{EBO}	Emitter Cutoff Current		10	μA	V_{EB} = 3.0 V, I_C = 0
$V_{BE\ (ON)}$	Base to Emitter "On" Voltage (Note 5)		1.1	V	I_C = 150 mA, V_{CE} = 5.0 V

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N5128; to junction a case thermal resistance of 143°C/W (derating factor of 7.0 mW/°C) and a junction to ambient thermal resistance of 333°C/W (derating factor of 3.0 mW/°C) for 2N5129. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/° C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5128 and PN5129.
4. This rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS15.

4

2N5130 • PN5130

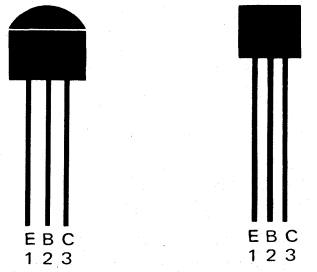
NPN SMALL SIGNAL RF AMPLIFIERS AND OSCILLATORS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **G_{pe} . . . 15 dB (TYP) @ 200 MHz**
- **P_O . . . 7.0 mW (TYP) @ 930 MHz**
- **NF . . . 4.0 dB (TYP) @ 60 MHz**

See Package Outlines

TO18-4 TO92-1



2N5130 PN5130

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5130	PN5130
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Note 2)			
Total Dissipation at 25°C Case Temperature		0.5 W	
at 25°C Ambient Temperature		0.2 W	
at or below 65°C Ambient Temperature			0.300 W
Maximum Voltages and Current			
V_{EBO}	Emitter to Base Voltage	1.0 V	1.0 V
V_{CBO}	Collector to Base Voltage	30 V	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	12 V	12 V
I_C	Collector Current	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		50	nA	V_{CB} = 10 V, I_C = 0
			5.0	μA	V_{CB} = 10 V, I_E = 0, T_A = 65°C
h_{FE}	DC Pulse Current Gain (Note 5)	15	250		I_C = 8.0 mA, V_{CE} = 10 V
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	I_E = 0, I_C = 100 μA
BV_{EBO}	Emitter to Base Breakdown Voltage	1.0		V	I_C = 0, I_E = 10 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage	12		V	I_C = 3.0 mA, I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.6	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		1.0	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		1.0	V	I_C = 10 mA, V_{CE} = 10 V
h_{fe}	Forward Current Transfer Ratio	12	300	V	I_C = 8.0 mA, V_{CE} = 10 V, f = 1.0 kHz
C_{cb}	Collector to Base Capacitance		1.7	pF	I_E = 0, V_{EB} = 10 V, f = 1.0 MHz
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	4.5			I_C = 8.0 mA, V_{CE} = 10 V, f = 100 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N5130. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 283°C/W (derating factor of 3.53 mW/°C) for PN5130.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS27.

2N5131 • PN5131 • 2N5132 • PN5132

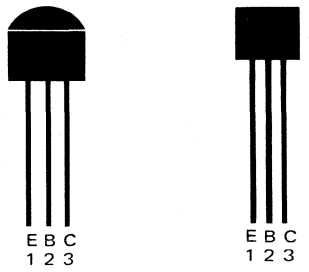
NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN Devices)
- V_{CEO} . . . 15 V (MIN) (2N/PN5131), 20 V (MIN) (2N/PN5132)
- h_{FE} . . . 30 - 500 (2N/PN5131), 30 - 400 (2N/PN5132) @ 10 mA
- P_G . . . 55 dB (TYP) @ 455 kHz, 32 dB (TYP) @ 10.7 MHz (2N/PN5132)
- COMPLEMENTS . . . 2N4121, 2N4916 (TO18)
  . . . 2N4125, PN4916 (TO92)

See Package Outlines

TO18-4 TO92-1



2N5131 2N5132 PN5131 PN5132

ABSOLUTE MAXIMUM RATINGS (Note 1)

	2N5131/2	PN5131/2
Maximum Temperatures		
Storage Temperature	−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature	125°C	150°C
Lead Temperature (10 seconds)	260°C	260°C
Maximum Power Dissipation		
Total Dissipation at 25°C Case Temperature	0.5 W	1.0 W
at 25°C Ambient Temperature	0.2 W	0.625 W

Maximum Voltages

V_{CBO}	Collector to Base Voltage		20 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	2N/PN5131	15 V
		2N/PN5132	20 V
V_{EBO}	Emitter to Base Voltage		3.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN5131 MIN.	2N/PN5131 TYP.	2N/PN5131 MAX.	2N/PN5132 MIN.	2N/PN5132 TYP.	2N/PN5132 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	30		500					I_C = 10 mA, V_{CE} = 1.0 V
					30		400		I_C = 10 mA, V_{CE} = 10 V
h_{fe}	High Frequency Current Gain				2.0				I_C = 10 mA, V_{CE} = 15 V, f = 100 MHz
		1.0							I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)			1.0			2.0	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter Voltage (Note 5)			1.0				V	I_C = 10 mA, V_{CE} = 5.0 V
							0.9	V	I_C = 10 mA, V_{CE} = 10 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)						0.90	V	I_C = 10 mA, I_B = 1.0 mA
I_{CBO}	Collector Cutoff Current			50			50	nA	I_E = 0, V_{CB} = 10 V
				5.0			5.0	μA	I_E = 0, V_{CB} = 10 V, T_A = 65°C
I_{EBO}	Emitter Cutoff Current			10			10	μA	I_C = 0, V_{EB} = 3.0 V
C_{cb}	Collector to Base Capacitance			6.0			3.5	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	15						V	I_C = 3.0 mA, I_B = 0
					20			V	I_C = 10 mA (pulsed), I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	20						V	I_C = 100 μA, I_E = 0
					20			V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0			3.0			V	I_C = 0, I_E = 10 μA
h_{fe}	Small Signal Current Gain				20		650		I_C = 10 mA, V_{CE} = 10 V, f = 1.0 kHz
		25		600					I_C = 10 mA, V_{CE} = 1.0 V, f = 1.0 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N5131 and 2N5132. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5131 and PN5132.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N/PN5131 MIN.	2N/PN5131 TYP.	2N/PN5131 MAX.	2N/PN5132 MIN.	2N/PN5132 TYP.	2N/PN5132 MAX.	UNITS	TEST CONDITIONS
NF	Noise Figure					4.0		dB	I_C = 3.0 mA, V_{CE} = 10 V, f = 1.0 MHz, R_S = 300 Ω
A_{pg}	Available Power Gain (neutralized) (see test circuit no. 2012)					32		dB	I_C = 7.0 mA, V_{CE} = 10 V, f = 10.7 MHz
	(see test circuit no. 2013)					55		dB	I_C = 3.0 mA, V_{CE} = 10 V, f = 455 kHz
G_C	Conversion Gain (see test circuit no. 2014)					20		dB	I_C = 7.0 mA, V_{CE} = 10 V, f = 108 MHz to 10.7 MHz
$r_b'C_c$	Collector-Base Time Constant					30		ps	I_C = 10 mA, V_{CE} = 15 V, f = 80 MHz

2N5133 • PN5133

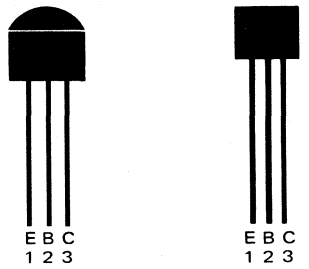
NPN LOW LEVEL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN5133)
- h_{FE} . . . 60 (MIN), 220 (TYP) @ 1.0 mA
- BV_{CEO} . . . 18 V (MIN) @ 3.0 mA

See Package Outlines

TO18-4 TO92-1



2N5133 PN5133

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5133	PN5133
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Note 2)			
Total Dissipation at 25°C Case Temperature		0.5 W	1.0 W
at 25°C Ambient Temperature		0.2 W	0.625 W
Maximum Voltages			
V_{CBO}	Collector to Base Voltage	20 V	20 V
V_{CEO}	Collector to Emitter Voltage (Note 3)	18 V	18 V
V_{EBO}	Emitter to Base Voltage	3.0 V	3.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	60	1000		I_C = 1.0 mA, V_{CE} = 5.0 V
h_{fe}	High Frequency Current Gain	2.0	20		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 20 MHz
$V_{CE(sat)}$	Collector Saturation Voltage		0.4	V	I_C = 1.0 mA, I_B = 0.1 mA
I_{CBO}	Collector Cutoff Current		50	nA	I_E = 0, V_{CB} = 15 V
			5.0	μA	I_E = 0, V_{CB} = 15 V, T_A = 65°C
I_{EBO}	Emitter Cutoff Current		50	nA	I_C = 0, V_{EB} = 2.0 V
C_{cb}	Collector to Base Capacitance		5.0	pF	I_E = 0, V_{CB} = 5.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	20		V	I_C = 100 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 3 & 4)	18		V	I_C = 3.0 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	I_E = 10 μA, I_C = 0
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.75	V	I_C = 100 μA, V_{CE} = 5.0 V
h_{fe}	Small Signal Current Gain	50	1100		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N5133. These ratings give a maximum junction temperature of 150°C, junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C). Junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5133.
3. Rating refers to a high current point where collector to emitter voltage is lowest.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5 - SS8.

2N5134 • PN5134

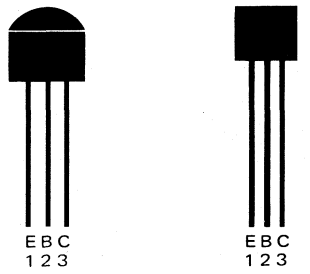
NPN SMALL SIGNAL HIGH SPEED SATURATED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN5134)
- f_T . . . 250 MHz (MIN)
- C_{cb} . . . 4.0 pF (MAX) @ 5.0 V
- τ_s . . . 18 ns (MAX) @ 10 mA
- t_{on} . . . 18 ns (MAX) @ 10 mA, t_{off} . . . 18 ns (MAX) @ 10 mA
- COMPLEMENTS . . . 2N3639, MPS3639

See Package Outlines

TO18-4 TO92-1



2N5134 PN5134

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5134	PN5134
Maximum Temperatures			
Storage Temperature		−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.5 W	1.0 W
at 25°C Ambient Temperature		0.2 W	0.625 W
Maximum Voltages and Currents			
V_{CBO}	Collector to Base Voltage	20 V	20 V
V_{CES}	Collector to Emitter Voltage	20 V	20 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	10 V	10 V
V_{EBO}	Emitter to Base Voltage	3.5 V	3.5 V
I_C	Collector Current (10 μs pulse)	500 mA	500 mA
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	20	66	150		I_C = 10 mA, V_{CE} = 1.0 V
		15	71			I_C = 30 mA, V_{CE} = 0.4 V
			40			I_C = 100 mA, V_{CE} = 1.0 V
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)	0.70	0.80	0.90	V	I_C = 10 mA, I_B = 1.0 mA
		0.72	0.85	1.10	V	I_C = 10 mA, I_B = 3.3 mA
			0.90		V	I_C = 30 mA, I_B = 3.0 mA
			1.10		V	I_C = 100 mA, I_B = 10 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.14	0.25	V	I_C = 10 mA, I_B = 1.0 mA
			0.12	0.20	V	I_C = 10 mA, I_B = 3.3 mA
			0.17		V	I_C = 30 mA, I_B = 3.0 mA
			0.28		V	I_C = 100 mA, I_B = 10 mA
			0.19		V	I_C = 10 mA, I_B = 1.0 mA, T_A = 65°C
h_{fe}	High Frequency Current Gain	2.5	5.75			I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		2.3	4.0	pF	I_E = 0, V_{CB} = 5.0 V
I_{CES}	Collector Reverse Current		0.05	0.40	μA	V_{CE} = 15 V, V_{EB} = 0
I_{CBO}	Collector Cutoff Current		1.0	10	μA	I_E = 0, V_{CB} = 15 V, T_A = 65°C
BV_{CES}	Collector to Emitter Breakdown Voltage	20			V	I_C = 10 μA, V_{EB} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	20			V	I_C = 10 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	10			V	I_C = 10 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.5			V	I_C = 0, I_E = 10 μA
τ_s	Charge Storage Time Constant (see test circuit no. 3111)		7.0	18	ns	I_C = 10 mA, $I_{B1} \approx -I_{B2} \approx$ 10 mA, V_{CC} = 10 V
t_{on}	Turn On Time (see test circuit no. 381)		8.0	18	ns	$I_C \approx$ 10 mA, $I_{B1} \approx$ 3.3 mA, V_{CC} = 3.0 V
t_{off}	Turn Off Time (see test circuit no. 381)		7.0	18	ns	$I_C \approx$ 10 mA, $I_{B1} \approx$ 3.3 mA, $I_{B2} \approx -3.3$ mA, V_{CC} = 3.0 V

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N5134. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5134.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS28.

2N/PN5135 • 2N/PN5136 • 2N/PN5137

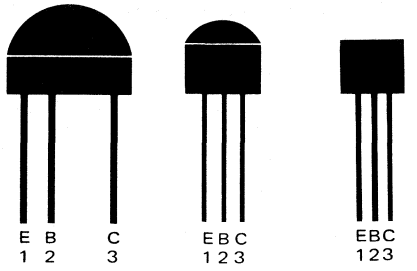
NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN SERIES)
- V_{CEO} . . . 25 V (MIN) (2N/PN5135)
- f_T . . . 40 MHz (MIN)
- h_{FE} . . . 50-600 @ 10 mA (2N/PN5135), 20-400 @ 150 mA (2N/PN5136/7)
- COMPLEMENTS . . . 2N/PN5142, 2N/PN5143

See Package Outlines

TO 5-4 TO 18-4 TO 92-1



2N5135 2N5136 | 2N5137 | PN5135 PN5136 PN5137

ABSOLUTE MAXIMUM RATINGS (Note 1)

	PN5135/36/37	2N5135/36/37
Maximum Temperatures		
Storage Temperature Range	−55°C to +150°C	−55°C to +125°C
Operating Junction Temperature	150°C	125°C
Lead Temperature (10 seconds)	260°C	260°C

Maximum Power Dissipation (Notes 2 & 3)	PN5135/36/37	2N5135/36	2N5137
Total Dissipation			
at 25°C Case Temperature	1.0 W	0.8 W	0.6 W
at 25°C Ambient Temperature	0.625 W	0.3 W	0.22 W

Maximum Voltages and Current		2N/PN5135	2N/PN5136/37
V_{CES}	Collector to Emitter Voltage	30 V	30 V
V_{CBO}	Collector to Base Voltage	30 V	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	25 V	20 V
V_{EBO}	Emitter to Base Voltage	4.0 V	3.0 V
I_C	Collector Current	200 mA	500 mA

ELECTRICAL CHARACTERISTIC (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5135 PN5135 MIN.	2N5135 PN5135 MAX.	2N5136 PN5136 MIN.	2N5136 PN5136 MAX.	2N5137 PN5137 MIN.	2N5137 PN5137 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	50	600						I_C = 10 mA, V_{CE} = 10 V
		15							I_C = 2.0 mA, V_{CE} = 1.0 V
				20	400	20	400		I_C = 150 mA, V_{CE} = 1.0 V
				20		20			I_C = 30 mA, V_{CE} = 1.0 V
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		1.0					V	I_C = 100 mA, V_{CE} = 10 V
					1.1		1.1	V	I_C = 150 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		1.0					V	I_C = 100 mA, I_B = 10 mA
					0.25		0.25	V	I_C = 150 mA, I_B = 15 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		1.0					V	I_C = 100 mA, I_B = 10 mA
					1.1		1.1	V	I_C = 150 mA, I_B = 15 mA
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	2.0	15						I_C = 30 mA, V_{CE} = 10 V, f = 20 MHz
				2.0	20	2.0	20		I_C = 50 mA, V_{CE} = 5.0 V, f = 20 MHz
C_{cb}	Collector to Base Capacitance		25		35		35	pF	I_E = 0, V_{CB} = 10 V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance				85		85	pF	I_C = 0, V_{EB} = 0.5 V, f = 1.0 MHz
I_{CBO}	Collector Cutoff Current		300					nA	I_E = 0, V_{CB} = 15 V
					100		100	nA	I_E = 0, V_{CB} = 20 V
			10					μA	I_E = 0, V_{CB} = 15 V, T_A = 65°C
					10		10	μA	I_E = 0, V_{CB} = 20 V, T_A = 65°C

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature 125°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C) for 2N5135/2N5136 and 167°C/W (derating factor of 6.0 mW/°C) for 2N5137. Junction to ambient thermal resistance is 333°C/W (derating factor of 3.0 mW/°C) for 2N5135 and 2N5136, and 455°C/W (derating factor of 2.2 mW/°C) for 2N5137. Maximum junction temperature is 150°C, and junction to case thermal resistance is 125°C/W (derating factor of 8.0 mW/°C) for PN5135, PN5136, and PN5137. Junction to ambient thermal resistance is 200°C/W (derating factor of 5.0 mW/°C) for PN5135, PN5136, and PN5137.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS15.

ELECTRICAL CHARACTERISTIC (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N5135 PN5135 MIN.	2N5135 PN5135 MAX.	2N5136 PN5136 MIN.	2N5136 PN5136 MAX.	2N5137 PN5137 MIN.	2N5137 PN5137 MAX.	UNITS	TEST CONDITIONS
I_{EBO}	Emitter Cutoff Current				100		100	nA	$I_C = 0$, $V_{EB} = 2.0$ V
			10					μA	$I_C = 0$, $V_{EB} = 4.0$ V
BV_{CES}	Collector to Emitter Breakdown Voltage	30		30		30		V	$I_C = 100$ μA, $V_{BE} = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	30		30		30		V	$I_E = 0$, $I_C = 100$ μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	25		20		20		V	$I_C = 10$ mA (pulsed), $I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		3.0		3.0		V	$I_C = 0$, $I_E = 10$ μA

2N5138 • PN5138

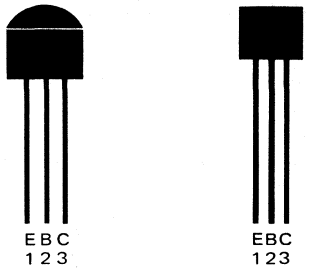
PNP LOW LEVEL AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN5138)
- h_{FE} . . . 50 (MIN) @ 100 μA & 10 mA
- V_{CEO} . . . 30 V (MIN)

See Package Outlines

TO18-4 TO92-1



2N5138 PN5138

ABSOLUTE MAXIMUM RATINGS (Note 1)

	2N5138	PN5138
Maximum Temperatures		
Storage Temperature	−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature	125°C	150°C
Lead Temperature (10 seconds)	260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Case Temperature	0.5 W	1.0 W
at 25°C Ambient Temperature	0.2 W	0.625 W
Maximum Voltages		
V_{CBO} Collector to Base Voltage	−30 V	−30 V
V_{CEO} Collector to Emitter Voltage	−30 V	−30 V
V_{EBO} Emitter to Base Voltage	−5.0 V	−5.0 V

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	50	800		I_C = 100 μA, V_{CE} = −10 V
		50			I_C = 1.0 mA, V_{CE} = −10 V
h_{FE}	DC Pulse Current Gain (Note 5)	50			I_C = 10 mA, V_{CE} = −10 V
BV_{CBO}	Collector to Base Breakdown Voltage	−30		V	I_C = 100 μA, I_E = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−30		V	I_C = 10 mA (pulsed), I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		V	I_C = 0, I_E = 100 μA
I_{CBO}	Collector Cutoff Current		50	nA	I_E = 0, V_{CB} = −20 V
			3.0	μA	I_E = 0, V_{CB} = −20 V, T_A = 65°C
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.3	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		−1.0	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		−1.0	V	I_C = 10 mA, V_{CE} = −10 V
h_{fe}	Small Signal Current Gain	40	1000		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{fe}	High Frequency Current Gain	1.5			I_C = 0.5 mA, V_{CE} = −5.0 V, f = 20 MHz
C_{cb}	Collector to Base Capacitance		7.0	pF	I_E = 0, V_{CB} = −5.0 V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		30	pF	I_C = 0, V_{EB} = −0.5 V, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C); for 2N5138. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5138.
4. This rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS33.

2N5139 • PN5139

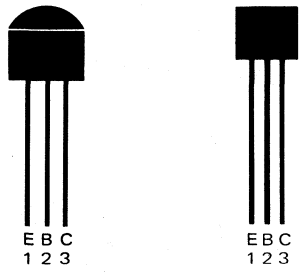
PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C (PN5139)**
- **V_{CEO} . . . –20 V (MIN)**
- **h_{FE} . . . 40 (MIN) @ 10 mA**
- **f_T . . . 300 MHz (MIN)**
- **C_{cb} . . . 5.0 pF (MAX) @ –10 V**

See Package Outlines

TO18-4 TO92-1



2N5139 PN5139

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5139	PN5139
Maximum Temperatures			
Storage Temperature		–55°C to +125°C	–55°C to +150°C
Operating Junction Temperature		125°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature		0.5 W	1.0 W
at 25°C Ambient Temperature		0.2 W	0.625 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage		–20 V
V_{CEO}	Collector to Emitter Voltage (Note 4)		–20 V
V_{EBO}	Emitter to Base Voltage		–5.0 V
I_C	Collector Current		100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	30	70			I_C = 100 μA, V_{CE} = –10 V
		40	100			I_C = 1.0 mA, V_{CE} = –10 V
h_{FE}	DC Pulse Current Gain (Note 5)	40	150			I_C = 10 mA, V_{CE} = –1.0 V
		15	30			I_C = 50 mA, V_{CE} = –10 V
$V_{CE(sat)}$	Collector Saturation Voltage			–0.15	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 5)			–0.20	V	I_C = 10 mA, I_B = 1.0 mA
			–0.2	–0.5	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 5)	–0.7	–0.77	–1.0	V	I_C = 10 mA, I_B = 1.0 mA
		–0.75		–1.25	V	I_C = 50 mA, I_B = 5.0 mA
t_{on}	Turn On Time (see test circuit no. 407)			50	ns	$I_C \approx$ 50 mA, $I_{B1} \approx$ 5.0 mA
t_{off}	Turn Off Time (see test circuit no. 407)			200	ns	$I_C \approx$ 50 mA, $I_{B1} \approx$ 5.0 mA, $I_{B2} \approx$ –5.0 mA
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	3.0	5.0			I_C = 10 mA, V_{CE} = –20 V, f = 100 MHz
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	–20			V	I_C = 10 mA (pulsed), I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	–20			V	I_C = 100 μA, I_E = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	–20			V	I_C = 100 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	–5.0			V	I_C = 0, I_E = 100 μA
I_{CES}	Collector Reverse Current			50	nA	V_{CE} = –15 V, V_{EB} = 0
				25	μA	V_{CE} = –15 V, V_{EB} = 0, T_A = 65°C
C_{cb}	Collector to Base Capacitance			5.0	pF	I_E = 0, V_{CB} = –10 V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance			8.0	pF	I_C = 0, V_{EB} = –0.5 V, f = 1.0 MHz

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to ambient thermal resistance of 500°C/W (derating factor of 2.0 mW/°C) for 2N5139. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5139.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.

2N5142 • 2N5143 • PN5142 • PN5143

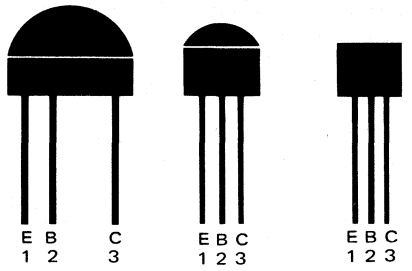
PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C (PN5142/3)
- h_{FE} . . . 30 (MIN) @ 50 mA
  . . . 15 (MIN) @ 300 mA
- t_{on} . . . 100 ns (MAX) @ 300 mA
- t_{off} . . . 200 ns (MAX) @ 300 mA
- V_{CEO} . . . 20 V (MIN) @ 10 mA

See Package Outlines

TO5-4 TO18-4 TO92-1



2N5142 2N5143 PN5142 PN5143

ABSOLUTE MAXIMUM RATINGS (Note 1)

	2N5142, 2N5143	PN5142, PN5143
Maximum Temperatures		
Storage Temperature	−55°C to +125°C	−55°C to +150°C
Operating Junction Temperature	125°C	150°C
Lead Temperature, (10 seconds)	260°C	260°C

Maximum Power Dissipation (Notes 2 & 3)	2N5142	2N5143	PN5142/3
Total Dissipation at 25°C Case Temperature	0.7 W	0.5 W	1.0 W
at 25°C Ambient Temperature	0.3 W	0.2 W	0.625 W

Maximum Voltages and Current				
V_{CBO}	Collector to Base Voltage	−20 V	−20 V	−20 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−20 V	−20 V	−20 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.0 V	−4.0 V
I_C	Collector Current	500 mA	500 mA	500 mA

ELECTRICAL CHARACTERISTICS: (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS.	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	30			I_C = 50 mA, V_{CE} = 1.0 V
		15			I_C = 300 mA, V_{CE} = −10 V
h_{fe}	High Frequency Current Gain	1.0			I_C = 50 mA, V_{CE} = −3.0 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		10	pF	I_E = 0, V_{CB} = −10 V, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		30	pF	I_C = 0, V_{EB} = −0.5 V, f = 1.0 MHz
$V_{CE\ (sat)}$	Collector Saturation Voltage (pulsed,		−0.5	V	I_C = 50 mA, I_B = 2.5 mA
	Note 5)		−2.0	V	I_C = 300 mA, I_B = 30 mA
$V_{CEO\ (sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−20		V	I_C = 10 mA (pulsed), I_B = 0
$V_{BE\ (sat)}$	Base Saturation Voltage (pulsed, Note 5)		−1.5	V	I_C = 50 mA, I_B = 2.5 mA
		−0.8	−2.5	V	I_C = 300 mA, I_B = 30 mA
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		V	I_C = 0, I_E = 100 μA
BV_{CBO}	Collector to Base Breakdown Voltage	−20		V	I_C = 100 μA, I_E = 0
t_{on}	Turn On Time (see test circuit no. 245)		100	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA
t_{off}	Turn Off Time (see test circuit no. 245)		200	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA, $I_{B2} \approx$ −30 mA
I_{CES}	Collector Reverse Current		50	nA	V_{CE} = −12V, V_{BE} = 0
			2.0	μA	V_{CE} = −12 V, V_{BE} = 0, T_A = 65°C

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 125°C and junction to case thermal resistance of 143°C/W (derating factor of 7.0 mW/°C) for 2N5142, and 200°C/W (derating factor of 5.0 mW/°C) for 2N5143; junction to ambient thermal resistance of 333°C/W (derating factor of 3.0 mW/°C) for 2N5142, and 500°C/W (derating factor of 2.0 mW/°C) for 2N5143. Maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C) and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5142, PN5143.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse Conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS22.

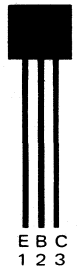
2N5209 • 2N5210

NPN LOW LEVEL LOW NOISE HIGH GAIN AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 50 V (MIN)
- h_{FE} . . . 200 (MIN) @ 100 μA (2N5210)
  . . . 250 (MIN) @ 1.0 mA AND 10 mA (2N5210)
- NF . . . 2.0 dB (MAX) WIDE BAND (2N5210)
- COMPLEMENTS . . . 2N5086, 2N5087

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

† Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	260°C
† Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W
at 70°C Ambient Temperature	0.400 W
Maximum Voltages and Current	
V_{CBO} Collector to Base Voltage	50 V
V_{CEO} Collector to Emitter Voltage	50 V
V_{EBO} Emitter to Base Voltage	4.5 V
I_C Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5209 MIN.	2N5209 MAX.	2N5210 MIN.	2N5210 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	50		50		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	50		50		V	I_C = 100 μA, I_E = 0
†I_{CBO}	Collector Cutoff Current		10		10	nA	V_{CB} = 10 V, I_E = 0
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = 35 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = 3.0 V, I_C = 0
†I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 4.5 V, I_C = 0
h_{FE}	DC Current Gain (Note 4)	100	300	200	600		I_C = 100 μA, V_{CE} = 5.0 V
		150		250			I_C = 1.0 mA, V_{CE} = 5.0 V
		150		250			I_C = 10 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		0.7		0.7	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.85		0.85	V	I_C = 1.0 mA, V_{CE} = 5.0 V
f_T	Current Gain Bandwidth Product	30		30		MHz	I_C = 500 μA, V_{CE} = 5.0 V, f = 20 MHz
C_{cb}	Collector to Base Capacitance		4.0		4.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz
h_{fe}	Small Signal Current Gain	150	600	250	900		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
NF	Noise Figure		3.0		2.0	dB	I_C = 20 μA, V_{CE} = 5.0 V, R_S = 22 kΩ, f = 10 Hz to 15.7 kHz
			4.0		3.0	dB	I_C = 20 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, f = 1.0 kHz

*Planar is a patented Fairchild process.
†Fairchild exceeds JEDEC registered values.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle < 2%.
5. Rating refers to a high current point where collector to emitter voltage is lowest.

2N5219 • 2N5223

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS AND OSCILLATORS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 15 V (MIN) (2N5219), 20 V (MIN) (2N5223)
- h_{FE} . . . 35-500 (2N5219), 50-800 (2N5223) @ 2.0 mA
- f_T . . . 150 MHz (MIN) @ 10 mA
- C_{cb} . . . 4.0 pF (MAX)
- COMPLEMENTS . . . 2N5221, 2N5227

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (60 seconds)	260°C

†Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W

Maximum Voltages and Current		2N5219	2N5223
V_{CBO}	Collector to Base Voltage	20 V	25 V
V_{CEO}	Collector to Emitter Voltage	15 V	20 V
V_{EBO}	Emitter to Base Voltage	3.0 V	3.0 V
I_C	Collector Current	100 mA	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5219 MIN.	2N5219 MAX.	2N5223 MIN.	2N5223 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	15		20		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	20		25		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		3.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100		100	nA	V_{CB} = 10 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		500			nA	V_{EB} = 2.0 V, I_C = 0
					500	nA	V_{EB} = 3.0 V, I_C = 0
h_{FE}	DC Current Gain	35	500	50	800		I_C = 2.0 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		0.4		0.7	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)		1.0		1.2	V	I_C = 10 mA, I_B = 1.0 mA
f_T	Current Gain Bandwidth Product	150		150		MHz	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		4.0		4.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	35	1500	50	1600		I_C = 2.0 mA, V_{CE} = 10 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered values.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C); junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle < 2%.

2N5220 • 2N5221

NPN-PNP SMALL SIGNAL GENERAL PURPOSE COMPLEMENTARY AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 15 V (MIN)
- h_{FE} . . . 30–600 @ 50 mA
- $V_{CE\ (sat)}$ . . . 0.5 V (MAX) @ 150 mA
- COMPLEMENTS 2N5220 (NPN), 2N5221 (PNP)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperature

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (60 seconds)	260°C

†Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	0.625 mW
at 25°C Case Temperature	1.0 W

Maximum Voltages and Current		**2N5220**	**2N5221**
V_{CBO}	Collector to Base Voltage	15 V	−15 V
V_{CEO}	Collector to Emitter Voltage	15 V	−15 V
V_{EBO}	Emitter to Base Voltage	3.0 V	−3.0 V
I_C	DC Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5220 MIN.	2N5220 MAX.	2N5221 MIN.	2N5221 MAX.	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	15		−15		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	15		−15		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		−3.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100		100	nA	V_{CB} = 10 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 3.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 4)	25		25			I_C = 10 mA, V_{CE} = 10 V
h_{FE}	DC Current Gain (Note 4)	30	600	30	600		I_C = 50 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		0.5		−0.5	V	I_C = 150 mA, I_B = 15 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)		1.1		−1.1	V	I_C = 150 mA, I_B = 15 mA
f_T	Current Gain Bandwidth Product	100		100		MHz	I_C = 20 mA, V_{CE} = 10 V
C_{cb}	Collector to Base Capacitance		10		15	pF	V_{CB} = 5.0 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	30	1800	30	1800		I_C = 50 mA, V_{CE} = 10 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered values.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle < 2%.
5. For product family characteristic curves refer to Section 5-SS15 for 2N5220 and SS22 for 2N5221.

2N5224

NPN LOW LEVEL SWITCH

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 12 V (MIN)
- t_{on} . . . 45 ns (MAX) @ 10 mA
- t_{off} . . . 60 ns (MAX) @ 10 mA
- f_T . . . 250 MHz (MIN) @ 10 mA
- C_{cb} . . . 4.0 pF (MAX)
- COMPLEMENTS . . . MPSL08

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (60 seconds)	260°C
†Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W
Maximum Voltages and Current	
V_{CBO} Collector to Base Voltage	25 V
V_{CEO} Collector to Emitter Voltage	12 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C DC Collector Current	100 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	12		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	25		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		500	nA	V_{CB} = 15 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100	μA	V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 4)	40	400		I_C = 10 mA, V_{CE} = 1.0 V
		15			I_C = 100 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		0.35	V	I_C = 10 mA, I_B = 3.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)		0.9	V	I_C = 10 mA, I_B = 3.0 mA
f_T	Current Gain Bandwidth Product	250		MHz	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		4.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 1.0 MHz
t_d	Delay Time (see test circuit test no. 531)		25	ns	I_C = 10 mA, I_{B1} = 3.0 mA, V_{CC} = 3.0 V
t_r	Rise Time (see test circuit test no. 531)		20	ns	I_C = 10 mA, I_{B1} = 3.0 mA, V_{CC} = 3.0 V
t_s	Storage Time (see test circuit test no. 531)		35	ns	I_C = 10 mA, I_{B1} = I_{B2} = 3.0 mA V_{CC} = 3.0 V
t_f	Fall Time (see test circuit no. 531)		25	ns	I_C = 10 mA, I_{B1} = I_{B2} = 3.0 mA, V_{CC} = 3.0 V

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered values.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle < 2%.
5. For product family characteristic curves, refer to Section 5-SS5.

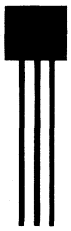
2N5225 • 2N5226

NPN-PNP SMALL SIGNAL GENERAL PURPOSE COMPLEMENTARY AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 25 V (MIN)
- h_{FE} . . . 30–600 @ 50 mA
- $V_{CE(sat)}$ . . . 0.8 V (MAX) @ 100 mA
- COMPLEMENTS . . . 2N5225 (NPN), 2N5226 (PNP)

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

† Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Lead Temperature (60 seconds)		260°C
† Maximum Power Dissipation (Notes 2 & 3)		
Total Dissipation at 25°C Ambient Temperature		0.625 W
at 25°C Case Temperature		1.0 W

Maximum Voltages and Current		**2N5225**	**2N5226**
V_{CBO}	Collector to Base Voltage	25 V	−25 V
V_{CEO}	Collector to Emitter Voltage	25 V	−25 V
V_{EBO}	Emitter to Base Voltage	4.0 V	−4.0 V
I_C	Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5225 MIN.	2N5225 MAX.	2N5226 MIN.	2N5226 MAX.	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	25		−25		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	25		−25		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		−4.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		300		300	nA	V_{CB} = 15 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		500		500		V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 4)	25		25			I_C = 10 mA, V_{CE} = 10 V
		30	600	30	600		I_C = 50 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)		0.8		−0.8	V	I_C = 100 mA, I_B = 10 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)		1.0		−1.0	V	I_C = 100 mA, I_B = 10 mA
f_T	Current Gain Bandwidth Product	50		50		MHz	I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz
C_{cb}	Collector to Base Capacitance		20		20	pF	V_{CB} = 5.0 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current	30	1,800	30	1,800		I_C = 50 mA, V_{CE} = 10 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered value for this parameter.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs, duty cycle < 2%.
5. For product family characteristic curves, refer to Section 5-SS15 for 2N5225, SS22 for 2N5226.

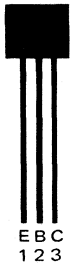
2N5227

PNP SMALL SIGNAL GENERAL PURPOSE AMPLIFIER AND OSCILLATOR

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 30 V (MIN)
- h_{FE} . . . 50-700 @ 2.0 mA
- f_T . . . 100 MHz (MIN) @ 10 mA
- C_{cb} . . . 5.0 pF (MAX)
- COMPLEMENT . . . 2N5223

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

†Maximum Temperatures	
Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (60 seconds)	260°C
†Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W
Maximum Voltages and Current	
V_{CBO} Collector to Base Voltage	−30 V
V_{CEO} Collector to Emitter Voltage	−30 V
V_{EBO} Emitter to Base Voltage	−3.0 V
I_C DC Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	−30		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−30		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−3.0		V	I_E = 100 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100	nA	V_{CB} = −10 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		500	nA	V_{EB} = −2.0 V
h_{FE}	DC Current Gain	30			I_C = 100 μA, V_{CE} = −10 V
		50	700		I_C = 2.0 mA, V_{CE} = −10 V
$V_{CE(sat)}$	Collector Saturation Voltage		−0.4	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		−1.0	V	I_C = 10 mA, I_B = 1.0 mA
f_T	Current Gain Bandwidth Product	100		V	I_C = 10 mA, V_{CE} = −10 V, f = 100 MHz
h_{FE}	Small Signal Current Gain	50	1500		I_C = 2.0 mA, V_{CE} = −10 V, f = 1.0 kHz
C_{cb}	Collector to Base Capacitance		5.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz

†Fairchild exceeds JEDEC registered values.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).

2N5228

PNP LOW LEVEL LOGIC SWITCH

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- **P_D . . . 625 mW @ T_A = 25°C**
- **V_{CEO} . . . –5.0 V (MIN)**
- **t_{on} . . . 75 ns (MAX) @ 10 mA**
- **t_{off} . . . 140 ns (MAX) @ 10 mA**
- **f_T . . . 300 MHz (MIN) @ 10 mA**
- **C_{cb} . . . 5.0 pF (MAX)**
- **COMPLEMENTS . . . 2N5224**

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

† Maximum Temperatures	
Storage Temperature	–55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (60 seconds)	260°C
† Maximum Power Dissipation (Notes 2 & 3)	
Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W
Maximum Voltages and Current	
V_{CES} Collector to Emitter Voltage	–6.0 V
V_{CBO} Collector to Base Voltage	–5.0 V
V_{CEO} Collector to Emitter Voltage	–5.0 V
V_{EBO} Emitter to Base Voltage	–3.0 V
I_C DC Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	–5.0		V	I_C = 10 mA, I_B = 0
	(Note 4)	–6.0			
BV_{CES}	Collector to Emitter Breakdown Voltage	–5.0		V	I_C = 100 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	–3.0		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage			V	I_E = 100 μA, I_C = 0
I_{CES}	Collector Cutoff Current		100	nA	V_{CE} = –4.0 V, V_{BE} = 0
I_{EBO}	Emitter Cutoff Current	30	100	μA	V_{EB} = –2.5 V, I_C = 0
h_{FE}	DC Current Gain (Note 4)	15			I_C = 10 mA, V_{CE} = –0.3 V
					I_C = 50 mA, V_{CE} = –1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 4)	–0.65	–0.4	V	I_C = 10 mA, I_B = 3.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 4)	300	–1.25	V	I_C = 10 mA, I_B = 3.0 mA
f_T	Current Gain Bandwidth Product			MHz	I_C = 10 mA, V_{CE} = –5.0 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		5.0	pF	V_{CB} = –5.0 V, I_E = 0, f = 1.0 MHz
t_d	Delay Time (see test circuit no. 532)		25	ns	$I_C \approx$ 10 mA, $I_{B1} \approx$ 3.0 mA, V_{CC} = –3.0 V
t_r	Rise Time (see test circuit no. 532)		50	ns	$I_C \approx$ 10 mA, $I_{B1} \approx$ 3.0 mA, V_{CC} = –3.0 V
t_s	Storage Time (see test circuit no. 532)		90	ns	$I_C \approx$ 10 mA, $I_{B1} \approx -I_{B2} \approx$ 3.0 mA, V_{CC} = –3.0 V
t_f	Fall Time (see test circuit no. 532)		50	ns	$I_C \approx$ 10 mA, $I_{B1} \approx -I_{B2} \approx$ 3.0 mA, V_{CC} = –3.0 V

*Planar is a patented Fairchild process.
†Fairchild exceeds JEDEC registered values.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle < 2%.
5. For product family characteristic curves, refer to Section 5-SS31.

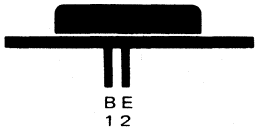
2N5301 • 2N5302 • 2N5303

200 WATT NPN POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- h_{FE} . . . 15–60 @ 10A (2N5303), @ 15A (2N5301, 2N5302)
- $V_{CE(sat)}$ . . . 2.0 V (MAX) @ 20 A
- COMPLEMENTS . . . 2N4398, 2N4399, 2N5745

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature			−65°C to +200°C	
Operating Junction Temperature			200°C	
Maximum Power Dissipation				
Total Dissipation at 25°C Case Temperature			200 W	
Linear Derating Factor			1.14 W/°C	
Maximum Voltages and Current		**2N5301**	**2N5302**	**2N5303**
V_{CBO}	Collector to Base Voltage	40 V	60 V	80 V
V_{CEO}	Collector to Emitter Voltage	40 V	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
I_C	Collector Current (Continuous)	30 A	30 A	20 A
I_B	Base Current (Continuous)	7.5 A	7.5 A	7.5 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5301 MIN.	2N5301 MAX.	2N5302 MAX.	2N5302 MAX.	2N5303 MIN.	2N5303 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		1.0					mA	V_{CE} = 40 V, V_{EB} = 1.5 V
					1.0			mA	V_{CE} = 60 V, V_{EB} = 1.5 V
							1.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
			10					mA	V_{CE} = 40 V, V_{EB} = 1.5 V, T_C = 150°C
					10			mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150°C
							10	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150°C
I_{CBO}	Collector Cutoff Current		1.0					mA	V_{CB} = 40 V, I_E = 0
					1.0			mA	V_{CB} = 60 V, I_E = 0
							1.0	mA	V_{CB} = 80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		5.0		5.0		5.0	mA	V_{EB} = 5.0 V, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 2)	40		60		80		V	I_C = 200 mA, I_B = 0
I_{CEO}	Collector Cutoff Current		5.0					mA	V_{CE} = 40 V, I_B = 0
					5.0			mA	V_{CE} = 60 V, I_B = 0
							5.0	mA	V_{CE} = 80 V, I_B = 0
h_{FE}	DC Current Gain (Note 2)	5.0		5.0					V_{CE} = 2.0 V, I_C = 30 A
						5.0			V_{CE} = 2.0 V, I_C = 20 A
		15	60	15	60				V_{CE} = 2.0 V, I_C = 15 A
						15	60		V_{CE} = 2.0 V, I_C = 10 A
		40		40		40			V_{CE} = 2.0 V, I_C = 1.0 A
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		0.75		0.75		1.0	V	I_C = 10 A, I_B = 1.0 A
							1.5	V	I_C = 15 A, I_B = 1.5 A
			2.0		2.0			V	I_C = 20 A, I_B = 2.0 A
							2.0	V	I_C = 20 A, I_B = 4.0 A
			3.0		3.0			V	I_C = 30 A, I_B = 6.0 A

Additional Electrical Characteristics on following page.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5-PWR7.

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N5301 MIN.	2N5301 MAX.	2N5302 MIN.	2N5302 MAX.	2N5303 MIN.	2N5303 MAX.	UNITS	TEST CONDITIONS
$V_{BE(sat)}$	Base Saturation Voltage (Note 2)		1.7		1.7		1.7	V	I_C = 10 A, I_B = 1.0 A
			1.8		1.8		2.0	V	I_C = 15 A, I_B = 1.5 A
			2.5		2.5			V	I_C = 20 A, I_B = 2.0 A
							2.5	V	I_C = 20 A, I_B = 4.0 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.8		1.8			V	V_{CE} = 2.0 V, I_C = 15 A
							1.5	V	V_{CE} = 2.0 V, I_C = 10 A
			3.0		3.0			V	V_{CE} = 4.0 V, I_C = 30 A
							2.5	V	V_{CE} = 4.0 V, I_C = 20 A
f_T	Current Gain Bandwidth Product	2.0		2.0		2.0		MHz	V_{CE} = 10 V, I_C = 1.0 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	40		40		40			V_{CE} = 10 V, I_C = 1.0 A, f = 1.0 kHz
t_r	Rise Time		1.0		1.0		1.0	μs	V_{CC} = 30 V, I_C = 10 A, I_{B1} = I_{B2} = I_{B1} = 1.0 A
t_s	Storage Time		2.0		2.0		2.0	μs	V_{CC} = 30 V, I_C = 10 A, I_{B1} = I_{B2} = 1.0 A
t_f	Fall Time		1.0		1.0		1.0	μs	V_{CC} = 30 V, I_C = 10 A, I_{B1} = I_{B2} = 1.0 A

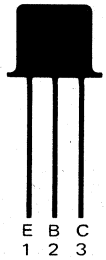
2N5320 • 2N5321 • 2N5322 • 2N5323

10 WATT NPN-PNP SILICON POWER

DIFFUSED SILICON PLANAR* TRANSISTORS

- $V_{CE(sat)}$ . . . −0.7 V
- h_{FE} . . . 40-250 @ V_{CE} = 4.0 V, I_C = 0.5 A
- **COMPLEMENTS . . . 2N5320, NPN (2N5322, PNP); 2N5321, NPN (2N5323, PNP)**

See TO5-2 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures					
Storage Temperature					−65° C to +200° C
Operating Junction Temperature					200° C
Lead Temperature (10 seconds)					230° C
Maximum Power Dissipation					
Total Dissipation at 25° C Case Temperature					10 W
Linear Derating Factor					0.057 W/° C
Maximum Voltages and Currents		**2N5320**	**2N5321**	**2N5322**	**2N5323**
V_{CBO}	Collector to Base Voltage	100 V	75 V	−100 V	−75 V
V_{EBO}	Emitter to Base Voltage	7.0 V	5.0 V	−7.0 V	−5.0 V
V_{CEO}	Collector to Emitter Voltage	75 V	50 V	−75 V	−50 V
I_C	Collector Current	2.0 A	2.0 A	2.0 A	2.0 A
I_B	Base Current	1.0 A	1.0 A	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25° C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5320 MIN.	2N5320 MAX.	2N5321 MIN.	2N5321 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current (Note 3)		5.0			mA	V_{CE} = 70 V, V_{EB} = 1.5 V, T_C = 150° C
					5.0	mA	V_{CE} = 45 V, V_{EB} = 1.5 V, T_C = 150° C
			0.1			mA	V_{CE} = 100 V, V_{EB} = 1.5 V
					0.1	mA	V_{CE} = 75 V, V_{EB} = 1.5 V
I_{EBO}	Emitter Cutoff Current		0.1			mA	V_{EB} = 7.0 V
					0.1	mA	V_{EB} = 5.0 V
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	75		50		V	I_B = 0, I_C = 100 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		0.5		0.8	V	I_B = 50 mA, I_C = 500 mA
h_{FE}	DC Current Gain (Note 2)	10					V_{CE} = 2.0 V, I_C = 1.0 A
		30	130	40	250		V_{CE} = 4.0 V, I_C = 0.5 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.1		1.4	V	I_C = 500 mA, V_{CE} = 4.0 V
t_{on}	Turn On Time (Note 3)		80		80	ns	I_C = 500 mA, I_{B1} = 50 mA
t_{off}	Turn Off Time (Note 3)		800		800	ns	I_C = 500 mA, I_{B1} = 50 mA, I_{B2} = −50 mA
h_{fe}	Small Signal Current Gain	5.0		5.0			V_{CE} = 4.0 V, I_C = 50 mA, f = 10 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ⩽ 10%.
3. Pulse Rep. Frequency = 1 kHz; pulse width = 20 μs.
4. Emitter diode is reversed biased.
5. For product family characteristic curves refer to Section 5 — PWR 2 for 2N5320 and 2N5321, PWR 12 for 2N5322 and 2N5323.

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N5322 MIN.	2N5322 MAX.	2N5323 MIN.	2N5323 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		5.0			mA	V_{CE} = –70 V, V_{EB} = –1.5 V, T_C = 150°C
					5.0	mA	V_{CE} = –45 V, V_{EB} = –1.5 V, T_C = 150°C
			0.1			mA	V_{CE} = –100 V, V_{EB} = –1.5 V
					0.1	mA	V_{CE} = –75 V, V_{EB} = –1.5 V
I_{EBO}	Emitter Cutoff Current		0.1			mA	V_{EB} = –7.0 V
					0.1	mA	V_{EB} = –5.0 V
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	–75		–50		V	I_B = 0, I_C = –100 mA
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		–0.7		–1.2	V	I_B = 50 mA, I_C = 500 mA
$V_{BE(ON)}$	Base to Emitter "ON" Voltage (Note 2)		–1.1		–1.4	V	I_C = 500 mA, V_{CE} = –4.0 V
h_{FE}	DC Current Gain (Note 2)	10					V_{CE} = –2.0 V, I_C = 1.0 A
		30	130	40	250		V_{CE} = –4.0 V, I_C = 500 mA
t_{on}	Turn On Time (Note 3)		100		100	ns	I_C = 500 mA, I_{B1} = –50 mA
t_{off}	Turn Off Time (Note 3)		1000		1000	ns	I_C = 500 mA, I_{B1} = –50 mA, I_{B2} = 50 mA
h_{fe}	Small Signal Current Gain	5.0		5.0			V_{CE} = 4.0 V, I_C = 50 mA, f = 10 MHz

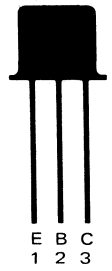
2N5336 • 2N5337 • 2N5338 • 2N5339

6 WATT NPN POWER

DIFFUSED SILICON PLANAR* TRANSISTORS

- **LV_{CEO} . . . 80 V AND 100 V (MIN)**
- **$V_{CE(sat)}$ . . . 1.2 V (MAX) @ 5.0 A**
- **P_D . . . 6.0 W @ T_C = 25°C**

See TO5-3 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C

Maximum Power Dissipation

Total Dissipation at ≤ 25°C Case Temperature (Note 3)	6.0 W

Maximum Voltages and Currents

		2N5336 2N5337	2N5338 2N5339
V_{CBO}	Collector to Base Voltage	80 V	100 V
V_{CEO}	Collector to Emitter Voltage	80 V	100 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current	5.0 A	5.0 A
I_B	Base Current	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5336 2N5337 MIN.	2N5336 2N5337 MAX.	2N5338 2N5339 MIN.	2N5338 2N5339 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		10			μA	V_{CE} = 75 V, V_{EB} = 1.5 V
			1.0			mA	V_{CE} = 75 V, V_{EB} = 1.5 V, T_C = 150°C
					10	μA	V_{CE} = 90 V, V_{EB} = 1.5 V
					1.0	mA	V_{CE} = 90 V, V_{EB} = 1.5 V, T_C = 150°C
I_{CBO}			10			μA	V_{CB} = 80 V, I_E = 0
					10	μA	V_{CB} = 100 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	μA	V_{EB} = 6.0 V, I_C = 0
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 2)	80		100		V	I_C = 50 mA, I_B = 0
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 2)		0.7		0.7	V	I_C = 2.0 A, I_B = 200 mA
			1.2		1.2	V	I_C = 5.0 A, I_B = 500 mA
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 2)		1.2		1.2	V	I_C = 2.0 A, I_B = 200 mA
			1.8		1.8	V	I_C = 5.0 A, I_B = 500 mA
t_d	Turn On Delay Time		100		100	ns	V_{CC} = 4.0 V, I_C = 2.0 A, I_{B1} = 200 mA
t_r	Turn On Rise Time		100		100	ns	V_{CC} = 40 V, I_C = 2.0 A, I_{B1} = 200 mA
t_s	Turn Off Storage Time		2.0		2.0	μs	V_{CC} = 40 V, I_C = 2.0 A, I_{B1} = I_{B2} = 200 mA
t_f	Turn Off Fall Time		200		200	ns	V_{CC} = 40 V, I_C = 2.0 A, I_{B1} = I_{B2} = 200 mA

SYMBOL	CHARACTERISTIC	2N5336 2N5338 MIN.	2N5336 2N5338 MAX.	2N5337 2N5339 MIN.	2N5337 2N5339 MAX.	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 2)	30		60		I_C = 500 mA, V_{CE} = 2.0 V
		30	120	60	240	I_C = 2.0 A, V_{CE} = 2.0 V
		20		40		I_C = 5.0 A, V_{CE} = 2.0 V

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5-PWR4.

2N5400 • 2N5401

PNP HIGH VOLTAGE SMALL SIGNAL GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . −120 V (MIN) (2N5400), −150 V (MIN) (2N5401)
- h_{FE} . . . 60-240 @ 10 mA (2N5401)
- $V_{CE(sat)}$ . . . −0.5 V (MAX) @ 50 mA
- COMPLEMENTS . . . 2N5550, MPS5551M

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

†**Maximum Temperatures**			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
†**Maximum Power Dissipation** (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature			0.625 W
at 25°C Case Temperature			1.0 W
Maximum Voltages and Current		**2N5400**	**2N5401**
V_{CBO}	Collector to Base Voltage	−130 V	−160 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	−120 V	−150 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5400 MIN.	2N5400 MAX.	2N5401 MIN.	2N5401 MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	−120		−150		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−130		−160		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = −100 V, I_E = 0
					50	nA	V_{CB} = −120 V, I_E = 0
			100			μA	V_{CB} = −100 V, I_E = 0, T_A = 100°C
					50	μA	V_{CB} = −120 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = −3.0 V, I_C = 0
h_{FE}	DC Pulse Current Gain (Note 5)	30		50			I_C = 1.0 mA, V_{CE} = −5.0 V
		40	180	60	240		I_C = 10 mA, V_{CE} = −5.0 V
		40		50			I_C = 50 mA, V_{CE} = −5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		−0.20		−0.20	V	I_C = 10 mA, I_B = 1.0 mA
			−0.5		−0.5	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		−1.0		−1.0	V	I_C = 10 mA, I_B = 1.0 mA
			−1.0		−1.0	V	I_C = 50 mA, I_B = 5.0 mA
f_T	Current Gain Bandwidth Product	100	400	100	300	MHz	I_C = 10 mA, V_{CE} = −10 V, f = 100 MHz
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	30	200	40	200		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
NF	Noise Figure		8.0		8.0	dB	I_C = 250 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, f = 10 Hz to 15.7 kHz

†Fairchild exceeds JEDEC registered value for this parameter.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5 — SS25.

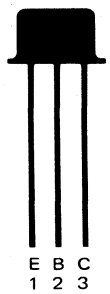
2N5455 • 2N5456

PNP HIGH SPEED SATURATED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- t_{on} . . . 20 ns (MAX) @ 300 mA
- t_{off} . . . 30 ns (MAX) @ 300 mA
- τ_s . . . 35 ns (MAX) @ 10 mA
- V_{CEO} . . . 15 V (MIN) (2N5455), 25 V (MIN) (2N5456)
- COMPLEMENTS . . . 2N3013, 2N3014

See TO18-2 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (60 seconds)			300°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Case Temperature			1.0 W
at 25°C Ambient Temperature			0.34 W
Maximum Voltages and Current		**2N5456**	**2N5455**
V_{CBO}	Collector to Base Voltage	−25 V	−15 V
V_{CES}	Collector to Emitter Voltage	−25 V	−15 V
V_{EBO}	Emitter to Base Voltage	−4.5 V	−4.5 V
V_{CEO}	Collector to Emitter Voltage (Notes 4 & 7)	−25 V	−15 V
I_C	DC Collector Current	300 mA	300 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5455 MIN.	2N5455 MAX.	2N5456 MIN.	2N5456 MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Cutoff Current		50			nA	V_{CE} = −10 V, V_{BE} = 0
					50	nA	V_{CE} = −15 V, V_{BE} = 0
			50			μA	V_{CE} = −10 V, V_{BE} = 0, T_A = 125°C
					50	μA	V_{CE} = −15 V, V_{BE} = 0, T_A = 125°C
I_{EBO}	Emitter Cutoff Current		100		100	μA	V_{EB} = −4.5 V, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−15		−25		V	I_E = 0, I_C = 100 μA
BV_{CES}	Collector to Emitter Breakdown Voltage	−15		−25		V	I_C = 100 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.5		−4.5		V	I_C = 0, I_E = 100 μA
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 6)	−15		−25		V	I_C = 10 mA
h_{FE}	DC Current Gain	20		20			V_{CE} = −0.4 V, I_C = 10 mA
	(Note 6)	30	120	30	120		V_{CE} = −0.4 V, I_C = 30 mA
		30		30			V_{CE} = −1.0 V, I_C = 100 mA
		25		25			V_{CE} = −1.0 V, I_C = 300 mA
		15		15			V_{CE} = −1.0 V, I_C = 100 mA, T_A = −55°C
$V_{CE(sat)}$	Collector to Emitter Saturation		−0.15		−0.15	V	I_C = 10 mA, I_B = 1.0 mA
	Voltage (Note 6)		−0.15		−0.15	V	I_C = 30 mA, I_B = 3.0 mA
			−0.23		−0.23	V	I_C = 100 mA, I_B = 10 mA
			−0.50		−0.55	V	I_C = 300 mA, I_B = 30 mA
V_{BE}	Base to Emitter Voltage		−0.85		−0.85	V	I_C = 10 mA, I_B = 1.0 mA
	(Note 6)	-0.70	−0.96	−0.70	−0.96	V	I_C = 30 mA, I_B = 3.0 mA
			−1.20		−1.20	V	I_C = 100 mA, I_B = 10 mA
			−1.60		−1.60	V	I_C = 300 mA, I_B = 30 mA
C_{eb}	Emitter to Base Capacitance (Note 5)		25		25	pF	I_C = 0, V_{EB} = −0.5 V, f = 1.0 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C, and junction to ambient thermal resistance of 515°C/W (derating factor of 1.94 mW/°C; junction to case thermal resistance of 175°C/W (derating factor of 5.7 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. C_{eb} and C_{cb} measurements employ a three terminal capacitance bridge incorporating a guard circuit. The terminal, for which the dc bias current is specified as zero, shall be connected to the guard terminal of the bridge. The case also shall be guarded.
6. Pulse Conditions: length = 300 μs; duty cycle = 1.0%.
7. Applicable 10 μA to 300 mA; pulse width ≤ 10 μs, duty cycle = 2.0%.
8. For product family characteristic curves, refer to Section 5-SS21.

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N5455 MIN.	2N5455 MAX.	2N5456 MIN.	2N5456 MAX.	UNITS	TEST CONDITIONS
C_{cb}	Collector to Base Capacitance (Note 5)		6.0		6.0	pF	$I_E = 0$, $V_{CB} = -10$ V, f = 1.0 MHz
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	4.5		4.5			$V_{CE} = -10$ V, $I_C = 30$ mA, f = 100 MHz
τ_s	Charge Storage Time Constant (see test circuit no. 384.)		35		35	ns	$I_C = 10$ mA, $I_{B1} = I_{B2} = 10$ mA
t_{on}	Turn On Time (see test circuit no. 470)		20		20	ns	$I_C = 300$ mA, $I_{B1} = 30$ mA
t_{off}	Turn Off Time (see test circuit no. 470)		30		30	ns	$I_C = 300$ mA, $I_{B1} = I_{B2} = 30$ mA

2N5457 • 2N5458 • 2N5459

N-CHANNEL DEPLETION MODE JUNCTION FIELD EFFECT

DIFFUSED SILICON PLANAR* TRANSISTORS

- y_{fs} . . . 1000 to 6000 μmhos
- I_{DSS} . . . 1.0 mA to 16 mA

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +150°C
Operating Junction Temperature	150°C

† **Maximum Power Dissipation** (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W

Maximum Voltages and Current

V_{DS}	Drain to Source Voltage	25 V
V_{DG}	Drain to Gate Voltage	25 V
$V_{GS(r)}$	Reverse Gate to Source Voltage	25 V
I_G	Gate Current	10 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5457 MIN.	2N5457 MAX.	2N5458 MIN.	2N5458 MAX.	2N5459 MIN.	2N5459 MAX.	UNITS	TEST CONDITIONS
BV_{GSS}	Gate to Source Breakdown Voltage	25		25		25		V	$I_G = -10\ \mu A$, $V_{DS} = 0$
I_{GSS}	Gate Reverse Current		1.0		1.0		1.0	nA	$V_{GS} = -15$ V, $V_{DS} = 0$
			200		200		200	nA	$V_{GS} = -15$ V, $V_{DS} = 0$, $T_A = 100°C$
$V_{GS(OFF)}$	Gate to Source Cutoff Voltage	0.5	6.0	1.0	7.0	2.0	8.0	V	$V_{DS} = 15$ V, $I_C = 10$ nA
I_{DSS}	Zero Gate Voltage Drain Current (Note 4)	1.0	5.0	2.0	9.0	4.0	16	mA	$V_{DS} = 15$ V, $V_{GS} = 0$
$\lvert y_{fs} \rvert$	Forward Transfer Admittance (Note 4)	1000	5000	1500	5500	2000	6000	μmhos	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 kHz
$\lvert y_{os} \rvert$	Output Admittance (Note 4)		50		50		50	μmhos	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 kHz
C_{iss}	Input Capacitance		7.0		7.0		7.0	pF	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 MHz
C_{rss}	Reverse Transfer Capacitance		3.0		3.0		3.0	pF	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 MHz
NF	Common Source Spot Noise Figure		3.0		3.0		3.0	dB	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 kHz, $y_G = 1.0$ μmho, $R_G = 1.0$ MΩ, BW = 1.0 Hz

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered value for this parameter.

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: pulse width ≤ 630 ms; duty cycle ≤ 10%.

2N5484 • 2N5485 • 2N5486

N-CHANNEL DEPLETION MODE JUNCTION FIELD EFFECT

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C**
- **G_{PS} . . . 18–30 dB @ 100 MHz, 10–20 dB @ 400 MHz (2N5485, 2N5486)**
- **NF . . . 2.0 dB (MAX) @ 100 MHz, 4.0 dB (MAX) @ 400 MHz, 2.5 dB (MAX) @ 1.0 kHz (2N5485, 2N5486)**

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

† Maximum Temperatures

Storage Temperature	−65°C to +150°C
Operating Junction Temperature	150°C

† Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W

Maximum Voltages and Currents

V_{DS}	Drain Gate Voltage	25 V
V_{GS}	Reverse Gate to Source Voltage	25 V
I_D	Drain Current	30 mA
$I_{G(f)}$	Forward Gate Current	10 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5484 MIN.	2N5484 MAX.	2N5485 MIN.	2N5485 MAX.	2N5486 MIN.	2N5486 MAX.	UNITS	TEST CONDITIONS
$V_{(BR)GSS}$	Gate to Source Breakdown Voltage	25		25		25		V	I_G = 1.0 μA, V_{DS} = 0
$V_{GS(OFF)}$	Gate to Source Cutoff Voltage	0.3	3.0	0.5	4.0	3.0	7.5	V	V_{DS} = 15 V, I_D = 10 nA
I_{GSS}	Gate Reverse Current		1.0		1.0		1.0	nA	V_{GS} = 20 V, V_{DS} = 0
			0.2		0.2		0.2	μA	V_{GS} = 20 V, V_{DS} = 0, T_A = 100°C
I_{DSS}	Zero Gate Voltage Drain Current	1.0	5.0	4.0	10	8.0	20	mA	V_{DS} = 15 V, V_{GS} = 0
$\lvert y_{fs} \rvert$	Forward Transmittance	3,000	6,000	3,500	7,000	4,000	8,000	μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz
Re (y_{fs})	Forward Transconductance	2,500						μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
				3,000		3,500		μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 400 MHz
$\lvert y_{os} \rvert$	Output Admittance		50		60		75	μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz
Re (y_{os})	Output Conductance		75					μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
					100		100	μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 400 MHz
Re (y_{is})	Input Conductance		100					μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
					1.0		1.0	mmhos	V_{DS} = 15 V, V_{GS} = 0, f = 400 MHz
C_{iss}	Input Capacitance		5.0		5.0		5.0	pF	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz
C_{rss}	Reverse Transfer Capacitance		1.0		1.0		1.0	pF	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz
C_{oss}	Output Capacitance		2.0		2.0		2.0	pF	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz
NF	Noise Figure		2.5		2.5		2.5	dB	V_{DS} = 15 V, V_{GS} = 0, R_G = 1.0 MΩ, f = 1.0 kHz
			3.0					dB	V_{DS} = 15 V, I_D = 1.0 mA, R_G = 1.0 kΩ, f = 100 MHz
					2.0		2.0	dB	V_{DS} = 15 V, I_D = 4.0 mA, R_G = 1.0 kΩ, f = 100 MHz
					4.0		4.0	dB	V_{DS} = 15 V, I_D = 4.0 mA, R_G = 1.0 kΩ, f = 400 MHz
		4.0 (TYP)						dB	V_{DS} = 15 V, I_D = 1.0 mA, R_G = 1.0 kΩ, f = 200 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.
†Fairchild exceeds JEDEC registered value.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N5484 MIN.	2N5484 MAX.	2N5485 MIN.	2N5485 MAX.	2N5486 MIN.	2N5486 MAX.	UNITS	TEST CONDITIONS
G_{PS}	Insertion Power Gain	16	25					dB	V_{DS} = 15 V, I_D = 1.0 mA, f = 100 MHz
				18	30	18	30	dB	V_{DS} = 15 V, I_D = 4.0 mA, f = 100 MHz
				10	20	10	20	dB	V_{DS} = 15 V, I_D = 4.0 mA, f = 400 MHz

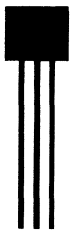
2N5550 • MPS5551M

NPN SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 160 V (MIN) (MPS5551M)
- h_{FE} . . . 80–250 @ 10 mA (MPS5551M)
- $V_{CE(sat)}$ . . . 0.2 V (MAX) @ 50 mA (MPS5551M)
- COMPLEMENTS . . . 2N5400, 2N5401

See TO92-1 Package Outline



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ABSOLUTE MAXIMUM RATINGS (Note 1)

† **Maximum Temperatures**			
Storage Temperature			−55°C to +150°C
Operating Junction Temperature			150°C
Lead Temperature (10 seconds)			260°C
† **Maximum Power Dissipation** (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature			0.625 W
at 25°C Case Temperature			1.0 W
Maximum Voltages and Current		**2N5550**	**MPS5551M**
V_{CBO}	Collector to Base Voltage	160 V	180 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	140 V	160 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V
I_C	Collector Current	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5550 MIN.	2N5550 MAX.	MPS5551M MIN.	MPS5551M MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage	140		160		V	I_C = 1.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	160		180		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = 100 V, I_E = 0
					50	nA	V_{CB} = 120 V, I_E = 0
			100			μA	V_{CB} = 100 V, I_E = 0, T_A = 100°C
					50	μA	V_{CB} = 120 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Pulse Current Gain (Note 5)	60		80			I_C = 1.0 mA, V_{CE} = 5.0 V
		60	250	80	250		I_C = 10 mA, V_{CE} = 5.0 V
		20		30			I_C = 50 mA, V_{CE} = 5.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.15		0.15	V	I_C = 10 mA, I_B = 1.0 mA
			0.25		0.20	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		1.0		1.0	V	I_C = 10 mA, I_B = 1.0 mA
			1.2		1.0	V	I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
C_{ib}	Input Capacitance		30		30	pF	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz
f_T	Current Gain Bandwidth Product	100	300	100	300	MHz	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
h_{fe}	Small Signal Current Gain	50	200	50	200		I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
NF	Noise Figure		10		8.0	dB	I_C = 250 μA, V_{CE} = 5.0 V, R_S = 1.0 kΩ, f = 10 Hz to 15.7 kHz

*Planar is a patented Fairchild process.
†Fairchild exceeds JEDEC registered values.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS16.

2N5668 • 2N5669 • 2N5670

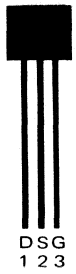
N-CHANNEL JUNCTION FIELD EFFECT

DIFFUSED SILICON PLANAR* TRANSISTORS

VHF AMPLIFIER AND MIXER

- P_D . . . 625 mW @ T_A = 25°C
- NF . . . 2.5 dB (MAX)
- C_{rss} . . . 1.0 pF (TYP)
- C_{iss} . . . 4.7 pF (TYP)

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +150°C
Operating Junction Temperature	150°C

† **Maximum Power Dissipation** (Notes 2 & 3)

Total Dissipation at 25°C Case Temperature	1.0 W
at 25°C Ambient Temperature	0.625 W

Maximum Voltages and Currents

V_{DS}	Drain to Source Voltage	25 V
V_{DG}	Drain Gate Voltage	25 V
V_{GSR}	Reverse Gate to Source Voltage	25 V
I_{GF}	Forward Gate Current	10 mA
I_D	Drain Current	20 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5668 MIN.	2N5668 MAX.	2N5669 MIN.	2N5669 MAX.	2N5670 MIN.	2N5670 MAX.	UNITS	TEST CONDITIONS
$V_{(BR)GSS}$	Gate Source Breakdown Voltage	25		25		25		V	I_G = 10 μA, V_{DS} = 0
$V_{GS(Off)}$	Gate Source Cutoff Voltage	0.2	4.0	1.0	6.0	2.0	8.0	V	I_{DS} = 15 V, I_D = 10 nA
I_{GSS}	Gate Reverse Current		2.0		2.0		2.0	nA	V_{GS} = −15 V, V_{DS} = 0
			2.0		2.0		2.0	μA	V_{GS} = −15 V, V_{DS} = 0, T_A = 100°C
I_{DSS}	Zero Gate Voltage Drain	1.0	5.0	4.0	10	8.0	20	nA	V_{DS} = 15 V, V_{GS} = 0
$\|y_{fs}\|$	Forward Transadmittance	1,500	6,500	2,000	6,500	3,000	7,500	μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz
$R_e(y_{fs})$	Forward Transconductance	1,000		1,600		2,500		μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
$\|y_{os}\|$	Output Admittance		20		50		75	μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz
$R_e(y_{os})$	Output Conductance		50		100		150	μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
$R_e(y_{is})$	Input Conductance		800		800		800	μmhos	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz
C_{iss}	Input Capacitance		7.0		7.0		7.0	pF	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz
C_{rss}	Reverse Transfer Capacitance		3.0		3.0		3.0	pF	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz
C_{oss}	Output Capacitance		4.0		4.0		4.0	pF	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz
NF	Common Source Noise (see test circuit no. 2010)		2.5		2.5		2.5	dB	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz, R_G = 1.0 kΩ
G_{ps}	Power Gain (see test circuit no. 2010)	16		16		16		dB	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz

*Planar is a patented Fairchild process.
†Fairchild exceeds JEDEC registered values.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 100 ms; duty cycle ≤ 10%.

2N5679 • 2N5680 • 2N5681 • 2N5682

1.0 AMP 10 WATT NPN-PNP COMPLEMENTARY POWER

DIFFUSED SILICON PLANAR* TRANSISTORS

- f_T . . . 30 MHz @ I_C = 100 mA
- $V_{CE(sat)}$ . . . 0.6 V @ I_C = 0.25 A
- COMPLEMENTS . . . 2N5679, PNP (2N5681, NPN); 2N5680, PNP (2N5682, NPN)

See TO5-2 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5679	2N5680	2N5681	2N5682
Maximum Temperatures					
Storage Temperature				−65°C to +200°C	
Operating Junction Temperature				200°C	
Lead Temperature (60 seconds)				230°C	
Maximum Power Dissipation					
Continuous Dissipation at 25°C Case Temperature				10 W	
Linear Derating Factor				0.057 W/°C	
Continuous Dissipation at 25°C Ambient Temperature				1.0 W	
Linear Derating Factor				0.0057 W/°C	
Maximum Voltages and Currents					
V_{CBO}	Collector to Base Voltage	−100 V	−120 V	100 V	120 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.0 V	4.0 V	4.0 V
V_{CEO}	Collector to Emitter Voltage	−100 V	−120 V	100 V	120 V
I_C	Collector Current	1.0 A	1.0 A	1.0 A	1.0 A
I_B	Base Current	0.5 A	0.5 A	0.5 A	0.5 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5679 MIN.	2N5679 MAX.	2N5680 MIN.	2N5680 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	−100		−120		V	I_C = 10 mA, I_B = 0
h_{FE}	DC Current Gain (Note 2)	5.0		5.0			I_C = 1.0 A, V_{CE} = −2.0 V
		40	150	40	150		I_C = 250 mA, V_{CE} = −2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		−2.0		−2.0	V	I_C = 1.0 A, I_B = 200 mA
			−1.0		−1.0	V	I_C = 500 mA, I_B = 50 mA
			−0.6		−0.6	V	I_C = 250 mA, I_B = 25 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		−1.0		−1.0	V	I_C = 250 mA, V_{CE} = −2.0 V
h_{fe}	High Frequency Current Gain	3.0		3.0			I_C = 100 mA, V_{CE} = −10 V, f = 10 MHz
C_{ob}	Common Base Output Capacitance		50		50	pF	V_{CB} = −20 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	40		40			V_{CE} = −1.5 V, I_C = 200 mA, f = 1.0 kHz
I_{CEX}	Collector Cutoff Current (Note 3)		1.0			mA	V_{CE} = −100 V, V_{EB} = −1.5 V, T_C = 150°C
					1.0	mA	V_{CE} = −120 V, V_{EB} = −1.5 V, T_C = 150°C
			1.0			μA	V_{CE} = −100 V, V_{EB} = −1.5 V
					1.0	μA	V_{CE} = −120 V, V_{EB} = −1.5 V
I_{CBO}	Collector Cutoff Current		1.0			μA	V_{CB} = −100 V, I_E = 0
					1.0	μA	V_{CB} = −120 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	μA	V_{EB} = −4.0 V, I_C = 0
I_{CEO}	Collector Cutoff Current		10			μA	V_{CE} = −70 V, I_B = 0
					10	μA	V_{CE} = −80 V, I_B = 0

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle = 2%.
3. Emitter diode is reversed biased.
4. For product family characteristic curves, refer to Section 5 — PWR 13 for 2N5679 and 2N5680, PWR 3 for 2N5681 and 2N5682.

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N5681 MIN.	2N5681 MAX.	2N5682 MIN.	2N5682 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current		1.0			mA	V_{CE} = 100 V, V_{EB} = 1.5 V, T_C = 150°C
					1.0	mA	V_{CE} = 120 V, V_{EB} = 1.5 V, T_C = 150°C
			1.0			μA	V_{CE} = 100 V, V_{EB} = 1.5 V
					1.0	μA	V_{CE} = 120 V, V_{EB} = 1.5 V
I_{CBO}	Collector Cutoff Current		1.0			μA	V_{CB} = 100 V, I_E = 0
					1.0	μA	V_{CB} = 120 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	μA	V_{EB} = 4.0 V, I_C = 0
I_{CEO}	Collector Cutoff Current		10			μA	V_{CE} = 70 V, I_B = 0
					10	μA	V_{CE} = 80 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	100		120		V	I_C = 10 mA, I_B = 0
h_{FE}	DC Current Gain (Note 2)	5.0		5.0			I_C = 1.0 A, V_{CE} = 2.0 V
		40	150	40	150		I_C = 250 mA, V_{CE} = 2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		2.0		2.0	V	I_C = 1.0 A, I_B = 200 mA
			1.0		1.0	V	I_C = 500 mA, I_B = 50 mA
			0.6		0.6	V	I_C = 250 mA, I_B = 25 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.0		1.0	V	I_C = 250 mA, V_{CE} = 2.0 V
h_{fe}	High Frequency Current Gain	3.0		3.0			I_C = 100 mA, V_{CE} = 10 V, f = 10 MHz
C_{ob}	Common Base Output Capacitance		50		50	pF	V_{CB} = 20 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	40		40			V_{CE} = 1.5 V, I_C = 200 mA, f = 1.0 kHz

4

2N5771 • 2N5910 • PN5910

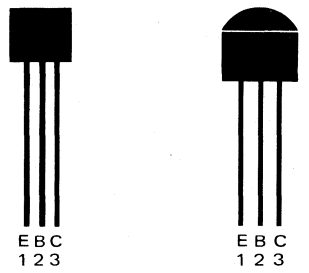
PNP ULTRA HIGH SPEED SATURATED LOGIC SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTOR

- P_D . . . 625 mW @ T_A = 25°C (2N5771, PN5910)
- t_{on} . . . 15 ns (MAX) @ 10 mA, t_{off} . . . 20 ns (MAX) @ 10 mA
- τ_s . . . 20 ns (MAX) @ 10 mA
- V_{CEO} . . . 15 V (MIN) (2N5771), 20 V (MIN) (2N/PN5910)
- COMPLEMENTS . . . 2N5769, 2N5772, (TO92); 2N3646, 2N4275 (TO18)

See Package Outlines

TO92-1 TO18-4



2N5771
PN5910

2N5910

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5910	2N5771, PN5910
Maximum Temperatures			
Storage Temperature		−55°C to +135°C	−55°C to +150°C
Operating Junction Temperature		135°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature		0.310 W	0.625 W
at 25°C Case Temperature			1.0 W
Maximum Voltages and Current		**2N/PN5910**	**2N5771**
V_{CBO}	Collector to Base Voltage		−15 V
V_{CEO}	Collector to Emitter Voltage	−20 V	−15 V
V_{EBO}	Emitter to Base Voltage	−4.5 V	−4.5 V
V_{CES}	Collector to Emitter Voltage	−20 V	
I_C	Collector Current	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN5910 MIN.	2N/PN5910 MAX.	2N5771 MIN.	2N5771 MAX.	UNITS	TEST CONDITIONS
I_{CES}	Collector Reverse Current		10			nA	V_{CE} = −10 V, V_{BE} = 0
					10	nA	V_{CE} = −8.0 V, V_{BE} = 0
			5.0			μA	V_{CE} = −10 V, V_{BE} = 0, T_A = 65°C
					5.0	μA	V_{CE} = −8.0 V, V_{BE} = 0, T_A = 125°C
I_{EBO}	Emitter Cutoff Current		100			μA	V_{EB} = −4.0 V, I_C = 0
					1.0	μA	V_{EB} = −4.5 V, I_C = 0
I_B	Base Current		10			nA	V_{CE} = −6.0 V, V_{EB} = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	−20		−15		V	I_C = 100 μA, V_{BE} = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	−20		−15		V	I_C = 3.0 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−20		−15		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.5		−4.5		V	I_E = 100 μA, I_C = 0
h_{FE}	DC Current Gain (Note 5)	15		35			V_{CE} = −0.5 V, I_C = 1.0 mA
		30	120	50	120		V_{CE} = −0.3 V, I_C = 10 mA
		30		40			V_{CE} = −1.0 V, I_C = 50 mA
				20			I_C = 10 mA, V_{CE} = −0.3 V, T_A = −55°C
$V_{CE(sat)}$	Collector Emitter Saturation Voltage (Note 5)		−0.15		−0.18	V	I_C = 10 mA, I_B = 1.0 mA
					−0.15	V	I_C = 1.0 mA, I_B = 0.1 mA
			−0.5		−0.6	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)				−0.8	V	I_C = 1.0 mA, I_B = 0.1 mA
		−0.75	−0.95	−0.8	−0.95	V	I_C = 10 mA, I_B = 1.0 mA
			−1.5		−1.5	V	I_C = 50 mA, I_B = 5.0 mA

Additional Electrical Characteristics on following page.

NOTES:

*Planar is a patented Fairchild process.

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for 2N5771 and PN5910. These ratings give a maximum junction temperature of 135°C and junction to ambient thermal resistance of 355°C/W (derating factor of 2.82 MW/°C), for 2N5910.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5 - SS31.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N/PN5910 MIN.	2N/PN5910 MAX.	2N5771 MIN.	2N5771 MAX.	UNITS	TEST CONDITIONS
C_{eb}	Emitter to Base Capacitance		3.5		3.5	pF	$I_C = 0$, $V_{EB} = -0.5$ V, f = 140 kHz
C_{cb}	Collector to Base Capacitance		3.0		3.0	pF	$I_E = 0$, $V_{CB} = -5.0$ V, f = 140 kHz
h_{fe}	High Frequency Current Gain	7.0		8.5			I_C = 10 mA, $V_{CE} = -10$ V, f = 100 MHz
t_{on}	Turn On Time (see test circuit no. 348)		15		15	ns	I_C = 10 mA, I_{B1} = 1.0 mA
t_{off}	Turn Off Time (see test circuit no. 348)		20		20	ns	I_C = 10 mA, $I_{B1} = I_{B2}$ = 1.0 mA
τ_s	Charge Storage Time (see test circuit no. 234)		20		20	ns	I_C = 10 mA, $I_{B1}, \simeq I_{B2} \simeq$ 10 mA
I_{CBO}	Collector to Base Cutoff Current				10	ns	$V_{CB} = -8.0$ V, $I_C = 0$

2N5830 • 2N5831 • 2N5832 • 2N5833

NPN SMALL SIGNAL HIGH VOLTAGE GENERAL PURPOSE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- V_{CEO} . . . 100 V (MIN) (2N5830), 140 V (MIN) (2N5831/2), 180 V (MIN) (2N5833)
- h_{FE} . . . 80 (MIN) (2N5830/1), 175 (MIN) (2N5832), 50 (MIN) (2N5833)
- C_{cb} . . . 4.0 pF (MAX)

See TO92-1 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−55°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	260°C

Maximum Power Dissipation (Notes 2 & 3)

Total Dissipation at 25°C Ambient Temperature	0.625 W
at 25°C Case Temperature	1.0 W

Maximum Voltages and Current		**2N5830**	**2N5831, 2N5832**	**2N5833**
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	6.0 V
V_{CBO}	Collector to Base Voltage	120 V	160 V	200 V
V_{CEO}	Collector to Emitter Voltage	100 V	140 V	180 V
I_C	Collector Current	600 mA	600 mA	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5830 MIN.	2N5830 MAX.	2N5831 MIN.	2N5831 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		50			nA	V_{CB} = 100 V, I_E = 0
					50	nA	V_{CB} = 120 V, I_E = 0
			25			μA	V_{CB} = 100 V, I_E = 0, T_A = 100°C
					25	μA	V_{CB} = 120 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = 4.0 V, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	120		160		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		V	I_E = 10 μA, I_C = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage	100		140		V	I_C = 1.0 mA, I_B = 0
h_{FE}	DC Current Gain	60		60			V_{CE} = 5.0 V, I_C = 1.0 mA
	(Note 4)	80	500	80	250		V_{CE} = 5.0 V, I_C = 10 mA
		80		80			V_{CE} = 5.0 V, I_C = 50 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.8		0.8	V	I_C = 1.0 mA, V_{CE} = 5.0 V
$V_{BE(sat)}$	Base to Emitter Saturation		0.8		0.8	V	I_C = 1.0 mA, I_B = 0.1 mA
	Voltage (Note 4)		1.0		1.0	V	I_C = 10 mA, I_B = 1.0 mA
			1.0		1.0	V	I_C = 50 mA, I_B = 5.0 mA
$V_{CE(sat)}$	Collector to Emitter		0.15		0.15	V	I_C = 1.0 mA, I_B = 0.1 mA
	Saturation Voltage (Note 4)		0.20		0.20	V	I_C = 10 mA, I_B = 1.0 mA
			0.25		0.25	V	I_C = 50 mA, I_B = 5.0 mA
h_{ie}	Input Resistance		6.0		6.0	kΩ	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{oe}	Output Conductance		40		40	μmho	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	60		60			I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
C_{cb}	Collector to Base Capacitance		4.0		4.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
$\|h_{fe}\|$	Magnitude of Common Emitter High Frequency Current Gain	1.0	5.0	1.0	5.0		I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temeperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Pulse conditions: length ≤ 300 μs; duty cycle ≤ 1%.
5. For additional product family characteristic curves, refer to Section 5-SS16.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N5832 MIN.	2N5832 MAX.	2N5833 MIN.	2N5833 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		50			nA	V_{CB} = 120 V, I_E = 0
					10	nA	V_{CB} = 160 V, I_E = 0
			25			μA	V_{CB} = 120 V, I_E = 0, T_A = 100°C
					25	μA	V_{CB} = 160 V, I_E = 0, T_A = 100°C
I_{EBO}	Emitter Cutoff Current		50			nA	V_{EB} = 4.0 V, I_C = 0
					50	nA	V_{EB} = 5.0 V, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	160		200		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		6.0		V	I_E = 10 μA, I_C = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage	140		180		V	I_C = 1.0 mA, I_B = 0
h_{FE}	DC Current Gain (Note 4)	125		50			V_{CE} = 5.0 V, I_C = 1.0 mA
		175	500	50	250		V_{CE} = 5.0 V, I_C = 10 mA
		150		50			V_{CE} = 5.0 V, I_C = 50 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.8		0.8	V	I_C = 1.0 mA, V_{CE} = 5.0 V
$V_{BE(sat)}$	Base to Emitter Saturation		0.8		0.8	V	I_C = 1.0 mA, I_B = 0.1 mA
	Voltage (Note 4)		1.0		1.0	V	I_C = 10 mA, I_B = 1.0 mA
			1.0		1.0	V	I_C = 50 mA, I_B = 5.0 mA
$V_{CE(sat)}$	Collector to Emitter Saturation		0.15		0.15	V	I_C = 1.0 mA, I_B = 0.1 mA
	Voltage (Note 4)		0.20		0.20	V	I_C = 10 mA, I_B = 1.0 mA
			0.25		0.25	V	I_C = 50 mA, I_B = 5.0 mA
h_{ie}	Input Resistance		6.0		6.0	kΩ	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{oe}	Output Conductance		40		40	μmho	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	125		50			I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
C_{cb}	Collector to Base Capacitance		4.0		4.0	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
$\|h_{fe}\|$	Magnitude of Common Emitter High Frequency Current Gain	1.0	5.0	1.0	5.0		I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz

4

2N5845 • 2N5845A

NPN SMALL SIGNAL HIGH SPEED HIGH CURRENT SATURATED SWITCHES

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- t_{on} . . . 30 ns (MAX) @ 500 mA (2N5845A)
- t_{off} . . . 50 ns (MAX) @ 500 mA (2N5845A)
- V_{CEO} . . . 40 V (MIN)
- h_{FE} . . . 35 – 150 @ 500 mA, 1.0 V (2N5845A)
  . . . 50 – 200 @ 100 mA, 1.0 V (2N5845A)
- $V_{CE(sat)}$ . . . 0.5 V (MAX) @ 500 mA (2N5845A)

See TO92-1 Package Outline

E B C
1 2 3

ABSOLUTE MAXIMUM RATINGS (Note 1)

† Maximum Temperatures		
Storage Temperature		−55°C to +150°C
Operating Junction Temperature		150°C
Lead Temperature (10 seconds)		260°C
† Maximum Power Dissipation		
Total Dissipation at 25°C Case Temperature		1.5 W
at 25°C Ambient Temperature		0.625 W
Maximum Voltages and Current		
V_{CBO}	Collector to Base Voltage	50 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	40 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	600 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5845 MIN.	2N5845 MAX.	2N5845A MIN.	2N5845A MAX.	UNITS	TEST CONDITIONS
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	40		40		V	I_C = 10 mA, I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	50		50		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		500		500	nA	V_{CB} = 40 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		50		50	nA	V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 5)	50		50			I_C = 10 mA, V_{CE} = 1.0 V
		50	200	50	200		I_C = 100 mA, V_{CE} = 1.0 V
		25	150	35	150		I_C = 500 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.25		0.25	V	I_C = 100 mA, I_B = 10 mA
			0.6		0.5	V	I_C = 500 mA, I_B = 50 mA
$V_{BE(sat)}$	Base Saturation Voltage (Note 5)		0.85		0.85	V	I_C = 100 mA, I_B = 10 mA
		0.8	1.1	0.8	1.1	V	I_C = 500 mA, I_B = 50 mA
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	2.0		2.5			I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		9.0		9.0	pF	V_{CB} = 10 V, I_E = 0, f = 100 kHz
C_{eb}	Emitter to Base Capacitance		70		70	pF	V_{EB} = 0.5 V, I_C = 0, f = 100 kHz
t_{on}	Turn On Time (see test circuit no. 579)		40		30	ns	I_C = 500 mA, I_{B1} ≈ 50 mA, V_{CC} = 40 V
t_d	Delay Time (see test circuit no. 579)		17		15	ns	I_C = 500 mA, I_{B1} ≈ 50 mA
t_r	Rise Time (see test circuit no. 579)		28		25	ns	I_C = 500 mA, I_{B1} ≈ 50 mA
t_{off}	Turn Off Time (see test circuit no. 579)		60		50	ns	I_C = 500 mA, I_{B1} = I_{B2} ≈ 50 mA, V_{CC} = 40 V
t_s	Storage Time (see test circuit no. 579)		40		38	ns	I_C = 500 mA, I_{B1} ≈ I_{B2} ≈ 50 mA
t_f	Fall Time (see test circuit no. 579)		30		27	ns	I_C = 500 mA, I_{B1} ≈ I_{B2} ≈ 50 mA

*Planar is a patented Fairchild process.
†Fairchild exceeds the JEDEC registered values.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 83°C/W (derating factor of 12 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 2%.
6. For product family characteristic curves, refer to Section 5-SS13.

2N/PN5855 • 2N/PN5856 • 2N/PN5857 • 2N/PN5858

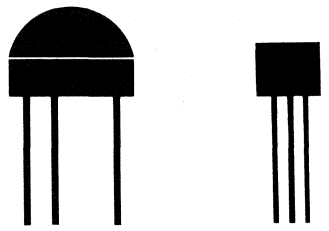
PNP-NPN SMALL SIGNAL COMPLEMENTARY GENERAL PURPOSE

DIFFUSED SILICON PLANAR*EPITAXIAL TRANSISTORS

- **P_D . . . 625 mW @ T_A = 25°C (FOR PN SERIES)**
- **V_{CEO} . . . 60 V AND 80 V (MIN)**
- **h_{FE} . . . 50 (MIN) FROM 10 mA TO 500 mA**
- **2N/PN5855, 2N/PN5857 (PNP); 2N/PN5856, 2N/PN5858 (NPN)**
- **COMPLEMENTS . . . SE6020, SE6021 (TO5), PE6020, PE6021 (TO92)**

See Package Outlines

TO5-4 **TO92-1**



2N5855/6 2N5857/8 **PN5856/6 PN5857/8**

ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5855/6/7/8	PN5855/6/7/8
Maximum Temperatures			
Storage Temperature		−55°C to +135°C	−55°C to +150°C
Operating Junction Temperature		135°C	150°C
Lead Temperature (10 seconds)		260°C	260°C
Maximum Power Dissipation (Notes 2 & 3)			
Total Dissipation at 25°C Ambient Temperature		0.750 W	0.625 W
Maximum Voltages and Current (Reverse Voltage Polarity for PNP)		**2N/PN5855 2N/PN5856**	**2N/PN5857 2N/PN5858**
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
V_{CBO}	Collector to Base Voltage	60 V	80 V
V_{CEO}	Collector to Emitter Voltage	60 V	80 V
I_C	Collector Current	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N/PN5855 2N/PN5856 MIN.	2N/PN5855 2N/PN5856 MAX.	2N/PN5857 2N/PN5858 MIN.	2N/PN5857 2N/PN5858 MAX.	UNITS	TEST CONDITIONS (Reverse Voltage Polarity for PNP)
I_{CBO}	Collector Cutoff Current		100			nA	V_{CB} = 40 V, I_E = 0
					100	nA	V_{CB} = 60 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = 4.0 V, I_C = 0
h_{FE}	DC Current Gain (Note 4)	50		50			V_{CE} = 10 V, I_C = 10 mA
		50	300	50	300		V_{CE} = 10 V, I_C = 150 mA
		50		50			V_{CE} = 10 V, I_C = 500 mA
		15		15			V_{CE} = 10 V, I_C = 1.0 A
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		1.3		1.3	V	I_C = 150 mA, I_B = 15 mA
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		0.4		0.4	V	I_C = 150 mA, I_B = 15 mA
BV_{CBO}	Collector to Base Breakdown Voltage	60		80		V	I_E = 0, I_C = 100 μA
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		V	I_C = 0, I_E = 10 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	60		80		V	I_C = 10 mA, I_B = 0
h_{fe}	High Frequency Current Gain	1.0		1.0			I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Output Capacitance		15		15	pF	I_E = 0, V_{CB} = 10 V, f = 100 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C) for PN5855, PN5856, PN5857 and PN5858. These ratings give a maximum junction temperature of 135°C and junction to ambient thermal resistance of 150°C/W (derating factor of 6.8 mW/°C) for 2N5855, 2N5856, 2N5857 and 2N5858.
4. Pulse conditions: length = 300 μs; duty cycle = 1%.
5. For product family characteristic curves, refer to Section 5-SS24 for 2N/PN5855/57 and SS17 for 2N/PN5856/58.

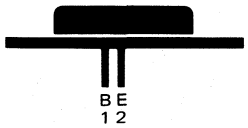
2N5871 • 2N5872

100 WATT PNP SILICON POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . 1.0V @ I_C = 4.0 A
- I_{CEX} . . . 0.25 mA (MAX)
- h_{FE} . . . 20-100 @ I_C = 2.5 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to + 200°C
Operating Junction Temperature			200°C
Lead Temperature (10 seconds)			250°C
Maximum Power Dissipation (Note 2)			
Total Dissipation at 25°C Case Temperature			115 W
Linear Derating Factor			0.658 W/°C
Maximum Voltages and Currents		**2N5871**	**2N5872**
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{CEO}	Collector to Emitter Voltage	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current (Continuous)	7.0 A	7.0 A
I_C	Collector Current (Peak)	15 A	15 A
I_B	Base Current (Continuous)	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5871 MIN.	2N5871 MAX.	2N5872 MIN.	2N5872 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	−60		−80		V	I_B = 0, I_C = 100 mA
h_{FE}	DC Current Gain (Note 4)	4.0		4.0			I_C = 7.0 A, V_{CE} = −4.0 V
		20	100	20	100		I_C = 2.5 A, V_{CE} = −4.0 V
		35		35			I_C = 500 mA, V_{CE} = −4.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		−1.0		−1.0	V	I_C = 4.0 A, I_B = 0.4 A
			−2.0		−2.0	V	I_C = 7.0 A, I_B = 1.75 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 4)		−1.5		−1.5	V	I_C = 2.5 A, V_{CE} = −4.0 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		−2.5		−2.5	V	I_C = 7.0 A, I_B = 1.75 A
I_{CEX}	Collector Cutoff Current (Note 3)		0.25			mA	V_{CE} = −60 V, V_{EB} = −1.5 V
					0.25	mA	V_{CE} = −80 V, V_{EB} = −1.5 V
			2.0			mA	V_{CE} = −60 V, V_{EB} = −1.5 V, T_C = 150°C
					2.0	mA	V_{CE} = −80 V, V_{EB} = −1.5 V, T_C = 150°C
I_{CBO}	Collector Cutoff Current		0.25			mA	V_{CB} = −60 V, I_E = 0
					0.25	mA	V_{CB} = −80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = 5.0 V
I_{CEO}	Collector Cutoff Current		0.5			mA	I_B = 0, V_{CE} = −30 V
					0.5	mA	I_B = 0, V_{CE} = −40 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = −10 V, I_C = 0.25 A, f = 1.0 MHz
C_{ob}	Output Capacitance		300		300	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	20		20			V_{CE} = −4.0 V, I_C = 500 mA, f = 1.0 kHz
t_r	Rise Time		0.7		0.7	μs	V_{CC} = −30 V, I_C = 2.5 A, I_{B1} = 0.25 A
t_s	Storage Time		1.0		1.0	μs	V_{CC} = −30 V, I_C = 2.5 A, I_{B1} = I_{B2} = 0.25 A
t_f	Fall Time		0.8		0.8	μs	V_{CC} = −30 V, I_C = 2.5 A, I_{B1} = I_{B2} = 0.25 A

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. Emitter diode is reversed biased.
4. Pulse conditions: length = 300 μs; duty cycle ⩽ 10%.
5. For product family characteristic curves, refer to Section 5 — PWR 15.

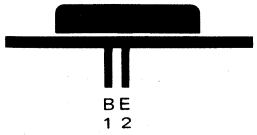
2N5873 • 2N5874

100 WATT NPN SILICON POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . 1.0 V @ I_C = 4.0 A
- I_{CEX} . . . 0.25 mA
- h_{FE} . . . 20-100 @ I_C = 2.5 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to +200°C
Operating Junction Temperature			200°C
Lead Temperature (10 seconds)			250°C
Maximum Power Dissipation			
Total Dissipation at 25°C Case Temperature			115 W
Linear Derating Factor			0.658 W/°C
Maximum Voltages and Currents		**2N5873**	**2N5874**
V_{CBO}	Collector to Base Voltage	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
V_{CEO}	Collector to Emitter Voltage	60 V	80 V
I_C	Collector Current (Continuous)	7.0 A	7.0 A
I_C	Collector Current (Peak)	15 A	15 A
I_B	Base Current	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5873 MIN.	2N5873 MAX.	2N5874 MIN.	2N5874 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	60		80		V	I_B = 0, I_C = 100 mA
h_{FE}	DC Current Gain (Note 2)	4.0		4.0			I_C = 7.0 A, V_{CE} = 4.0 V
		20	100	20	100		I_C = 2.5 A, V_{CE} = 4.0 V
		35		35			I_C = 500 mA, V_{CE} = 4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		1.0		1.0	V	I_C = 4.0 A, I_B = 0.4 A
			2.0		2.0	V	I_C = 7.0 A, I_B = 1.75 A
$V_{BE(sat)}$	Base Saturation Voltage (Note 2)		2.5		2.5	V	I_C = 7.0 A, I_B = 1.75 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.5		1.5	V	I_C = 2.5 A, V_{CE} = 4.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = 10 V, I_C = 0.25 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	20		20			V_{CE} = 4.0 V, I_C = 500 mA, f = 1.0 kHz
I_{CEX}	Collector Cutoff Current (Note 3)		2.0			mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150°C
					2.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150°C
			0.25			mA	V_{CE} = 60 V, V_{EB} = 1.5 V
					0.25	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
I_{CBO}	Collector Cutoff Current		0.25			mA	V_{CB} = 60 V, I_E = 0
					0.25	mA	V_{CB} = 80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = 5.0 V
I_{CEO}	Collector Cutoff Current		0.5			mA	I_B = 0, V_{CE} = 30 V
					0.5	mA	I_B = 0, V_{CE} = 40 V
C_{ob}	Output Capacitance		250		250	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
t_r	Rise Time		0.7		0.7	μs	V_{CC} = 30 V, I_C = 2.5 A, I_{B1} = 0.25 A
t_s	Storage Time		1.0		1.0	μs	V_{CC} = 30 V, I_C = 2.5 A, I_{B1} = I_{B2} = 0.25 A
t_f	Fall Time		0.8		0.8	μs	V_{CC} = 30 V, I_C = 2.5 A, I_{B1} = I_{B2} = 0.25 A

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ≤ 10%.
3. Emitter diode is reverse biased.
4. For product family characteristic curves, refer to Section 5 — PWR 6.

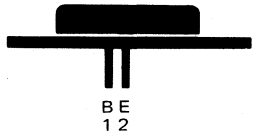
2N5875 • 2N5876

150 WATT PNP POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . −1.0V (MAX) @ I_C = 5.0 A
- I_{CEX} . . . 0.5 mA (MAX)
- h_{FE} . . . 20-100 @ I_C = 4.0 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

		2N5875	2N5876
Maximum Temperatures			
Storage Temperatures		−65° C to + 200° C	
Operating Junction Temperature		200° C	
Lead Temperature (10 seconds)		250° C	
Maximum Power Dissipation (Note 2)			
Total Dissipation at 25° C Case Temperature		150 W	
Linear Derating Factor		0.857 W/° C	
Maximum Voltages and Currents		**2N5875**	**2N5876**
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{CEO}	Collector to Emitter Voltage	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current (Continuous)	10 A	10 A
I_C	Collector Current (Peak)	20 A	20 A
I_B	Base Current (Continuous)	4.0 A	4.0 A

ELECTRICAL CHARACTERISTICS (25° C Case Temperature unless otherwise noted.)

SYMBOL	CHARACTERISTIC	2N5875 MIN.	2N5875 MAX.	2N5876 MIN.	2N5876 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current (Note 3)		0.5			mA	V_{CE} = −60 V, V_{EB} = −1.5 V
					0.5	mA	V_{CE} = −80 V, V_{EB} = −1.5 V
			5.0			mA	V_{CE} = −60 V, V_{EB} = −1.5 V, T_C = 150° C
					5.0	mA	V_{CE} = −80 V, V_{EB} = −1.5 V, T_C = 150° C
I_{CBO}	Collector Cutoff Current		0.5			mA	V_{CB} = −60 V, I_E = 0
					0.5	mA	V_{CB} = −80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = −5.0 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	−60		−80		V	I_B = 0, I_C = 200 mA
I_{CEO}	Collector Cutoff Current		1.0			mA	I_B = 0, V_{CE} = −30 V
					1.0	mA	I_B = 0, V_{CE} = −40 V
h_{FE}	DC Current Gain (Note 4)	4.0		4.0			I_C = 10 A, V_{CE} = −4.0 V
		20	100	20	100		I_C = 4.0 A, V_{CE} = −4.0 V
		35		35			I_C = 1.0 A, V_{CE} = −4.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		−1.0		−1.0	V	I_C = 5.0 A, I_B = 0.5 A
			−3.0		−3.0	V	I_C = 10 A, I_B = 2.5 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 4)		−1.5		−1.5	V	I_C = 4.0 A, V_{CE} = −4.0 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		−2.5		−2.5	V	I_C = 10 A, I_B = 2.5 A
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = −10 V, I_C = 0.5 A, f = 1.0 MHz
C_{ob}	Output Capacitance		500		500	μF	V_{CB} = −10 V, f = 1.0 MHz, I_E = 0
h_{fe}	Small Signal Current Gain	20		20			V_{CE} = −4.0 V, I_C = 1.0 A, f = 1.0 kHz
t_r	Rise Time		0.7		0.7	μs	V_{CC} = −30 V, I_C = 4.0 A, I_{B1} = 0.4 A
t_s	Storage Time		1.0		1.0	μs	V_{CC} = −30 V, I_C = 4.0 A, I_{B1} = I_{B2} = 0.4 A
t_f	Fall Time		0.8		0.8	μs	V_{CC} = −30 V, I_C = 4.0 A, I_{B1} = I_{B2} = 0.4 A

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. Emitter diode is reverse biased.
4. Pulse conditions: length = 300 μs; duty cycle ≤ 10%.
5. For product family characteristic curves, refer to Section 5 — PWR 15.

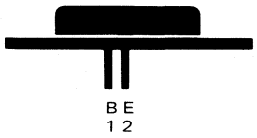
2N5877 • 2N5878

150 WATT NPN SILICON POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . 1.0V (MAX) @ I_C = 5.0 A
- I_{CEX} . . . 0.5 mA (MAX)
- h_{FE} . . . 20-100 @ I_C = 4.0 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65°C to 200°C
Operating Junction Temperature			200°C
Lead Temperature, (10 seconds)			250°C
Maximum Power Dissipation			
Total Dissipation at 25°C Case Temperature			150 W
Linear Derating Factor			0.857 W/°C
Maximum Voltage and Currents		**2N5877**	**2N5878**
V_{CBO}	Collector to Base Voltage	60 V	80 V
V_{CEO}	Collector to Emitter Voltage	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
I_C	Collector Current (Continuous)	10 A	10 A
I_C	Collector Current (Peak)	20 A	20 A
I_B	Base Current	4.0 A	4.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted.)

SYMBOL	CHARACTERISTIC	2N5877 MIN.	2N5877 MAX.	2N5878 MIN.	2N5878 MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		1.0		1.0	V	I_C = 5.0 A, I_B = 0.5 A
			3.0		3.0	V	I_C = 10 A, I_B = 2.5 A
$V_{BE(sat)}$	Base Saturation Voltage (Note 2)		2.5		2.5	V	I_C = 10 A, I_B = 2.5 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.5		1.5	V	I_C = 4.0 A, V_{CE} = 4.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = 10 V, I_C = 0.5 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	20		20			V_{CE} = 4.0 V, I_C = 1.0 A, f = 1.0 kHz
C_{ob}	Output Capacitance		300		300	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
t_r	Rise Time		0.7		0.7	μs	V_{CC} = 30 V, I_C = 4.0 A, I_{B1} = 0.4 A
t_s	Storage Time		1.0		1.0	μs	V_{CC} = 30 V, I_C = 4.0 A, I_{B1} = I_{B2} = 0.4 A
t_f	Fall Time		0.8		0.8	μs	V_{CC} = 30 V, I_C = 4.0 A, I_{B1} = I_{B2} = 0.4 A
I_{CEX}	Collector Cutoff Current (Note 3)		5.0			mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150°C
					5.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150°C
			0.5			mA	V_{CE} = 60 V, V_{EB} = 1.5 V
					0.5	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = 5.0 V
I_{CBO}	Collector Cutoff Current		0.5			mA	V_{CB} = 60 V, I_E = 0
					0.5	mA	V_{CB} = 80 V, I_E = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	60		80		V	I_B = 0, I_C = 200 mA
I_{CEO}	Collector Cutoff Current		1.0			mA	I_B = 0, V_{CE} = 30 V
					1.0	mA	I_B = 0, V_{CE} = 40 V
h_{FE}	DC Current Gain (Note 2)	4.0		4.0			I_C = 10 A, V_{CE} = 4.0 V
		20	100	20	100		I_C = 4.0 A, V_{CE} = 4.0 V
		35		35			I_C = 1.0 A, V_{CE} = 4.0 V

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ≤ 10%.
3. Emitter diode is reverse biased.
4. For product family characteristic curves, refer to Section 5 — PWR 6.

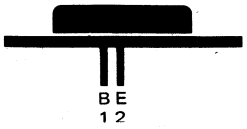
2N5879 • 2N5880

160 WATT PNP SILICON POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . −1.0 V (MAX) @ I_C = 7.0 A
- I_{CEX} . . . 0.5 mA (MAX)
- h_{FE} . . . 20-100 @ I_C = 6.0 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65° C to +200° C
Operating Junction Temperature			200° C
Lead Temperature (10 seconds)			250° C
Maximum Power Dissipation (Note 2)			
Total Dissipation at 25° C Case Temperature			160 W
Linear Derating Factor			0.915 W/° C
Maximum Voltages and Currents		**2N5879**	**2N5880**
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{CEO}	Collector to Emitter Voltage	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current (Continuous)	15 A	15 A
I_C	Collector Current (Peak)	30 A	30 A
I_B	Base Current (Continuous)	5.0 A	5.0 A

ELECTRICAL CHARACTERISTICS (25° C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5879 MIN.	2N5879 MAX.	2N5880 MIN.	2N5880 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	−60		−80		V	I_B = 0, I_C = 200 mA
h_{FE}	DC Current Gain (Note 4)	4.0		4.0			I_C = 15 A, V_{CE} = −4.0 V
		20	100	20	100		I_C = 6.0 A, V_{CE} = −4.0 V
		35		35			I_C = 2.0 A, V_{CE} = −4.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		−1.0		−1.0	V	I_C = 7.0 A, I_B = 0.7 A
			−4.0		−4.0	V	I_C = 15 A, I_B = 3.75 A
$V_{BE(ON)}$	Base to Emitter Voltage (Note 4)		−1.5		−1.5	V	I_C = 6.0 A, V_{CE} = −4.0 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		−2.5		−2.5	V	I_C = 15 A, I_B = 3.75 A
h_{fe}	Small Signal Current Gain	20		20			V_{CE} = −4.0 V, I_C = 2.0 A, f = 1.0 kHz
I_{CEX}	Collector Cutoff Current (Note 3)		5.0			mA	V_{CE} = 60 V, V_{EB} = −1.5 V, T_C = 150° C
					5.0	mA	V_{CE} = −80 V, V_{EB} = −1.5 V, T_C = 150° C
			0.5			mA	V_{CE} = −60 V, V_{EB} = −1.5 V
					0.5	mA	V_{CE} = −80 V, V_{EB} = −1.5 V
I_{CBO}	Collector Cutoff Current		0.5			mA	V_{CB} = −60 V, I_E = 0
					0.5	mA	V_{CB} = −80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = −5.0 V
I_{CEO}	Collector Cutoff Current		1.0			mA	I_B = 0, V_{CE} = −30 V
					1.0	mA	I_B = 0, V_{CE} = −40 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = −10 V, I_C = 1.0 A, f = 1.0 MHz
C_{ob}	Output Capacitance		600		600	pF	V_{CB} = −10 V, I_E = 0, f = 0.1 MHz
t_r	Rise Time		0.7		0.7	μs	V_{CC} = 30 V, I_C = 6.0 A, I_{B1} = 0.6 A
t_s	Storage Time		1.0		1.0	μs	V_{CC} = 30 V, I_C = 6.0 A, I_{B1} = I_{B2} = 0.6 A
t_f	Fall Time		0.8		0.8	μs	V_{CC} = 30 V, I_C = 6.0 A, I_{B1} = I_{B2} = 0.6 A

NOTES:

1. These ratings are limiting values above which their serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on application involving pulsed or low duty cycle operation.
3. Emitter diode is reverse biased.
4. Pulse conditions: length = 300 μs; duty cycle ≤ 10%.
5. For product family characteristic curves, refer to Section 5 — PWR 16.

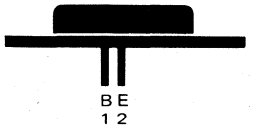
2N5881 • 2N5882

160 WATT NPN SILICON POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- V_{CE} . . . 1.0 V (MAX) @ I_C = 7.0 A
- I_{CEX} . . . 0.5 mA (MAX)
- h_{FE} . . . 20-100 @ I_C = 6.0 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65° C to + 200° C
Operating Junction Temperature			200° C
Lead Temperature (10 seconds)			250° C
Maximum Power Dissipation			
Total Dissipation at 25° C Case Temperature			160 W
Linear Derating Factor			0.915 W/° C
Maximum Voltages and Currents		**2N5881**	**2N5882**
V_{CBO}	Collector to Base Voltage	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
V_{CEO}	Collector to Emitter Voltage	60 V	80 V
I_C	Collector Current	15 A	15 A
I_B	Base Current	5.0 A	5.0 A

ELECTRICAL CHARACTERISTICS (25° C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5881 MIN.	2N5881 MAX.	2N5882 MIN.	2N5882 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	60		80		V	I_B = 0, I_C = 200 mA
I_{CEO}	Collector Cutoff Current		1.0			mA	I_B = 0, V_{CE} = 30 V
					1.0	mA	I_B = 0, V_{CE} = 40 V
h_{FE}	DC Current Gain (Note 2)	4.0		4.0			I_C = 15 A, V_{CE} = 4.0 V
		20	100	20	100		I_C = 6.0 A, V_{CE} = 4.0 V
		35		35			I_C = 2.0 A, V_{CE} = 4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		1.0		1.0	V	I_C = 7.0 A, I_B = 0.7 A
			4.0		4.0	V	I_C = 15 A, I_B = 3.75 A
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 2)		2.5		2.5	V	I_C = 15 A, I_B = 3.75 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.5		1.5	V	I_C = 6.0 A, V_{CE} = 4.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = 10 V, I_C = 1.0 A, f = 1.0 MHz
h_{fe}	Small Signal Current	20		20			V_{CE} = 4.0 V, I_C = 2.0 A, f = 1.0 kHz
I_{CEX}	Collector Cutoff Current (Note 3)		5.0			mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150° C
					5.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150° C
			0.5			mA	V_{CE} = 60 V, V_{EB} = 1.5 V
					0.5	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
I_{CBO}	Collector Cutoff Current		0.5			mA	V_{CB} = 60 V, I_E = 0
					0.5	mA	V_{CB} = 80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = 5.0 V
C_{ob}	Output Capacitance		400		400	pF	V_{CB} = 10 V, I_E = 0, f = 0.1 MHz
t_r	Rise Time		0.7		0.7	μs	V_{CC} = 30 V, I_C = 6.0 A, I_{B1} = 0.6 A
t_s	Storage Time		1.0		1.0	μs	V_{CC} = 30 V, I_C = 6.0 A, I_{B1} = I_{B2} = 0.6 A
t_f	Fall Time		0.8		0.8	μs	V_{CC} = 30 V, I_C = 6.0 A, I_{B1} = I_{B2} = 0.6 A

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ≤ 100%.
3. Emitter diode is reversed biased.
4. For product family characteristic curves, refer to Section 5 — PWR7.

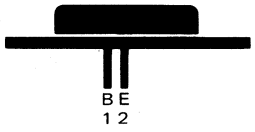
2N5883 • 2N5884

200 WATT PNP SILICON POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . −1.0 V (MAX) @ I_C = 15 A
- I_{CEX} . . . 1.0 mA (MAX)
- h_{FE} . . . 20-100 @ I_C = 10 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65° C to +200° C
Operating Junction Temperature			200° C
Lead Temperature (10 seconds)			250° C
Maximum Power Dissipation (Note 2)			
Total Dissipation at 25° C Case Temperature			200 W
Linear Derating Factor			1.15 mW/° C
Maximum Voltages and Currents		**2N5883**	**2N5884**
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
V_{CEO}	Collector to Emitter Voltage	−60 V	−80 V
I_C	Collector Current (Continuous)	25 A	25 A
I_C	Collector Current (Peak)	50 A	50 A
I_B	Base Current (Continuous)	7.5 A	7.5 A

ELECTRICAL CHARACTERISTICS (25° C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5883 MIN.	2N5883 MAX.	2N5884 MIN.	2N5884 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 4)	−60		−80		V	I_B = 0, I_C = 200 mA
h_{FE}	DC Current Gain (Note 4)	4.0		4.0			I_C = 25 A, V_{CE} = −4.0 V
		20	100	20	100		I_C = 10 A, V_{CE} = −4.0 V
		35		35			I_C = 3.0 A, V_{CE} = −4.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		−1.0		−1.0	V	I_C = 15 A, I_B = 1.5 A
			−4.0		−4.0	V	I_C = 25 A, I_B = 6.25 A
$V_{BE(ON)}$	Base to Emitter Voltage (Note 4)		−1.5		−1.5	V	I_C = 10 A, V_{CE} = −4.0 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)		−2.5		−2.5	V	I_C = 25 A, I_B = 6.25 A
h_{fe}	Small Signal Current Gain	20		20			V_{CE} = −4.0 V, I_C = 3.0 A, f = 1.0 kHz
I_{CEX}	Collector Cutoff Current (Note 3)		10			mA	V_{CE} = −60 V, V_{EB} = −1.5 V, T_C = 150° C
					10	mA	V_{CE} = −80 V, V_{EB} = −1.5 V, T_C = 150° C
			1.0			mA	V_{CE} = −60 V, V_{EB} = −1.5 V
					1.0	mA	V_{CE} = −80 V, V_{EB} = −1.5 V
I_{CBO}	Collector Cutoff Current		1.0			mA	V_{CB} = −60 V, I_E = 0
					1.0	mA	V_{CB} = −80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = −5.0 V
I_{CEO}	Collector Cutoff Current		2.0			mA	I_B = 0, V_{CE} = −30 V
					2.0	mA	I_B = 0, V_{CE} = −40 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	4.0		4.0			V_{CE} = −10 V, I_C = 1.0 A, f = 1.0 MHz
C_{ob}	Output Capacitance		1000		1000	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
t_r	Rise Time		0.7		0.7	μs	V_{CC} = −30 V, I_C = 10 A, I_{B1} = 1.0 A
t_s	Storage Time		1.0		1.0	μs	V_{CC} = −30 V, I_C = 10 A, I_{B1} = I_{B2} = 1.0 A
t_f	Fall Time		0.8		0.8	μs	V_{CC} = −30 V, I_C = 10 A, I_{B1} = I_{B2} = 1.0 A

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operation.
3. Emitter diode is reverse biased.
4. Pulse conditions: length = 300 μs; duty cycle ≤ 10%.
5. For product family characteristic curves refer to Section 5 — PWR 16.

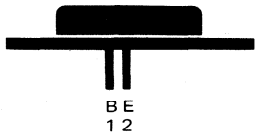
2N5885 • 2N5886

200 WATT NPN SILICON POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- $V_{CE(sat)}$ . . . 1.0 V (MAX) @ I_C = 15 A
- I_{CEX} . . . 1.0 mA (MAX)
- h_{FE} . . . 20-100 @ I_C = 10 A

See TO3-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			−65° C to 200° C
Operating Junction Temperature			200° C
Lead Temperature (10 seconds)			250° C
Maximum Power Dissipation			
Total Dissipation at 25° C Case Temperature			200 W
Linear Derating Factor			1.15 W/° C
Maximum Voltages and Currents		**2N5885**	**2N5886**
V_{CBO}	Collector to Base Voltage	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
V_{CEO}	Collector to Emitter Voltage	60 V	80 V
I_C	Collector Current	25 A	25 A
I_B	Base Current	7.5 A	7.5 A

ELECTRICAL CHARACTERISTICS (25° C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5885 MIN.	2N5885 MAX.	2N5886 MIN.	2N5886 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current (Note 3)		10			mA	V_{CE} = 60 V, V_{EB} = 1.5 V, T_C = 150° C
					10	mA	V_{CE} = 80 V, V_{EB} = 1.5 V, T_C = 150° C
			1.0			mA	V_{CE} = 60 V, V_{EB} = 1.5 V
					1.0	mA	V_{CE} = 80 V, V_{EB} = 1.5 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 2)	60		80		V	I_B = 0, I_C = 200 mA
h_{FE}	DC Current Gain (Note 2)	4.0		4.0			I_C = 25 A, V_{CE} = 4.0 V
		20	100	20	100		I_C = 10 A, V_{CE} = 4.0 V
		35		35			I_C = 3.0 A, V_{CE} = 4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		1.0		1.0	V	I_C = 15 A, I_B = 1.5 A
			4.0		4.0	V	I_C = 25 A, I_B = 6.25 A
$V_{BE(sat)}$	Base Saturation Voltage (Note 2)		2.5		2.5	V	I_C = 25 A, I_B = 6.25 A
I_{CBO}	Collector Cutoff Current		1.0			mA	V_{CB} = 60 V, I_E = 0
					1.0	mA	V_{CB} = 80 V, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	V_{EB} = 5.0 V
I_{CEO}	Collector Cutoff Current		2.0			mA	I_B = 0, V_{CE} = 30 V
					2.0	mA	I_B = 0, V_{CE} = 40 V
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.5		1.5	V	I_C = 10 A, V_{CE} = 4.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter, Small Signal Short Circuit Forward Current Transfer Ratio	4.0		4.0			V_{CE} = 10 V, I_C = 1.0 A, f = 1.0 MHz
h_{fe}	Small Signal Current Gain	20		20			V_{CE} = 4.0 V, I_C = 3.0 A, f = 1.0 kHz
C_{ob}	Output Capacitance		500		500	pF	V_{CB} = 10 V, I_E = 0 A, f = 1.0 MHz
t_r	Rise Time		0.7		0.7	μs	V_{CC} = 30 V, I_C = 10 A, I_{B1} = 1.0 A
t_f	Fall Time		0.8		0.8	μs	V_{CC} = 30 V, I_C = 10 A, I_{B1} = I_{B2} = 1.0 A
t_s	Storage Time		1.0		1.0	μs	V_{CC} = 30 V, I_C = 10 A, I_{B1} = I_{B2} = 1.0 A

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ≤ 10%.
3. Emitter diode is reversed biased.
4. For product family characteristic curves, refer to Section 5 — PWR 7.

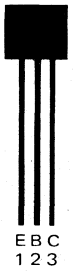
2N5961 • 2N5962 • 2N5963

NPN LOW LEVEL LOW NOISE AMPLIFIERS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

- P_D . . . 625 mW @ T_A = 25°C
- NF . . . 8.0 dB (MAX) @ 10 Hz, 1.0 kΩ (2N5963)
- h_{FE} . . . 900 (MIN) @ 10 μA, 1200 (MIN) @ 10 mA (2N5963)
- $V_{CE(sat)}$ . . . 0.2 V (MAX) @ 10 mA/0.5 mA
- I_{CBO} . . . 2.0 nA (MAX) @ V_{CB} = 45 V, 50 nA (MAX) @ V_{CB} = 45 V, T_A = 65°C (2N5961)

See TO92-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−55°C to 150°C
Operating Junction Temperature				150°C
Lead Temperature (10 seconds)				260°C
†**Maximum Power Dissipation** (Notes 2 & 3)				
Total Dissipation at 25°C Case Temperature				1.0 W
at 25°C Ambient Temperature				0.625 W
at 70°C Ambient Temperature				0.400 W
Maximum Voltages and Current		**2N5961**	**2N5962**	**2N5963**
V_{CBO}	Collector to Base Voltage	60 V	45 V	30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V	45 V	30 V
V_{EBO}	Emitter to Base Voltage	8.0 V	8.0 V	8.0 V
I_C	Collector Current (Continuous)	50 mA	50 mA	50 mA

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5961 MIN.	2N5961 MAX.	2N5962 MIN.	2N5962 MAX.	2N5963 MIN.	2N5963 MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	100		450		900			I_C = 10 μA, V_{CE} = 5.0 V
		120		500		1000			I_C = 100 μA, V_{CE} = 5.0 V
		135		550		1200			I_C = 1.0 mA, V_{CE} = 5.0 V
h_{FE}	DC Pulse Current Gain Note 5)	150	700	600	1400	1200	2200		I_C = 10 mA, V_{CE} = 5.0 V
NF	Narrow Band Noise Figure		6.0		6.0		6.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, R_S = 1.0 kΩ, BW = 400 Hz, f = 1.0 kHz
					4.0		3.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, BW = 400 Hz, f = 1.0 kHz
					8.0		6.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, R_S = 100 kΩ, BW = 400 Hz, f = 1.0 kHz
			3.0		3.0		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, BW = 400 Hz, f = 1.0 kHz
							8.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, R_S = 1.0 kΩ, BW = 10 Hz, f = 10 Hz
NF	Wide Band Noise Figure		3.0		3.0		3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, R_S = 1.0 kΩ, BW = 15.7 kHz, f = 10 Hz to 10 kHz

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

†Fairchild exceeds JEDEC registered values.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 125°C/W (derating factor of 8.0 mW/°C); junction to ambient thermal resistance of 200°C/W (derating factor of 5.0 mW/°C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Section 5-SS8.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd.)

SYMBOL	CHARACTERISTIC	2N5961 MIN.	2N5961 MAX.	2N5962 MIN.	2N5962 MAX.	2N5963 MIN.	2N5963 MAX.	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		2.0					nA	$I_E = 0, V_{CB} = 45$ V
					2.0			nA	$I_E = 0, V_{CB} = 30$ V
							2.0	nA	$I_E = 0, V_{CB} = 20$ V
			50					nA	$I_E = 0, V_{CB} = 45$ V, $T_A = 65°C$
					50			nA	$I_E = 0, V_{CB} = 30$ V, $T_A = 65°C$
							50	nA	$I_E = 0, V_{CB} = 20$ V, $T_A = 65°C$
I_{EBO}	Emitter Cutoff Current		1.0		1.0		1.0	nA	$I_C = 0, V_{EB} = 5.0$ V
BV_{CEO}	Collector to Emitter Breakdown Voltage	60		45		30		V	$I_C = 5.0$ mA, $I_B = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	60		45		30		V	$I_C = 10$ μA, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	8.0		8.0		8.0		V	$I_E = 10$ μA, $I_C = 0$
$V_{CE(sat)}$	Collector Saturation Voltage (Note 5)		0.2		0.2		0.2	V	$I_C = 10$ mA, $I_B = 0.5$ mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage	0.5	0.7	0.5	0.7	0.5	0.7	V	$I_C = 1.0$ mA, $V_{CE} = 5.0$ V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	1.0		1.0		1.5			$I_C = 10$ mA, $V_{CE} = 5.0$ V, f = 100 MHz
C_{cb}	Collector to Base Capacitance		4.0		4.0		4.0	pF	$V_{CB} = 5.0$ V, $I_E = 0$
C_{eb}	Emitter to Base Capacitance		6.0		6.0		6.0	pF	$V_{EB} = 0.5$ V, $I_C = 0$
h_{fe}	Small Signal Current Gain	150	1000	600	2000	1200	3000		$I_C = 10$ mA, $V_{CE} = 5.0$ V, f = 1.0 kHz

4

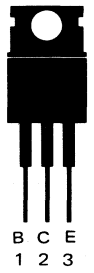
2N6121 • 2N6122 • 2N6123

40 WATT NPN SILICON POWER

MOLDED PLASTIC DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- P_D . . . 40 W
- $V_{CE(sat)}$ . . . 0.6 V (MAX) @ I_C = 1.5 A
- h_{FE} . . . 25-100 @ I_C = 1.5 A (2N6121, 2N6122), 20-80 @ I_C = 1.5 A (2N6123)
- PNP COMPLEMENTS . . . 2N6124, 2N6125, 2N6126

See TO220-00 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +150°C
Operating Junction Temperature	150°C
Lead Temperature (10 seconds)	235°C

Maximum Power Dissipation

Total Power Dissipation at 25°C Case Temperature (Note 3)	40 W
Linear Derating Factor	320 mW/°C

Maximum Voltages and Currents

		2N6121	2N6122	2N6123
V_{CEO}	Collector to Emitter Voltage	45 V	60 V	80 V
V_{CBO}	Collector to Base Voltage	45 V	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
I_C	Collector Current (Continuous)	4.0 A	4.0 A	4.0 A
I_B	Base Current	1.0 A	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector Sustaining Voltage	2N6121	45		V	I_C = 100 mA, I_B = 0
	(Note 2)	2N6122	60		V	I_C = 100 mA, I_B = 0
		2N6123	80		V	I_C = 100 mA, I_B = 0
h_{FE}	DC Pulse Current Gain	2N6121	25	100		I_C = 1.5 A, V_{CE} = 2.0 V
		2N6122	25	100		I_C = 1.5 A, V_{CE} = 2.0 V
		2N6123	20	80		I_C = 1.5 A, V_{CE} = 2.0 V
		2N6121	10			I_C = 4.0 A, V_{CE} = 2.0 V
		2N6122	10			I_C = 4.0 A, V_{CE} = 2.0 V
		2N6123	7.0			I_C = 4.0 A, V_{CE} = 2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage			0.6	V	I_C = 1.5 A, I_B = 0.15 A
	(Note 2)			1.4	V	I_C = 4.0 A, I_B = 1.0 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage			1.2	V	I_C = 1.5 A, V_{CE} = 2.0 V
	(Note 2)					
I_{CEO}	Collector Cutoff Current			1.0	mA	V_{CE} = V_{CEO}, I_B = 0
I_{CEX}	Collector Cutoff Current			0.1	mA	V_{CE} = V_{CEO}, V_{EB} = 1.5 V
I_{CEX}	Collector Cutoff Current			2.0	mA	V_{CE} = V_{CEO}, V_{EB} = 1.5 V, T_C = 125°C
I_{CBO}	Collector Cutoff Current			0.1	mA	V_{CB} = V_{CEO}, I_E = 0
I_{EBO}	Emitter Cutoff Current			1.0	mA	V_{EB} = 5.0 V, I_C = 0
$\|h_{fe}\|$	Magnitude of Common Emitter Small		2.5			I_C = 1.0 A, V_{CE} = 4.0 V, f = 1.0 MHz
	Signal Current Gain					
h_{fe}	Small Signal Current Gain		25			I_C = 0.1 A, V_{CE} = 2.0 V, f = 1.0 kHz

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual device may be impaired.
2. Pulse conditions: length = 300 μs, duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5-PWR5.

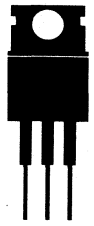
2N6124 • 2N6125 • 2N6126

40 WATT PNP POWER

MOLDED PLASTIC DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- P_D . . . 40 W
- $V_{CE(sat)}$ . . . −0.6 V (MAX) @ I_C = 1.5 A
- h_{FE} . . . 25-100 @ I_C = 1.5 A (2N6124, 2N6125), 20-80 @ I_C = 1.5 A (2N6126)
- NPN COMPLEMENTS . . . 2N6121, 2N6122, 2N6123

See TO220-00 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−65°C to +150°C
Operating Junction Temperature				150°C
Lead Temperature (10 seconds)				235°C
Maximum Power Dissipation				
Total Dissipation at 25°C Case Temperature (Note 3)				40 W
Linear Derating Factor				320 mW/°C
Maximum Voltages and Currents		**2N6124**	**2N6125**	**2N6126**
V_{CEO}	Collector to Emitter Voltage	−45 V	−60 V	−80 V
V_{CBO}	Collector to Base Voltage	−45 V	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V	−5.0 V
I_C	Collector Current (Continuous)	4.0 A	4.0 A	4.0 A
I_B	Base Current	1.0 A	1.0 A	1.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC		MIN.	MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector Sustaining Voltage	2N6124	−45		V	I_C = 100 mA, I_B = 0
	(Note 2)	2N6125	−60		V	I_C = 100 mA, I_B = 0
		2N6126	−80		V	I_C = 100 mA, I_B = 0
h_{FE}	DC Pulse Current Gain	2N6124	25	100		I_C = 1.5 A, V_{CE} = −2.0 V
	(Note 2)	2N6125	25	100		I_C = 1.5 A, V_{CE} = −2.0 V
		2N6126	20	80		I_C = 1.5 A, V_{CE} = −2.0 V
		2N6124	10			I_C = 4.0 A, V_{CE} = −2.0 V
		2N6125	10			I_C = 4.0 A, V_{CE} = −2.0 V
		2N6126	7.0			I_C = 4.0 A, V_{CE} = −2.0 V
$V_{CE(sat)}$	Collector Saturation Voltage			−0.6	V	I_C = 1.5 A, I_B = 0.15 A
	(Note 2)			−1.4	V	I_C = 4.0 A, I_B = 1.0 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)			−1.2	V	I_C = 1.5 A, V_{CE} = −2.0 V
I_{CEO}	Collector Cutoff Current			1.0	mA	V_{CE} = V_{CEO}, I_B = 0
I_{CEX}	Collector Cutoff Current			0.1	mA	V_{CE} = V_{CEO}, V_{EB} = −1.5 V
I_{CEX}	Collector Cutoff Current			2.0	mA	V_{CE} = V_{CEO}, V_{EB} = −1.5 V, T_C = 125°C
I_{CBO}	Collector Cutoff Current			0.1	mA	V_{CB} = V_{CEO}, I_E = 0
I_{EBO}	Emitter Cutoff Current			1.0	mA	V_{EB} = −5.0 V, I_C = 0
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain		2.5			I_C = 1.0 A, V_{CE} = −4.0 V, f = 1.0 MHz
h_{fe}	Small Signal Current Gain		25			I_C = 0.1 A, V_{CE} = −2.0 V, f = 1.0 kHz

4

NOTES:
1. These ratings are limiting values above which the serviceability of any individual device may be impaired.
2. Pulse conditions: length = 300 μs, duty cycle = 2%.
3. For product family characteristic curves, refer to Section 5-PWR14.

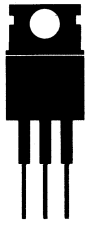
2N6129 • 2N6130 • 2N6131

50 WATT NPN SILICON POWER

DIFFUSED SILICON BI-MESAR™ TRANSISTORS

- P_D . . . 50 W
- h_{FE} . . . 20-100 @ I_C = 2.5 A
- COMPLEMENTS . . . 2N6132 THROUGH 2N6134

See TO220-00 Package Outline



B C E
1 2 3

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−65°C to 150°C
Operating Junction Temperature				150°C
Lead Temperature (10 seconds)				235°C
Maximum Power Dissipation (Note 2)				
Total Power Dissipation at T_C = 25°C				50 W
Linear Derating Factor				0.4 W/°C
Maximum Voltages and Currents		**2N6129**	**2N6130**	**2N6131**
V_{CEO}	Collector to Emitter Voltage	40 V	60 V	80 V
V_{CBO}	Collector to Base Voltage	40 V	60 V	80 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V	5.0 V
I_C	Collector Current	7.0 A	7.0 A	7.0 A
I_B	Base Current	3.0 A	3.0 A	3.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N6129 MIN.	2N6129 MAX.	2N6130 MIN.	2N6130 MAX.	2N6131 MIN.	2N6131 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 3)	40		60		80		V	I_B = 0, I_C = 100 mA
h_{FE}	DC Current Gain (Note 3)	7.0		7.0		5.0			V_{CE} = 4.0 V, I_C = 7.0 A
		20	100	20	100	20	100		V_{CE} = 4.0 V, I_C = 2.5 A
$V_{CE(sat)}$	Collector Saturation Voltage (Note 3)		1.4		1.4		2.0	V	I_C = 7.0 A, I_B = 3.0 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 3)		2.0		2.0		2.0	V	I_C = 2.5 A, V_{CE} = 4.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	2.5		2.5		2.5			V_{CE} = 4.0 V, I_C = 1.0 A, f = 1.0 MHz
I_{CEX}	Collector Cutoff Current		2.0		2.0		2.0	mA	V_{CE} = Rated LV_{CEO}, V_{EB} = 1.5 V, T_C = 125°C
			0.2		0.2		0.2	mA	V_{CE} = Rated LV_{CEO}, V_{EB} = 1.5 V
I_{CBO}	Collector Cutoff Current, Emitter Open		0.1		0.1		0.1	mA	V_{CB} = Rated LV_{CEO}, I_E = 0
I_{EBO}	Emitter Cutoff Current		1.0		1.0		1.0	mA	V_{EB} = 5.0 V
I_{CEO}	Collector Cutoff Current, Base Open		2.0		2.0		2.0	mA	V_{CE} = Rated LV_{CEO}, I_B = 0
h_{fe}	Small Signal Current Gain	25		25		25			I_C = 0.1 A, V_{CE} = 4.0 V, f = 1.0 kHz

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 150°C and junction to case thermal resistance of 2.5°C/W (derating factor of 400 mW/°C).
3. Pulse conditions: length = 300 μs; duty cycle = 1%.
4. For product family characteristic curves, refer to Section 5 — PWR10.

2N6132 • 2N6133 • 2N6134

50 WATT PNP SILICON POWER

DIFFUSED BI-MESAR™ TRANSISTORS

- P_D . . . 50 W
- h_{FE} . . . 20-100 @ I_C = 2.5 A
- COMPLEMENTS 2N6129 THROUGH 2N6131

See TO220-00 Package Outline

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures				
Storage Temperature				−65°C to +150°C
Operating Junction Temperature				150°C
Lead Temperature, (10 seconds)				235°C
Maximum Power Dissipation (Note 2)				
Total Power Dissipation at T_C = 25°C				50 W
Linear Derating Factor				0.4 W/°C
Maximum Voltage and Currents		**2N6132**	**2N6133**	**2N6134**
V_{CEO}	Collector to Emitter Voltage	−40 V	−60 V	−80 V
V_{CBO}	Collector to Base Voltage	−40 V	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V	−5.0 V
I_C	Collector Current	7.0 A	7.0 A	7.0 A
I_B	Base Current	3.0 A	3.0 A	3.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N6132 MIN.	2N6132 MAX.	2N6133 MIN.	2N6133 MAX.	2N6134 MIN.	2N6134 MAX.	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 3)	−40		−60		−80		V	I_B = 0, I_C = 100 mA
h_{FE}	DC Current Gain (Note 3)	7.0		7.0		5.0			V_{CE} = −4.0 V, I_C = 7.0 A
		20	100	20	100	20	100		V_{CE} = −4.0V, I_C = 2.5 A
$V_{CE(sat)}$	Collector Saturation Voltage (Note 3)		−1.4		−1.4		−1.8	V	I_C = 7.0 A, I_B = 3.0 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 3)		−2.0		−2.0		−2.0	V	I_C = 2.5 A, V_{CE} = −4.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	2.5		2.5		2.5			V_{CE} = −4.0 V, I_C = 1.0 A, f = 1.0 MHz
I_{CEX}	Collector Cutoff Current		2.0		2.0		2.0	mA	V_{CE} = Rated LV_{CFO}, V_{EB} = −1.5V, T_C = 125°C
			0.2		0.2		0.2	mA	V_{CE} = Rated LV_{CEO}, V_{EB} = −1.5V,
I_{EBO}	Emitter Cutoff Current		1.0		1.0		1.0	mA	V_{EB} = −5.0 V
I_{CBO}	Collector Cutoff Current, Emitter Open		0.5		0.5		0.5	mA	V_{CB} = Rated LV_{CEO}, I_E = 0
I_{CEO}	Collector Cutoff Current, Base Open		2.0		2.0		2.0	mA	V_{CE} = Rated LV_{CEO}, I_B = 0
h_{fe}	Small Signal Current Gain	25		25		25			V_{CE} = −4.0 V, I_C = 0.1 A, f = 1.0 kHz

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These ratings give a maximum junction temperature of 150° C and junction to case thermal resistance of 2.5° C/W. (Derating factor of 400 mW/° C).
3. Pulse conditions: length = 300 μs; duty cycle = 1%.
4. For product family characteristic curves, refer to Section 5 — PWR 17.

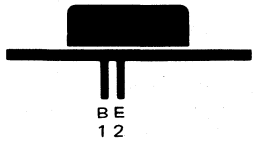
2N6233 • 2N6234 • 2N6235 • SE9051 • SE9052

NPN SILICON POWER

DIFFUSED SILICON PLANAR* TRANSISTORS

- f_T . . . 20 MHz (MIN)
- P_D . . . 50 W
- h_{FE} . . . 25-125 @ I_C = 1.0 A

See TO66-1 Package Outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures						
Storage Temperature						−65°C to 200°C
Operating Junction Temperature						200°C
Lead Temperature (Soldering 10 seconds)						260°C
Maximum Power Dissipation						
Total Dissipation at 25°C Case Temperature						50 W
Linear Derating Factor						0.286 W/°C
Maximum Voltages and Currents		**2N6233**	**2N6234**	**2N6235**	**SE9051**	**SE9052**
V_{CBO}	Collector to Base Voltage	250 V	300 V	350 V	300 V	325 V
V_{CEO}	Collector to Emitter Voltage	225 V	275 V	325 V	275 V	325 V
V_{EBO}	Emitter to Base Voltage	6.0 V	6.0 V	6.0 V	4.0 V	4.0 V
I_C	Collector Current (Peak)	10 A	10 A	10 A	10 A	10 A
I_B	Base Current	2.0 A	2.0 A	2.0 A	2.0 A	2.0 A

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N6233 MIN.	2N6233 MAX.	2N6234 MIN.	2N6234 MAX.	2N6235 MIN.	2N6235 MAX.	UNITS	TEST CONDITIONS
V_{CEO}	Collector Sustaining Voltage (Note 2)	225		275		325		V	I_B = 0, I_C = 20 mA
h_{FE}	DC Current Gain (Note 2)	25		25		25			V_{CE} = 5.0 V, I_C = 0.1 A
		15	125	25	125	25	125		V_{CE} = 5.0 V, I_C = 1.0 A
		10		10		10			V_{CE} = 5.0 V, I_C = 3.0 A
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		2.5		2.5		2.5	V	I_C = 5.0 A, I_B = 1.0 A
			0.5		0.5		0.5	V	I_C = 1.0 A, I_B = 0.1 A
$V_{BE(sat)}$	Base Saturation Voltage (Note 2)		2.0		2.0		2.0	V	I_C = 5.0 A, I_B = 1.0 A
			1.0		1.0		1.0	V	I_C = 1.0 A, I_B = 0.1 A
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 2)		1.0		1.0		1.0	V	I_C = 1.0 A, V_{CE} = 5.0 V
$\|h_{fe}\|$	Magnitude of Common Emitter Short Circuit Small Signal Current Gain	2.0		2.0		2.0			V_{CE} = 10 V, I_C = 0.25 A, f = 10 MHz
I_{CEX}	Collector Cutoff Current (Note 3)		1.0					mA	V_{CE} = 250 V, V_{EB} = 1.5 V, T_C = 150°C
					1.0			mA	V_{CE} = 300 V, V_{EB} = 1.5 V, T_C = 150°C
							1.0	mA	V_{CE} = 350 V, V_{EB} = 1.5 V, T_C = 150°C

Additional Electrical Characteristics on following page.

*Planar is a patented Fairchild process.

NOTES:
1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. Pulse conditions: length = 300 μs; duty cycle ≤ 10%.
3. Emitter diode is reversed biased.
4. For product family characteristic curves refer to Section 5—PWR 9.

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N6233 MIN.	2N6233 MAX.	2N6234 MIN.	2N6234 MAX.	2N6235 MIN.	2N6235 MAX.	UNITS	TEST CONDITIONS
I_{EBO}	Emitter Cutoff Current		0.1		0.1		0.1	mA	V_{EB} = 6.0 V
I_{CBO}	Collector Cutoff Current, Emitter Open		0.1					mA	V_{CB} = 250 V, I_E = 0
					0.1			mA	V_{CB} = 300 V, I_E = 0
							0.1	mA	V_{CB} = 350 V, I_E = 0
I_{CEO}	Collector Cutoff Current, Base Open		1.0					mA	V_{CE} = 225 V, I_B = 0
					1.0			mA	V_{CE} = 275 V, I_B = 0
							1.0	mA	V_{CE} = 325 V, I_B = 0
t_r	Rise Time		500		500		500	ns	V_{CC} = 200 V, I_C = 1.0 A, I_{B1} = 0.1 A
t_f	Fall Time		500		500		500	ns	V_{CC} = 200 V, I_C = 1.0 A I_{B1} = I_{B2} = 0.1 A
t_s	Storage Time		3.5		3.5		3.5	μs	V_{CC} = 200 V, I_C = 1.0 A I_{B1} = I_{B2} = 0.1 A
C_{ob}	Output Capacitance		250		250		250	pF	V_{CB} = 10 V, f = 0.1 MHz

SYMBOL	CHARACTERISTIC	SE9051 MIN.	SE9051 MAX.	SE9052 MIN.	SE9052 MAX.	UNITS	TEST CONDITIONS
I_{CEX}	Collector Cutoff Current (Note 3)		500		500	μA	V_{CE} = 250 V, V_{EB} = 0.5 V, T_C = 150°C
			15		15	μA	V_{CE} = 250 V, V_{EB} = 0.5 V
I_{EBO}	Emitter Cutoff Current		10		10	μA	V_{EB} = 4.0 V
I_{CBO}	Collector Cutoff Current		100			μA	V_{CB} = 300 V, I_B = 0
					100	μA	V_{CB} = 325 V, I_B = 0
$V_{CEO(sus)}$	Collector Sustaining Voltage (Note 2)	275		325		V	I_B = 0, I_C = 100 mA
h_{FE}	DC Current Gain (Note 2)	20	100	20	100		I_C = 1.0 A, V_{CE} = 4.0 V
$V_{CE(sat)}$	Collector Saturation Voltage (Note 2)		0.4		0.4	V	I_C = 1.2 A, I_B = 200 mA
			1.0		1.0	V	I_C = 5.0 A, I_B = 1.0 A
$V_{BE(sat)}$	Base Saturation Voltage (Note 2)		1.6		1.6	V	I_C = 5.0 A, I_B = 1.0 A
t_{on}	Turn On Time		300		300	ns	V_{CC} = 250 V, I_C = 1.2 A, I_{B1} = 0.2 A
t_f	Fall Time		500		500	ns	V_{CC} = 250 V, I_C = 1.2 A, I_{B1} = I_{B2} = 0.2 A
t_s	Storage Time		5.0		5.0	μs	V_{CC} = 250 V, I_C = 1.2 A, I_{B1} = I_{B2} = 0.2 A
f_T	Current Gain Bandwidth Product	20		20		MHz	V_{CE} = 10 V, I_C = 500 mA, f = 5.0 MHz
C_{ob}	Output Capacitance		250		250	pF	V_{CB} = 10 V, f = 0.1 MHz

DISCRETE PRODUCTS

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CURVE SET NUMBER D1

TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

RF400

FIGURE OF MERIT VERSUS FREQUENCY

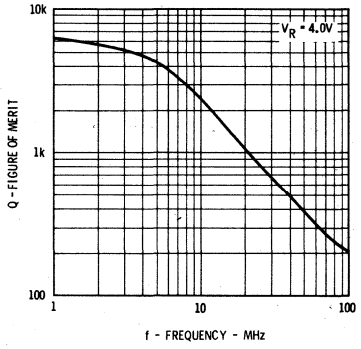
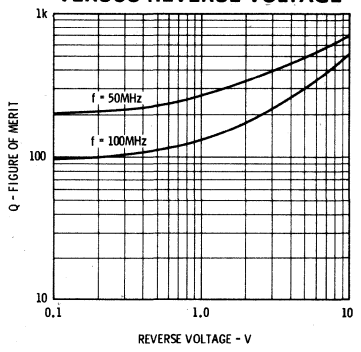
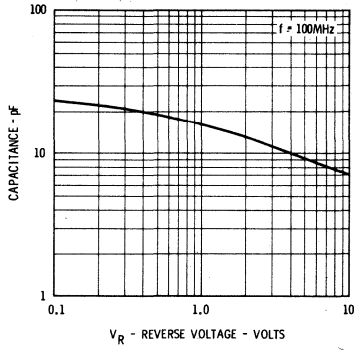


FIGURE OF MERIT VERSUS REVERSE VOLTAGE



CAPACITANCE VERSUS REVERSE VOLTAGE



RF401

FIGURE OF MERIT VERSUS FREQUENCY

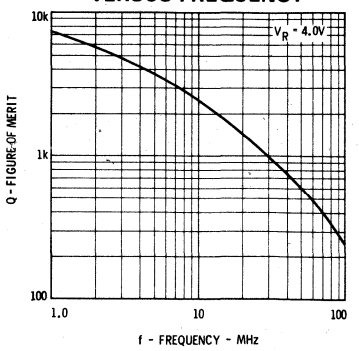
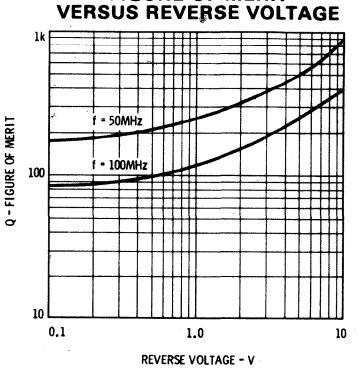
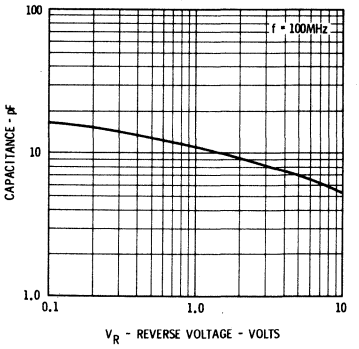


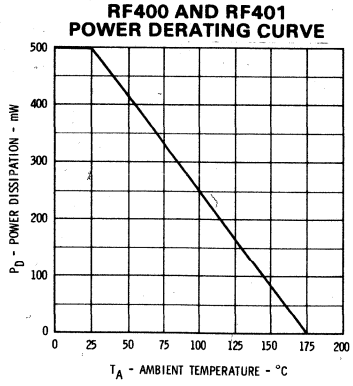
FIGURE OF MERIT VERSUS REVERSE VOLTAGE



CAPACITANCE VERSUS REVERSE VOLTAGE



RF400 AND RF401 POWER DERATING CURVE

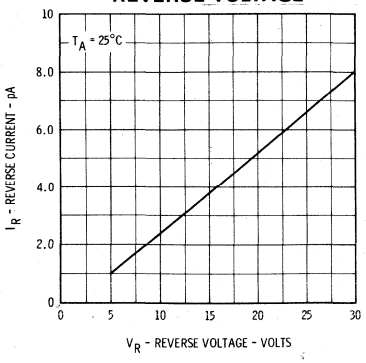


CURVE SET NUMBER D2

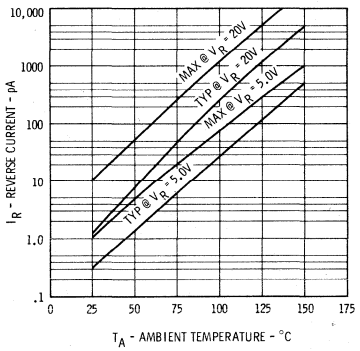
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

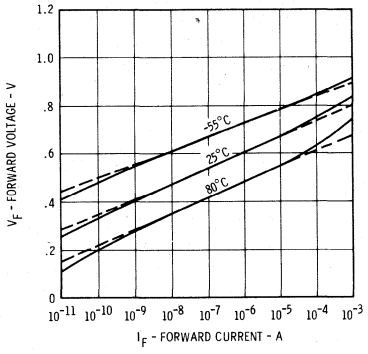
REVERSE CURRENT VERSUS REVERSE VOLTAGE



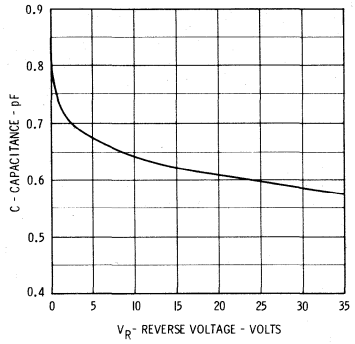
REVERSE CURRENT VERSUS TEMPERATURE



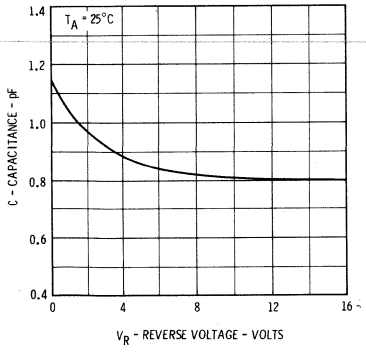
FORWARD VOLTAGE VERSUS FORWARD CURRENT



TO72 CAPACITANCE VERSUS REVERSE VOLTAGE

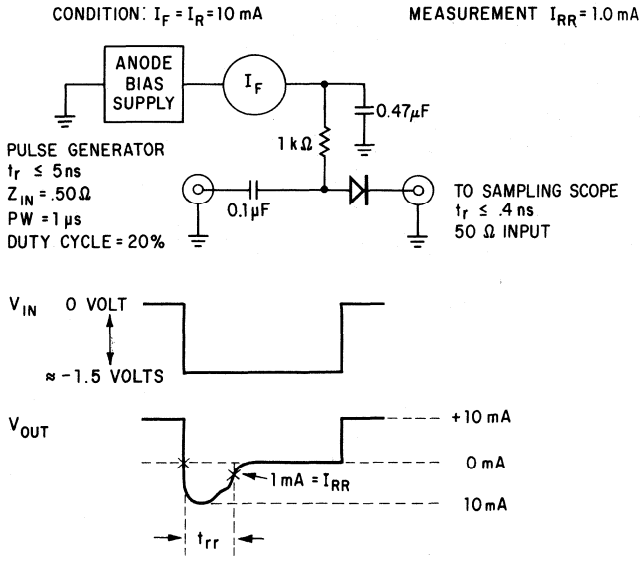


DO7 CAPACITANCE VERSUS REVERSE VOLTAGE

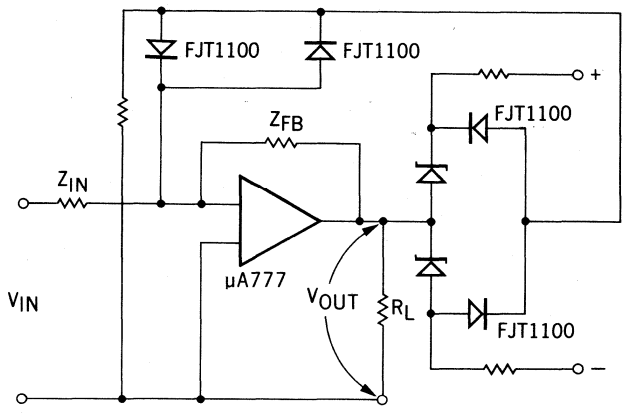


CURVE SET NUMBER D2

REVERSE RECOVERY TIME (t_{rr}) TEST CIRCUIT

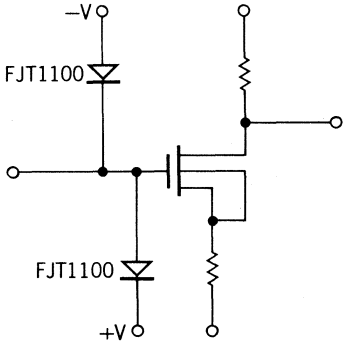


A BOUND CIRCUIT FOR OPERATIONAL AMPLIFIERS



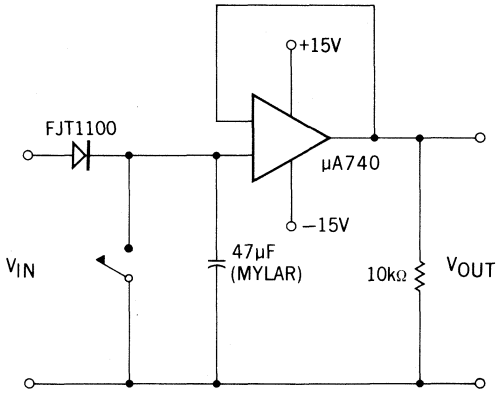
The bound circuit prevents overloading and saturation of operational amplifiers. The circuit has negligible effect on the operational amplifier until overload conditions occur. The use of the low leakage picoampere diode permits realization of extremely high input impedance for normal input voltages.

MOS FET PROTECTION CIRCUIT

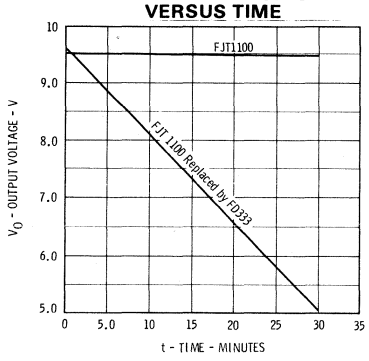


The picoampere diode affords excellent gate voltage protection while maintaining the DC input impedance at about one million megohms. In addition the very low capacity of the FJT1100 will have a relatively small effect on the circuit input capacity.

PEAK FOLLOWER CIRCUIT



OUTPUT VOLTAGE OF THE PEAK FOLLOWER CIRCUIT VERSUS TIME



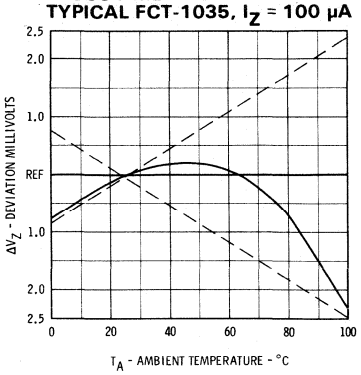
A nearly constant voltage peak follower circuit is available by using a picoampere diode. A comparison between the use of the FJT1100 and a "low leakage" FD333 diode in the circuit is shown in the curves of V_{OUT} vs Time.

CURVE SET NUMBER D3

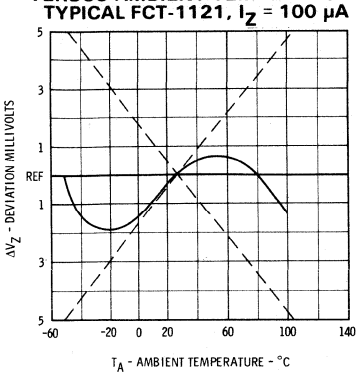
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

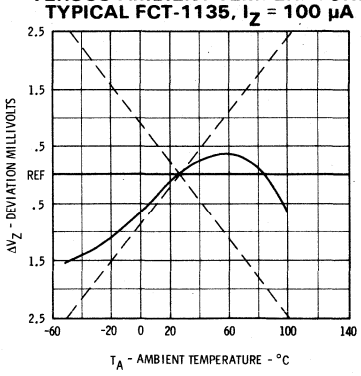
REFERENCE VOLTAGE DEVIATION VERSUS AMBIENT TEMPERATURE TYPICAL FCT-1035, I_Z = 100 µA



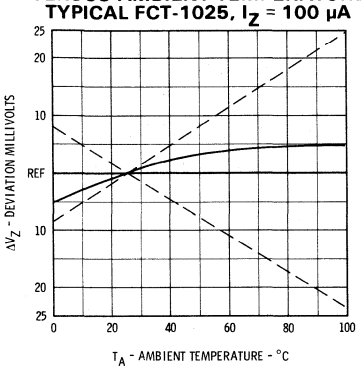
REFERENCE VOLTAGE DEVIATION VERSUS AMBIENT TEMPERATURE TYPICAL FCT-1121, I_Z = 100 µA



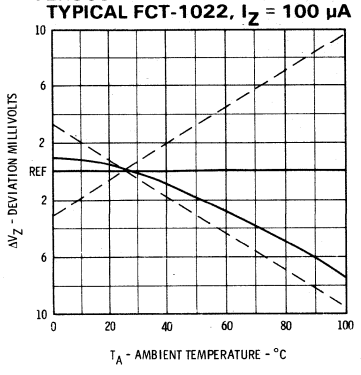
REFERENCE VOLTAGE DEVIATION VERSUS AMBIENT TEMPERATURE TYPICAL FCT-1135, I_Z = 100 µA



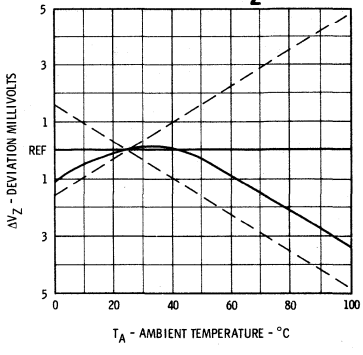
REFERENCE VOLTAGE DEVIATION VERSUS AMBIENT TEMPERATURE TYPICAL FCT-1025, I_Z = 100 µA



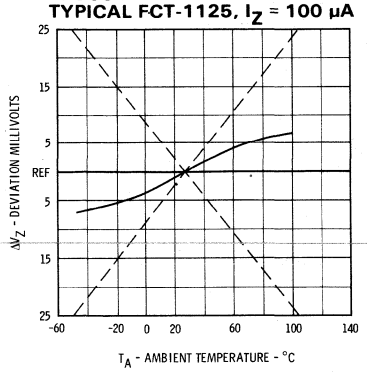
REFERENCE VOLTAGE DEVIATION VERSUS AMBIENT TEMPERATURE TYPICAL FCT-1022, I_Z = 100 µA



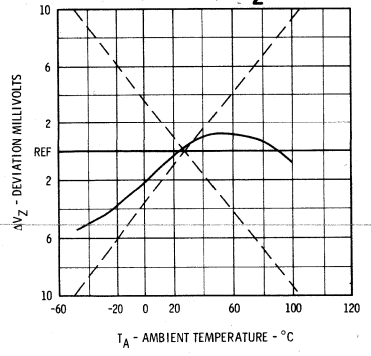
REFERENCE VOLTAGE DEVIATION VERSUS AMBIENT TEMPERATURE TYPICAL FCT-1021, I_Z = 100 µA



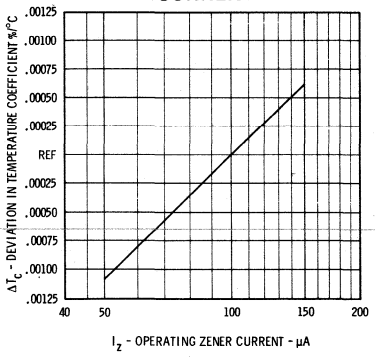
REFERENCE VOLTAGE DEVIATION VERSUS AMBIENT TEMPERATURE TYPICAL FCT-1125, I_Z = 100 µA



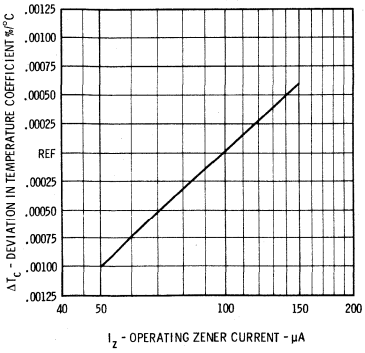
REFERENCE VOLTAGE DEVIATION VERSUS AMBIENT TEMPERATURE TYPICAL FCT-1122, I_Z = 100 µA



TEMPERATURE COEFFICIENT DEVIATION VERSUS OPERATING CURRENT



TEMPERATURE COEFFICIENT DEVIATION VERSUS OPERATING CURRENT



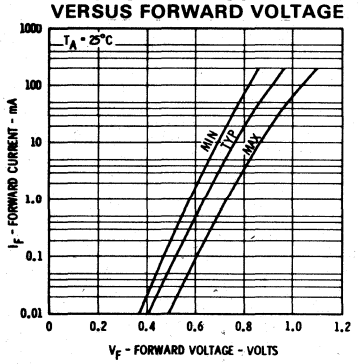
5

CURVE SET NUMBER D4

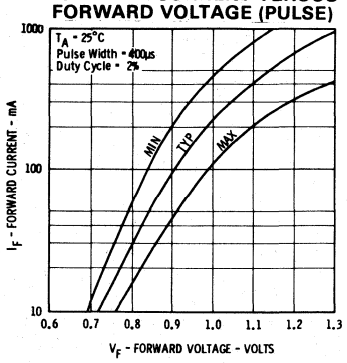
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

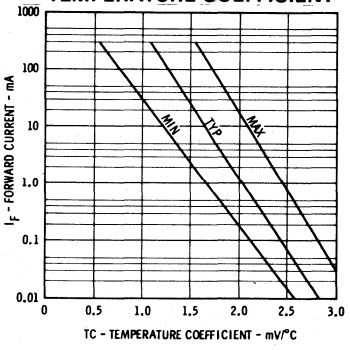
DC FORWARD CURRENT VERSUS FORWARD VOLTAGE



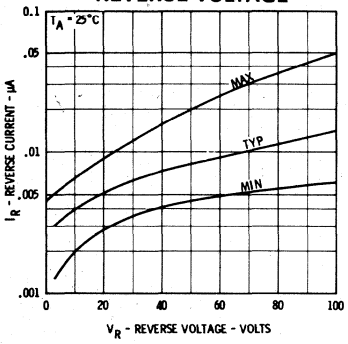
FORWARD CURRENT VERSUS FORWARD VOLTAGE (PULSE)



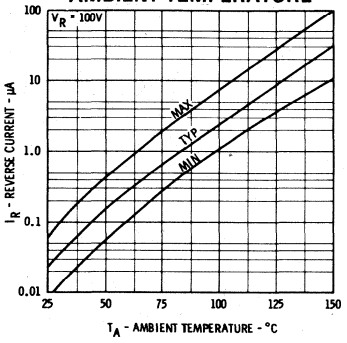
DC FORWARD CURRENT VERSUS TEMPERATURE COEFFICIENT



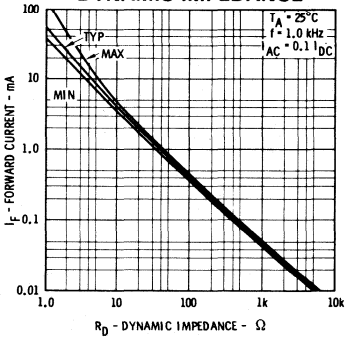
REVERSE CURRENT VERSUS REVERSE VOLTAGE



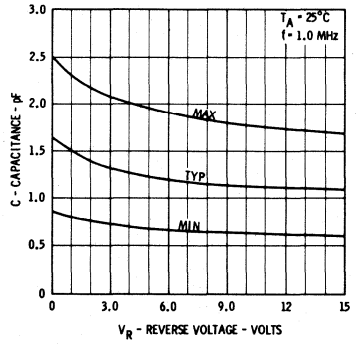
REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



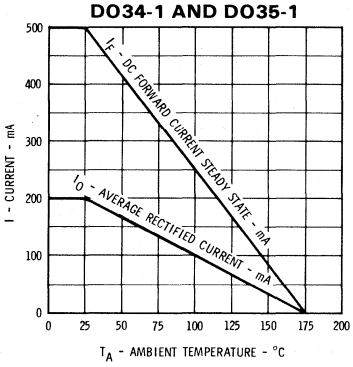
FORWARD CURRENT VERSUS DYNAMIC IMPEDANCE



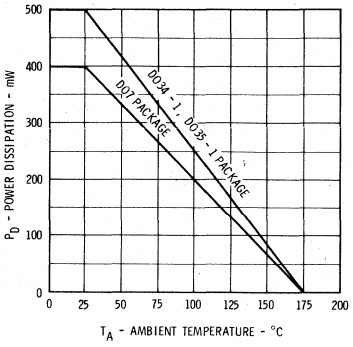
CAPACITANCE VERSUS REVERSE VOLTAGE



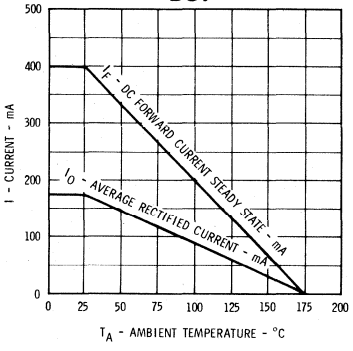
AVERAGE RECTIFIED CURRENT AND FORWARD CURRENT VERSUS AMBIENT TEMPERATURE DO34-1 AND DO35-1



POWER DERATING CURVE



AVERAGE RECTIFIED CURRENT AND FORWARD CURRENT VERSUS AMBIENT TEMPERATURE DO7

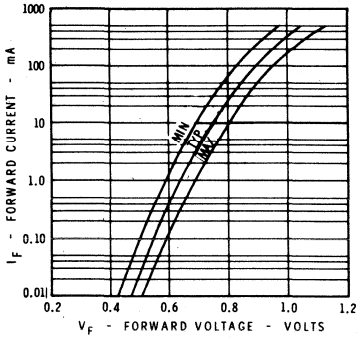


CURVE SET NUMBER D5

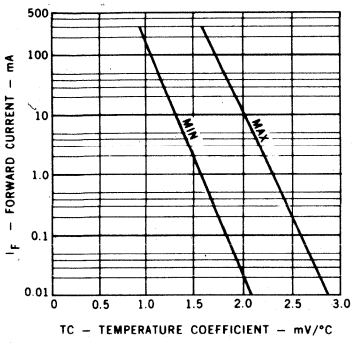
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

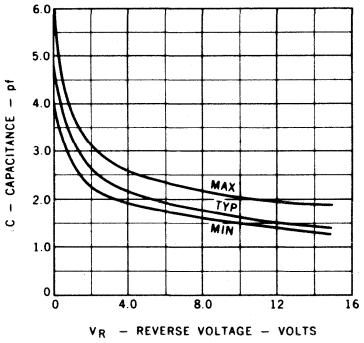
FORWARD VOLTAGE VERSUS FORWARD CURRENT



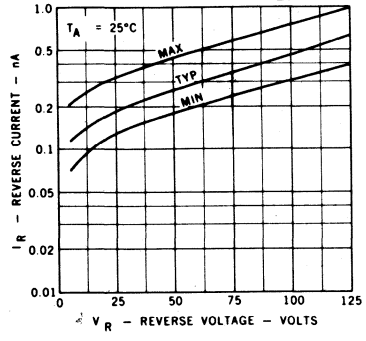
FORWARD CURRENT VERSUS TEMPERATURE COEFFICIENT



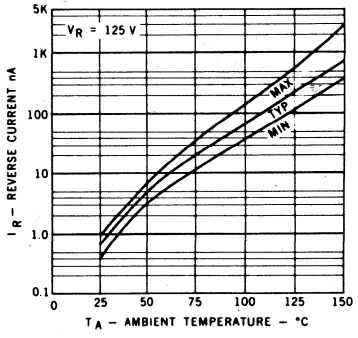
CAPACITANCE VERSUS REVERSE VOLTAGE



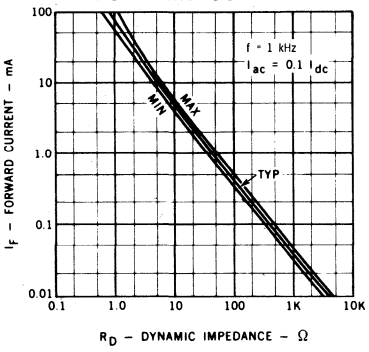
REVERSE VOLTAGE VERSUS REVERSE CURRENT



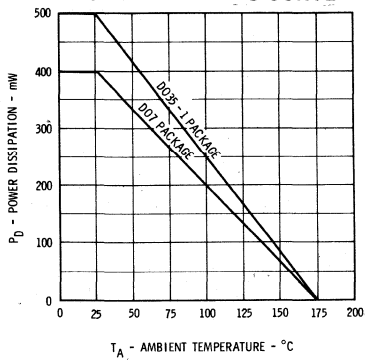
REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



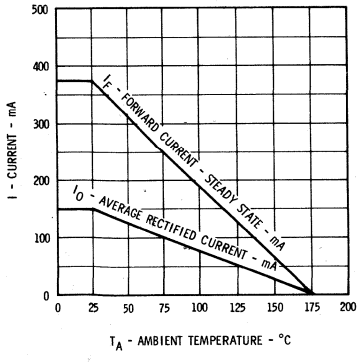
DYNAMIC IMPEDANCE VERSUS FORWARD CURRENT



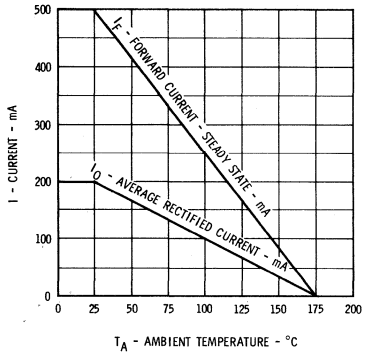
POWER DERATING CURVE



AVERAGE RECTIFIED CURRENT AND FORWARD CURRENT VERSUS AMBIENT TEMPERATURE DO7



AVERAGE RECTIFIED CURRENT AND FORWARD CURRENT VERSUS AMBIENT TEMPERATURE DO35-1



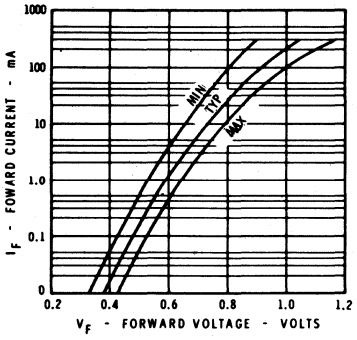
5

CURVE SET NUMBER D6

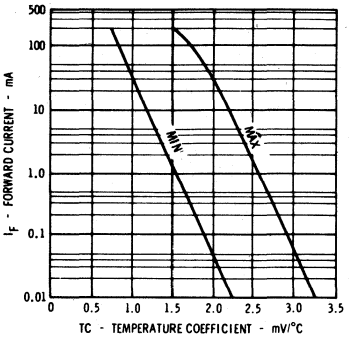
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

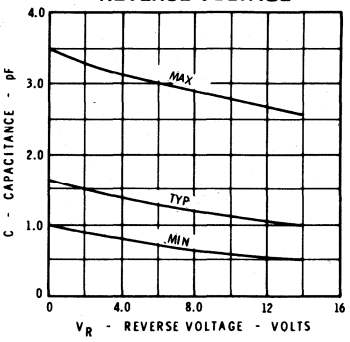
FORWARD VOLTAGE VERSUS FORWARD CURRENT



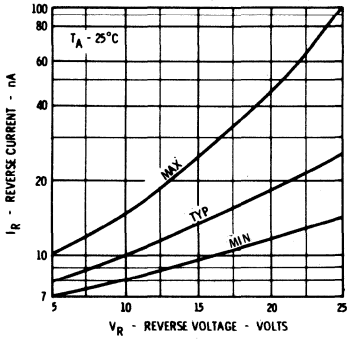
FORWARD CURRENT VERSUS TEMPERATURE COEFFICIENT



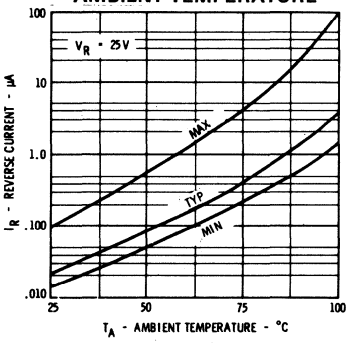
CAPACITANCE VERSUS REVERSE VOLTAGE



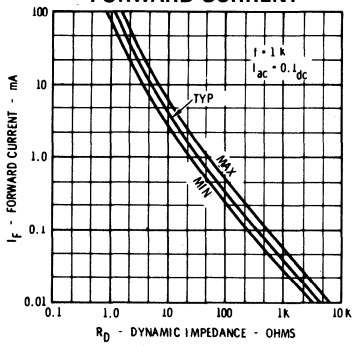
REVERSE CURRENT VERSUS REVERSE VOLTAGE



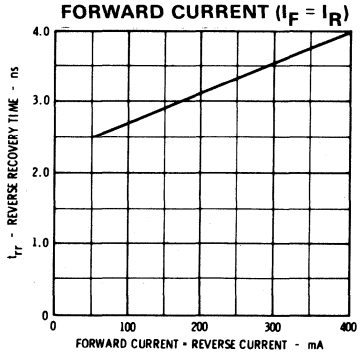
REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



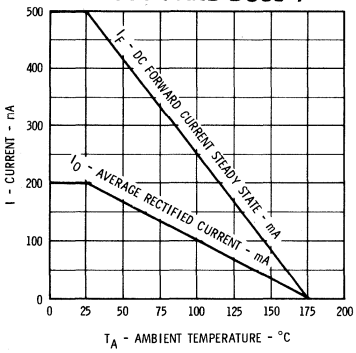
DYNAMIC IMPEDANCE VERSUS FORWARD CURRENT



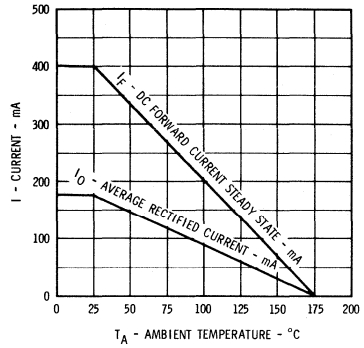
REVERSE RECOVERY TIME VERSUS FORWARD CURRENT ($I_F = I_R$)



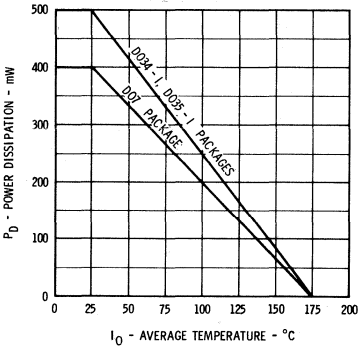
AVERAGE RECTIFIED CURRENT AND FORWARD CURRENT VERSUS AMBIENT TEMPERATURE DO34-1 AND DO35-1



AVERAGE RECTIFIED CURRENT AND FORWARD CURRENT VERSUS AMBIENT TEMPERATURE DO7



POWER DERATING CURVE

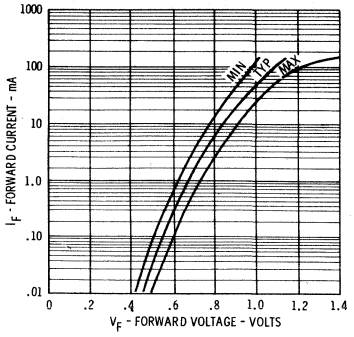


CURVE SET NUMBER D7

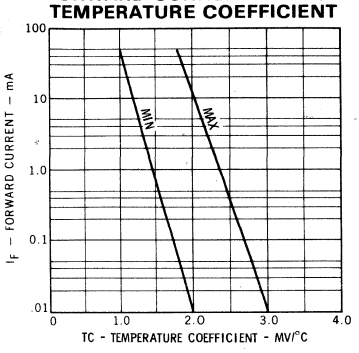
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

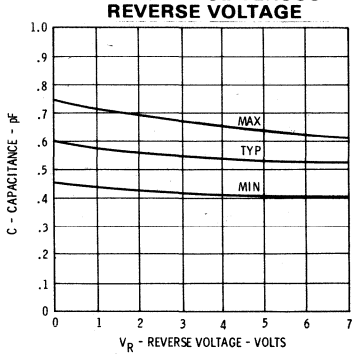
FORWARD VOLTAGE VERSUS FORWARD CURRENT



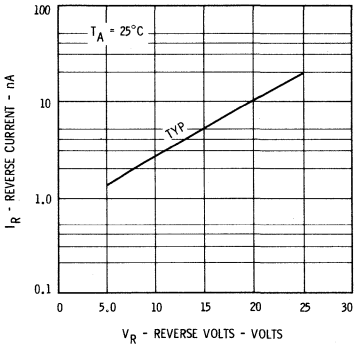
FORWARD CURRENT VERSUS TEMPERATURE COEFFICIENT



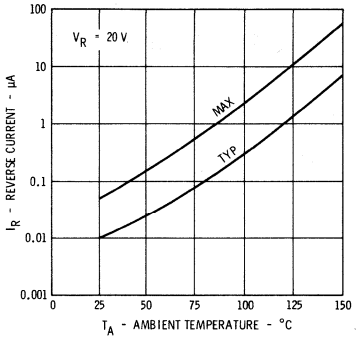
CAPACITANCE VERSUS REVERSE VOLTAGE



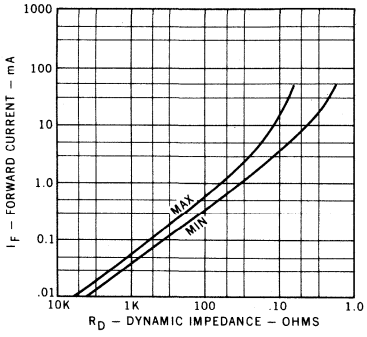
REVERSE VOLTAGE VERSUS REVERSE CURRENT



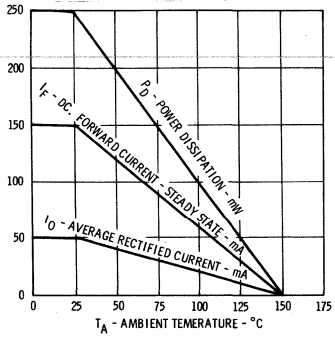
REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



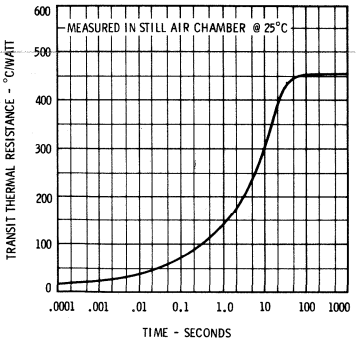
DYNAMIC IMPEDANCE VERSUS FORWARD CURRENT



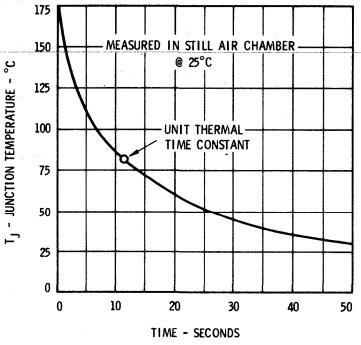
POWER DISSIPATION, AVERAGE RECTIFIED CURRENT AND FORWARD CURRENT VERSUS AMBIENT TEMPERATURE



TRANSIENT THERMAL RESISTANCE VERSUS TIME



JUNCTION TEMPERATURE VERSUS TIME (COOLING CURVE)



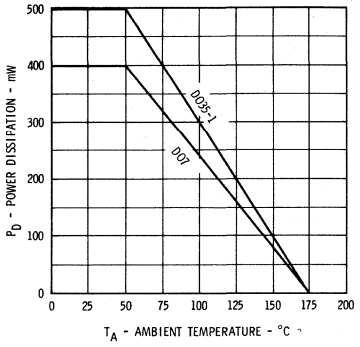
5

CURVE SET NUMBER D8

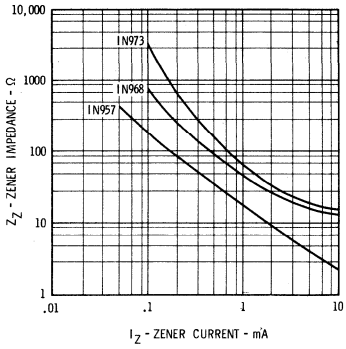
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

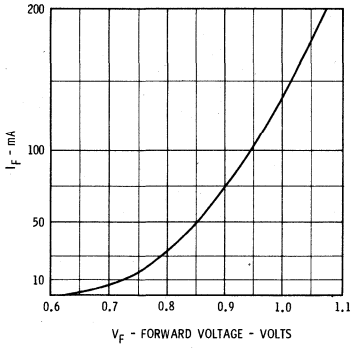
POWER DERATING CURVE



ZENER IMPEDANCE VERSUS REVERSE CURRENT



FORWARD CURRENT VERSUS FORWARD VOLTAGE

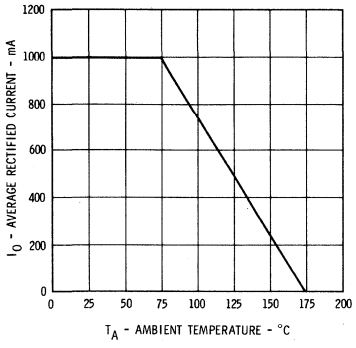


CURVE SET NUMBER D10

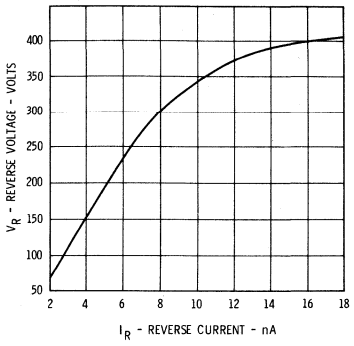
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

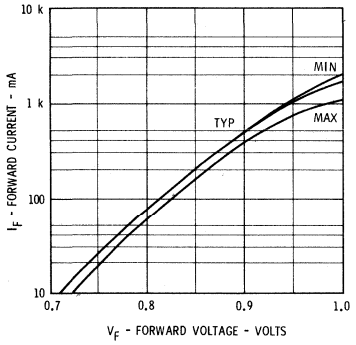
FORWARD CURRENT VERSUS TEMPERATURE



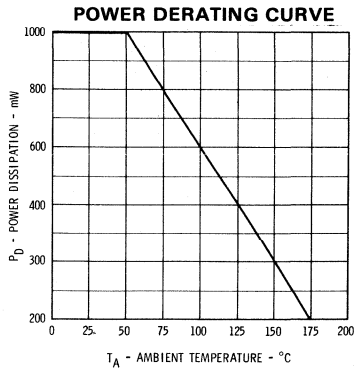
REVERSE VOLTAGE VERSUS REVERSE CURRENT



FORWARD VOLTAGE VERSUS FORWARD CURRENT



POWER DERATING CURVE

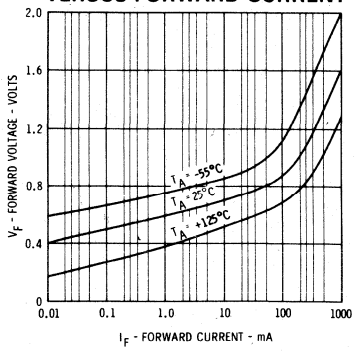


CURVE SET NUMBER D11

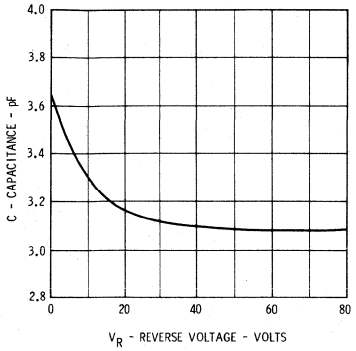
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

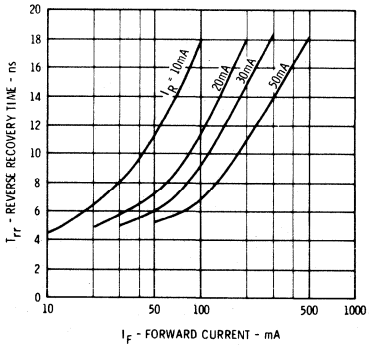
FORWARD VOLTAGE VERSUS FORWARD CURRENT



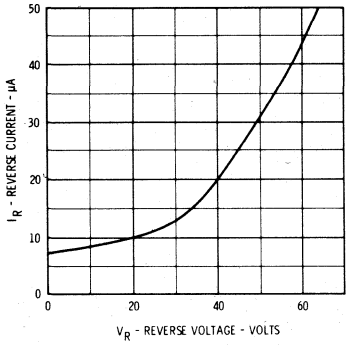
CAPACITANCE VERSUS REVERSE VOLTAGE



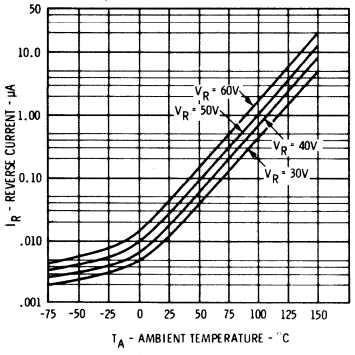
REVERSE RECOVER TIME VERSUS FORWARD CURRENT



REVERSE CURRENT VERSUS REVERSE VOLTAGE

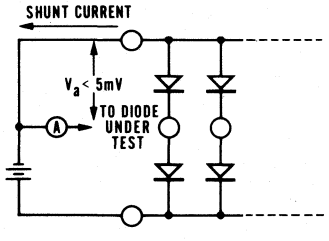


REVERSE CURRENT VERSUS AMBIENT TEMPERATURE

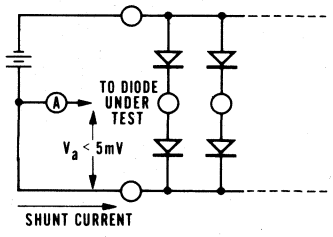


To measure reverse current of an individual diode, the following test circuits are used:

COMMON CATHODE DIODES



COMMON ANODE DIODES



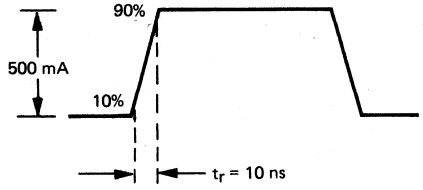
5

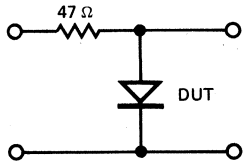
CURVE SET NUMBER D11

TEST CIRCUITS

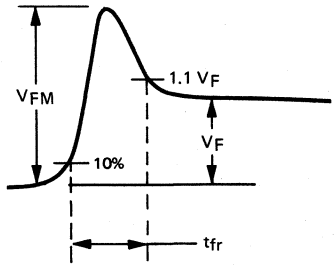
Test requirement for V_{FM} and t_{fr} is as shown below; all leads should be as short as possible.

INPUT CURRENT PULSE





OUTPUT VOLTAGE PULSE



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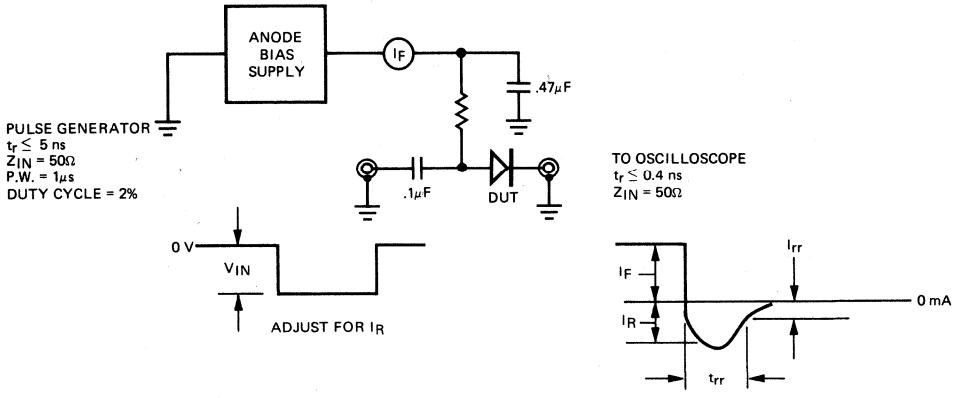
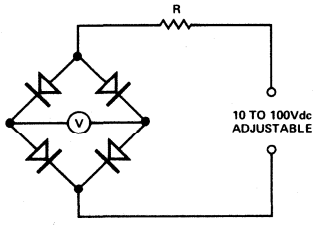
t_{rr} - REVERSE RECOVERY TIME TEST CIRCUIT
$I_f = I_r$, $I_{rr} = 0.1\ I_r$



ΔV_F BRIDGE MATCHING CIRCUIT

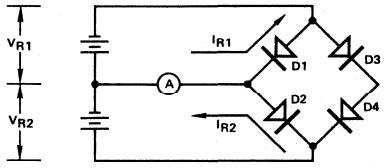


NOTES:
1. R Varies depending on the current range. For the most often used current ranges, R is as follows:

Current Range (amperes)	R (ohms)
10^{-5} to 10^{-4}	10^6
10^{-4} to 10^{-3}	10^5
10^{-3} to 10^{-2}	10^4
or 10^{-n} to 10^{-n+1}	10^{n+1}

2. V indicates mismatch of assembly.

ΔI_R BRIDGE MATCHING CIRCUIT



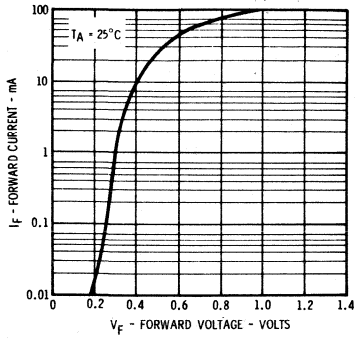
NOTES:
1. $V_{R2} = V_{R1}$ ±1%.
2. $I_{R2} - I_{R1} = \Delta I_R$ (difference in I_R between diodes D1 & D2). To measure diodes D3 & D4, reverse cathode-anodeterminal connections.
3. A is a center reading μμ ammeter. ΔI_R indicated directly on A.

CURVE SET NUMBER D12

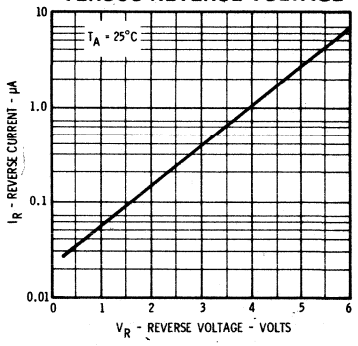
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

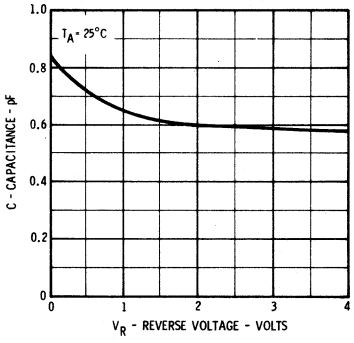
FORWARD CURRENT VERSUS FORWARD VOLTAGE

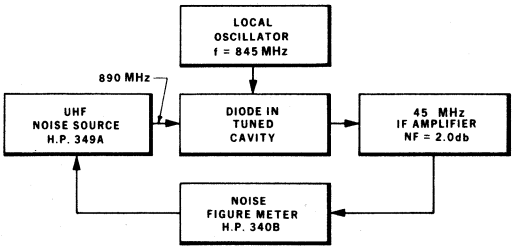


REVERSE CURRENT VERSUS REVERSE VOLTAGE



CAPACITANCE VERSUS REVERSE VOLTAGE





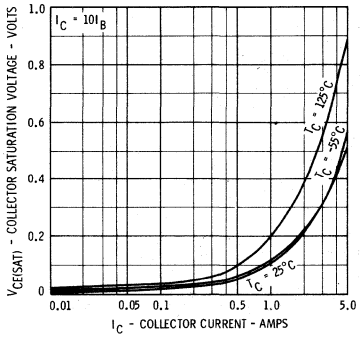
NOISE FIGURE TEST CIRCUIT

CURVE SET NUMBER PWR1

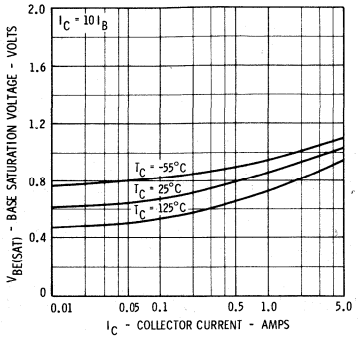
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

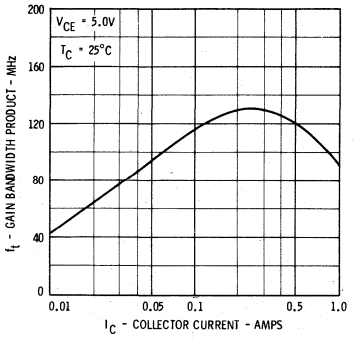
COLLECTOR SATURATION VOLTAGE VERSUS PULSED COLLECTOR CURRENT



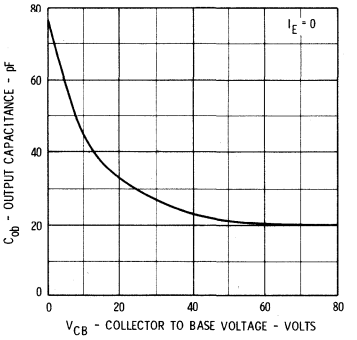
BASE SATURATION VOLTAGE VERSUS PULSED COLLECTOR CURRENT



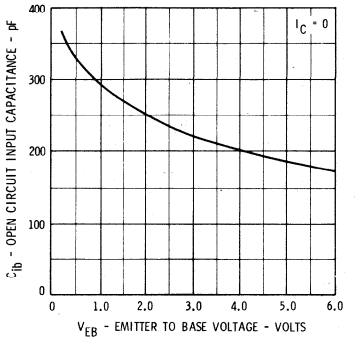
GAIN BANDWIDTH PRODUCT VERSUS COLLECTOR CURRENT



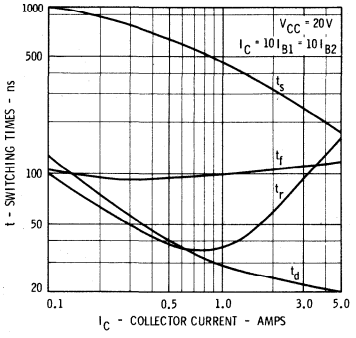
OPEN CIRCUIT OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



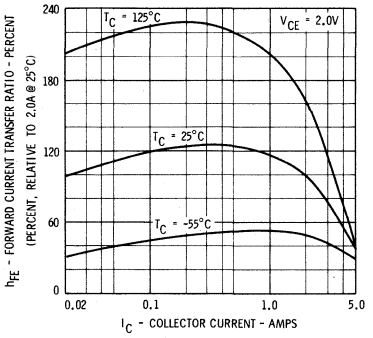
OPEN CIRCUIT INPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



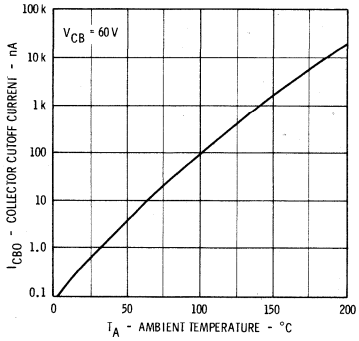
SWITCHING TIMES VERSUS COLLECTOR CURRENT



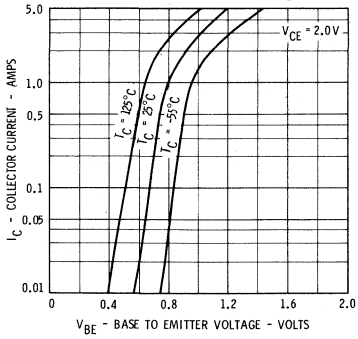
FORWARD CURRENT TRANSFER RATIO VERSUS COLLECTOR CURRENT



COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE

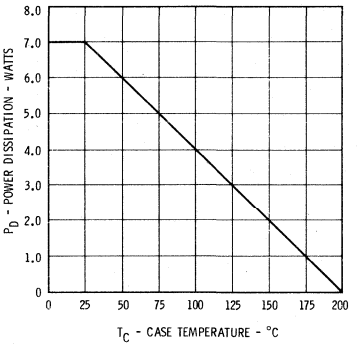


COLLECTOR CURRENT VERSUS BASE TO EMITTER VOLTAGE

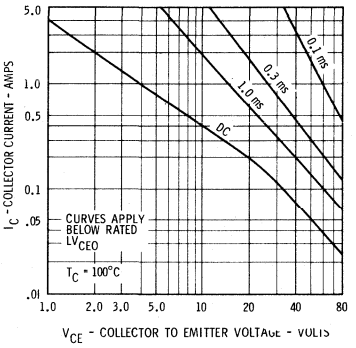


MAXIMUM RATING CURVES

POWER VERSUS TEMPERATURE DERATING CURVE



FORWARD BIASED SAFE OPERATING AREA

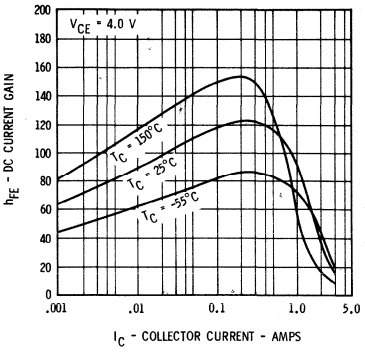


CURVE SET NUMBER PWR2

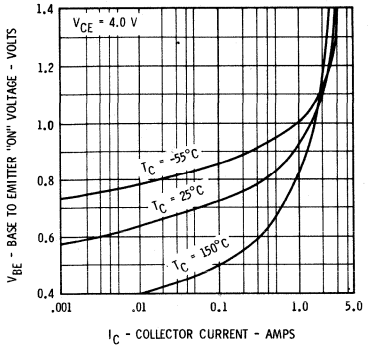
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

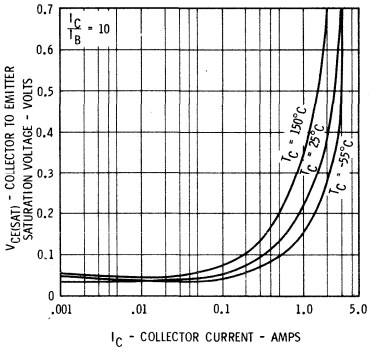
CURRENT GAIN VERSUS COLLECTOR CURRENT



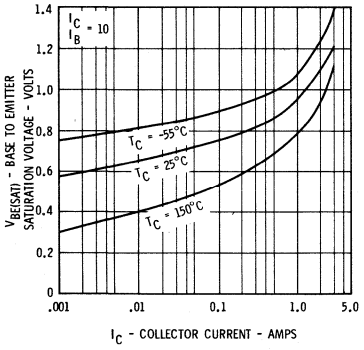
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



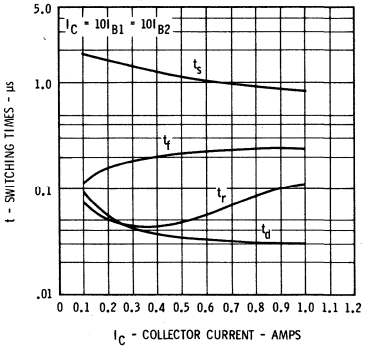
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

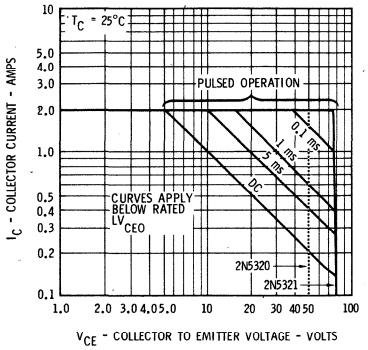


SWITCHING CHARACTERISTICS VERSUS COLLECTOR CURRENT

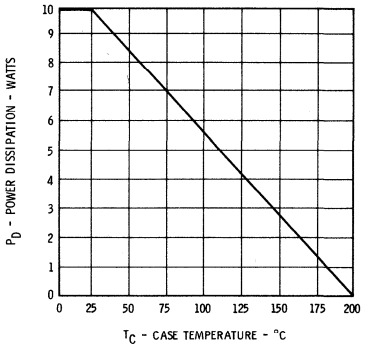


MAXIMUM RATING CURVES

SAFE OPERATING AREA



POWER VERSUS TEMPERATURE DERATING CURVE



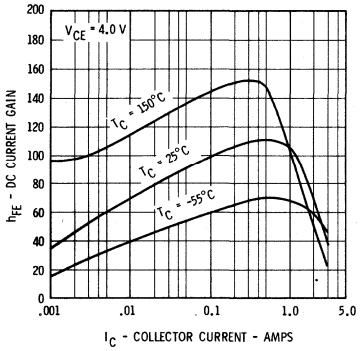
5

CURVE SET NUMBER PWR3

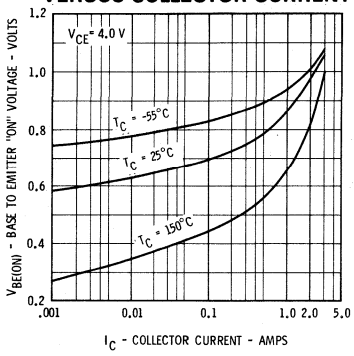
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

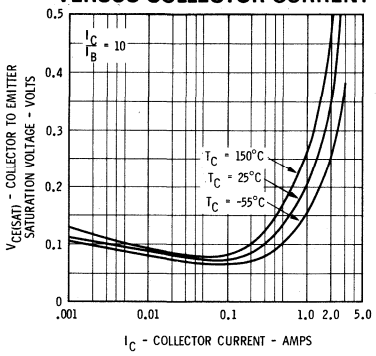
CURRENT GAIN VERSUS COLLECTOR CURRENT



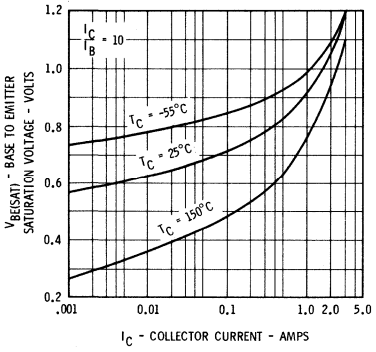
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



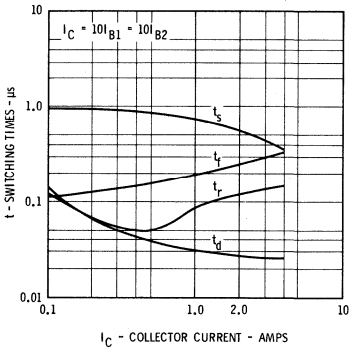
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

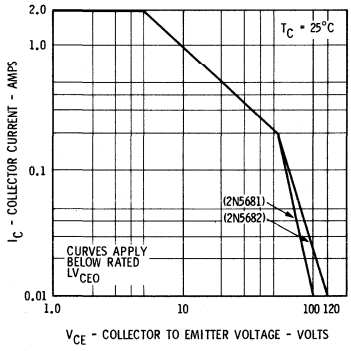


SWITCHING CHARACTERISTICS VERSUS COLLECTOR CURRENT

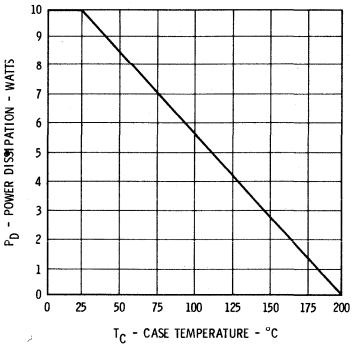


MAXIMUM RATING CURVES

DC SAFE OPERATING AREA



POWER VERSUS TEMPERATURE DERATING CURVE

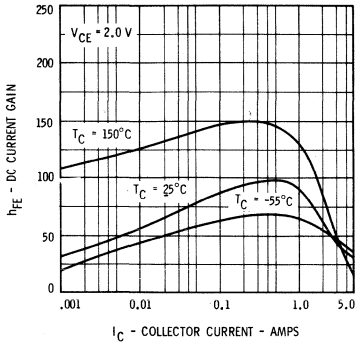


CURVE SET NUMBER PWR4

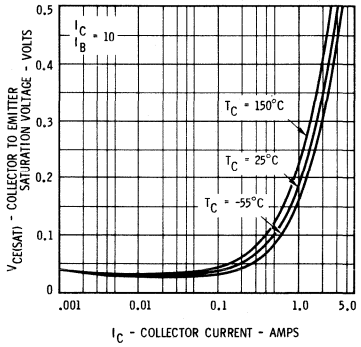
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

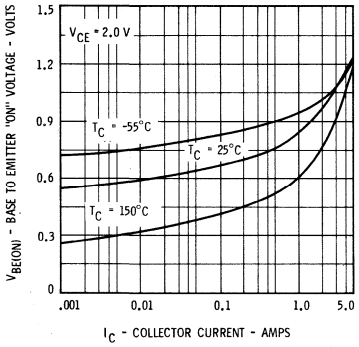
CURRENT GAIN VERSUS COLLECTOR CURRENT



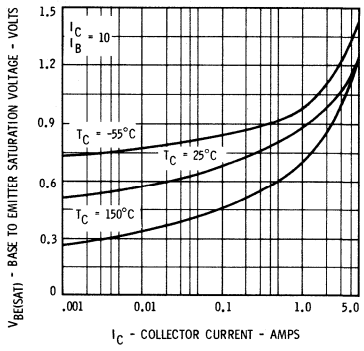
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT

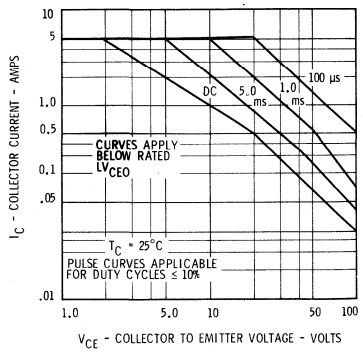


BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

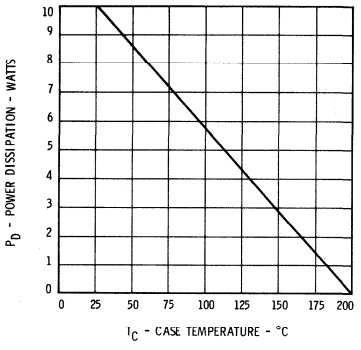


MAXIMUM RATING CURVES

SAFE OPERATING AREA



POWER VERSUS TEMPERATURE DERATING CURVE

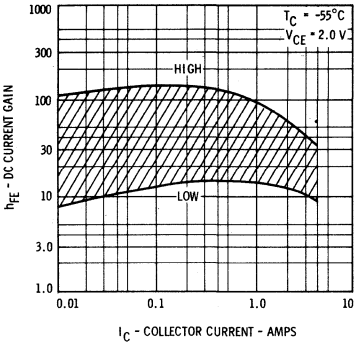


CURVE SET NUMBER PWR5

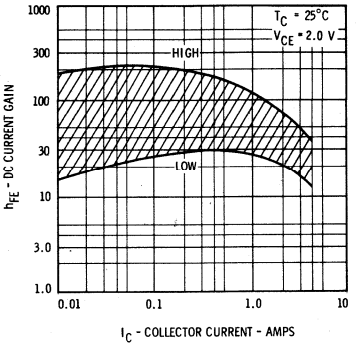
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

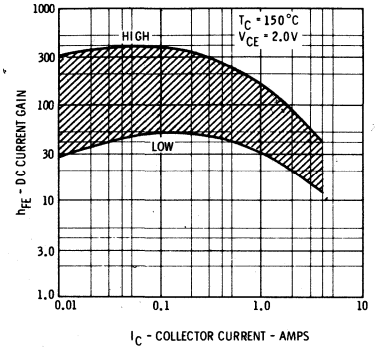
DC CURRENT GAIN VERSUS COLLECTOR CURRENT



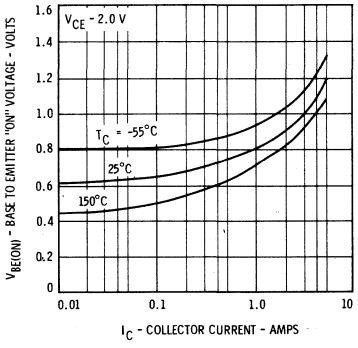
DC CURRENT GAIN VERSUS COLLECTOR CURRENT



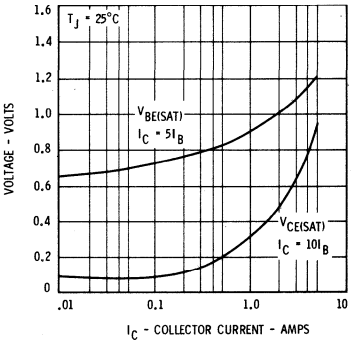
DC CURRENT GAIN VERSUS COLLECTOR CURRENT



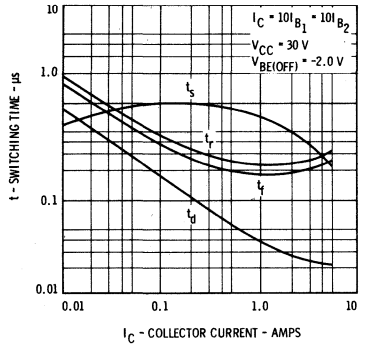
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



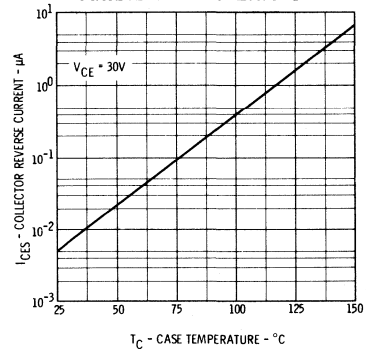
SATURATION VOLTAGES VERSUS COLLECTOR CURRENT



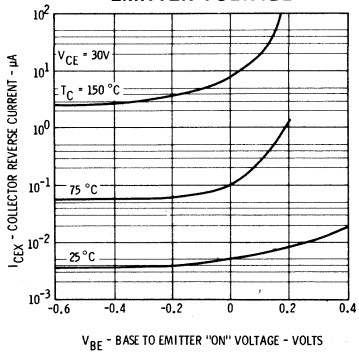
SWITCHING TIMES VERSUS COLLECTOR CURRENT



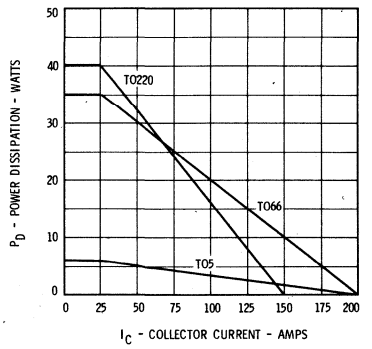
COLLECTOR REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



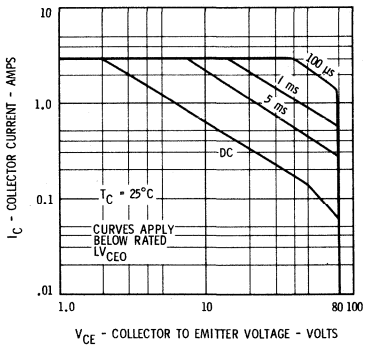
COLLECTOR REVERSE CURRENT VERSUS BASE TO EMITTER VOLTAGE



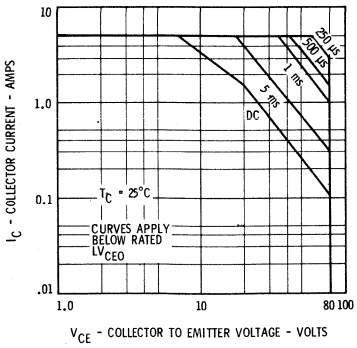
POWER VERSUS TEMPERATURE DERATING CURVE



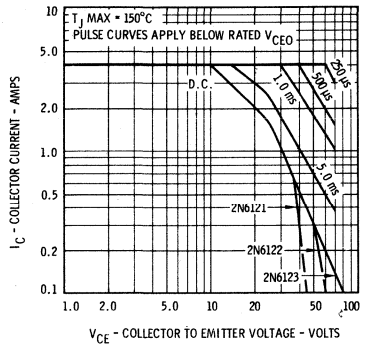
ACTIVE REGION SAFE OPERATING AREA TO5



ACTIVE REGION SAFE OPERATING AREA TO66



ACTIVE REGION SAFE OPERATING AREA TO220

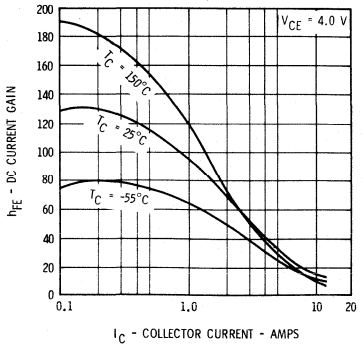


CURVE SET NUMBER PWR6

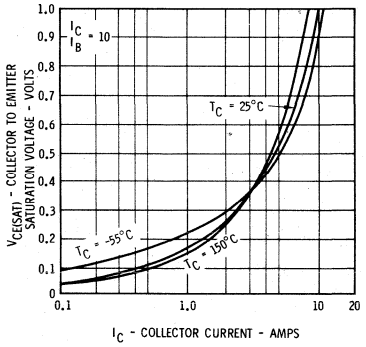
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

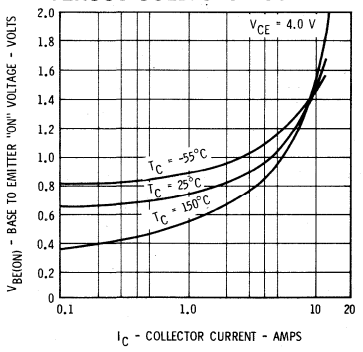
CURRENT GAIN VERSUS COLLECTOR CURRENT



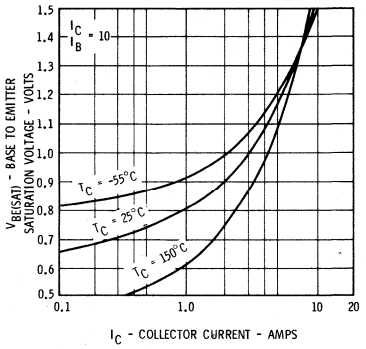
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT

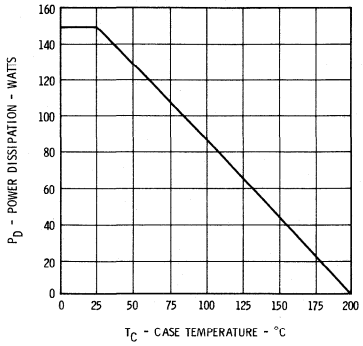


BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

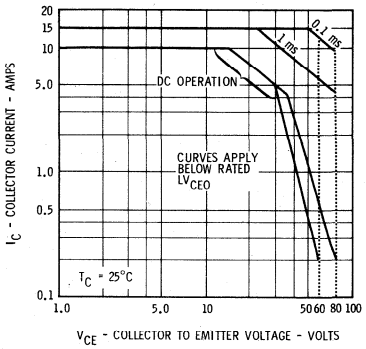


MAXIMUM RATING CURVES

POWER VERSUS TEMPERATURE DERATING CURVE



ACTIVE REGION SAFE OPERATING AREA

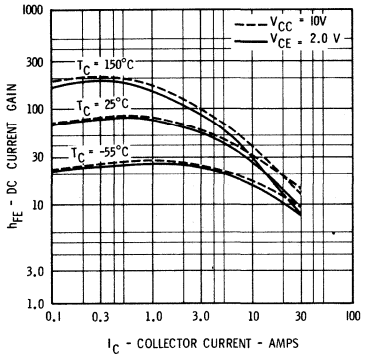


CURVE SET NUMBER PWR7

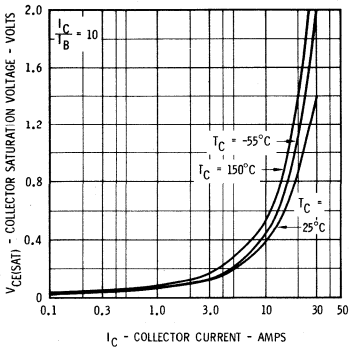
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

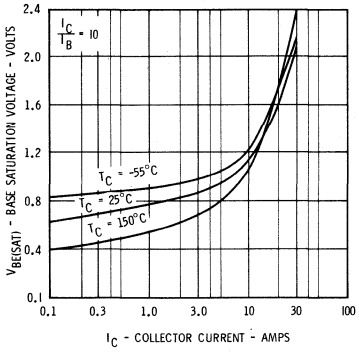
DC CURRENT GAIN VERSUS COLLECTOR CURRENT



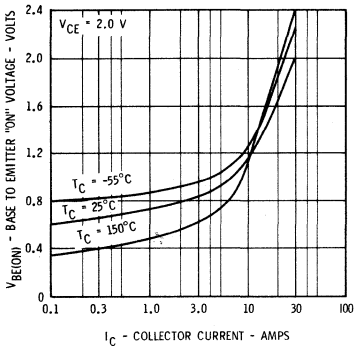
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



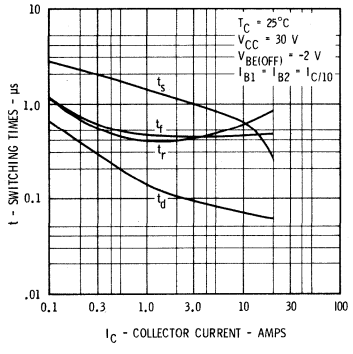
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



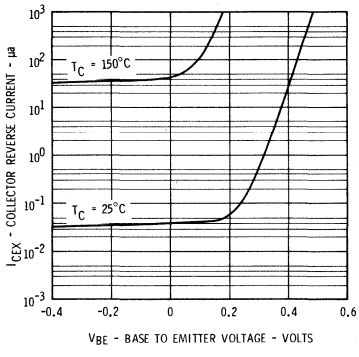
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



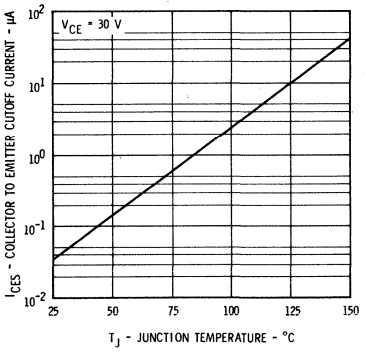
SWITCHING TIME VERSUS COLLECTOR CURRENT



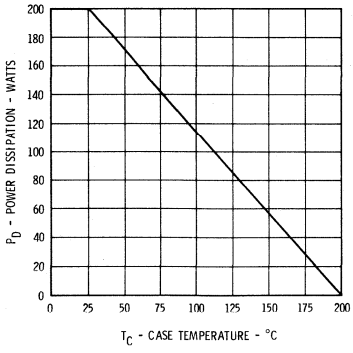
COLLECTOR REVERSE CURRENT VERSUS BASE TO EMITTER VOLTAGE



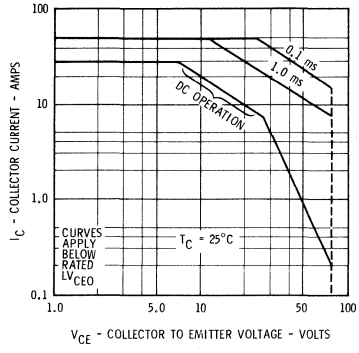
COLLECTOR CUTOFF CURRENT VERSUS JUNCTION TEMPERATURE



POWER VERSUS TEMPERATURE DERATING CURVE



SAFE OPERATING AREA

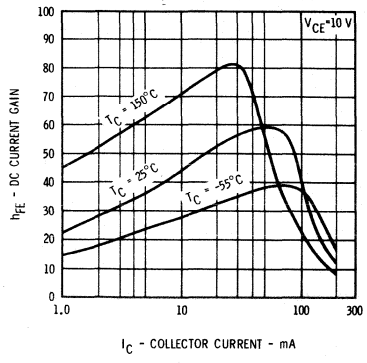


CURVE SET NUMBER PWR8

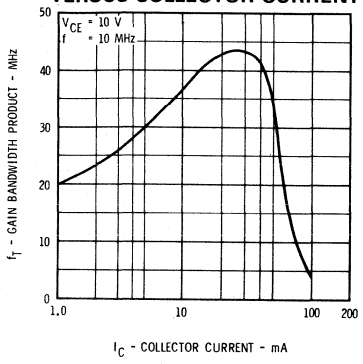
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

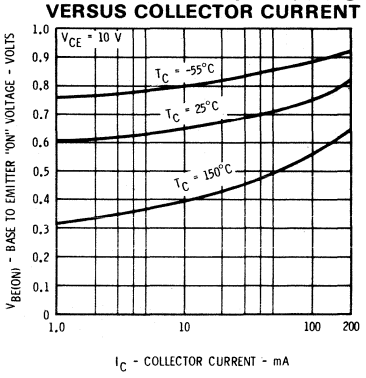
CURRENT GAIN VERSUS COLLECTOR CURRENT



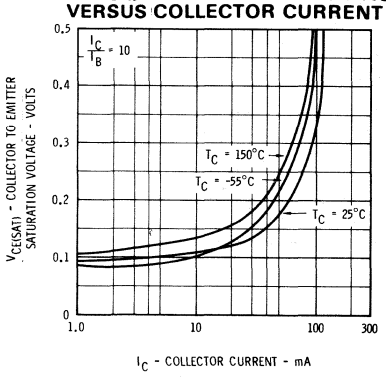
GAIN BANDWIDTH PRODUCT VERSUS COLLECTOR CURRENT



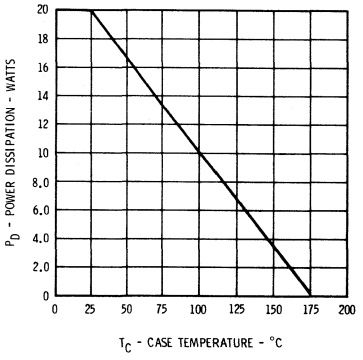
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



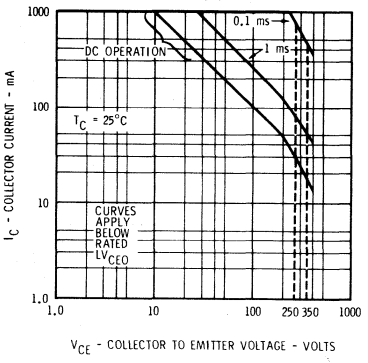
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



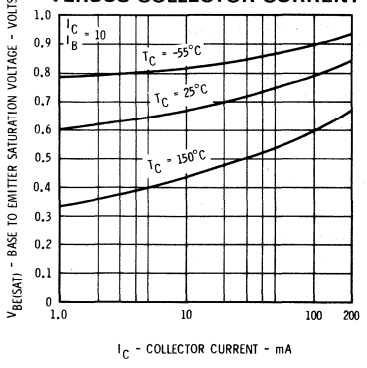
POWER VERSUS TEMPERATURE DERATING CURVE TO66



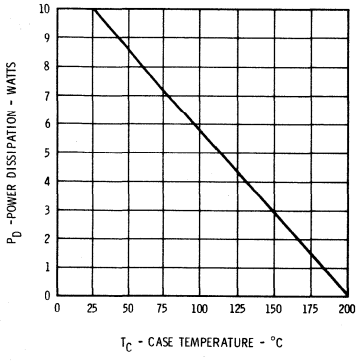
SAFE OPERATING AREA TO5



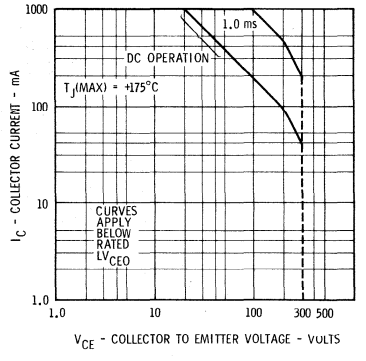
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



POWER VERSUS TEMPERATURE DERATING CURVE TO5



SAFE OPERATING AREA TO66



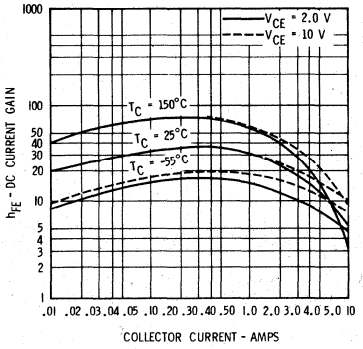
5

CURVE SET NUMBER PWR9

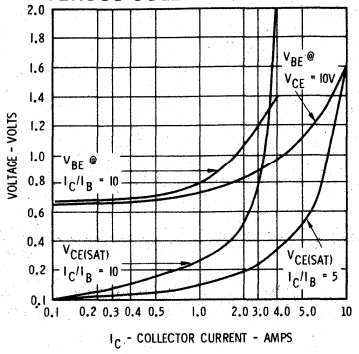
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

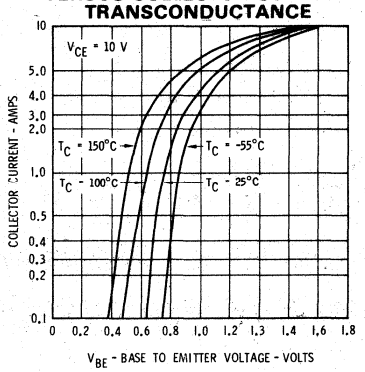
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



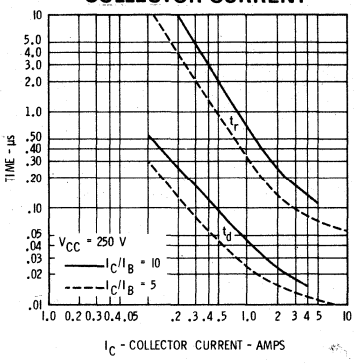
COLLECTOR SATURATION AND BASE TO EMITTER VOLTAGE VERSUS COLLECTOR CURRENT



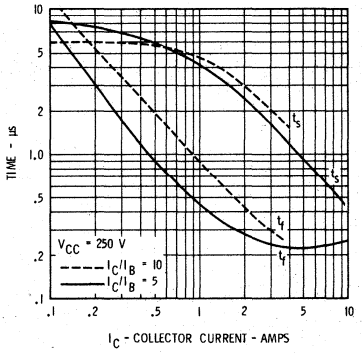
BASE TO EMITTER VOLTAGE VERSUS COLLECTOR CURRENT TRANSCONDUCTANCE



TURN ON TIME VERSUS COLLECTOR CURRENT

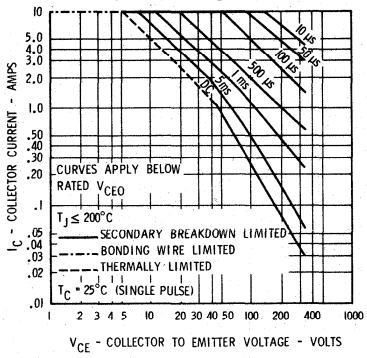


TURN OFF TIME VERSUS COLLECTOR CURRENT

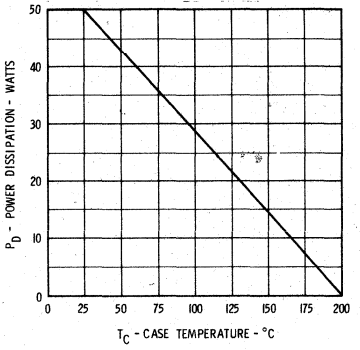


MAXIMUM RATING CURVES

ACTIVE REGION SAFE OPERATING AREA



POWER VERSUS TEMPERATURE DERATING CURVE

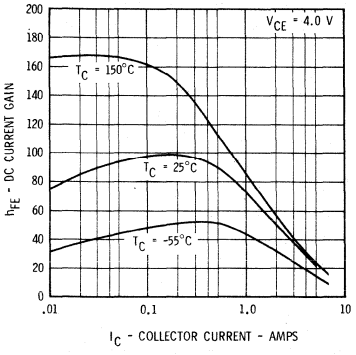


CURVE SET NUMBER PWR10

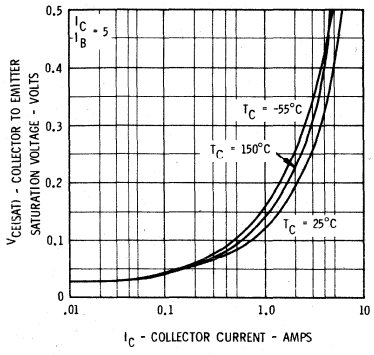
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

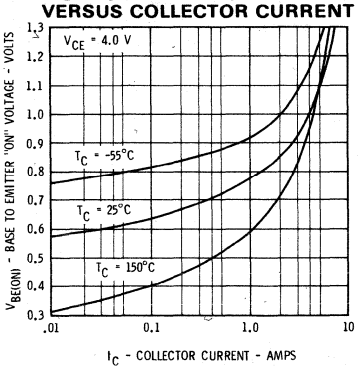
CURRENT GAIN VERSUS COLLECTOR CURRENT



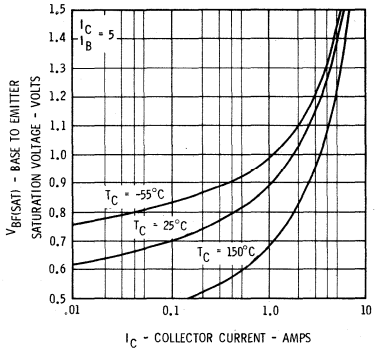
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



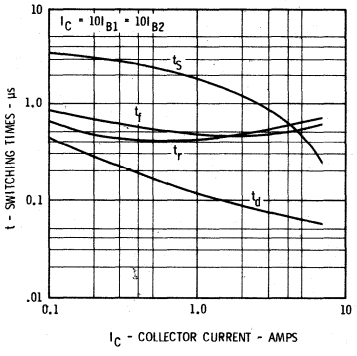
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

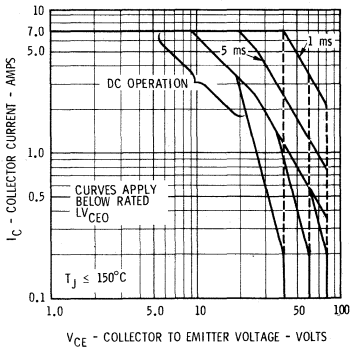


SWITCHING CHARACTERISTICS VERSUS COLLECTOR CURRENT

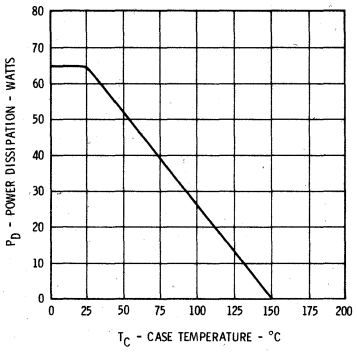


MAXIMUM RATING CURVES

SAFE OPERATING AREA



POWER VERSUS TEMPERATURE DERATING CURVE



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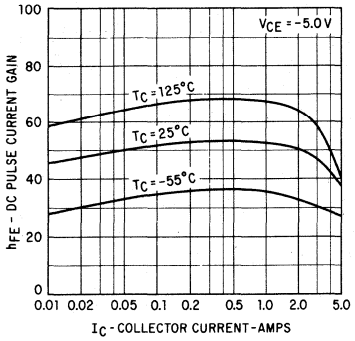
CURVE SET NUMBER PWR11

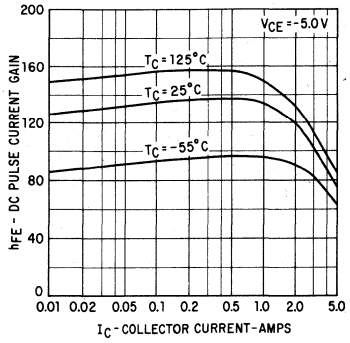
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

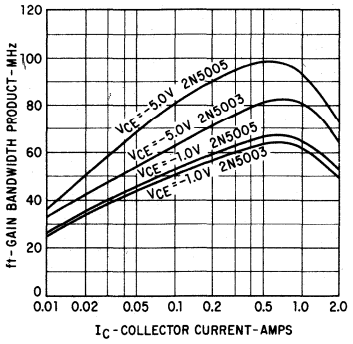
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT 2N5003



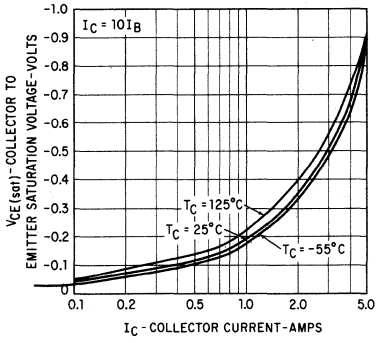
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT 2N5005



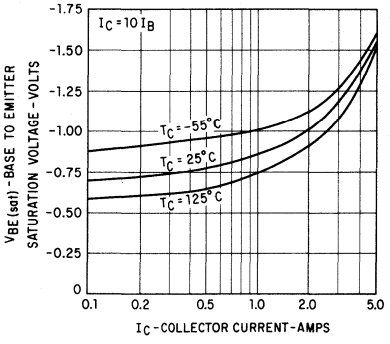
GAIN BANDWIDTH PRODUCT VERSUS COLLECTOR CURRENT



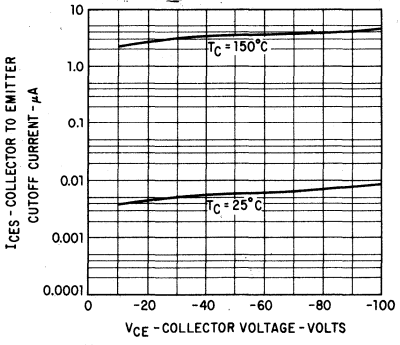
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



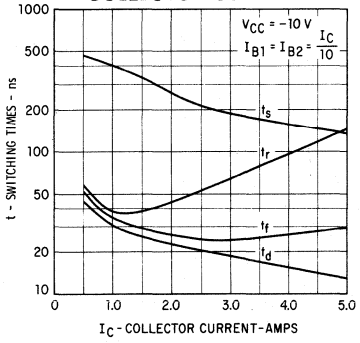
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



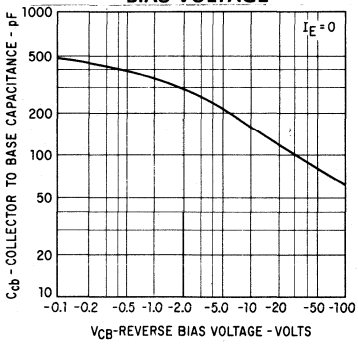
COLLECTOR CUTOFF CURRENT VERSUS COLLECTOR VOLTAGE



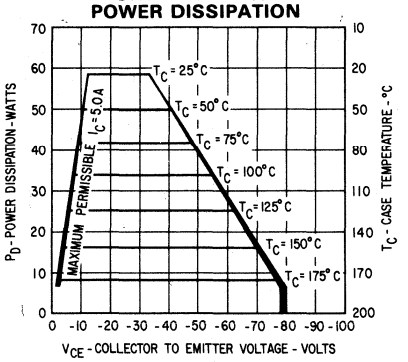
SWITCHING TIMES VERSUS COLLECTOR CURRENT



COLLECTOR TO BASE CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



MAXIMUM PERMISSIBLE DC FORWARD BIASED POWER DISSIPATION

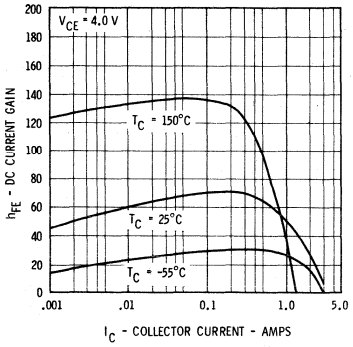


CURVE SET NUMBER PWR12

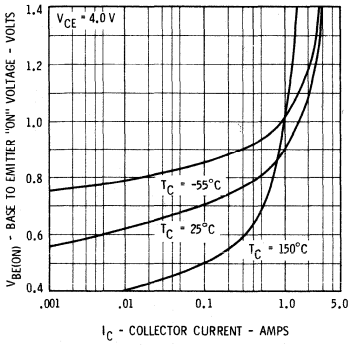
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

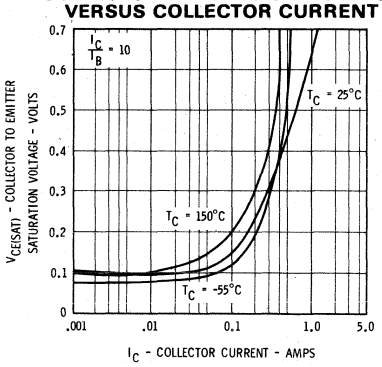
CURRENT GAIN VERSUS COLLECTOR CURRENT



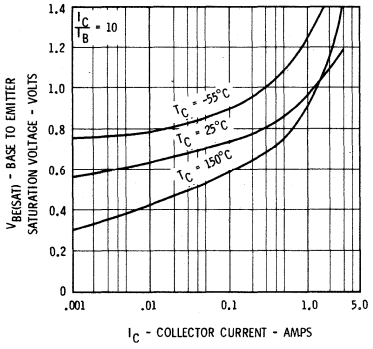
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



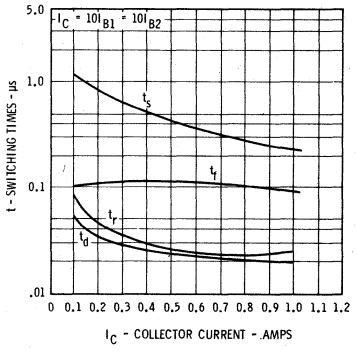
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

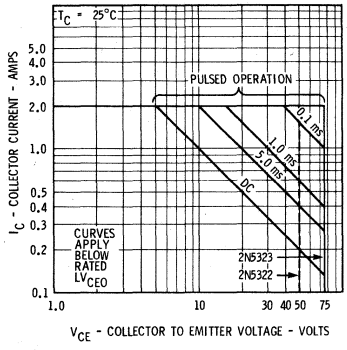


SWITCHING CHARACTERISTICS VERSUS COLLECTOR CURRENT

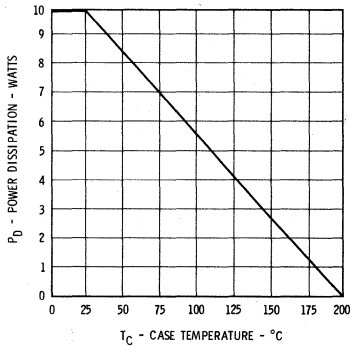


MAXIMUM RATING CURVES

SAFE OPERATING AREA



POWER VERSUS TEMPERATURE DERATING CURVE



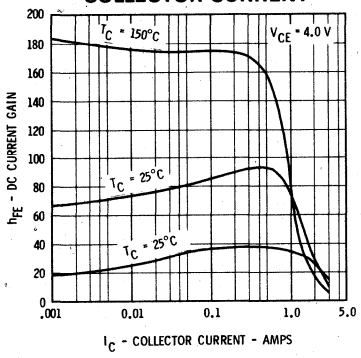
5

CURVE SET NUMBER PWR13

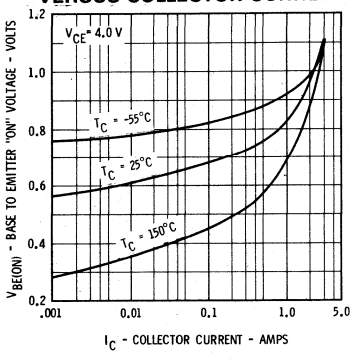
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

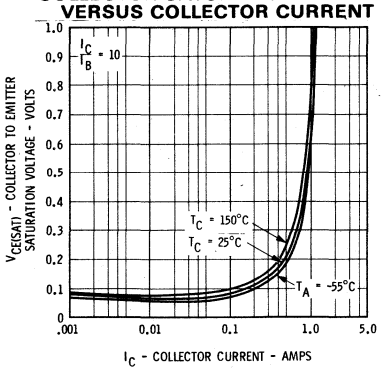
CURRENT GAIN VERSUS COLLECTOR CURRENT



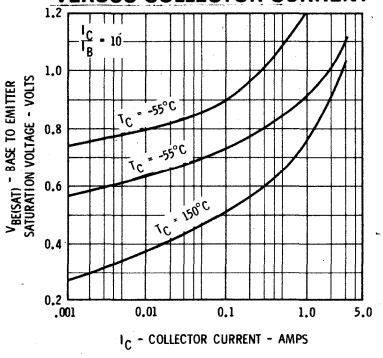
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



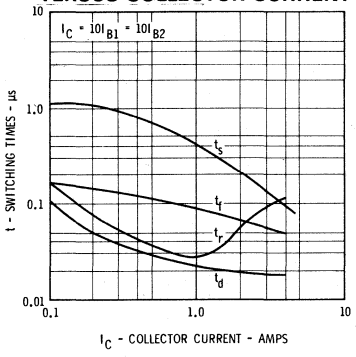
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

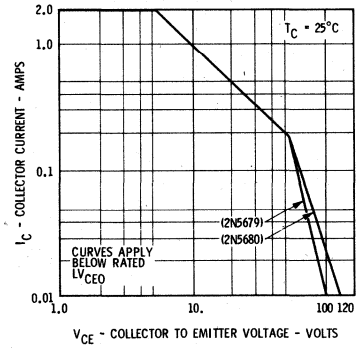


SWITCHING CHARACTERISTICS VERSUS COLLECTOR CURRENT

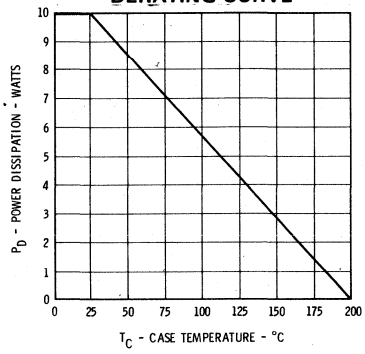


MAXIMUM RATING CURVES

DC SAFE OPERATING AREA



POWER VERSUS TEMPERATURE DERATING CURVE

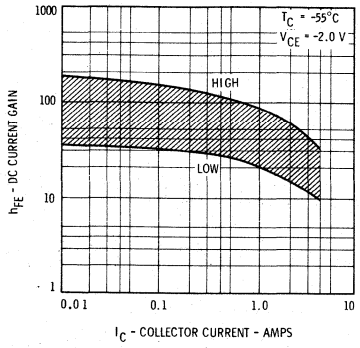


CURVE SET NUMBER PWR14

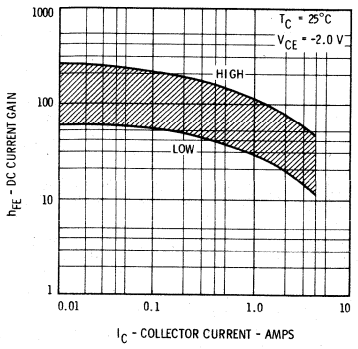
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

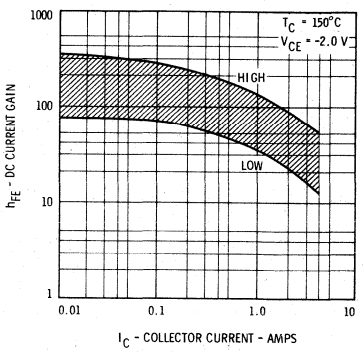
TYPICAL DC CURRENT GAIN VERSUS COLLECTOR CURRENT



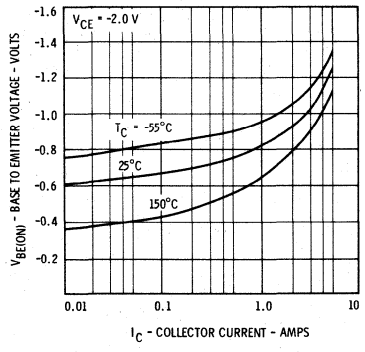
TYPICAL DC CURRENT GAIN VERSUS COLLECTOR CURRENT



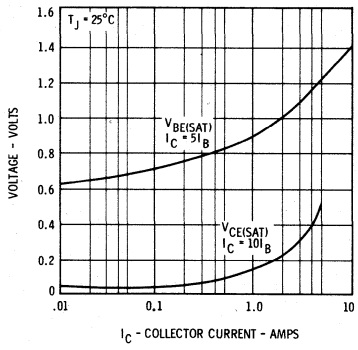
TYPICAL DC CURRENT GAIN VERSUS COLLECTOR CURRENT



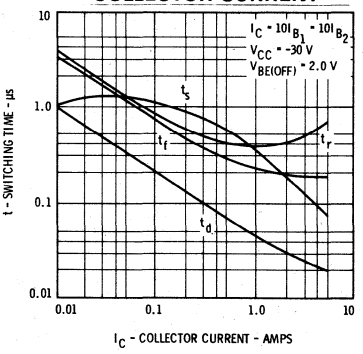
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



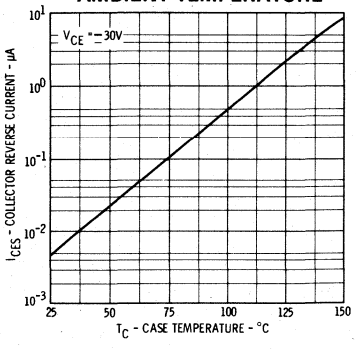
SATURATION VOLTAGES VERSUS COLLECTOR CURRENT



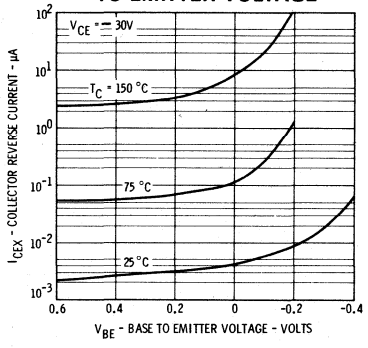
SWITCHING TIMES VERSUS COLLECTOR CURRENT



COLLECTOR REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



COLLECTOR REVERSE CURRENT VERSUS BASE TO EMITTER VOLTAGE

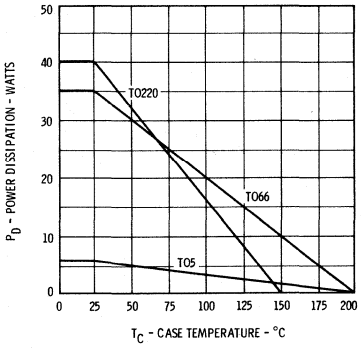


5

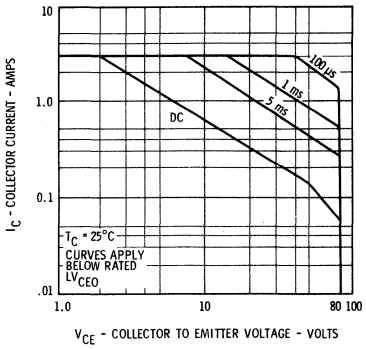
CURVE SET NUMBER PWR14

MAXIMUM RATING CURVES

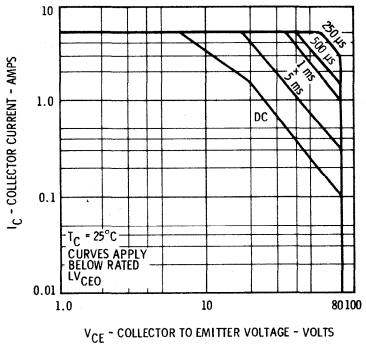
POWER VERSUS TEMPERATURE DERATING CURVE



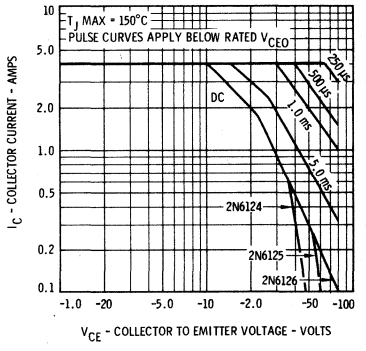
ACTIVE REGION SAFE OPERATING AREA TO5



ACTIVE REGION SAFE OPERATING AREA TO66



ACTIVE REGION SAFE OPERATING AREA TO220

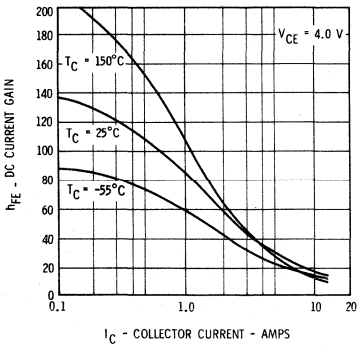


CURVE SET NUMBER PWR15

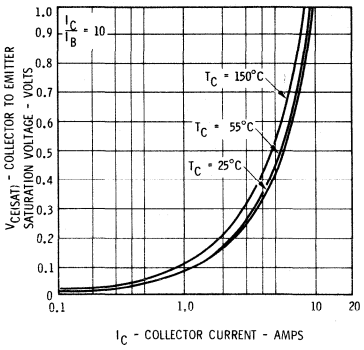
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

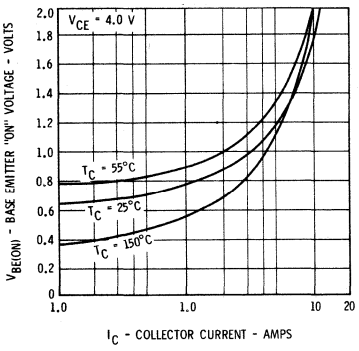
CURRENT GAIN VERSUS COLLECTOR CURRENT



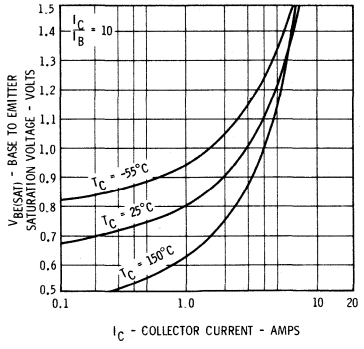
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT

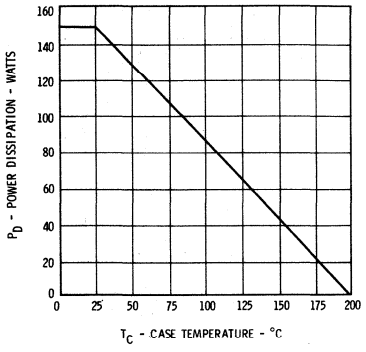


BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

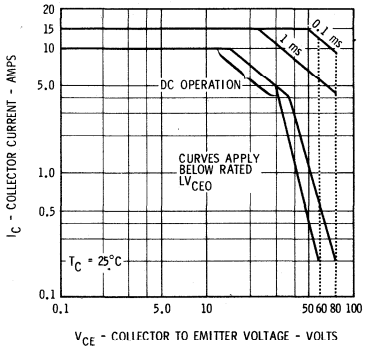


MAXIMUM RATING CURVES

POWER VERSUS TEMPERATURE DERATING CURVE



ACTIVE REGION SAFE OPERATING AREA

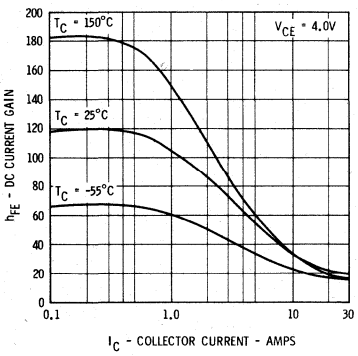


CURVE SET NUMBER PWR16

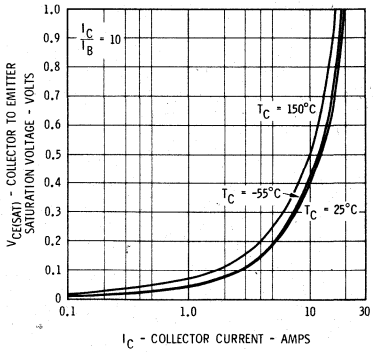
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

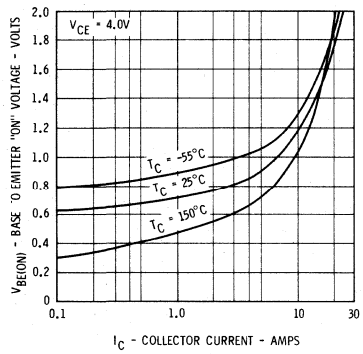
CURRENT GAIN VERSUS COLLECTOR CURRENT



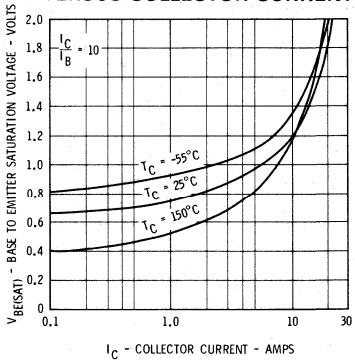
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT

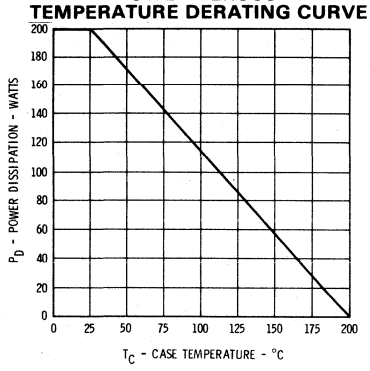


BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

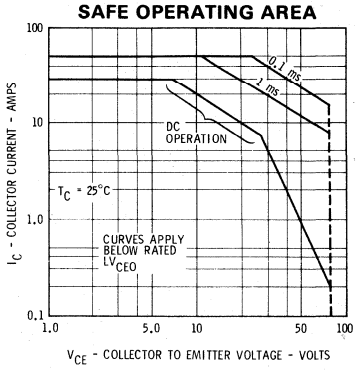


MAXIMUM RATING CURVES

POWER VERSUS TEMPERATURE DERATING CURVE



SAFE OPERATING AREA

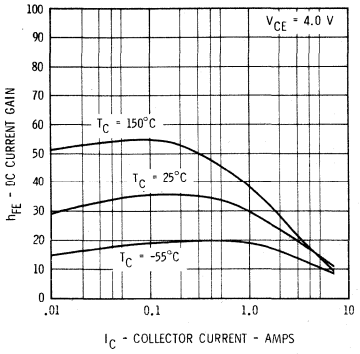


CURVE SET NUMBER PWR17

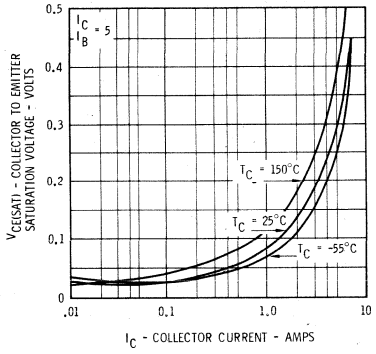
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

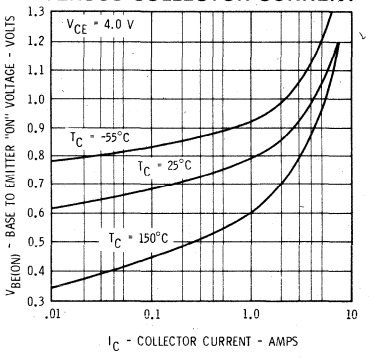
CURRENT GAIN VERSUS COLLECTOR CURRENT



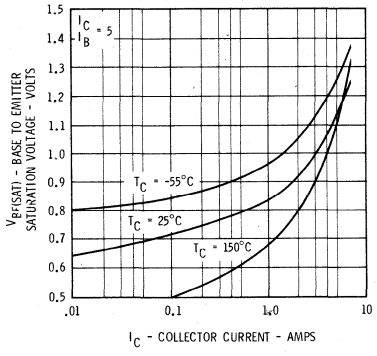
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



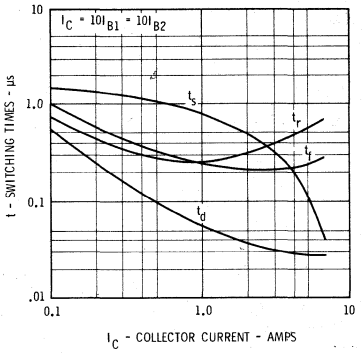
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

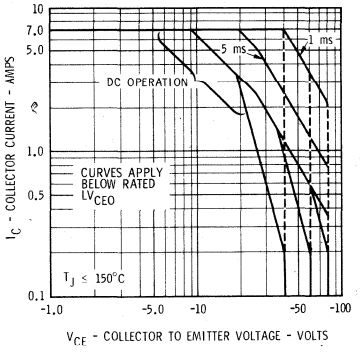


SWITCHING CHARACTERISTICS VERSUS COLLECTOR CURRENT

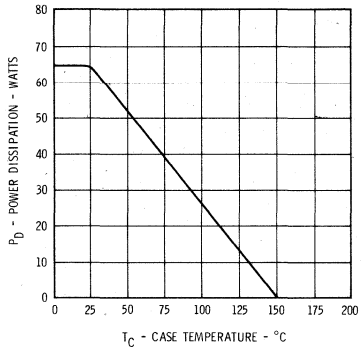


MAXIMUM RATING CURVES

SAFE OPERATING AREA



POWER VERSUS TEMPERATURE DERATING CURVE

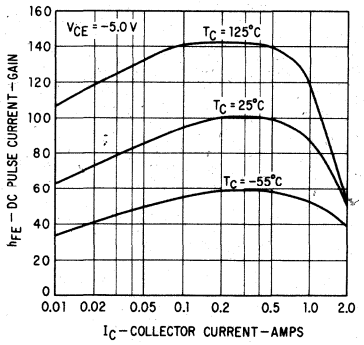


CURVE SET NUMBER PWR18

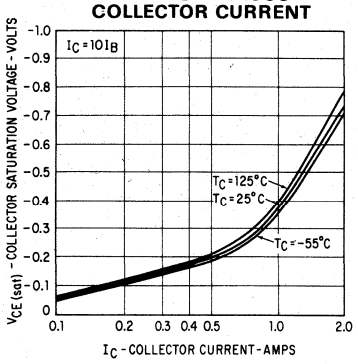
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

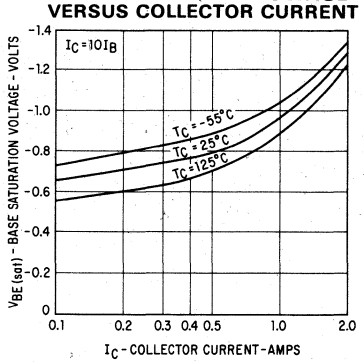
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



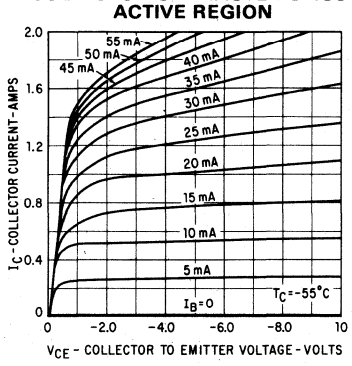
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



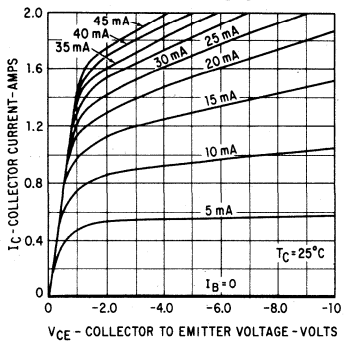
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



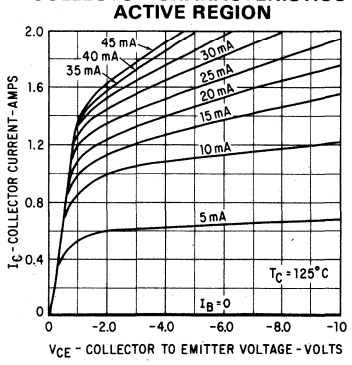
COLLECTOR CHARACTERISTICS ACTIVE REGION



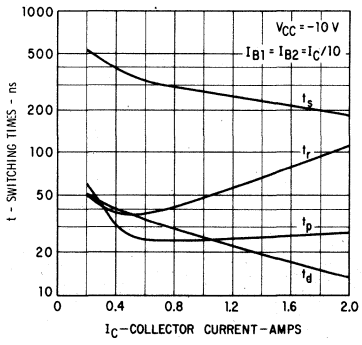
COLLECTOR CHARACTERISTICS ACTIVE REGION



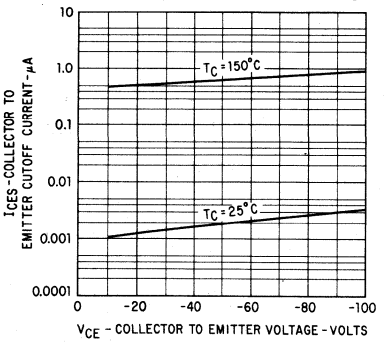
COLLECTOR CHARACTERISTICS ACTIVE REGION



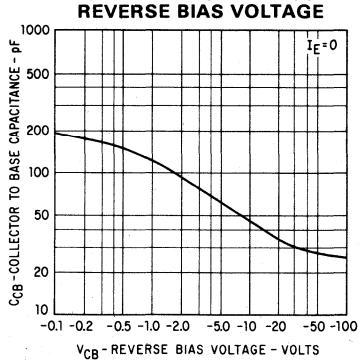
SWITCHING TIMES VERSUS COLLECTOR CURRENT



COLLECTOR CUTOFF CURRENT VERSUS COLLECTOR VOLTAGE

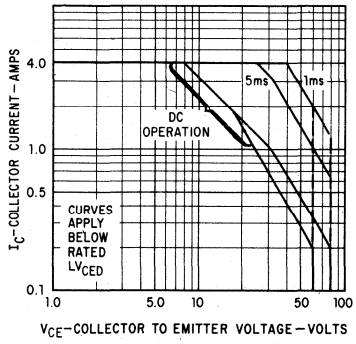


COLLECTOR TO BASE CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



MAXIMUM RATING CURVE

SAFE OPERATING AREA

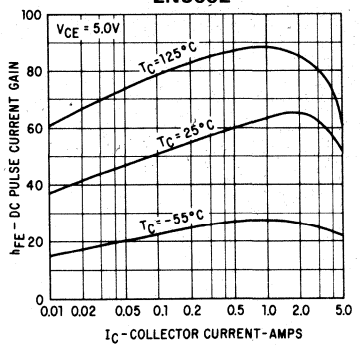


CURVE SET NUMBER PWR19

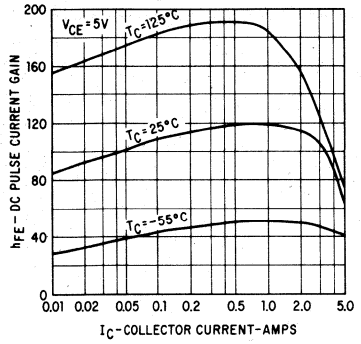
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

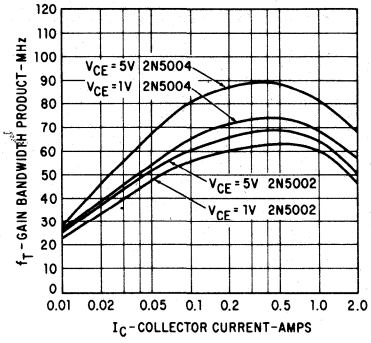
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT 2N5002



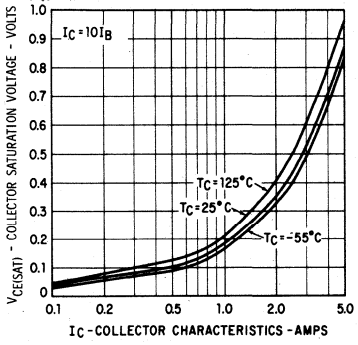
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT 2N5004



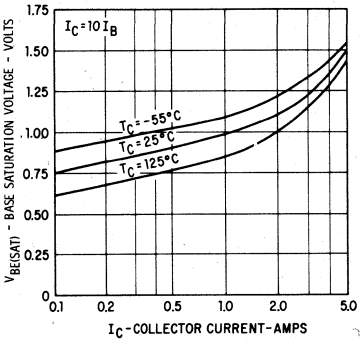
GAIN BANDWIDTH PRODUCT VERSUS COLLECTOR CURRENT



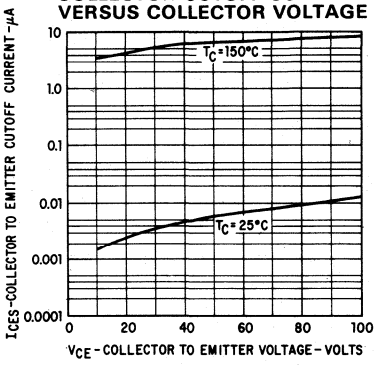
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



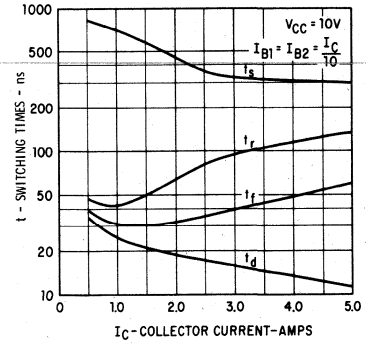
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



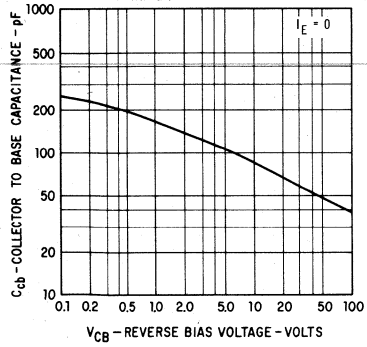
COLLECTOR CUTOFF CURRENT VERSUS COLLECTOR VOLTAGE



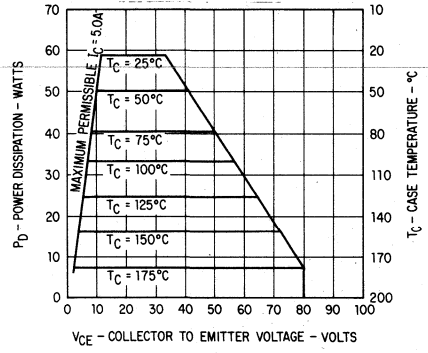
SWITCHING TIMES VERSUS COLLECTOR CURRENT



COLLECTOR TO BASE CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



MAXIMUM PERMISSIBLE DC FORWARD BIASED POWER DISSIPATION



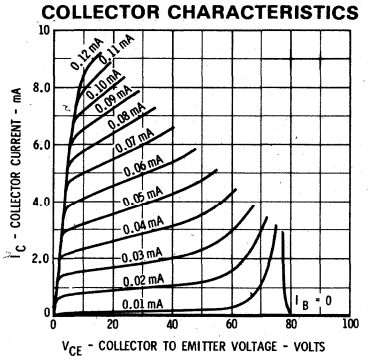
5

CURVE SET NUMBER SS1

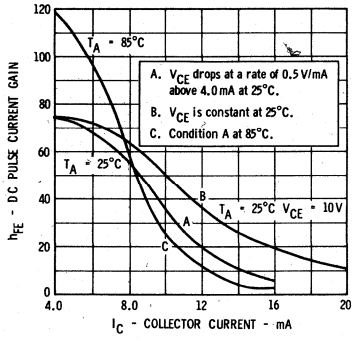
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

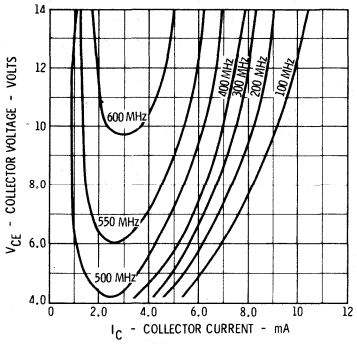
COLLECTOR CHARACTERISTICS



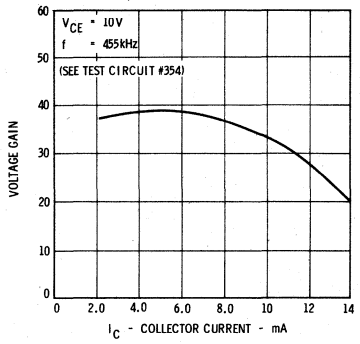
DC CURRENT GAIN VERSUS COLLECTOR CURRENT



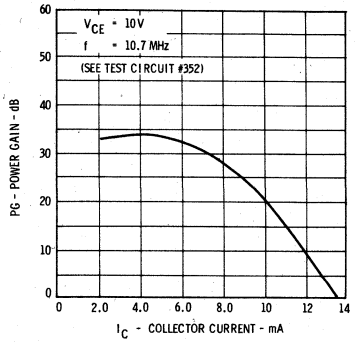
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



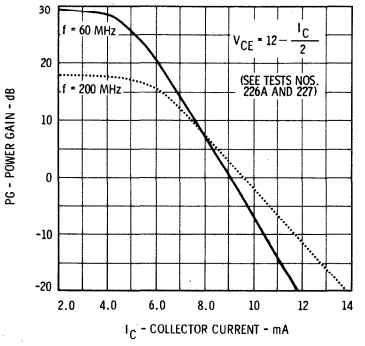
VOLTAGE GAIN VERSUS COLLECTOR CURRENT



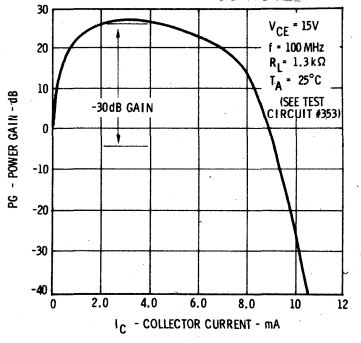
POWER GAIN VERSUS COLLECTOR CURRENT



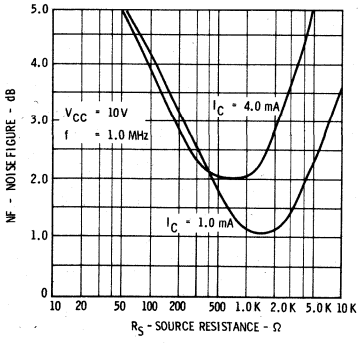
POWER GAIN VERSUS COLLECTOR CURRENT



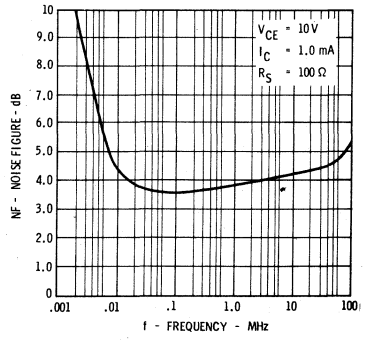
POWER GAIN VERSUS COLLECTOR CURRENT



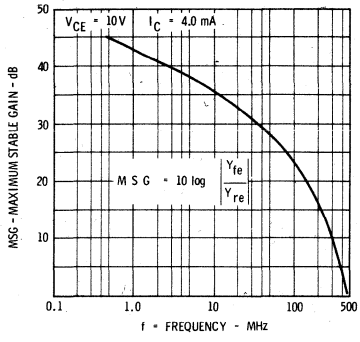
NARROW BAND NOISE FIGURE VERSUS SOURCE RESISTANCE



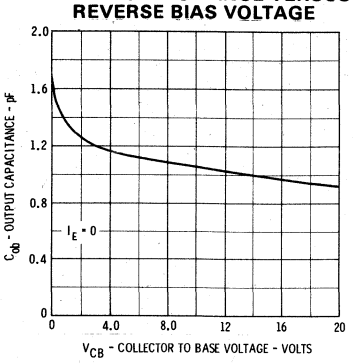
NOISE FIGURE VERSUS FREQUENCY



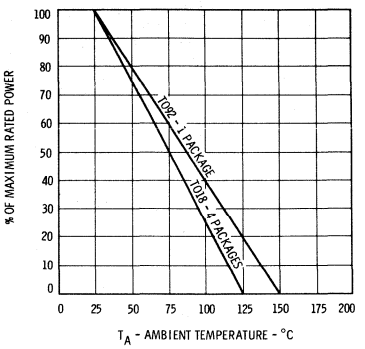
MAXIMUM STABLE GAIN VERSUS FREQUENCY



OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

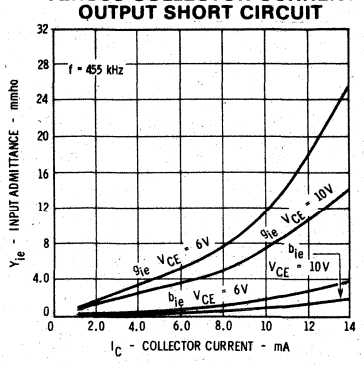


CURVE SET NUMBER SS1

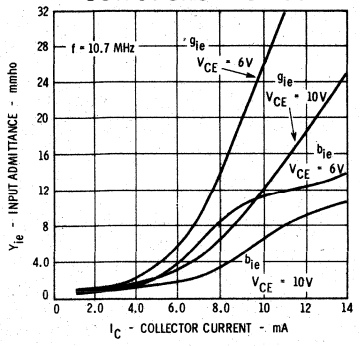
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

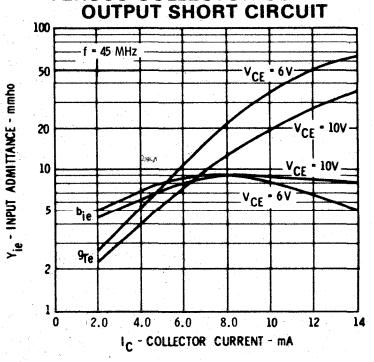
455 kHz INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



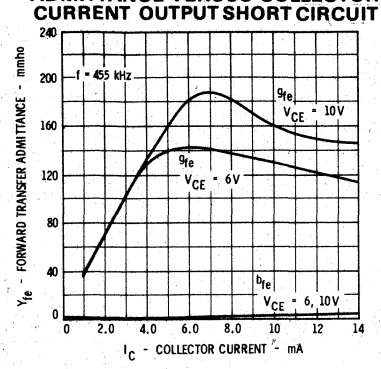
10.7 MHz INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



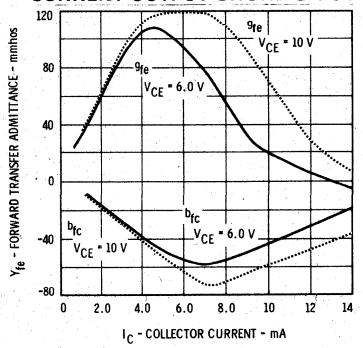
45 MHz INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



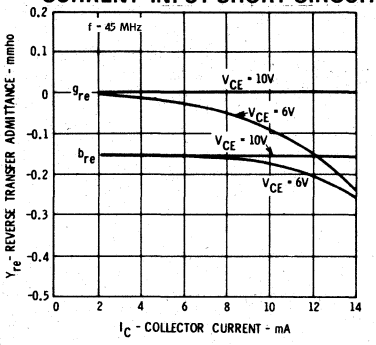
455 kHz FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



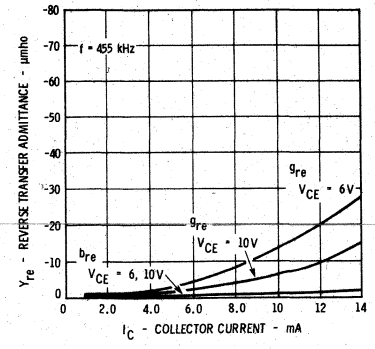
10.7 MHz FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



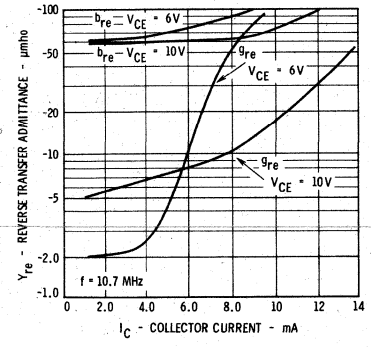
45 MHz REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



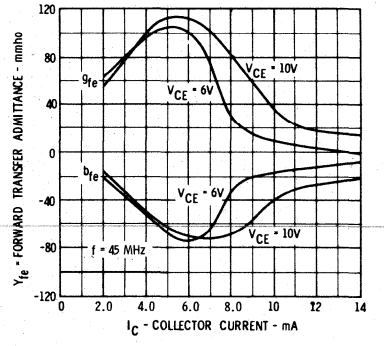
455 kHz REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



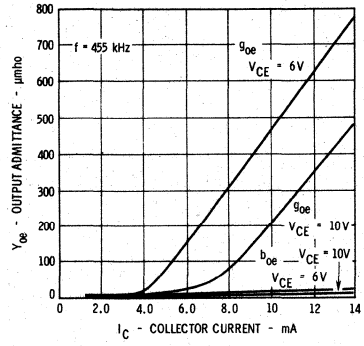
10.7 MHz REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



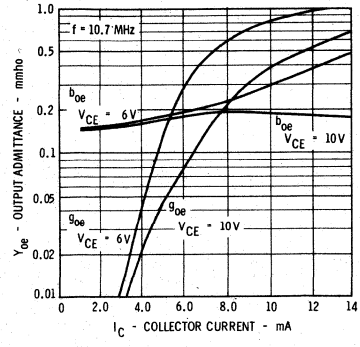
45 MHz FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



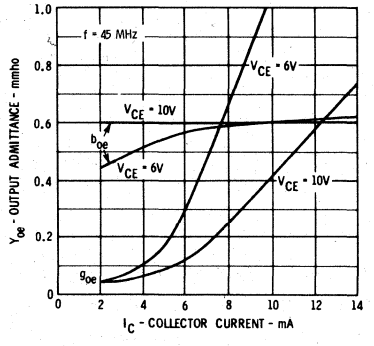
455 kHz OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



10.7 MHz OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



45 MHz OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



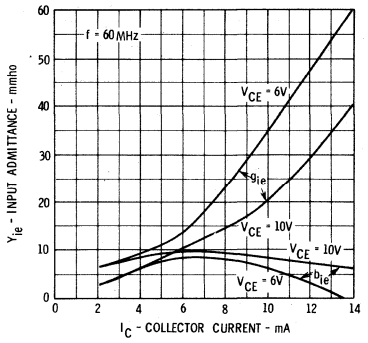
5

CURVE SET NUMBER SS1

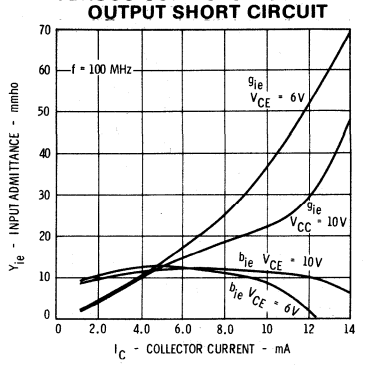
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

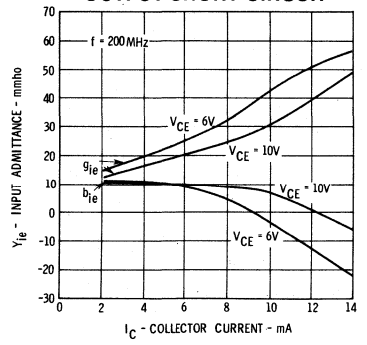
60 MHz INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



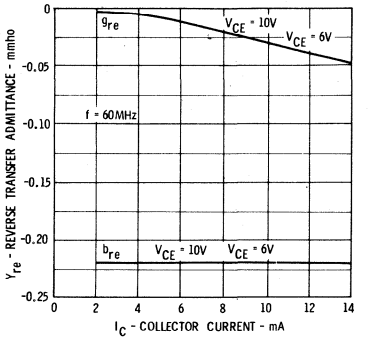
100 MHz INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



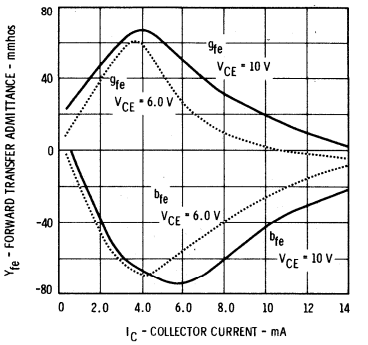
200 MHz INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



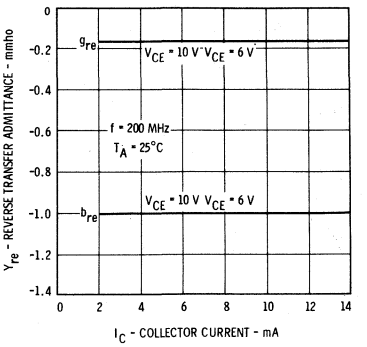
60 MHz REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



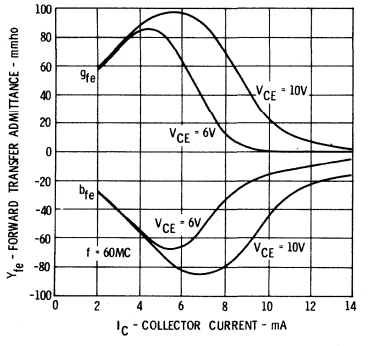
100 MHz FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



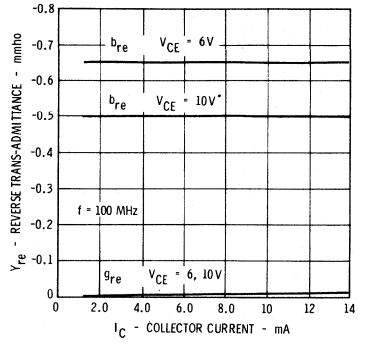
200 MHz REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



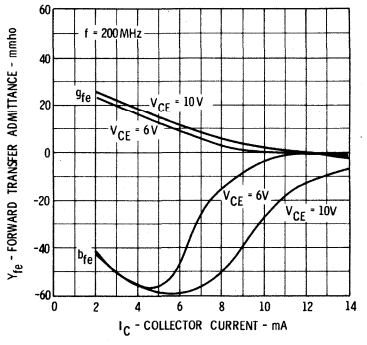
60 MHz FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



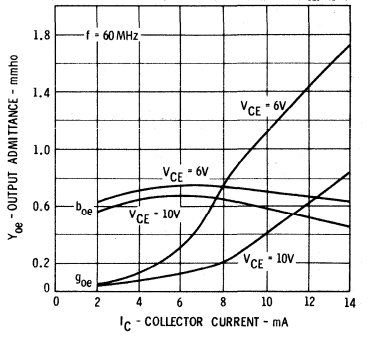
100 MHz REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



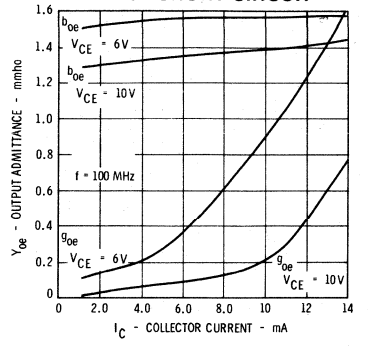
200 MHz FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



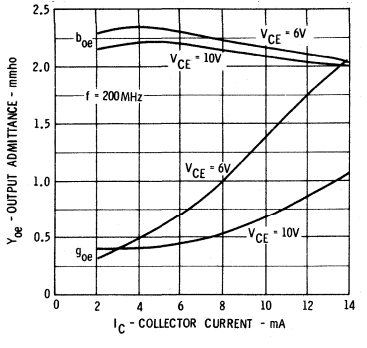
60 MHz OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



100 MHz OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



200 MHz OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT

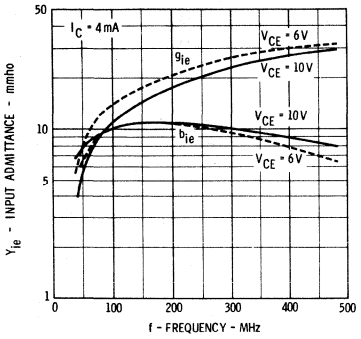


CURVE SET NUMBER SS1

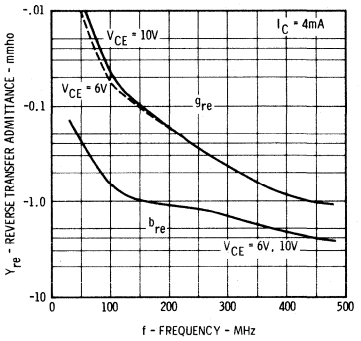
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

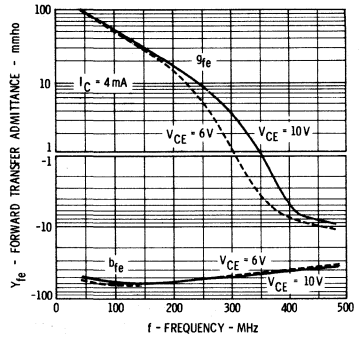
INPUT ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



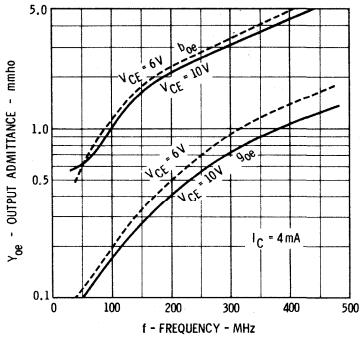
REVERSE TRANSFER ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



FORWARD TRANSFER ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



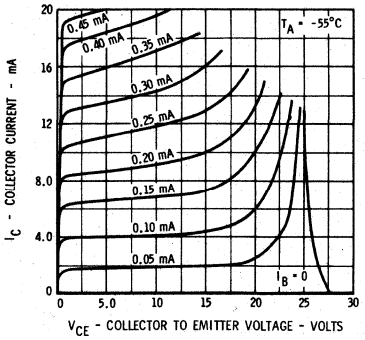
5

CURVE SET NUMBER SS2

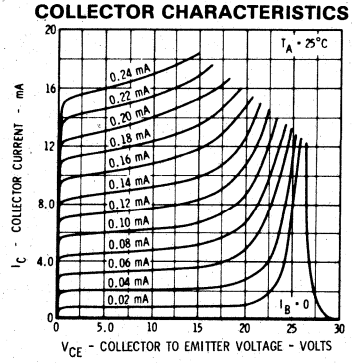
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

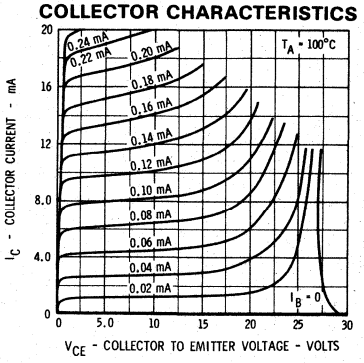
COLLECTOR CHARACTERISTICS



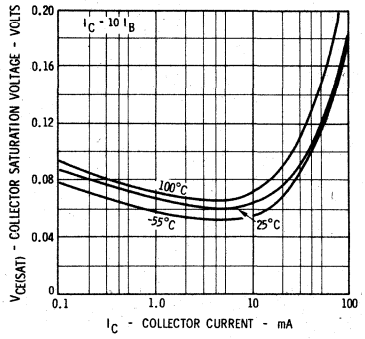
COLLECTOR CHARACTERISTICS



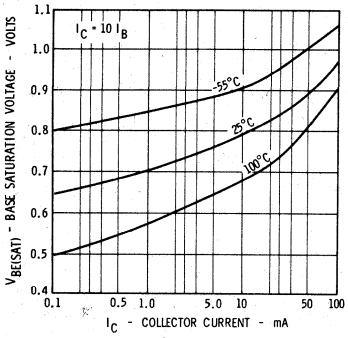
COLLECTOR CHARACTERISTICS



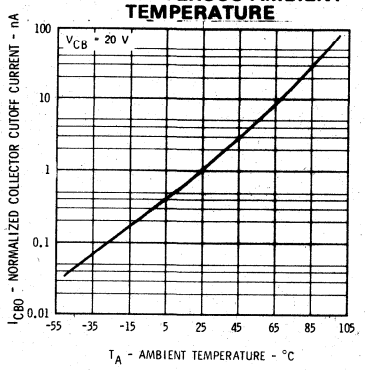
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



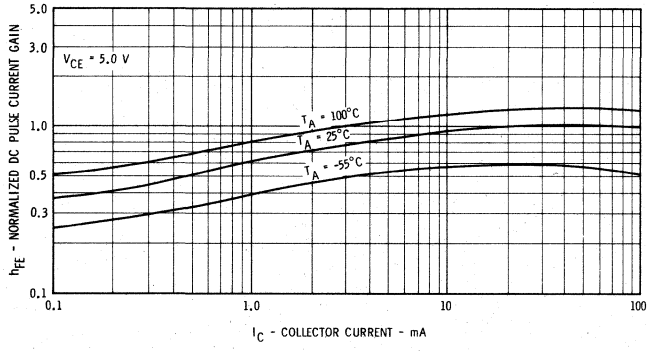
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



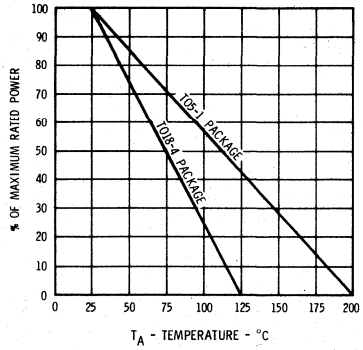
NORMALIZED COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



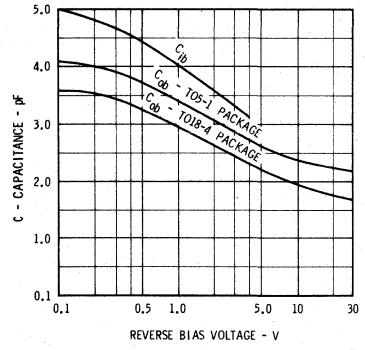
NORMALIZED CURRENT GAIN VERSUS COLLECTOR CURRENT



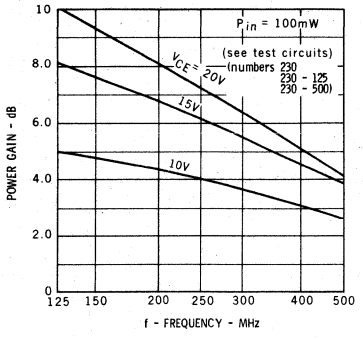
ALLOWABLE POWER DISSIPATION VERSUS TEMPERATURE



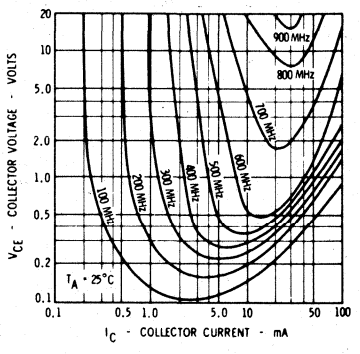
INPUT AND OUTPUT CAPACITANCES VERSUS REVERSE BIAS VOLTAGE



POWER GAIN VERSUS FREQUENCY



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT

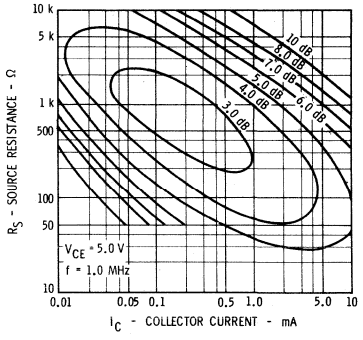


CURVE SET NUMBER SS2

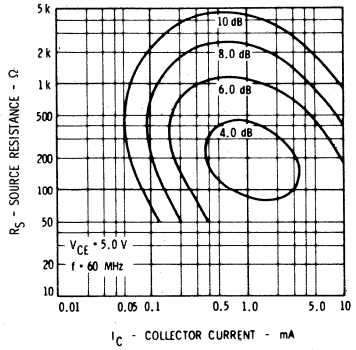
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

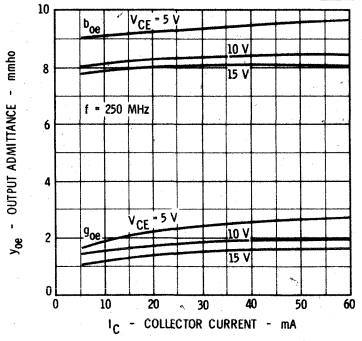
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



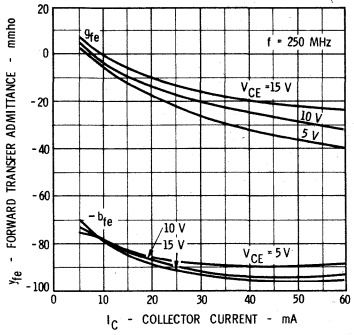
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



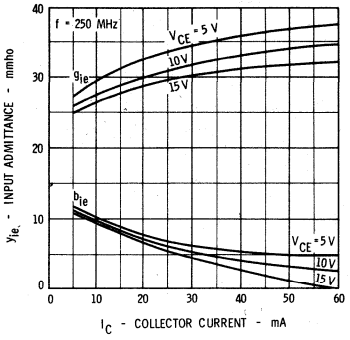
OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



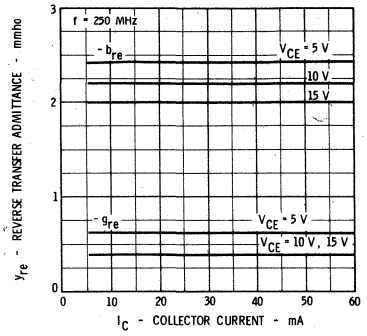
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



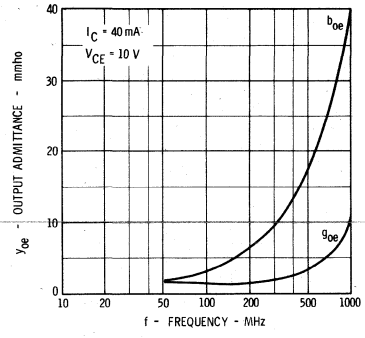
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



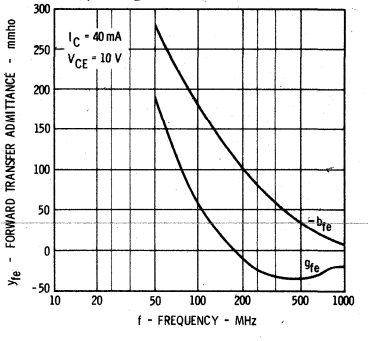
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



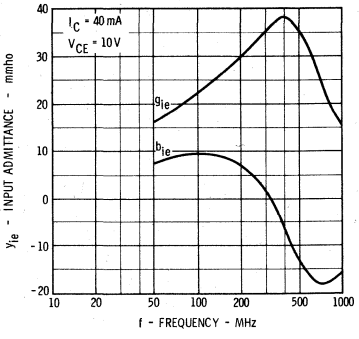
OUTPUT ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



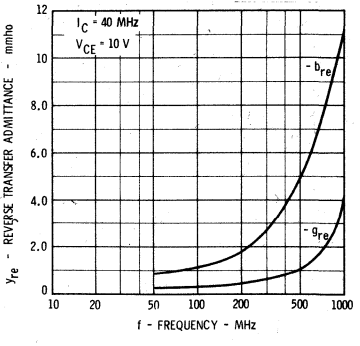
FORWARD TRANSFER ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



INPUT ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



REVERSE TRANSFER ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



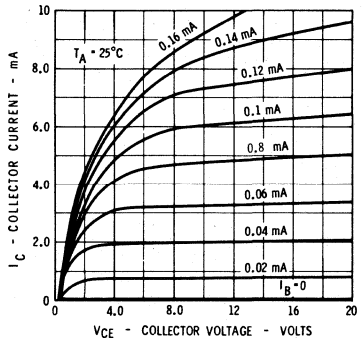
5

CURVE SET NUMBER SS3

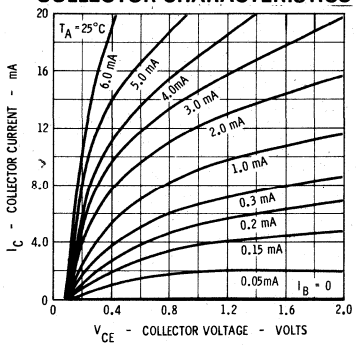
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

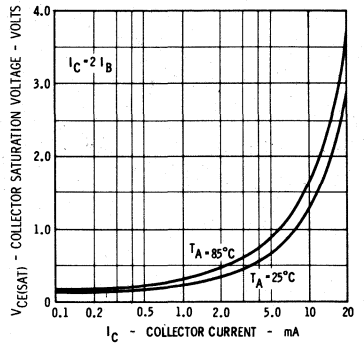
COLLECTOR CHARACTERISTICS



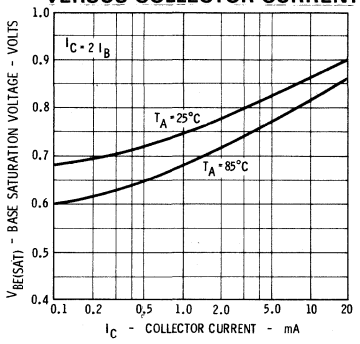
COLLECTOR CHARACTERISTICS



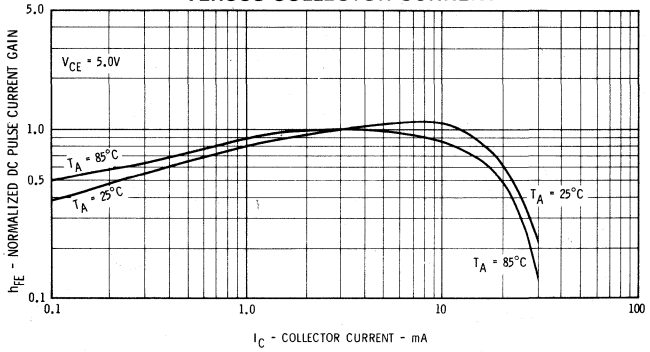
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



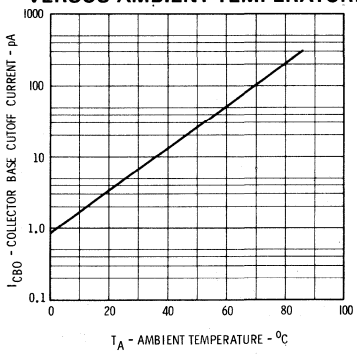
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



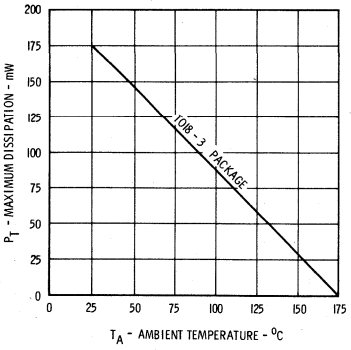
NORMALIZED CURRENT GAIN VERSUS COLLECTOR CURRENT



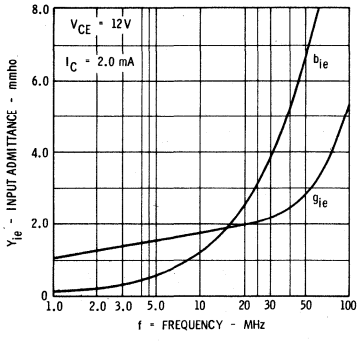
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



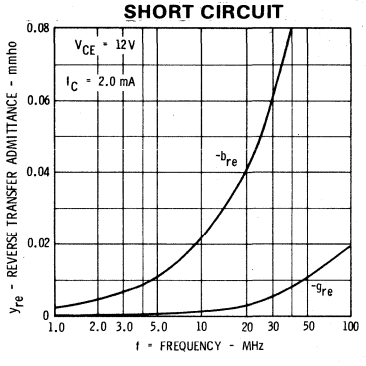
MAXIMUM DISSIPATION VERSUS TEMPERATURE



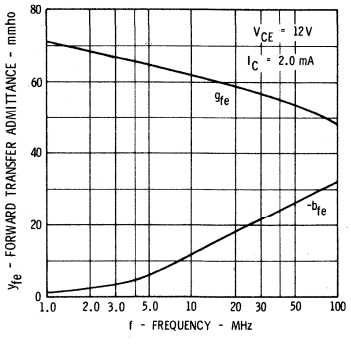
INPUT ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



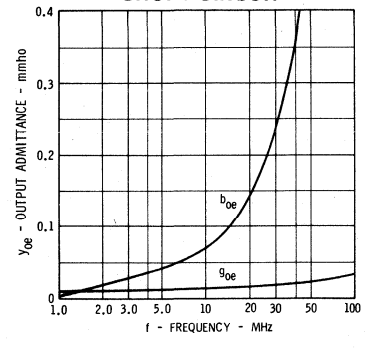
REVERSE TRANSFER ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



FORWARD TRANSFER ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



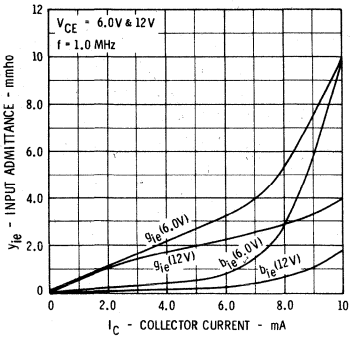
CURVE SET NUMBER SS3

TYPICAL ELECTRICAL CHARACTERISTIC CURVES

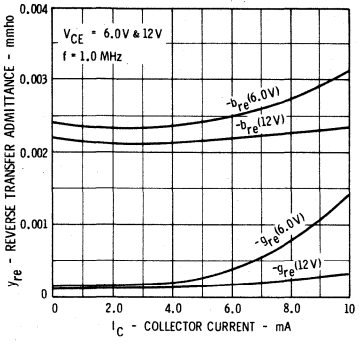
AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

f = 1.0 MHz

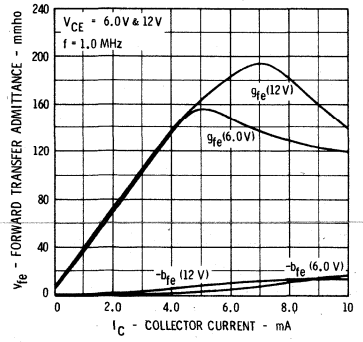
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



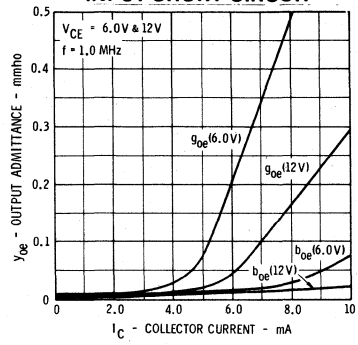
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT

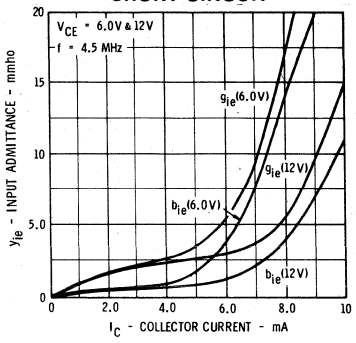


OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT

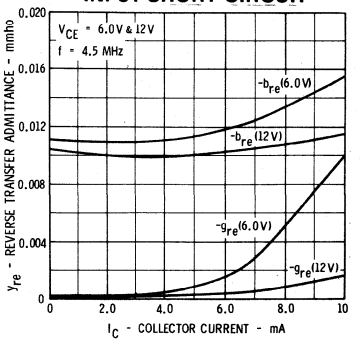


f = 4.5 MHz

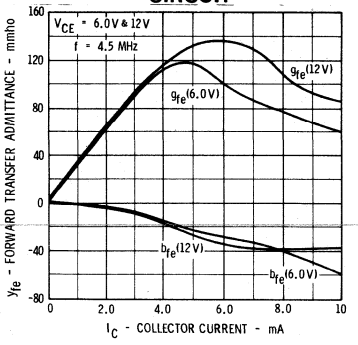
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



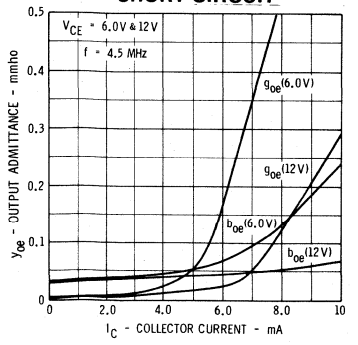
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT

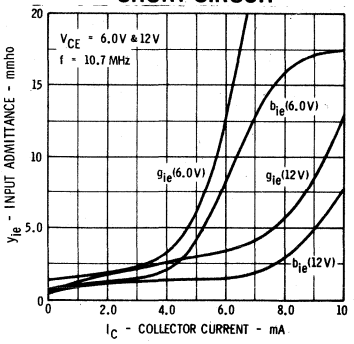


OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT

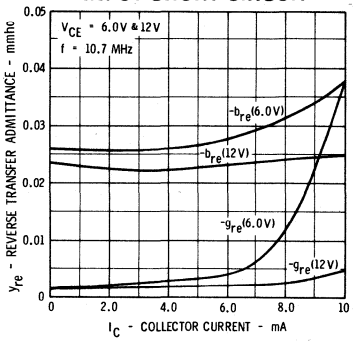


f = 10.7 MHz

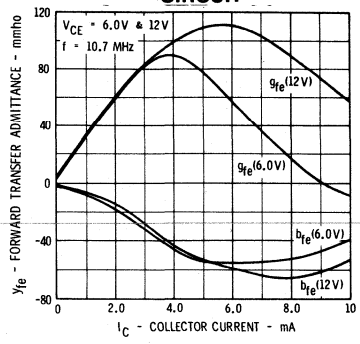
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



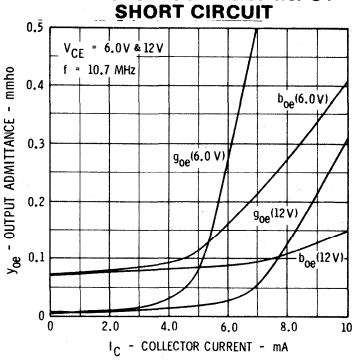
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



5

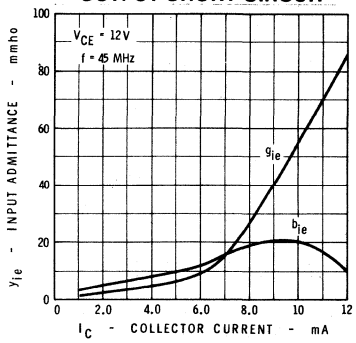
CURVE SET NUMBER SS3

TYPICAL ELECTRICAL CHARACTERISTIC CURVES

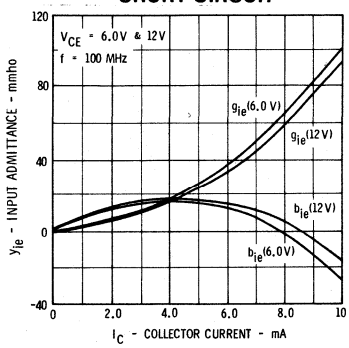
AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

f = 45 MHz	f = 100 MHz	f = 200 MHz

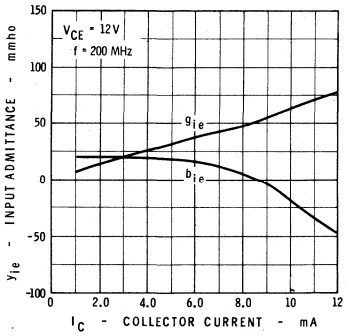
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



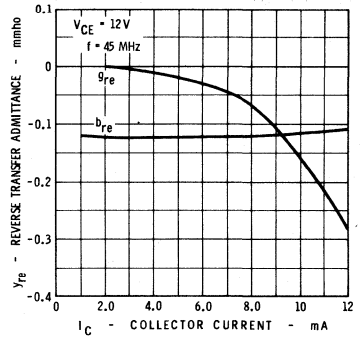
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



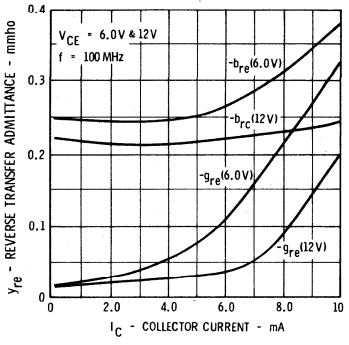
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



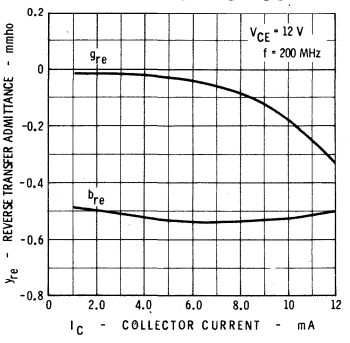
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



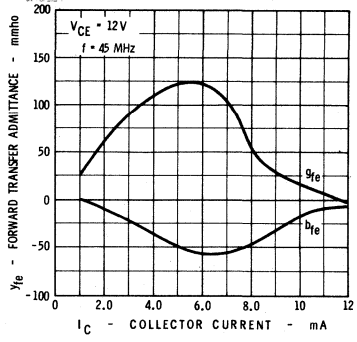
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



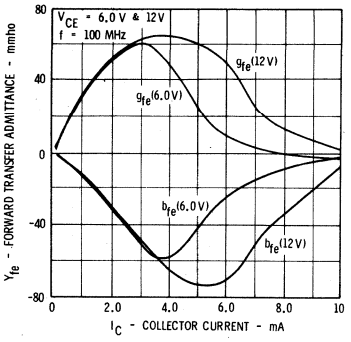
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



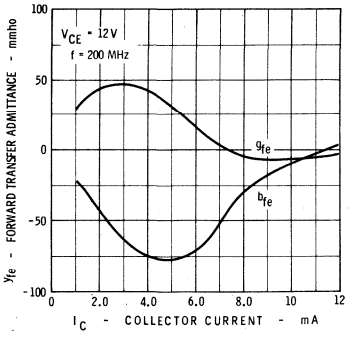
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



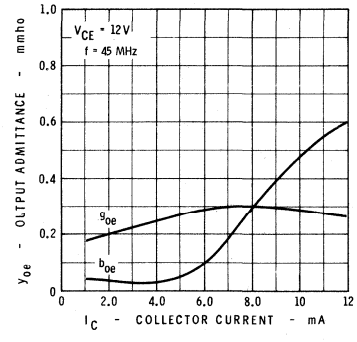
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



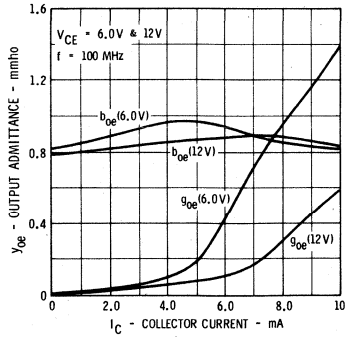
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



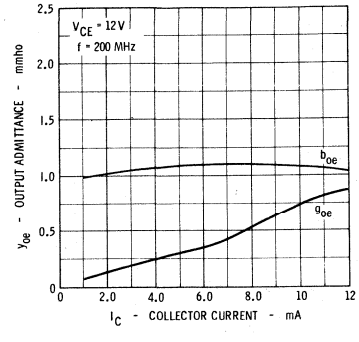
OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT

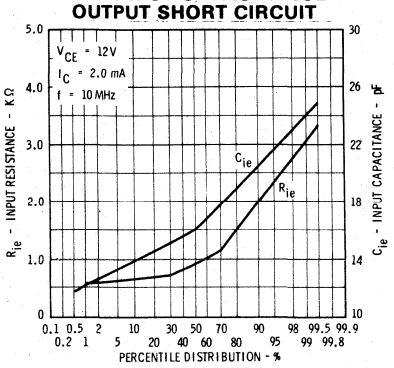


CURVE SET NUMBER SS3

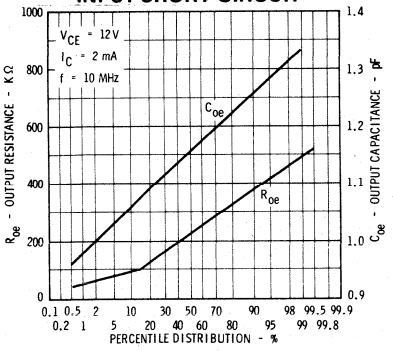
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

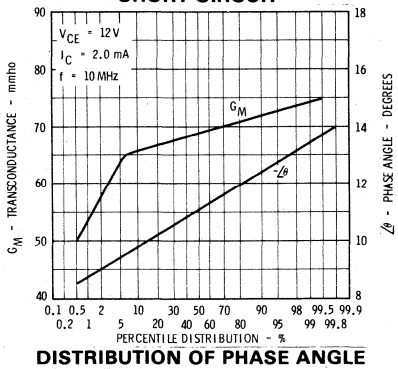
DISTRIBUTION OF COMMON EMITTER INPUT RESISTANCE AND INPUT CAPACITANCE OUTPUT SHORT CIRCUIT



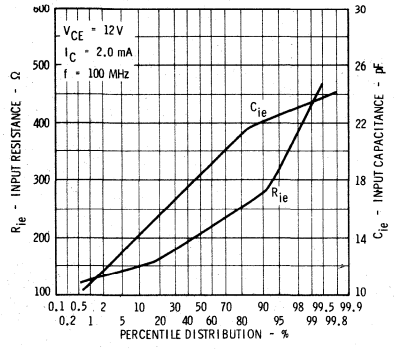
DISTRIBUTION OF COMMON EMITTER OUTPUT RESISTANCE AND OUTPUT CAPACITANCE INPUT SHORT CIRCUIT



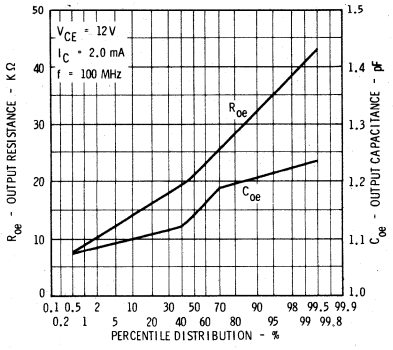
DISTRIBUTION OF PHASE ANGLE AND TRANSCONDUCTANCE COMMON EMITTER CONFIGURATION OUTPUT SHORT CIRCUIT



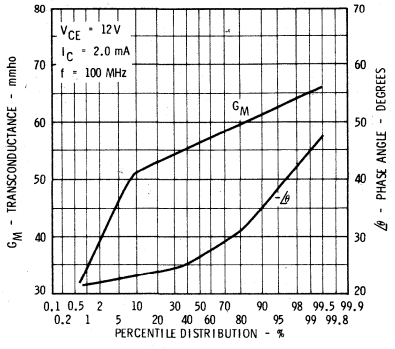
DISTRIBUTION OF COMMON EMITTER INPUT RESISTANCE AND INPUT CAPACITANCE OUTPUT SHORT CIRCUIT



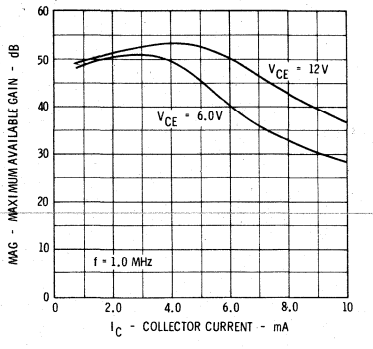
DISTRIBUTION OF COMMON EMITTER OUTPUT RESISTANCE AND OUTPUT CAPACITANCE INPUT SHORT CIRCUIT



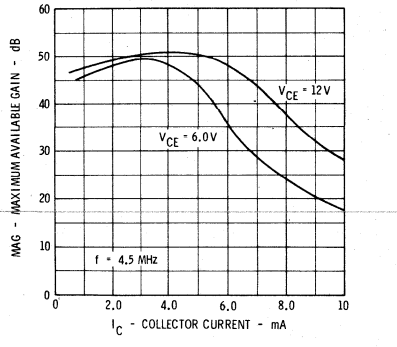
DISTRIBUTION OF PHASE ANGLE AND TRANSCONDUCTANCE COMMON EMITTER CONFIGURATION OUTPUT SHORT CIRCUIT



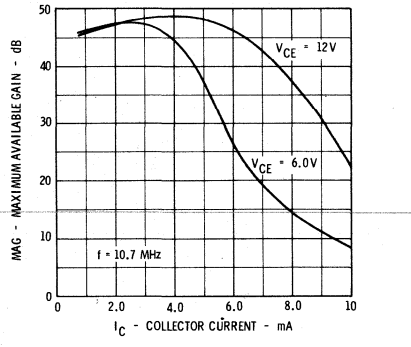
MAXIMUM AVAILABLE GAIN VERSUS COLLECTOR CURRENT



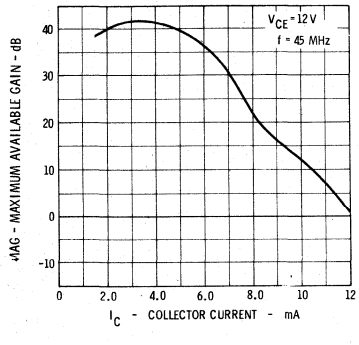
MAXIMUM AVAILABLE GAIN VERSUS COLLECTOR CURRENT



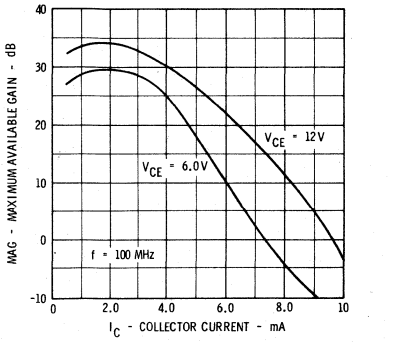
MAXIMUM AVAILABLE GAIN VERSUS COLLECTOR CURRENT



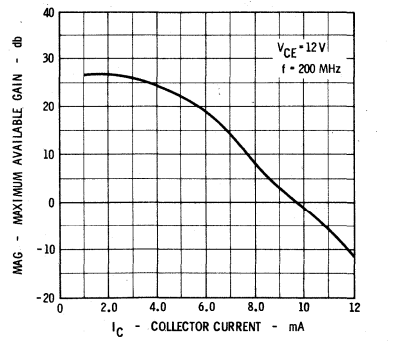
MAXIMUM AVAILABLE GAIN VERSUS COLLECTOR CURRENT



MAXIMUM AVAILABLE GAIN VERSUS COLLECTOR CURRENT



MAXIMUM AVAILABLE GAIN VERSUS COLLECTOR CURRENT



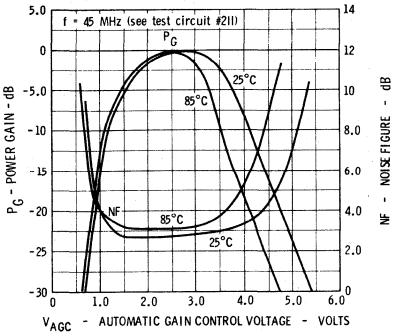
5

CURVE SET NUMBER SS3

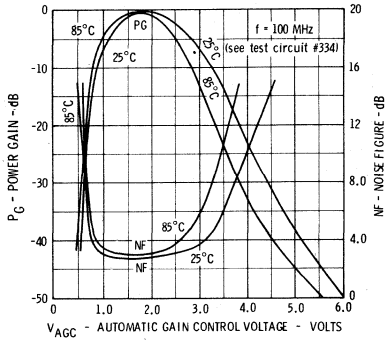
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

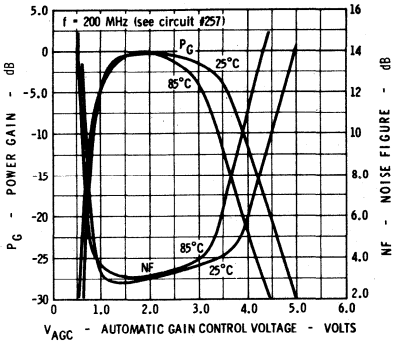
POWER GAIN AND NOISE FIGURE VERSUS AUTOMATIC GAIN CONTROL VOLTAGE



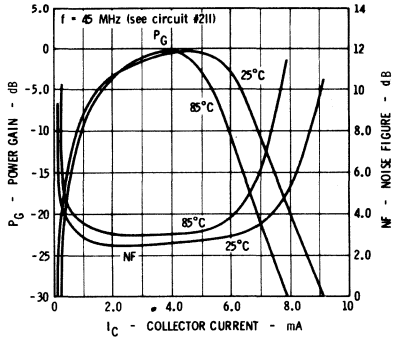
POWER GAIN AND NOISE FIGURE VERSUS GAIN CONTROL VOLTAGE



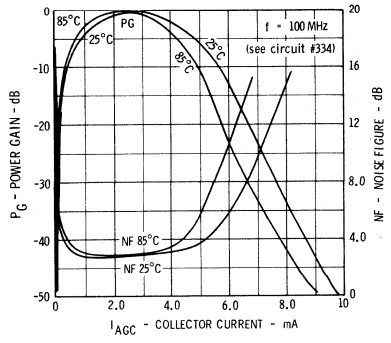
POWER GAIN AND NOISE FIGURE VERSUS AUTOMATIC GAIN CONTROL VOLTAGE



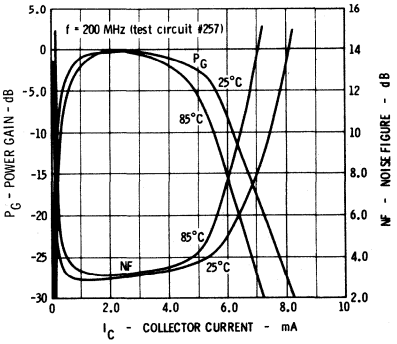
POWER GAIN AND NOISE FIGURE VERSUS COLLECTOR CURRENT



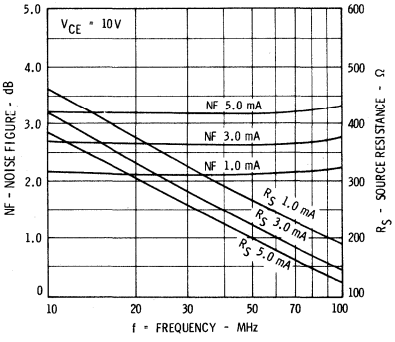
POWER GAIN AND NOISE FIGURE VERSUS COLLECTOR CURRENT



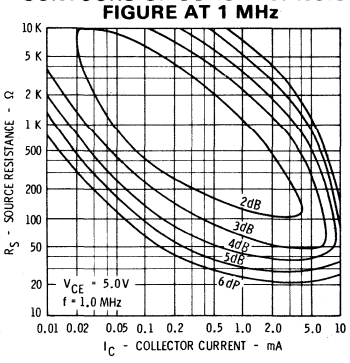
POWER GAIN AND NOISE FIGURE VERSUS COLLECTOR CURRENT



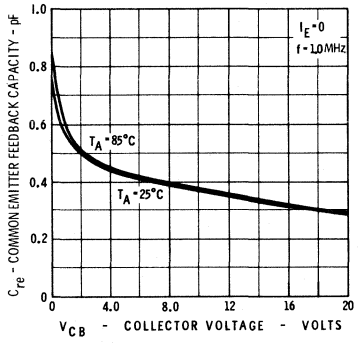
SOURCE REISTANCE AND NOISE FIGURE VERSUS FREQUENCY AT VARIOUS VALUES OF COLLECTOR CURRENT



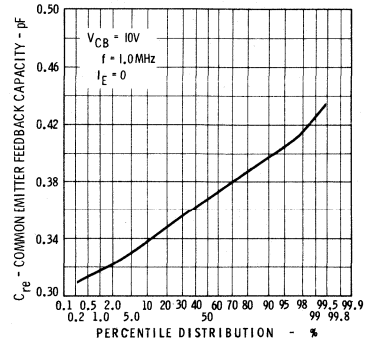
CONTOURS OF CONSTANT NOISE FIGURE AT 1 MHz



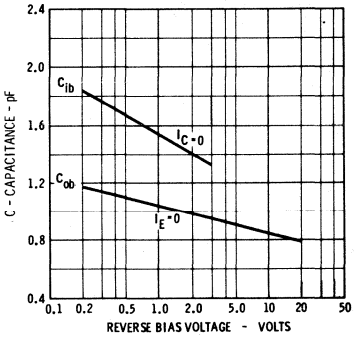
COMMON EMITTER FEEDBACK CAPCITY VERSUS COLLECTOR VOLTAGE



DISTRIBUTION OF COMMON EMITTER FEEDBACK CAPACITY



INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE

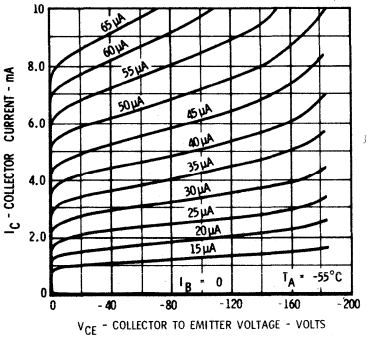


CURVE SET NUMBER SS4

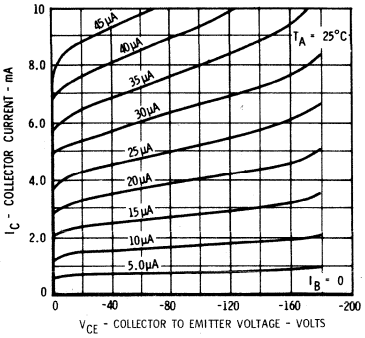
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

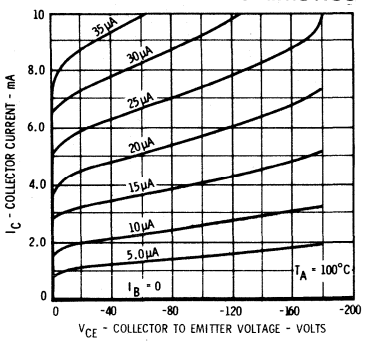
COLLECTOR CHARACTERISTICS



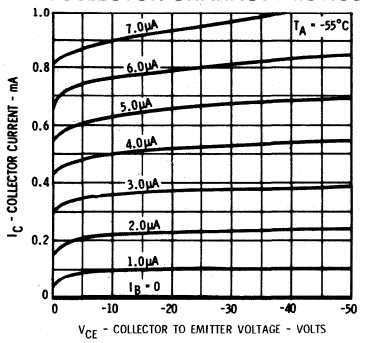
COLLECTOR CHARACTERISTICS



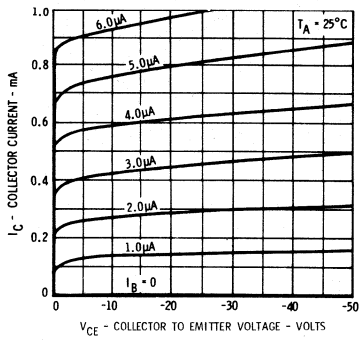
COLLECTOR CHARACTERISTICS



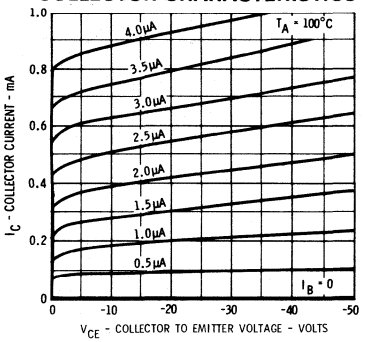
COLLECTOR CHARACTERISTICS



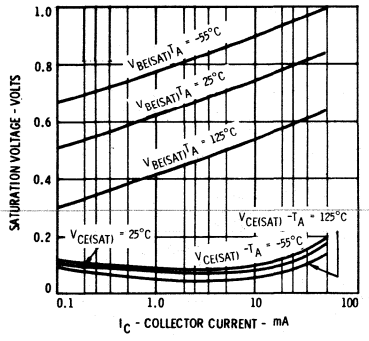
COLLECTOR CHARACTERISTICS



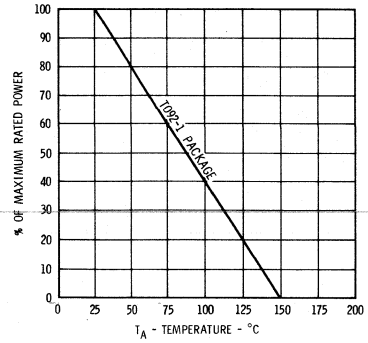
COLLECTOR CHARACTERISTICS



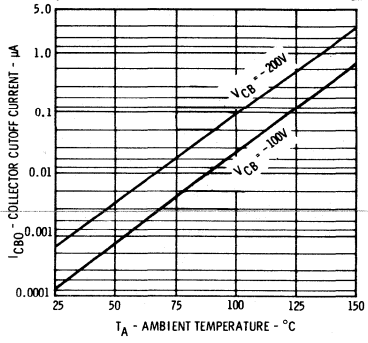
COLLECTOR AND BASE SATURATION VOLTAGES VERSUS COLLECTOR CURRENT



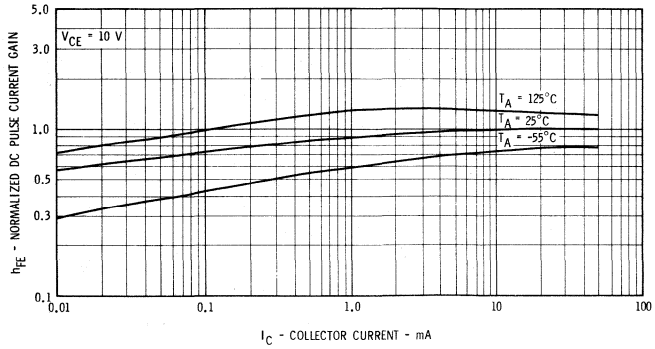
ALLOWABLE POWER DISSIPATION VERSUS TEMPERATURE



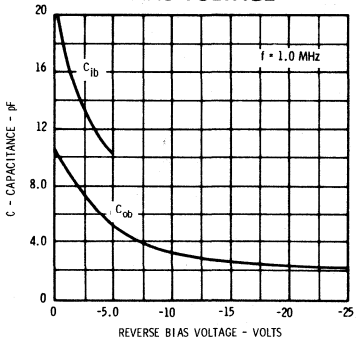
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



NORMALIZED CURRENT GAIN VERSUS COLLECTOR CURRENT



INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



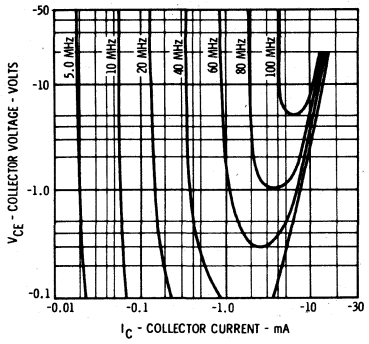
5

CURVE SET NUMBER SS4

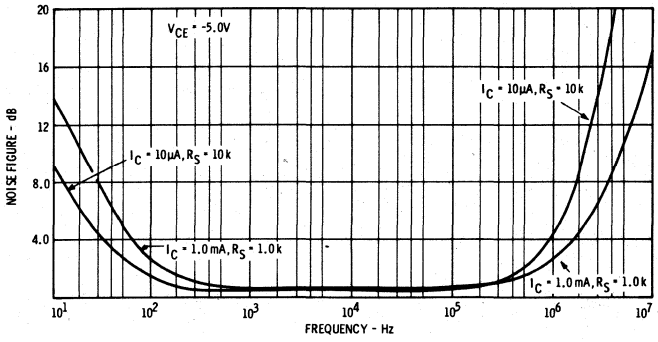
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

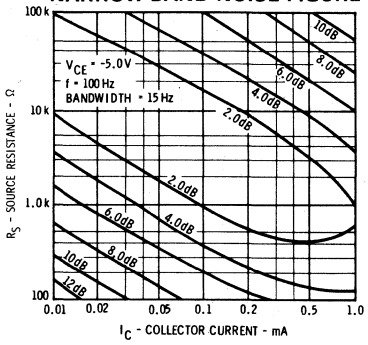
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



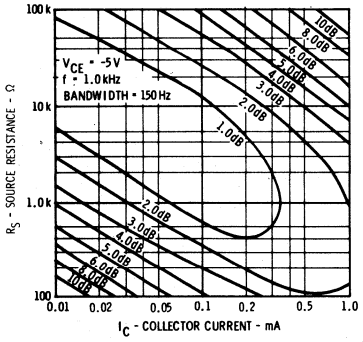
SPOT NOISE FIGURE VERSUS FREQUENCY



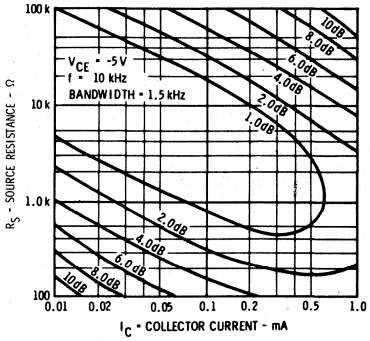
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



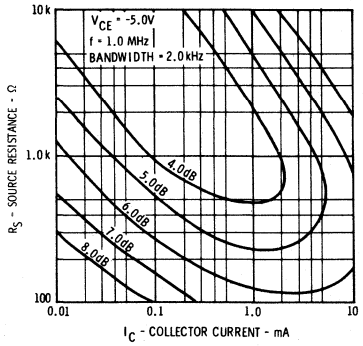
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



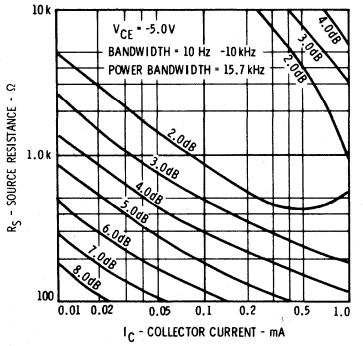
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



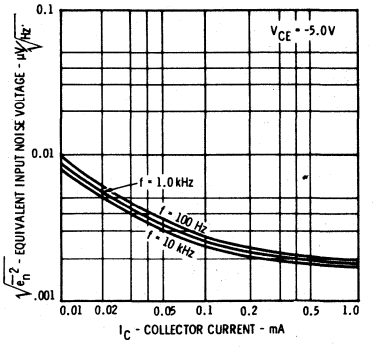
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



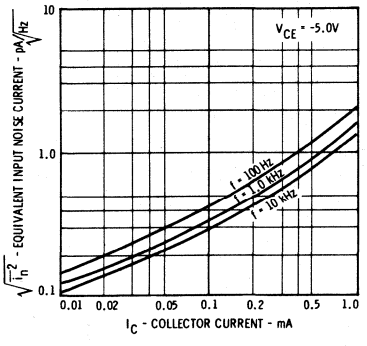
CONTOURS OF CONSTANT WIDE BAND NOISE FIGURE



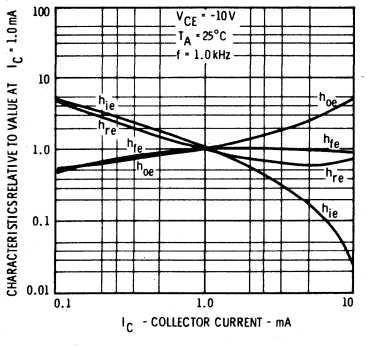
EQUIVALENT INPUT NOISE VOLTAGE VERSUS COLLECTOR CURRENT



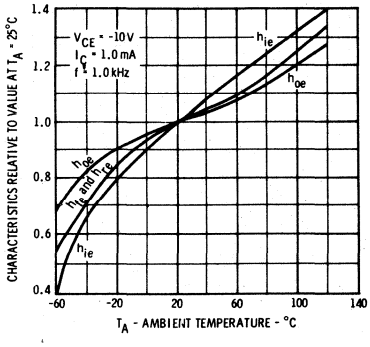
EQUIVALENT INPUT NOISE CURRENT VERSUS COLLECTOR CURRENT



COMMON EMITTER CHARACTERISTICS VERSUS COLLECTOR CURRENT



COMMON EMITTER CHARACTERISTICS VERSUS AMBIENT TEMPERATURE

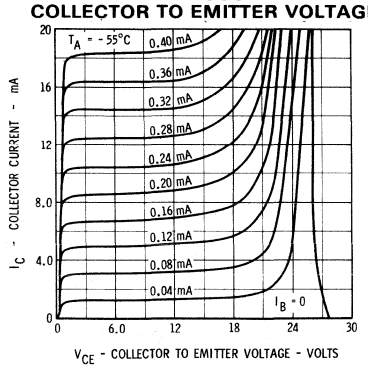


CURVE SET NUMBER SS5

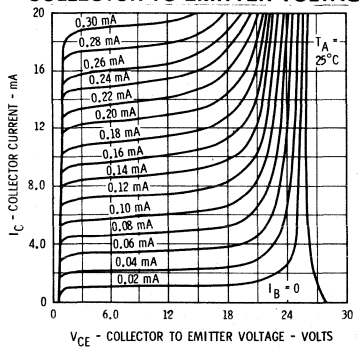
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

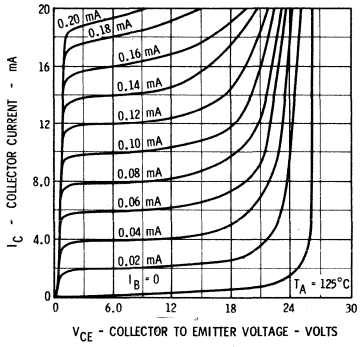
COLLECTOR CURRENT VERSUS COLLECTOR TO EMITTER VOLTAGE



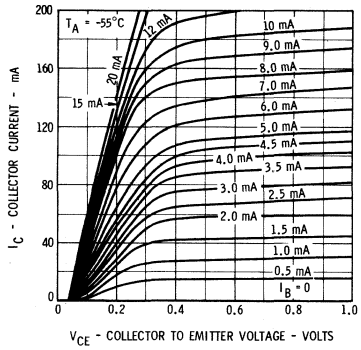
COLLECTOR CURRENT VERSUS COLLECTOR TO EMITTER VOLTAGE



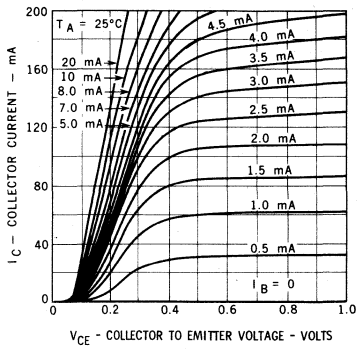
COLLECTOR CURRENT VERSUS COLLECTOR TO EMITTER VOLTAGE



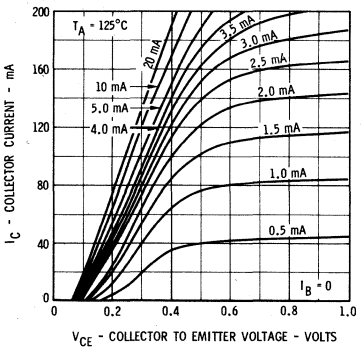
COLLECTOR CURRENT VERSUS COLLECTOR TO EMITTER VOLTAGE



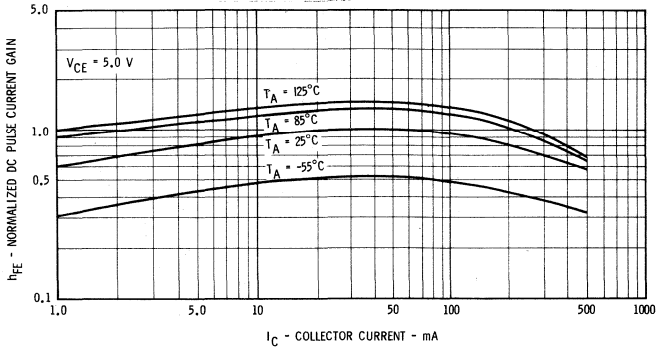
COLLECTOR CURRENT VERSUS COLLECTOR TO EMITTER VOLTAGE



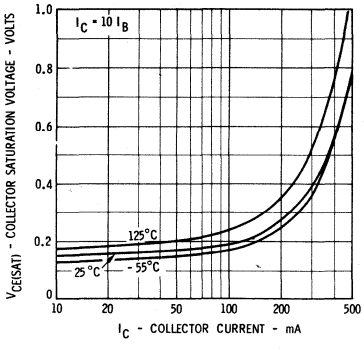
COLLECTOR CURRENT VERSUS COLLECTOR TO EMITTER VOLTAGE



NORMALIZED CURRENT GAIN VERSUS COLLECTOR CURRENT



COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



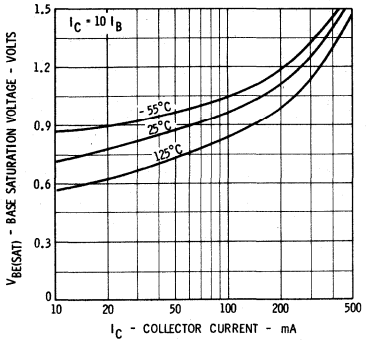
5

CURVE SET NUMBER SS5

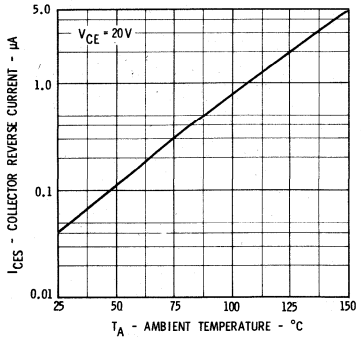
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

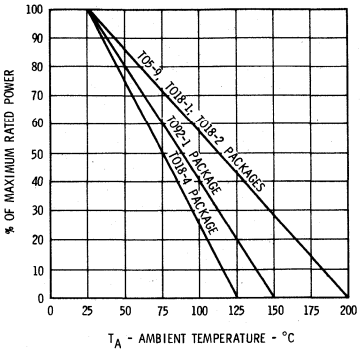
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



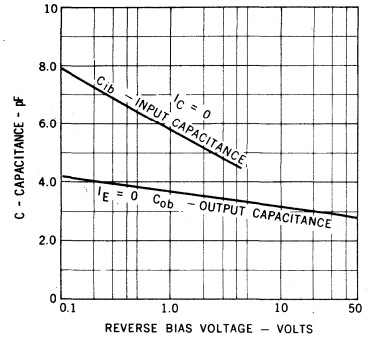
COLLECTOR REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



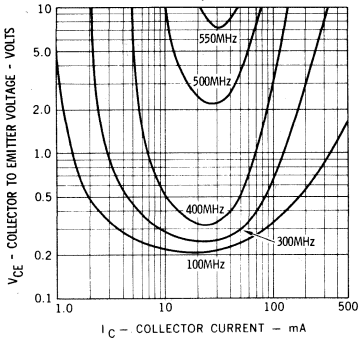
ALLOWABLE POWER DISSIPATION VERSUS TEMPERATURE



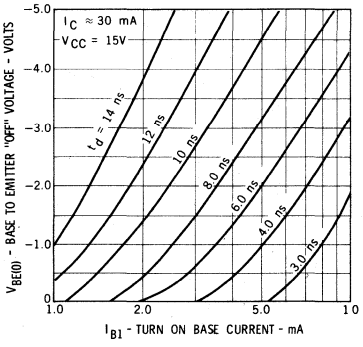
INPUT AND OUTPUT CAPACITANCES VERSUS REVERSE BIAS VOLTAGE



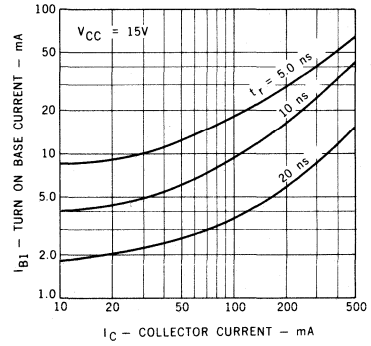
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT (f_T)



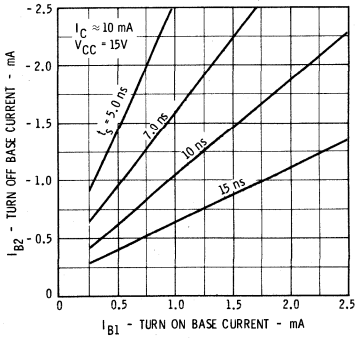
DELAY TIME VERSUS BASE EMITTER OFF VOLTAGE AND TURN ON BASE CURRENT



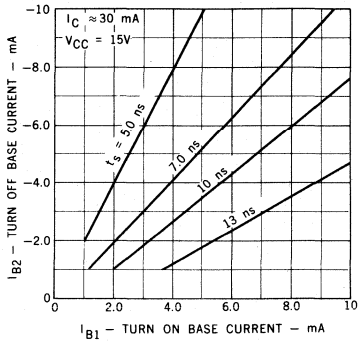
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENTS



STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS

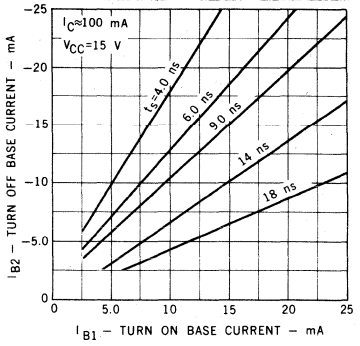


CURVE SET NUMBER SS5

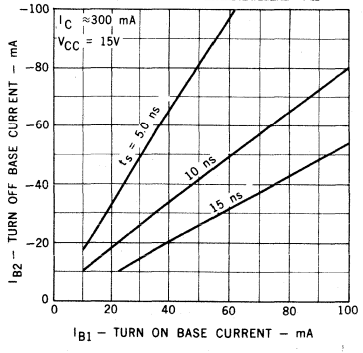
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

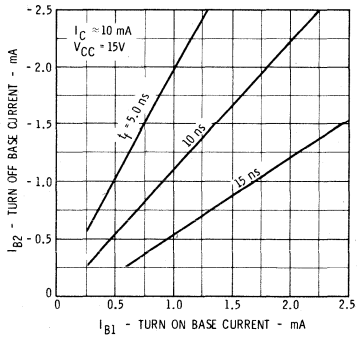
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



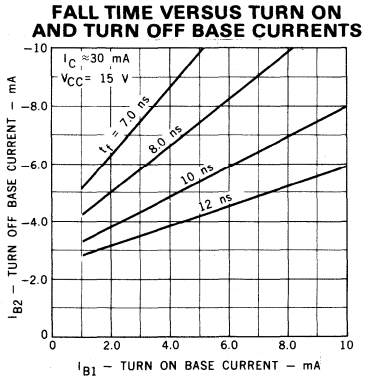
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



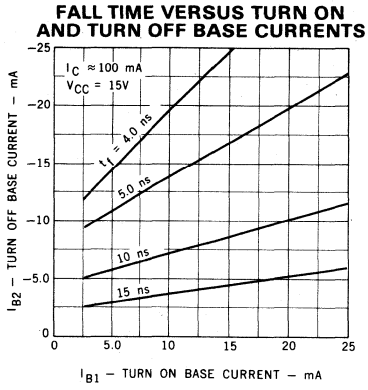
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



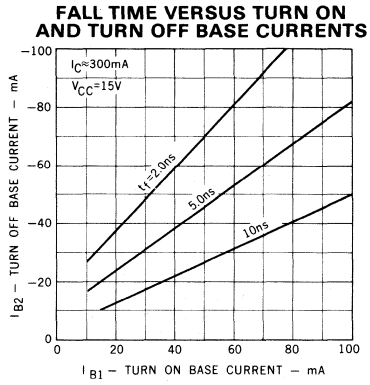
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



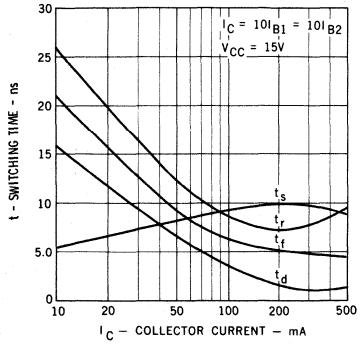
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



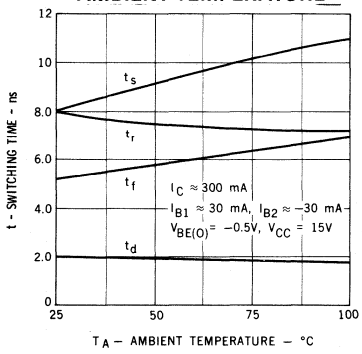
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



SWITCHING TIMES VERSUS COLLECTOR CURRENT



SWITCHING TIMES VERSUS AMBIENT TEMPERATURE



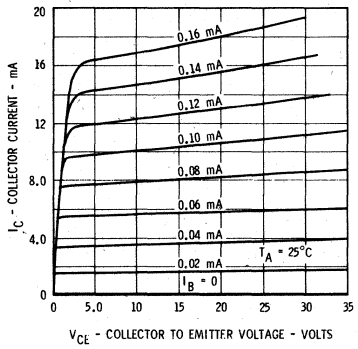
5

CURVE SET NUMBER SS6

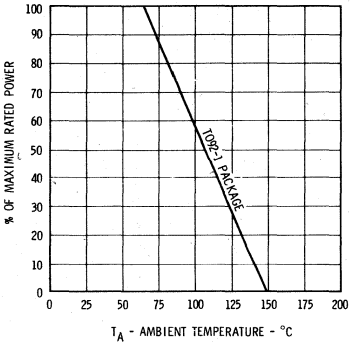
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

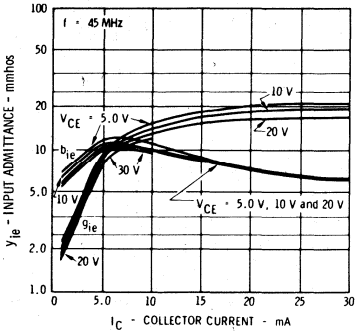
COLLECTOR CHARACTERISTICS



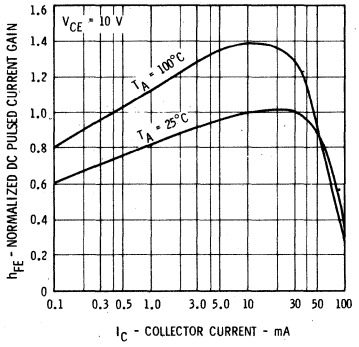
ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



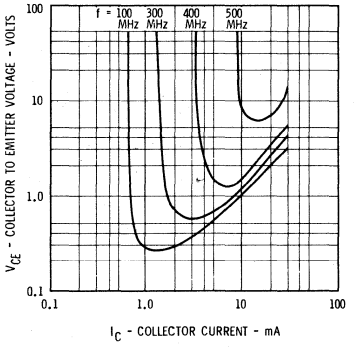
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT



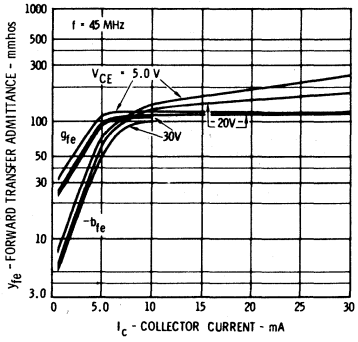
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



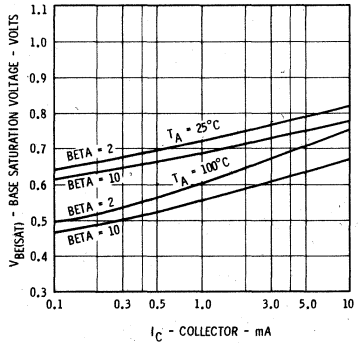
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



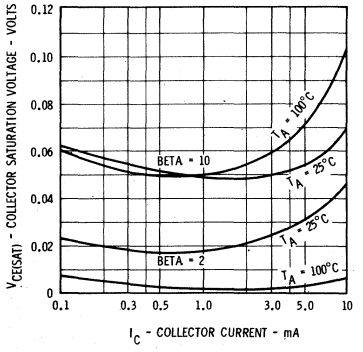
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT



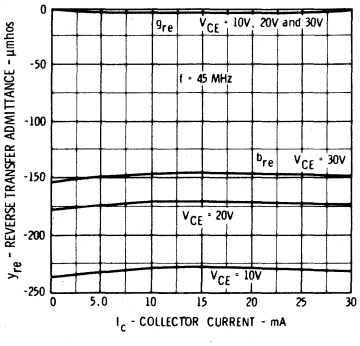
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



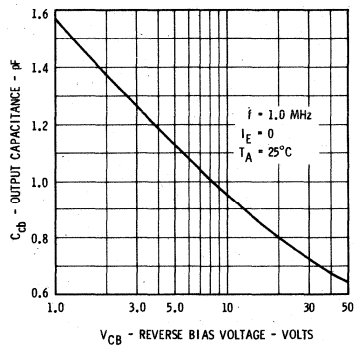
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



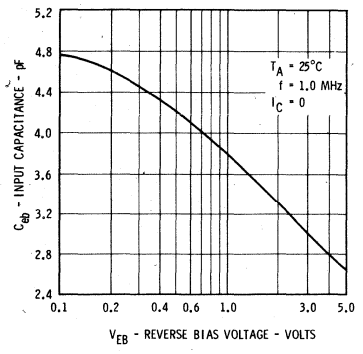
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT



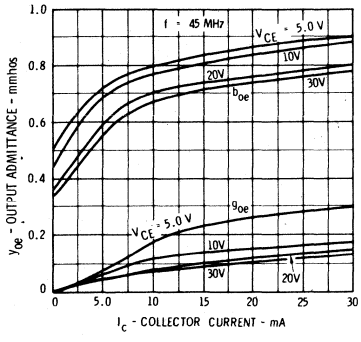
OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



INPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT

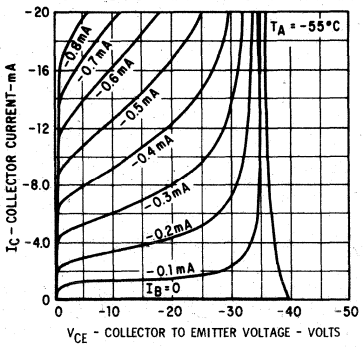


CURVE SET NUMBER SS7

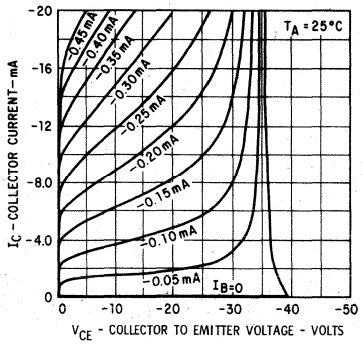
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

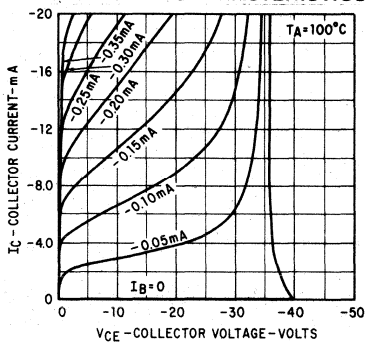
COLLECTOR CHARACTERISTICS



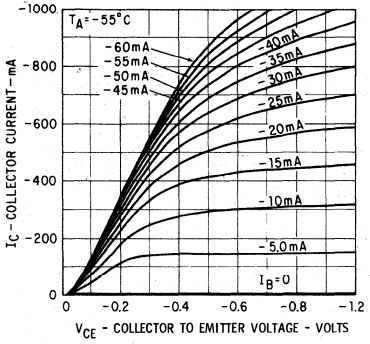
COLLECTOR CHARACTERISTICS



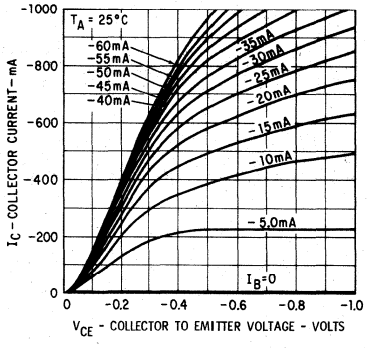
COLLECTOR CHARACTERISTICS



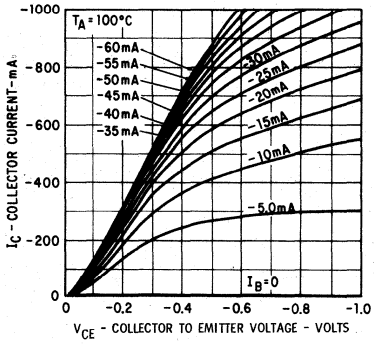
COLLECTOR CHARACTERISTICS



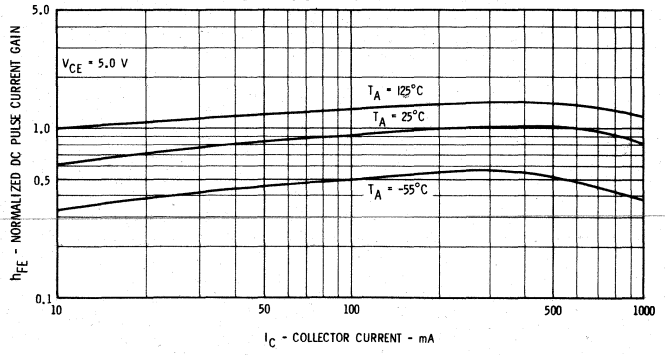
COLLECTOR CHARACTERISTICS



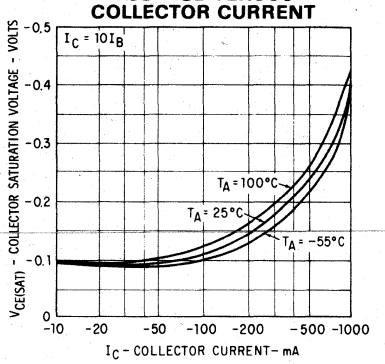
COLLECTOR CHARACTERISTICS



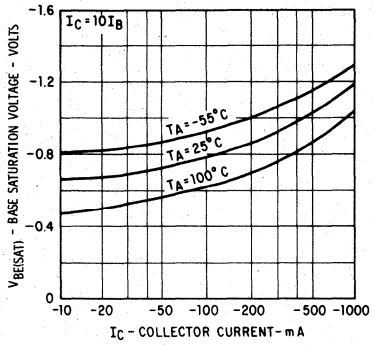
NORMALIZED CURRENT GAIN VERSUS COLLECTOR CURRENT



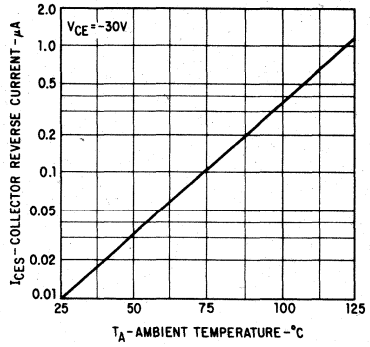
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



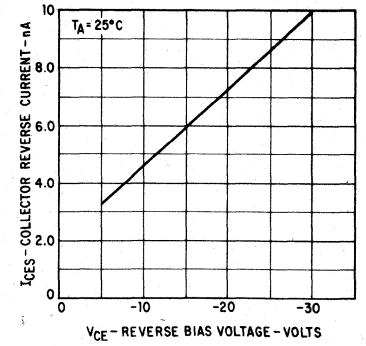
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



COLLECTOR REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



COLLECTOR REVERSE CURRENT VERSUS REVERSE BIAS VOLTAGE



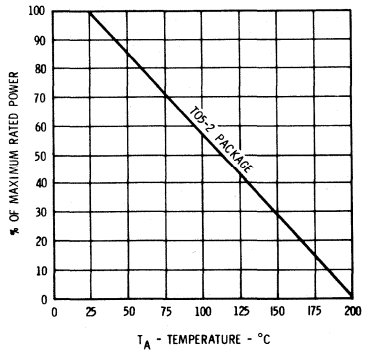
5

CURVE SET NUMBER SS7

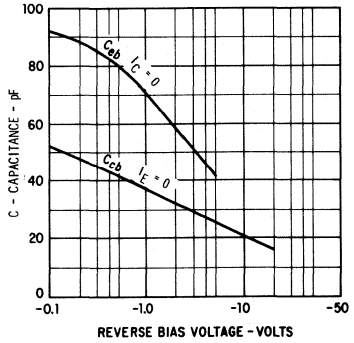
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

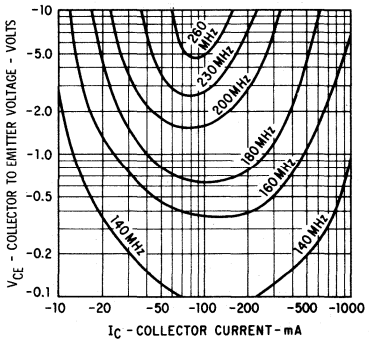
ALLOWABLE POWER DISSIPATION VERSUS TEMPERATURE



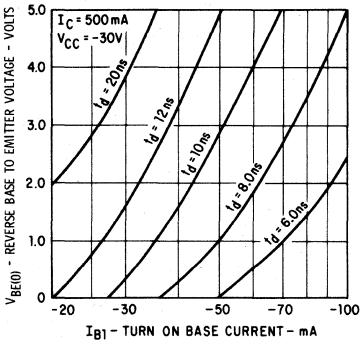
INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



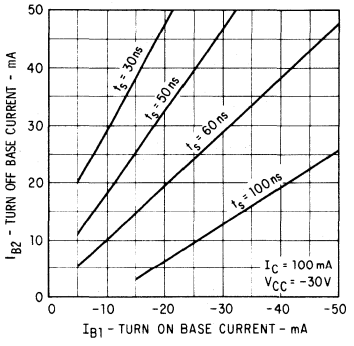
CONTOURS OF CONSTANT BANDWIDTH PRODUCT



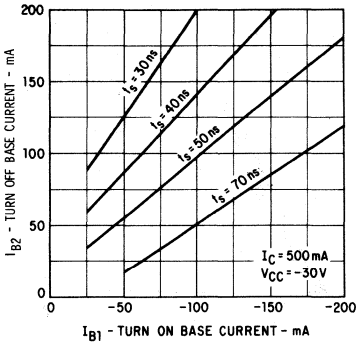
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE



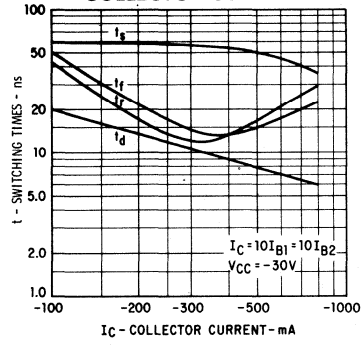
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



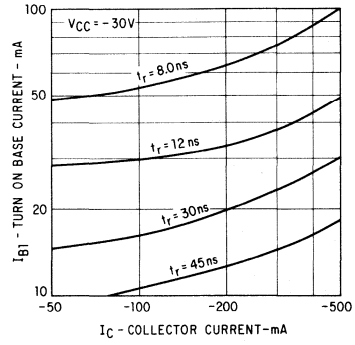
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



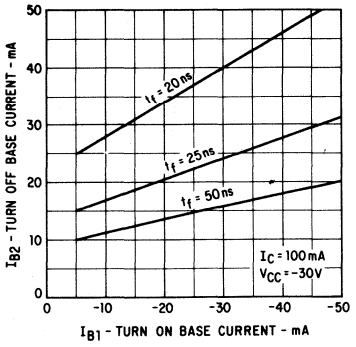
SWITCHING TIMES VERSUS COLLECTOR CURRENT



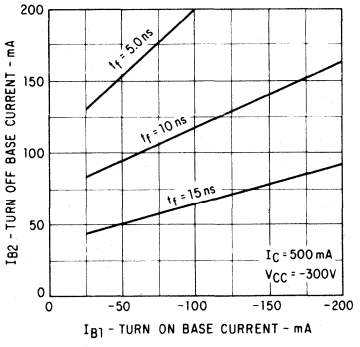
RISE TIME VERSUS COLLECTOR CURRENT AND TURN ON BASE CURRENTS



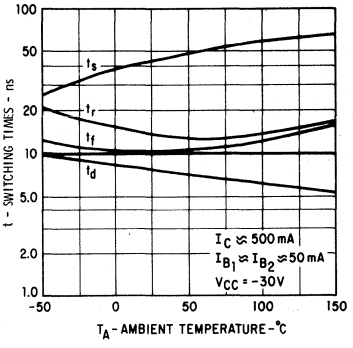
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



SWITCHING TIMES VERSUS AMBIENT TEMPERATURE

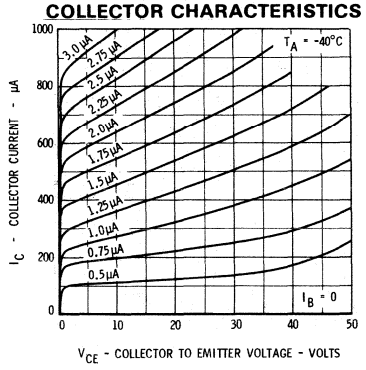


CURVE SET NUMBER SS8

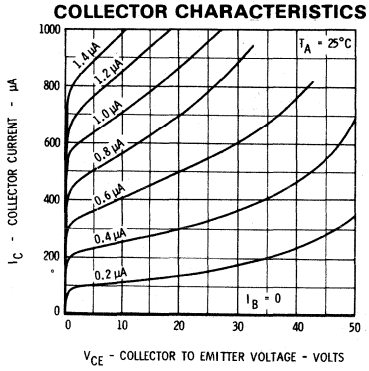
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

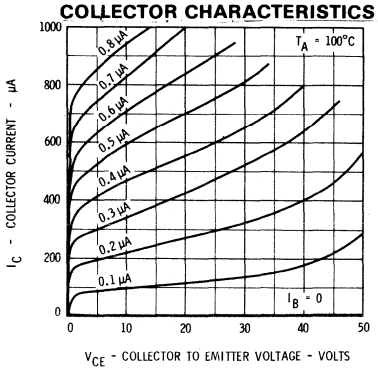
COLLECTOR CHARACTERISTICS



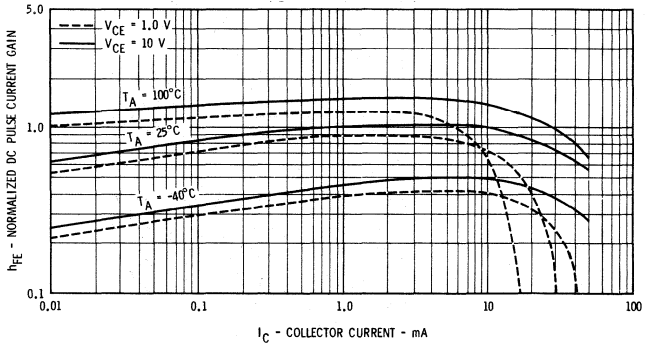
COLLECTOR CHARACTERISTICS



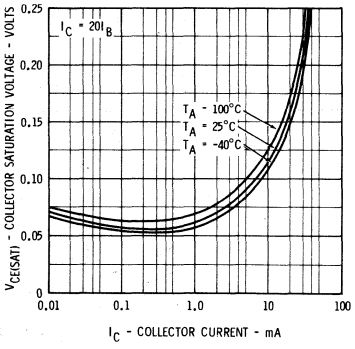
COLLECTOR CHARACTERISTICS



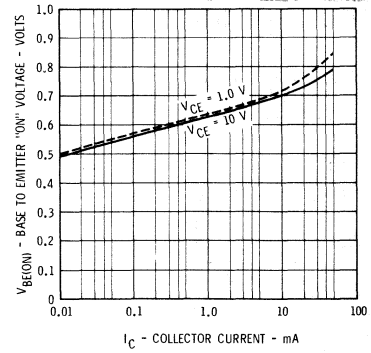
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



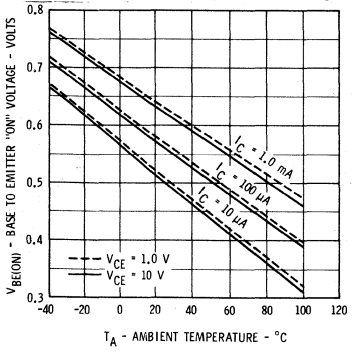
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



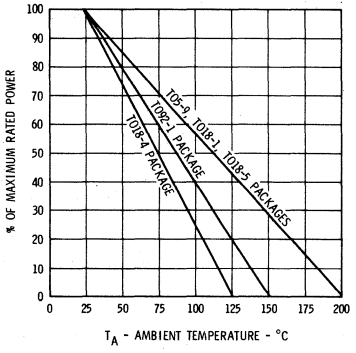
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS AMBIENT TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



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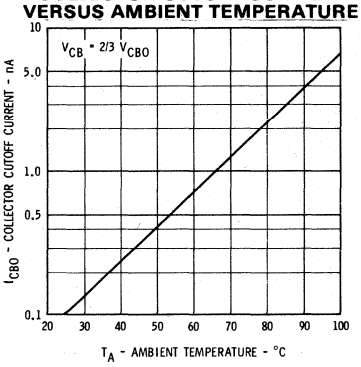
CURVE SET NUMBER SS8

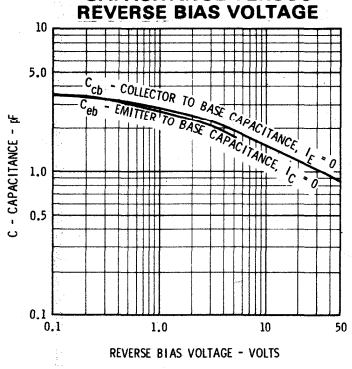
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

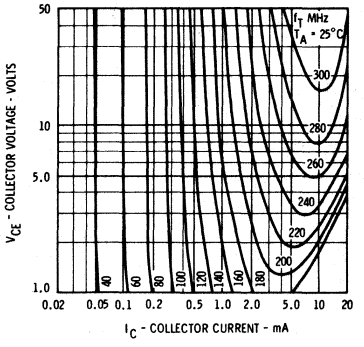
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



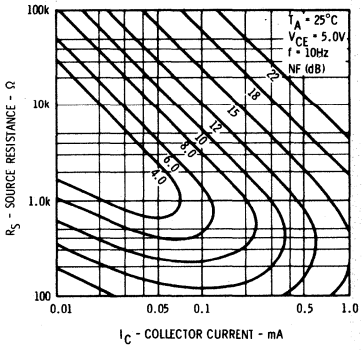
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



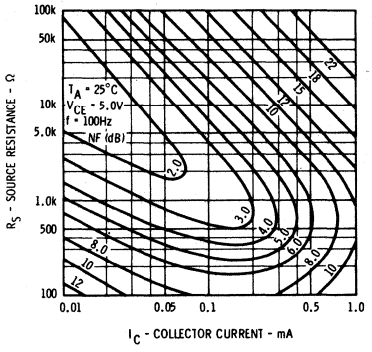
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



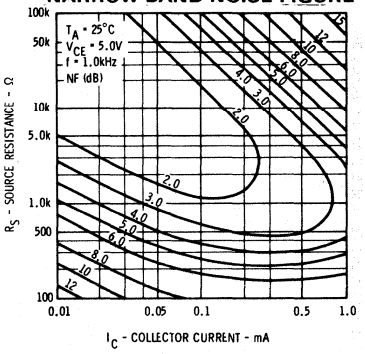
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



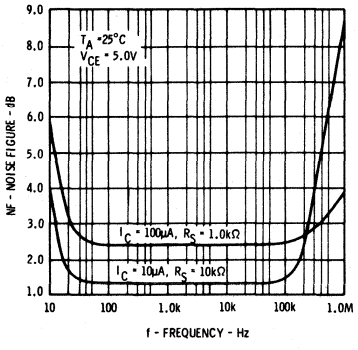
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



NOISE FIGURE VERSUS FREQUENCY

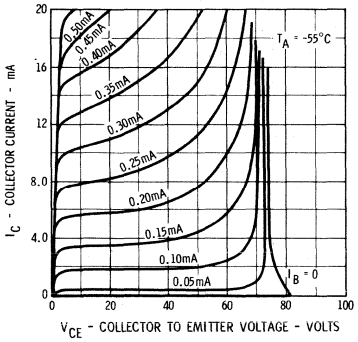


CURVE SET NUMBER SS9

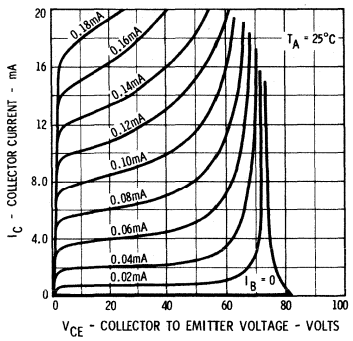
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

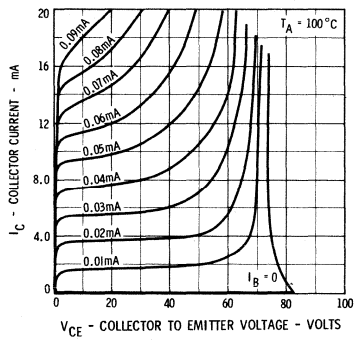
COLLECTOR CHARACTERISTICS



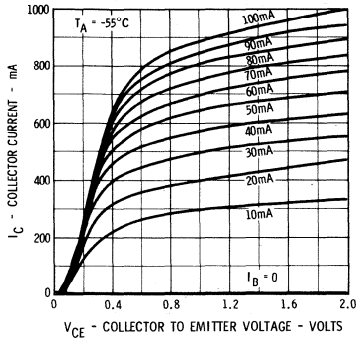
COLLECTOR CHARACTERISTICS



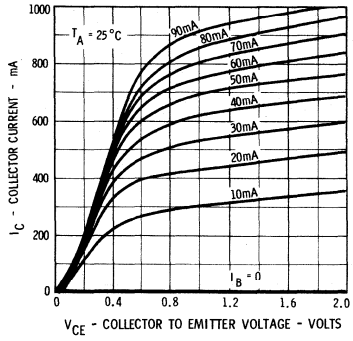
COLLECTOR CHARACTERISTICS



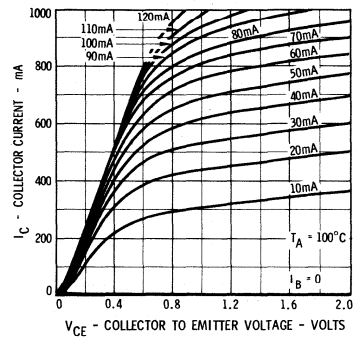
COLLECTOR CHARACTERISTICS



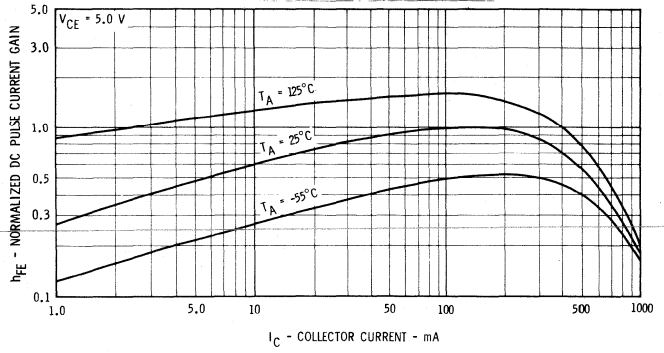
COLLECTOR CHARACTERISTICS



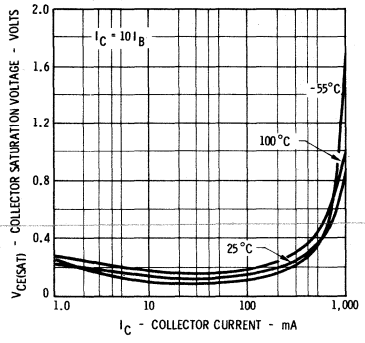
COLLECTOR CHARACTERISTICS



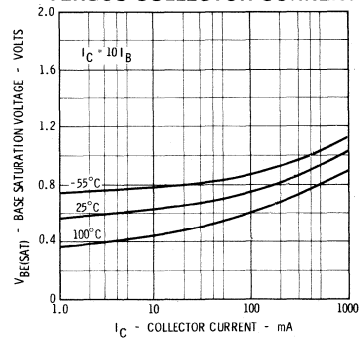
NORMALIZED CURRENT GAIN VERSUS COLLECTOR CURRENT



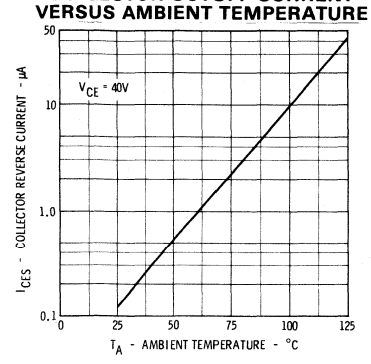
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



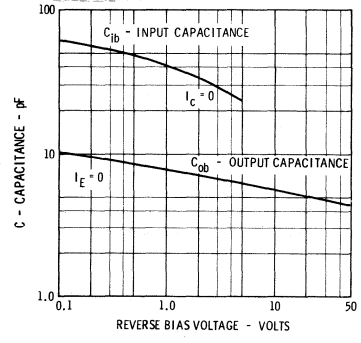
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



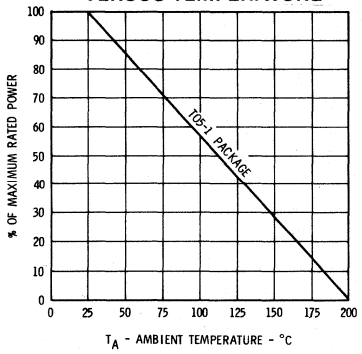
5

CURVE SET NUMBER SS9

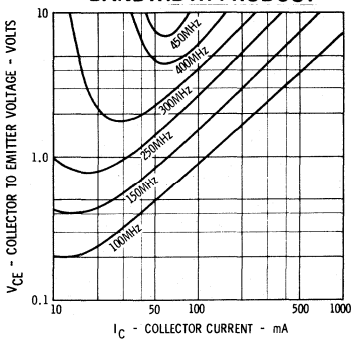
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

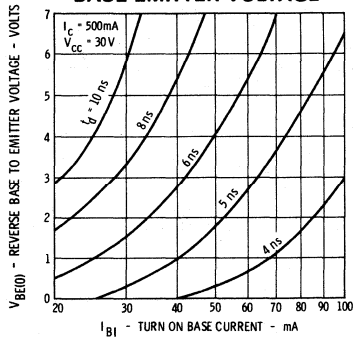
ALLOWABLE POWER DISSIPATION VERSUS TEMPERATURE



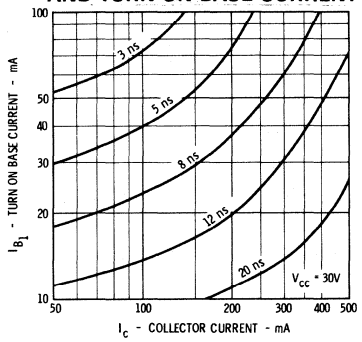
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



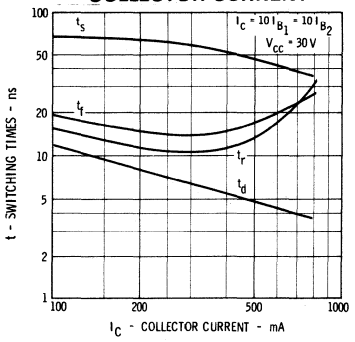
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE



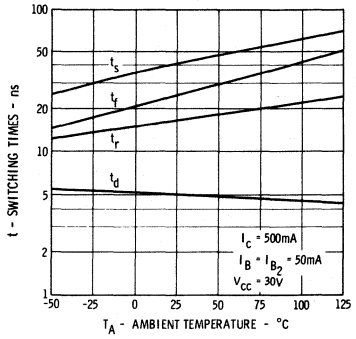
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENT



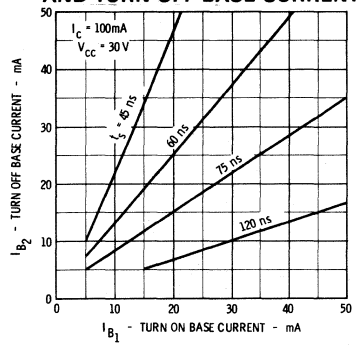
SWITCHING TIMES VERSUS COLLECTOR CURRENT



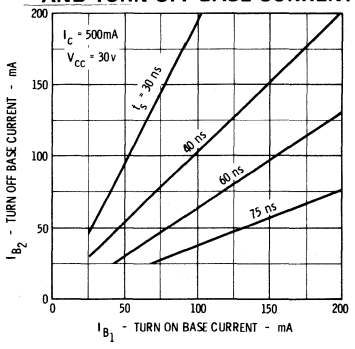
SWITCHING TIMES VERSUS AMBIENT TEMPERATURE



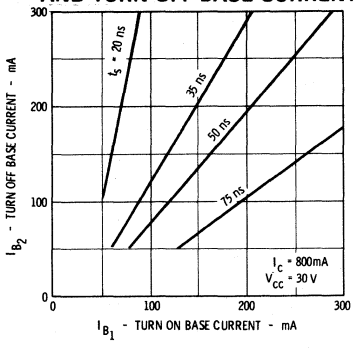
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



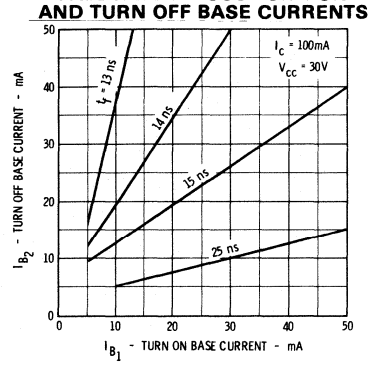
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



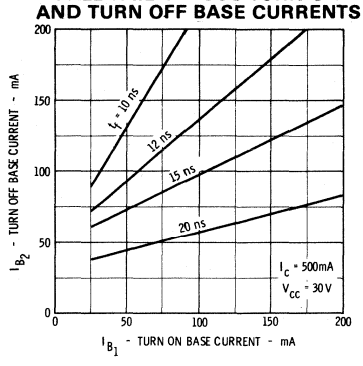
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



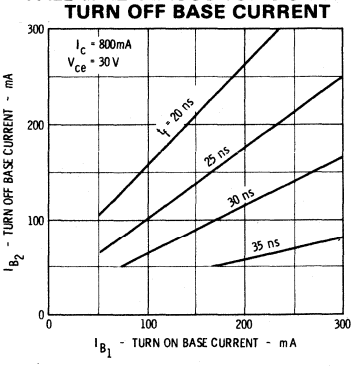
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENT

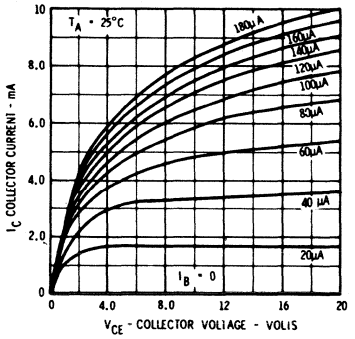


CURVE SET NUMBER SS10

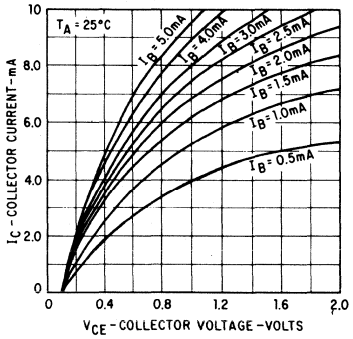
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

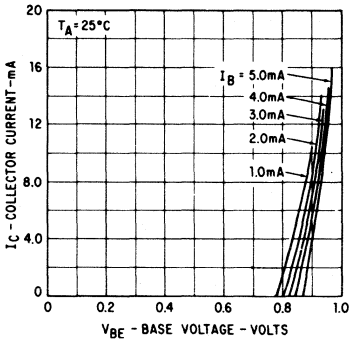
COLLECTOR CHARACTERISTICS



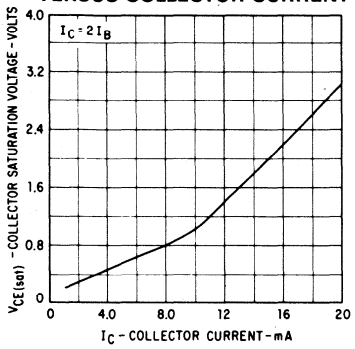
COLLECTOR CHARACTERISTICS



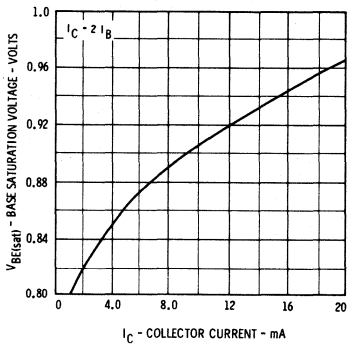
BASE CHARACTERISTICS



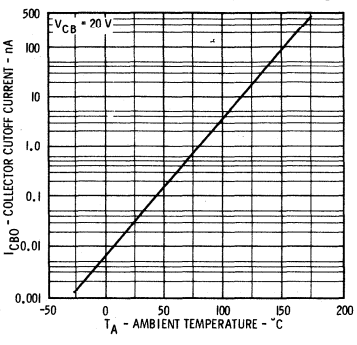
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



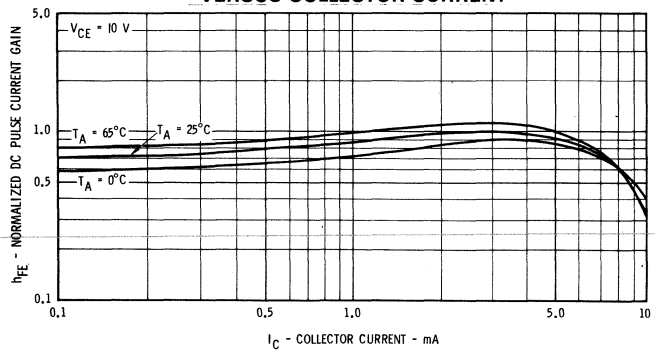
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



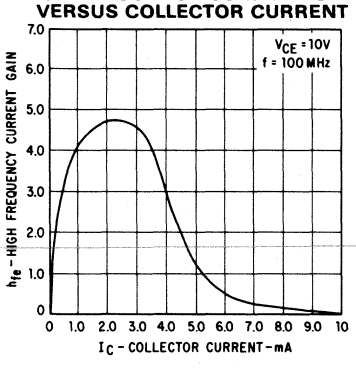
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



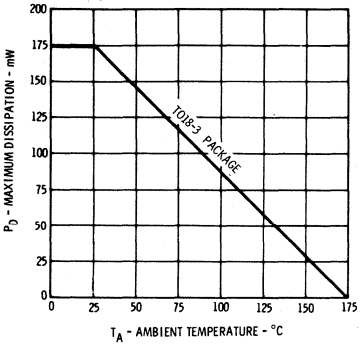
NORMALIZED CURRENT GAIN VERSUS COLLECTOR CURRENT



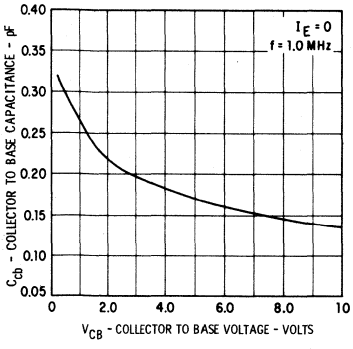
HIGH FREQUENCY CURRENT GAIN VERSUS COLLECTOR CURRENT



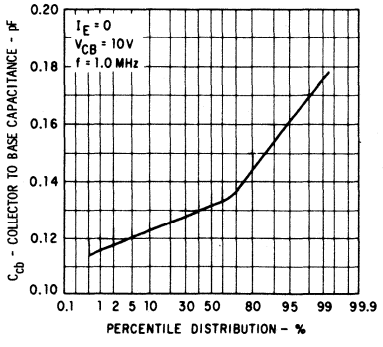
MAXIMUM DISSIPATION VERSUS TEMPERATURE



COLLECTOR TO BASE CAPACITANCE VERSUS COLLECTOR TO BASE VOLTAGE



DISTRIBUTION OF COLLECTOR TO BASE CAPACITANCE



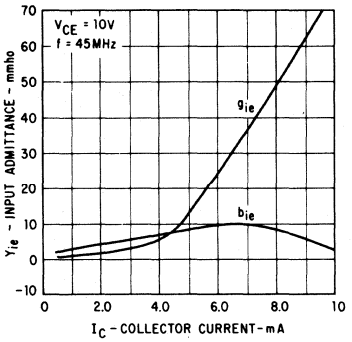
5

CURVE SET NUMBER SS10

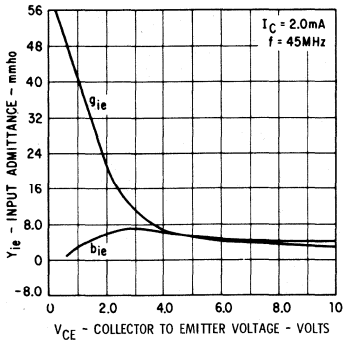
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

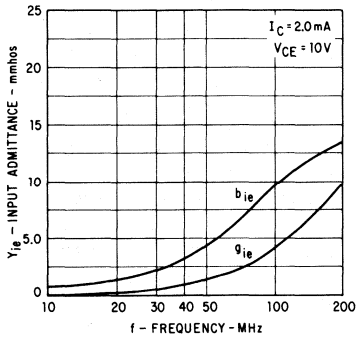
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



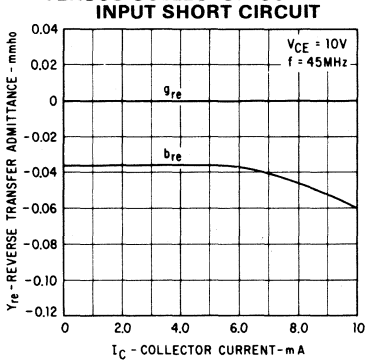
INPUT ADMITTANCE VERSUS COLLECTOR VOLTAGE OUTPUT SHORT CIRCUIT



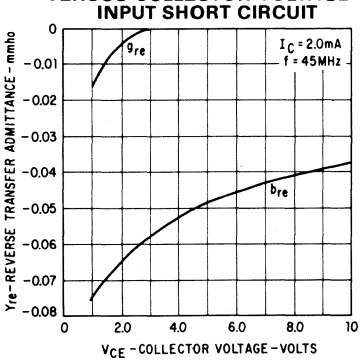
INPUT ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



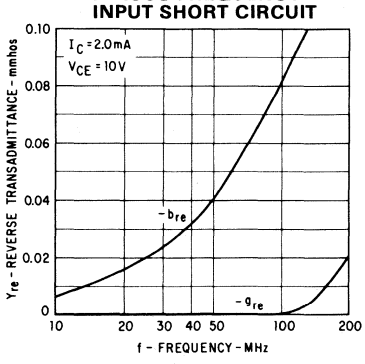
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



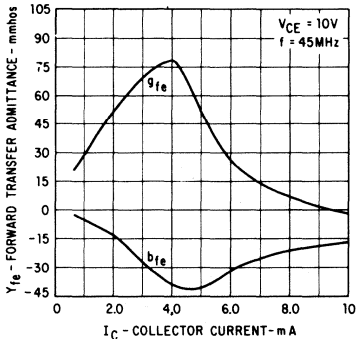
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR VOLTAGE INPUT SHORT CIRCUIT



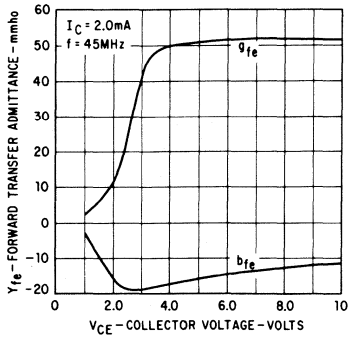
REVERSE TRANSADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



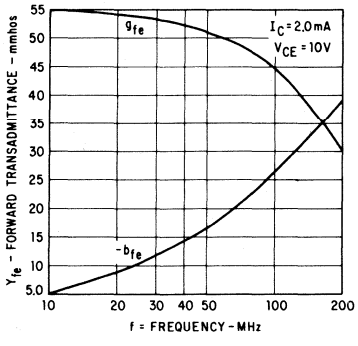
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



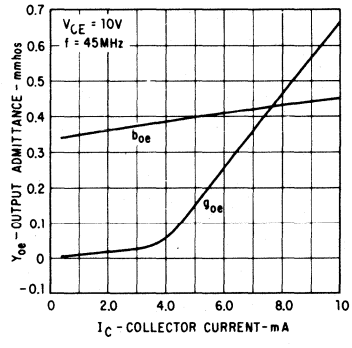
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR VOLTAGE OUTPUT SHORT CIRCUIT



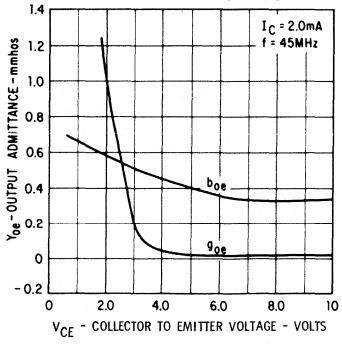
FORWARD TRANSADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



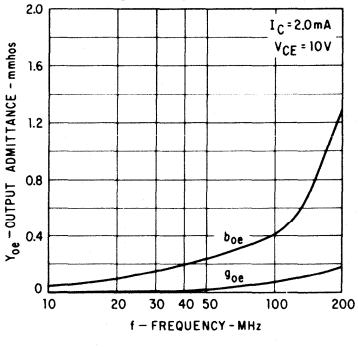
OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS COLLECTOR VOLTAGE INPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT

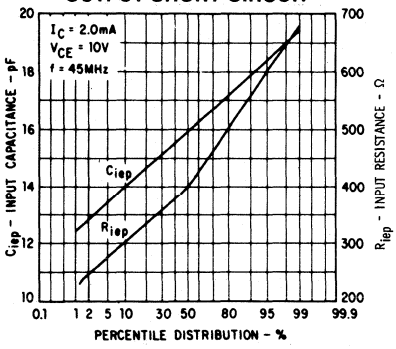


CURVE SET NUMBER SS10

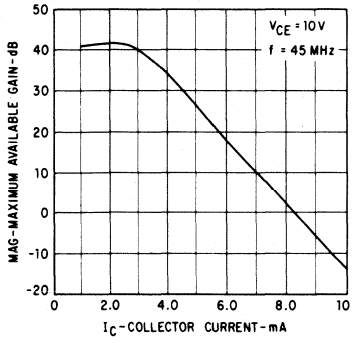
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

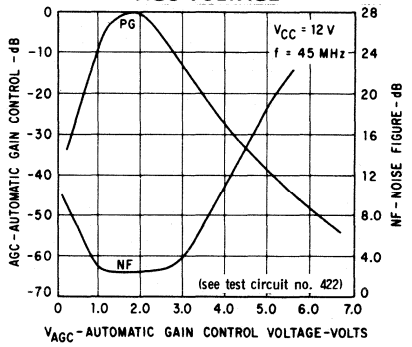
DISTRIBUTION OF INPUT CAPACITANCE AND INPUT RESISTANCE OUTPUT SHORT CIRCUIT



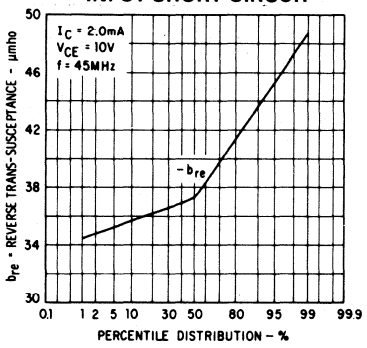
MAXIMUM AVAILABLE GAIN VERSUS COLLECTOR CURRENT



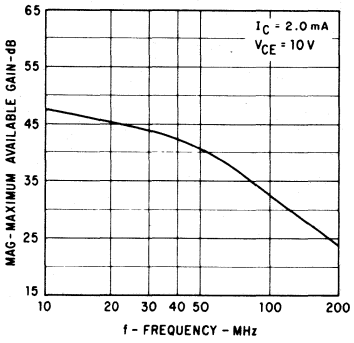
AUTOMATIC GAIN CONTROL AND NOISE FIGURE VERSUS AGC VOLTAGE



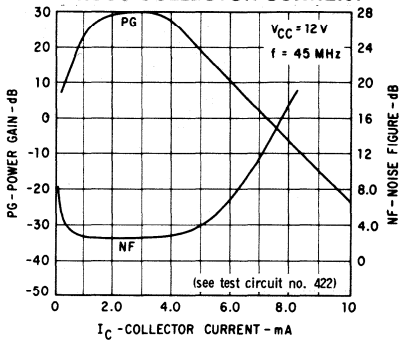
DISTRIBUTION OF REVERSE TRANSADMITTANCE INPUT SHORT CIRCUIT



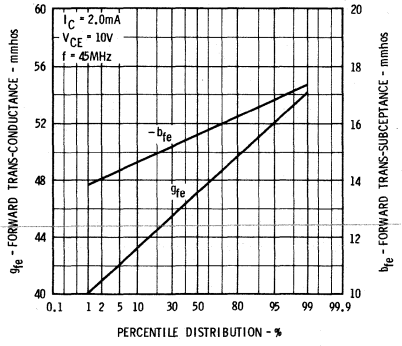
MAXIMUM AVAILABLE GAIN VERSUS FREQUENCY



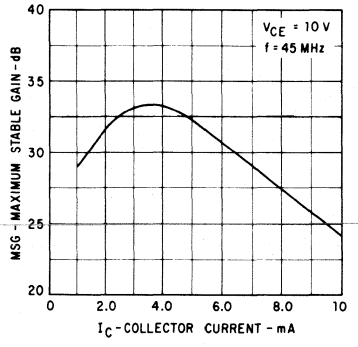
POWER GAIN AND NOISE FIGURE VERSUS COLLECTOR CURRENT



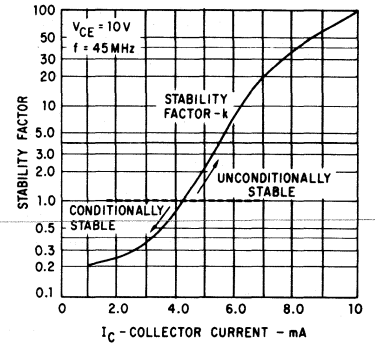
DISTRIBUTION OF FORWARD TRANSFER ADMITTANCE OUTPUT SHORT CIRCUIT



MAXIMUM STABLE GAIN VERSUS COLLECTOR CURRENT

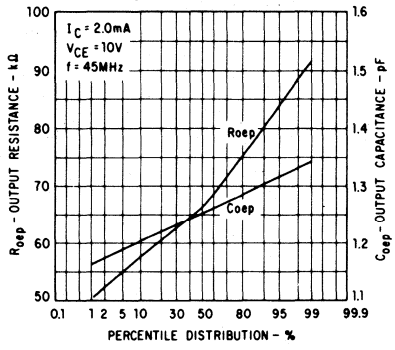


STABILITY FACTOR* VERSUS COLLECTOR CURRENT

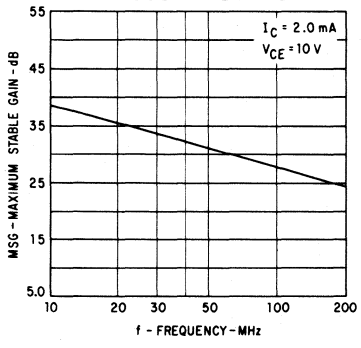


* Rollett stability factor k, where $k = \frac{2\ gigo - Re(Y_f Y_r)}{|Y_f Y_r|}$

DISTRIBUTION OF OUTPUT CAPACITANCE AND OUTPUT RESISTANCE INPUT SHORT CIRCUIT



MAXIMUM STABLE GAIN VERSUS FREQUENCY



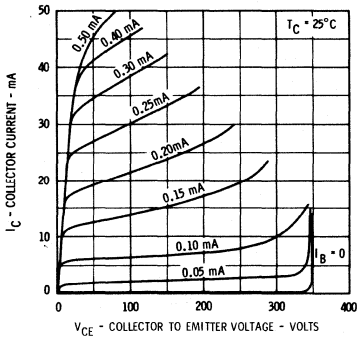
5

CURVE SET NUMBER SS11

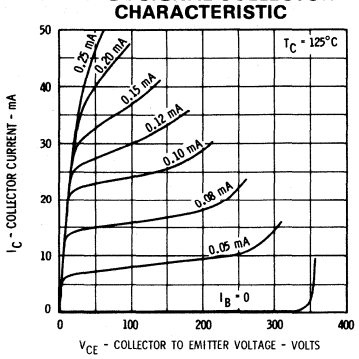
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

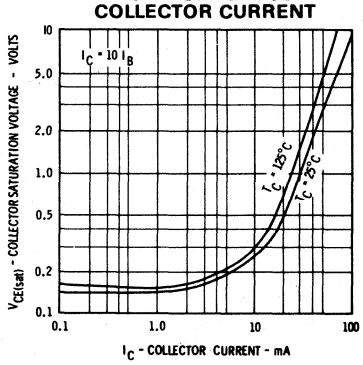
LARGE SIGNAL COLLECTOR CHARACTERISTIC



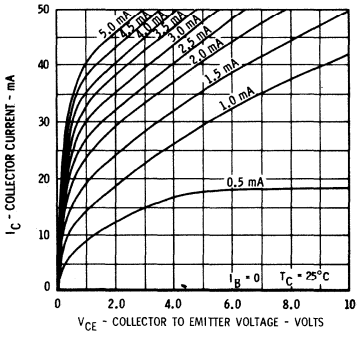
LARGE SIGNAL COLLECTOR CHARACTERISTIC



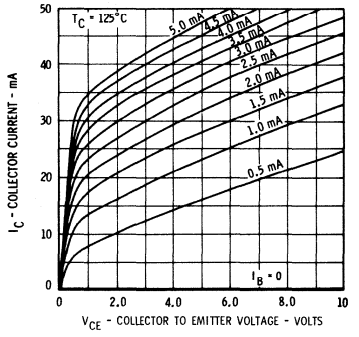
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



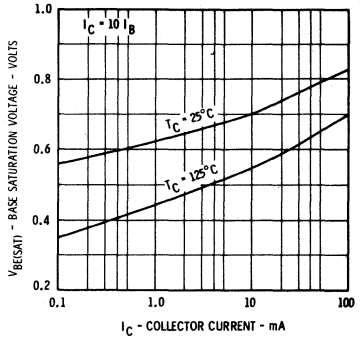
COLLECTOR SATURATION CHARACTERISTICS



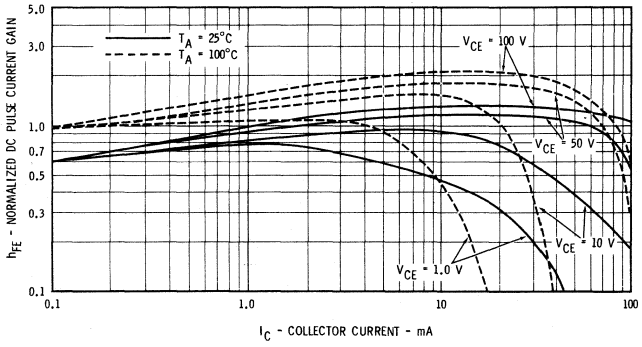
COLLECTOR SATURATION CHARACTERISTICS



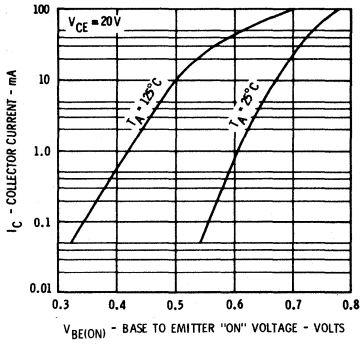
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



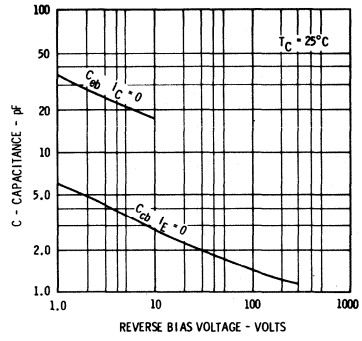
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



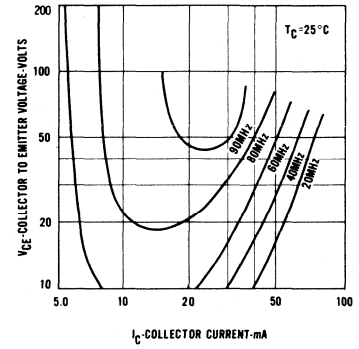
COLLECTOR CURRENT VERSUS EMITTER TO BASE 'ON' VOLTAGE



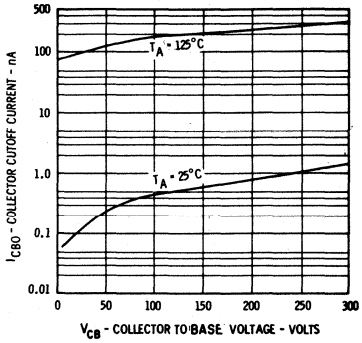
COLLECTOR TO BASE AND EMITTER TO BASE CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



COLLECTOR CUTOFF CURRENT VERSUS COLLECTOR VOLTAGE

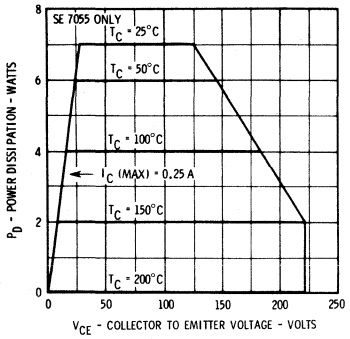


CURVE SET NUMBER SS11

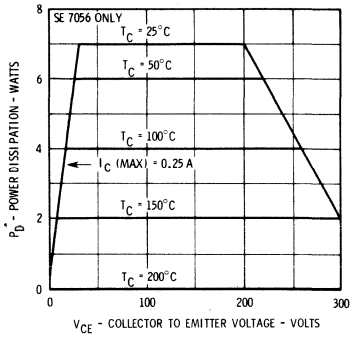
MAXIMUM RATING CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

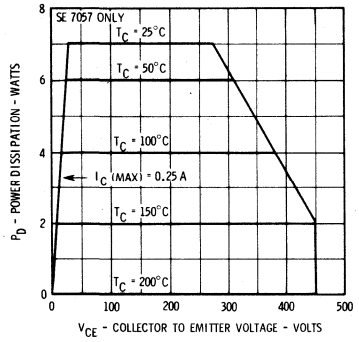
GUARANTEED MAXIMUM DC POWER DISSIPATION VERSUS COLLECTOR TO EMITTER VOLTAGE



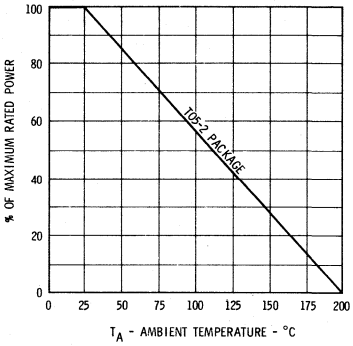
GUARANTEED MAXIMUM DC POWER DISSIPATION VERSUS COLLECTOR TO EMITTER VOLTAGE



GUARANTEED MAXIMUM DC POWER DISSIPATION VERSUS COLLECTOR TO EMITTER VOLTAGE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



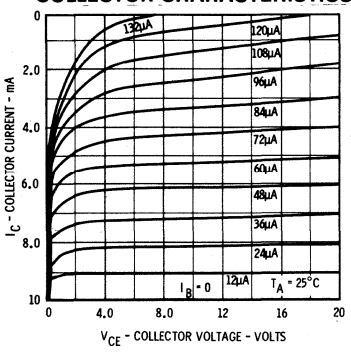
5

CURVE SET NUMBER SS12

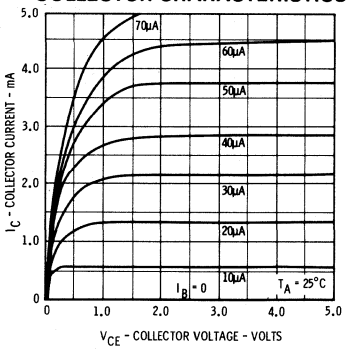
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

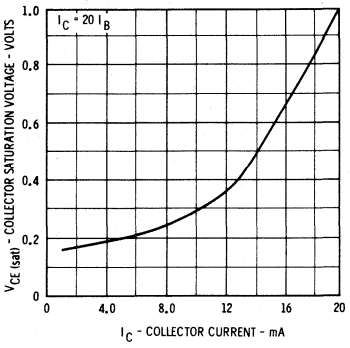
COLLECTOR CHARACTERISTICS



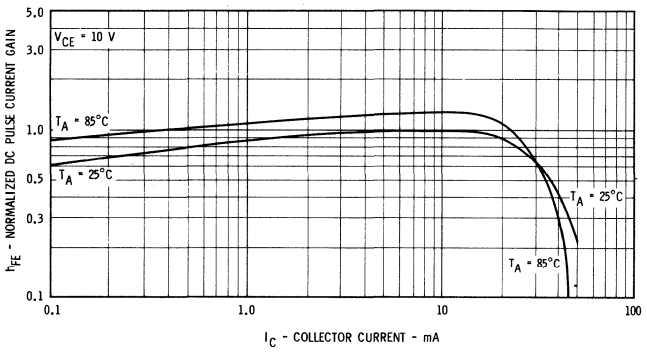
COLLECTOR CHARACTERISTICS



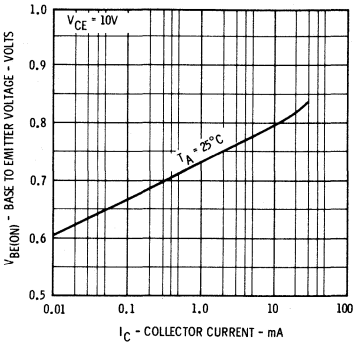
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



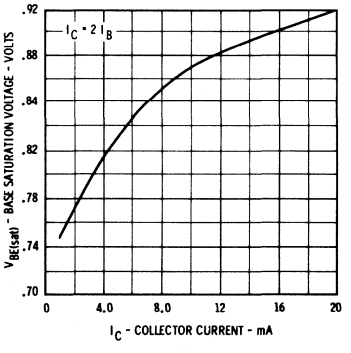
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



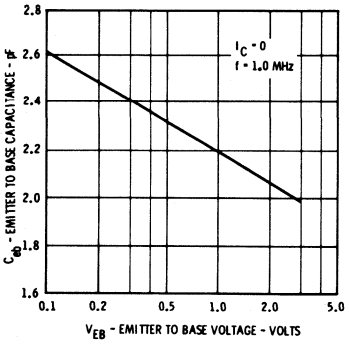
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



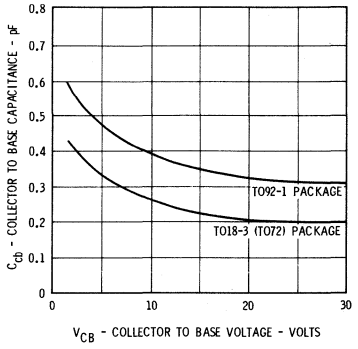
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



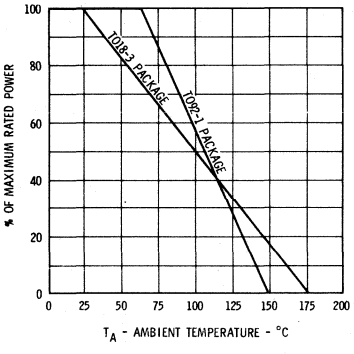
EMITTER TO BASE CAPACITANCE VERSUS EMITTER TO BASE VOLTAGE



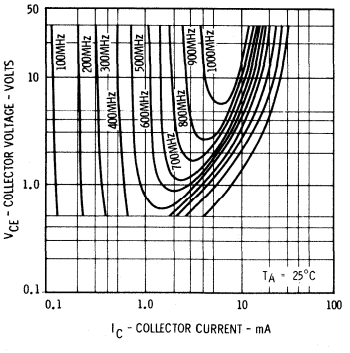
COLLECTOR TO BASE CAPACITANCE VERSUS COLLECTOR TO BASE VOLTAGE



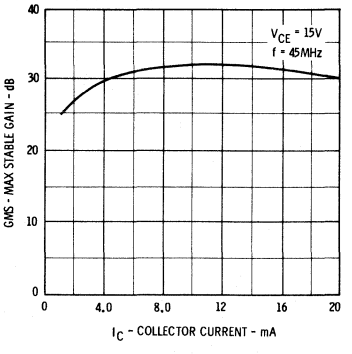
ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



CONTOURS OF CONSTANT BANDWIDTH PRODUCT



MAXIMUM STABLE GAIN VERSUS COLLECTOR CURRENT

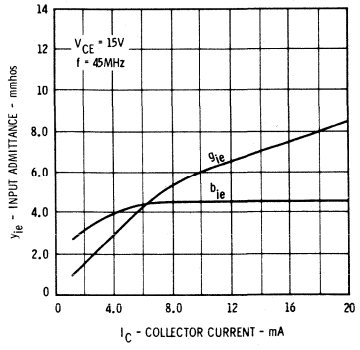


CURVE SET NUMBER SS12

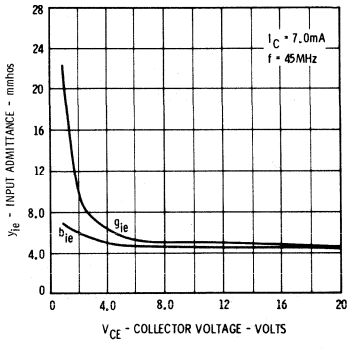
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

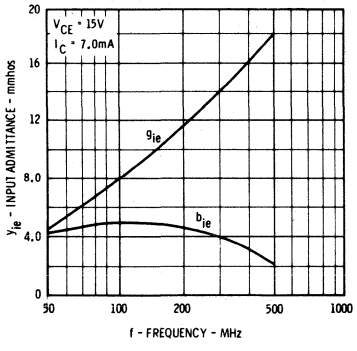
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT



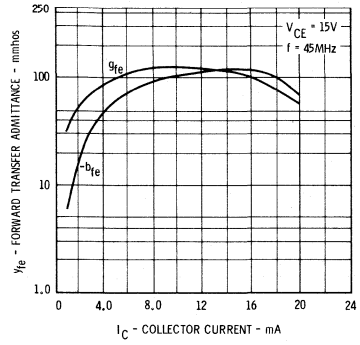
INPUT ADMITTANCE VERSUS COLLECTOR VOLTAGE



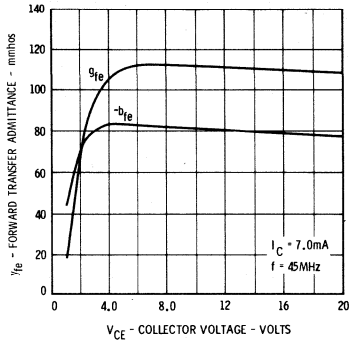
INPUT ADMITTANCE VERSUS FREQUENCY



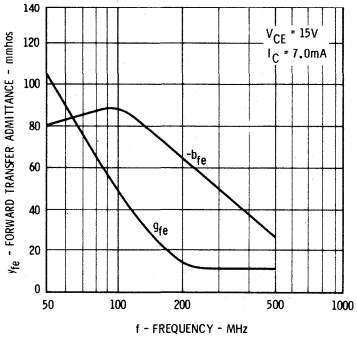
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT



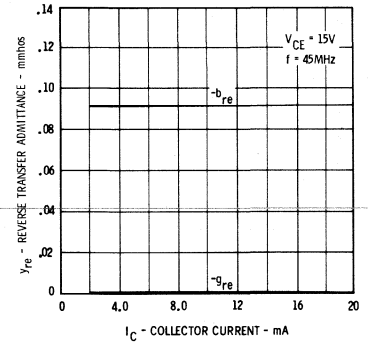
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR VOLTAGE



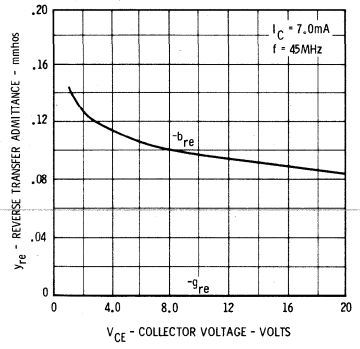
FORWARD TRANSFER ADMITTANCE VERSUS FREQUENCY



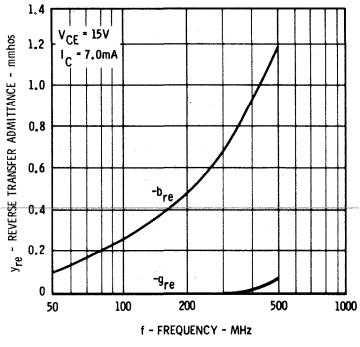
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT



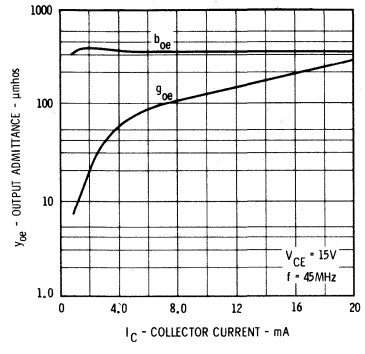
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR VOLTAGE



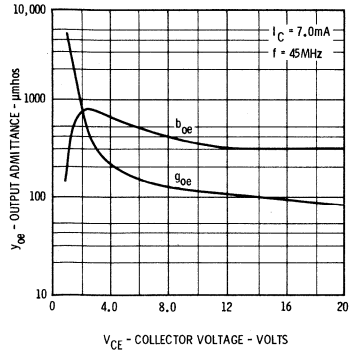
REVERSE TRANSFER ADMITTANCE VERSUS FREQUENCY



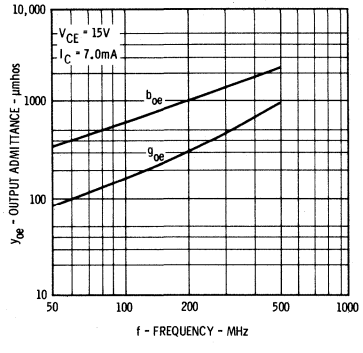
OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT



OUTPUT ADMITTANCE VERSUS COLLECTOR VOLTAGE



OUTPUT ADMITTANCE VERSUS FREQUENCY



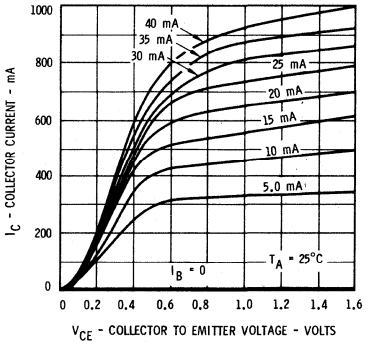
5

CURVE SET NUMBER SS13

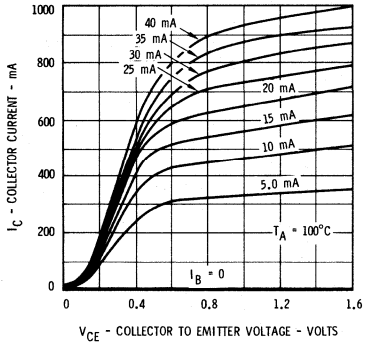
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

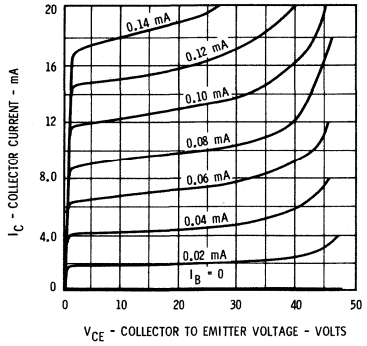
COLLECTOR CHARACTERISTICS



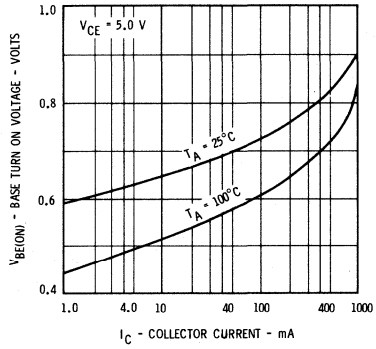
COLLECTOR CHARACTERISTICS



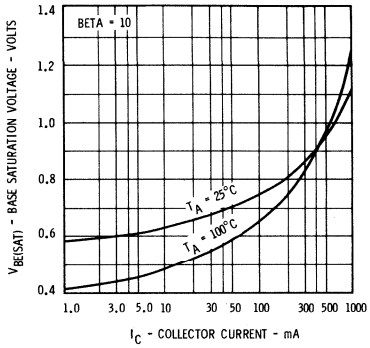
COLLECTOR CHARACTERISTICS



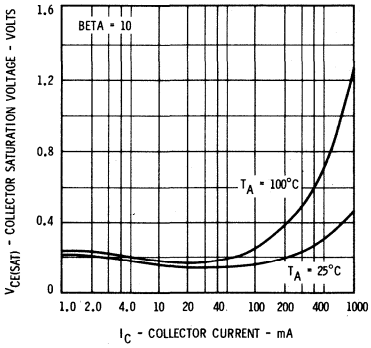
BASE TURN ON VOLTAGE VERSUS COLLECTOR CURRENT



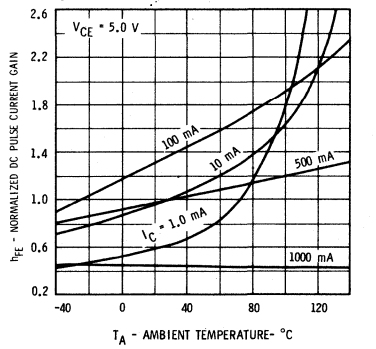
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



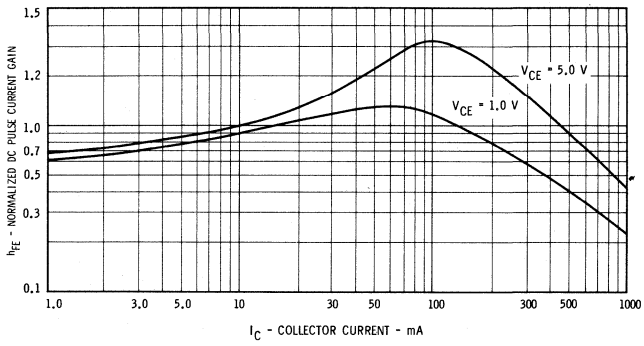
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



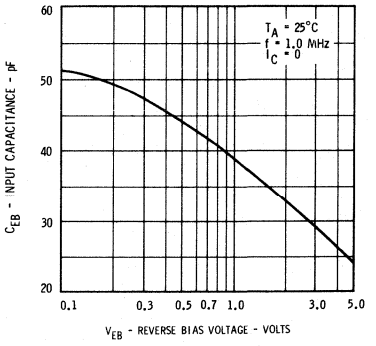
NORMALIZED DC PULSED CURRENT GAIN VERSUS TEMPERATURE



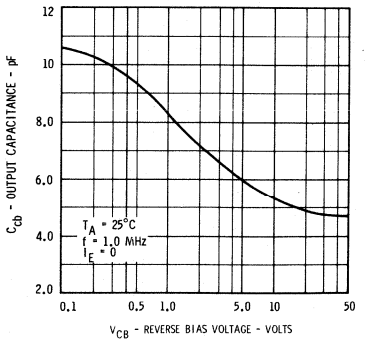
NORMALIZED DC PULSED CURRENT GAIN VERSUS COLLECTOR CURRENT



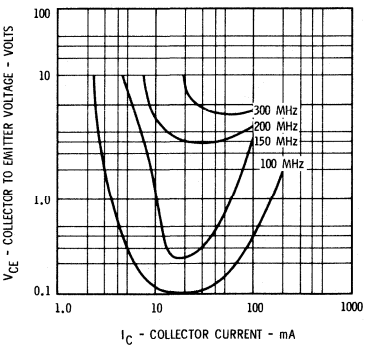
INPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT

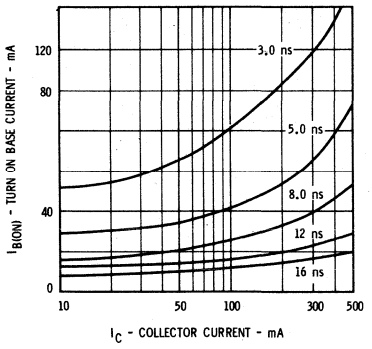


CURVE SET NUMBER SS13

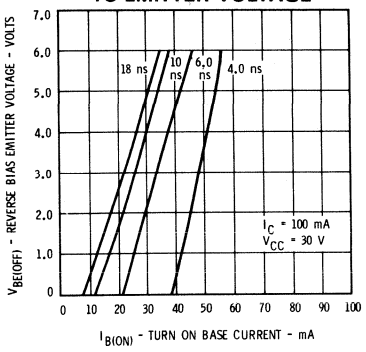
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

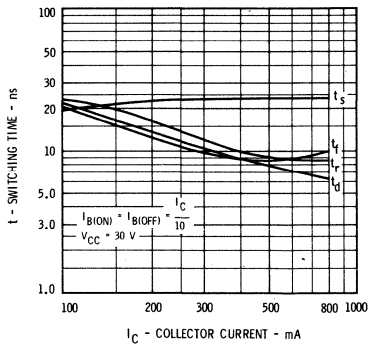
RISE TIME VERSUS COLLECTOR CURRENT AND TURN ON BASE CURRENT



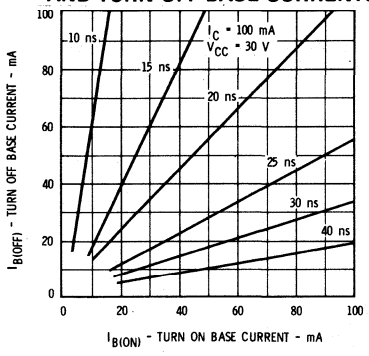
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE TO EMITTER VOLTAGE



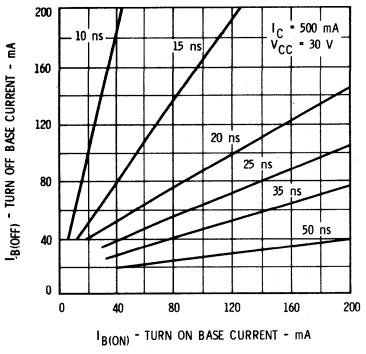
SWITCHING TIME VERSUS COLLECTOR CURRENT



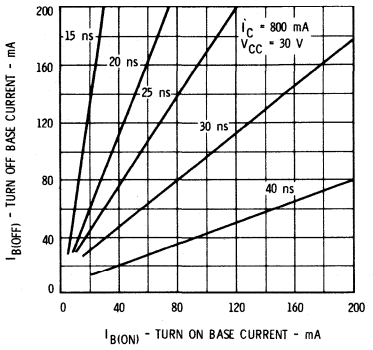
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



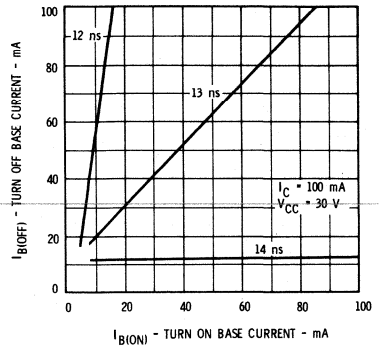
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



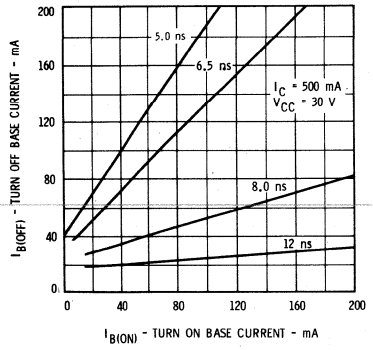
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



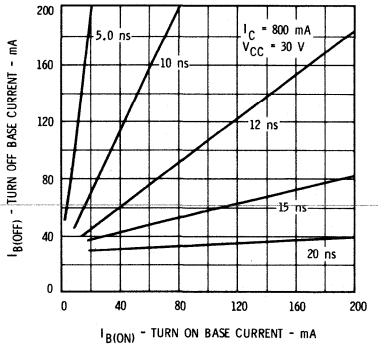
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS

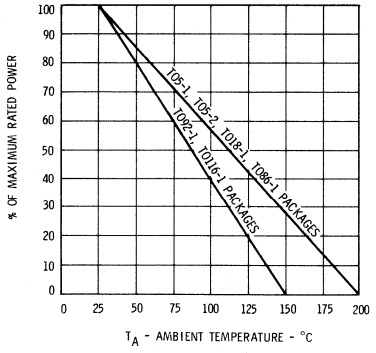


FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



MAXIMUM RATING CURVES

ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

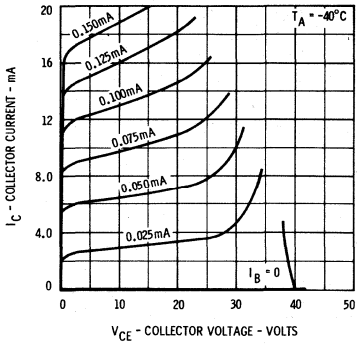


CURVE SET NUMBER SS14

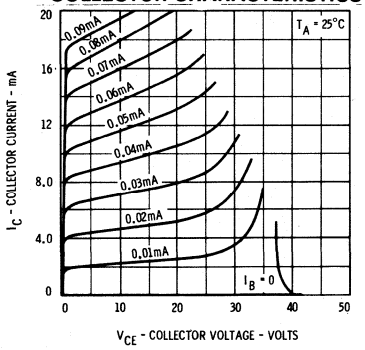
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

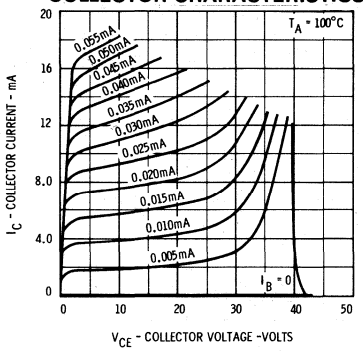
COLLECTOR CHARACTERISTICS



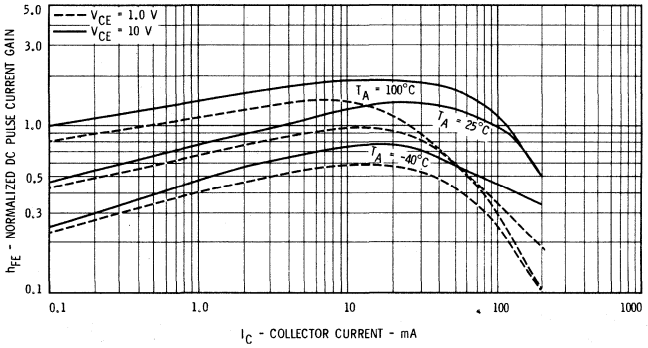
COLLECTOR CHARACTERISTICS



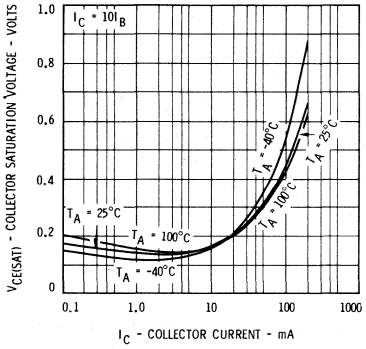
COLLECTOR CHARACTERISTICS



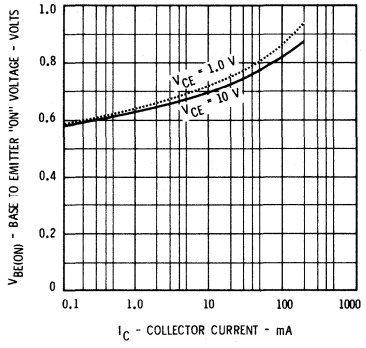
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



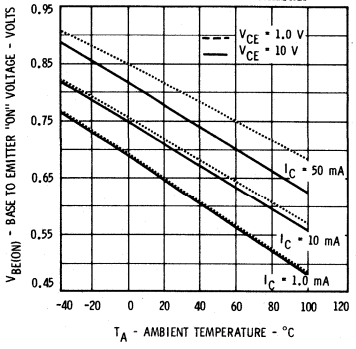
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



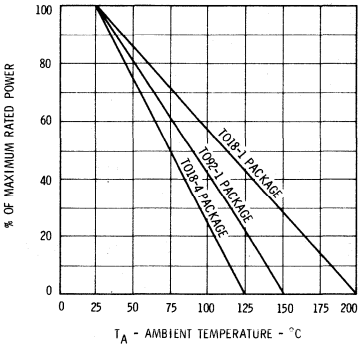
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS AMBIENT TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

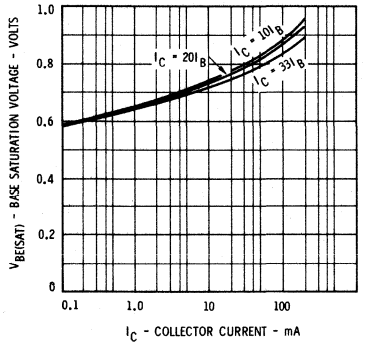


CURVE SET NUMBER SS14

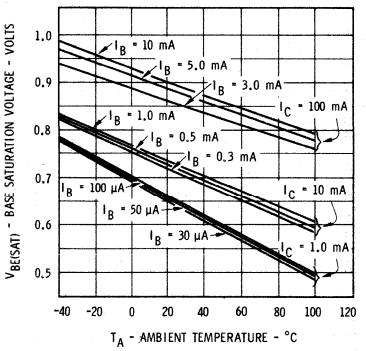
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

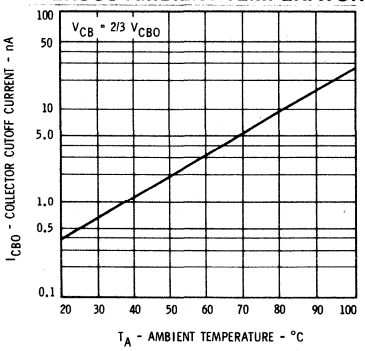
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



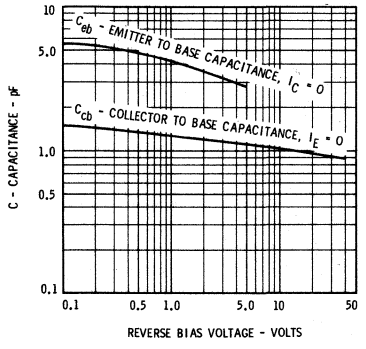
BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



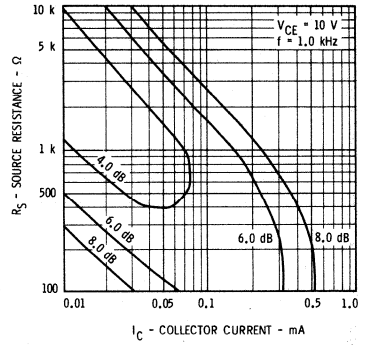
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



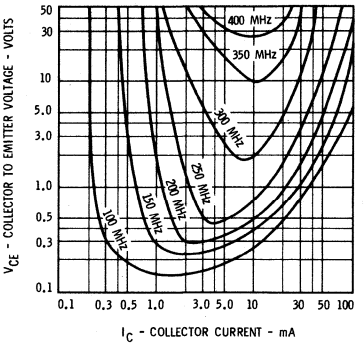
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



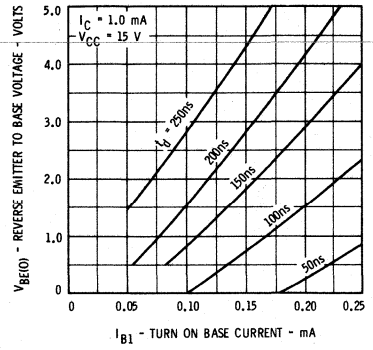
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



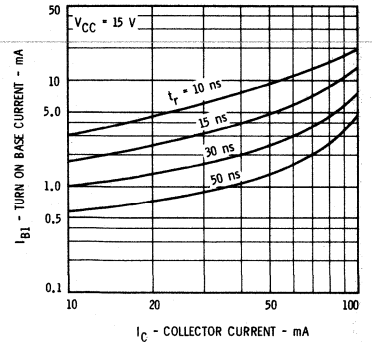
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



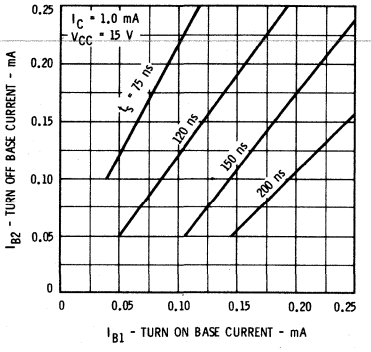
DELAY TIME VERSUS REVERSE BASE TO EMITTER VOLTAGE AND TURN ON BASE CURRENTS



RISE TIME VERSUS TURN ON BASE CURRENT AND COLLECTOR CURRENT



STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



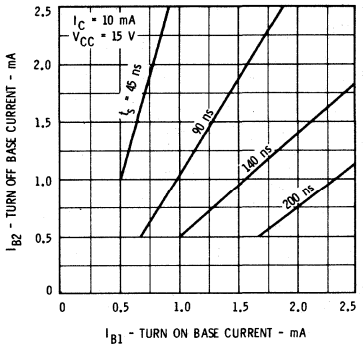
5

CURVE SET NUMBER SS14

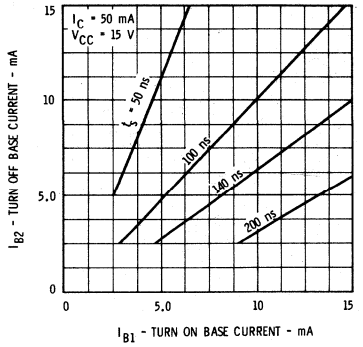
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

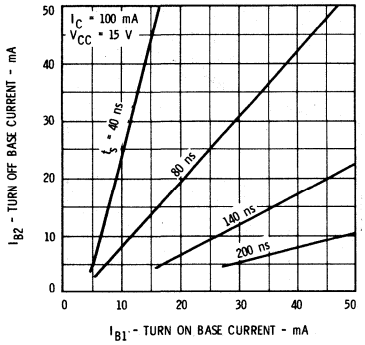
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



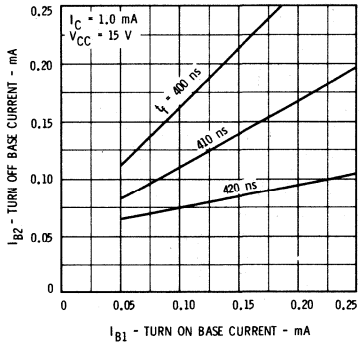
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



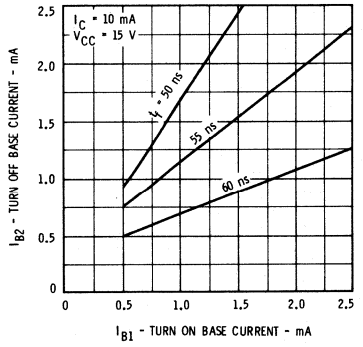
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



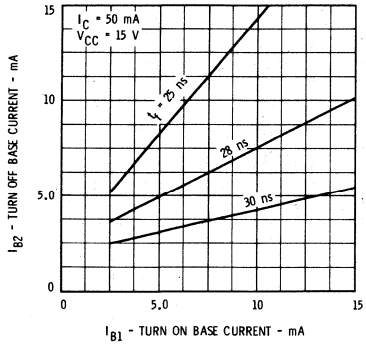
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



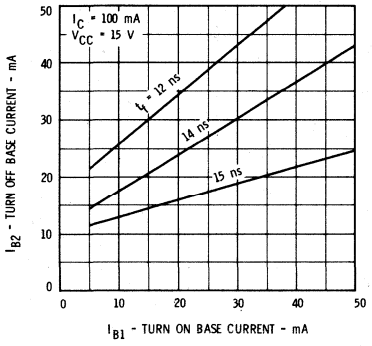
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



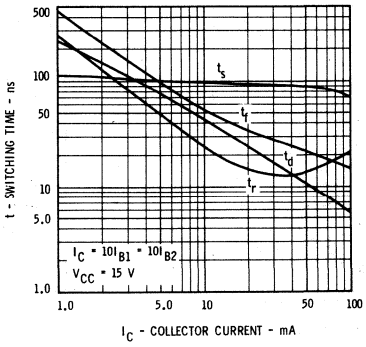
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



SWITCHING TIME VERSUS COLLECTOR CURRENT

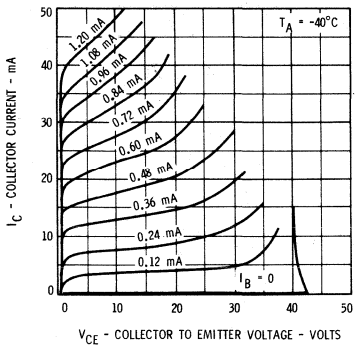


CURVE SET NUMBER SS15

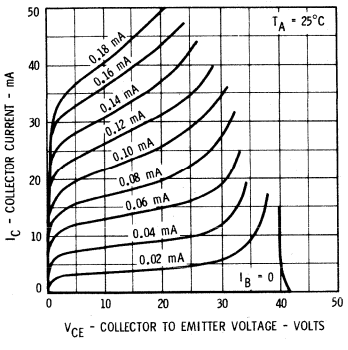
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

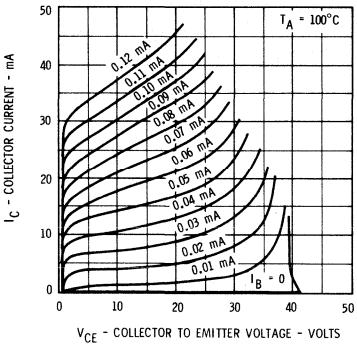
COLLECTOR CHARACTERISTICS



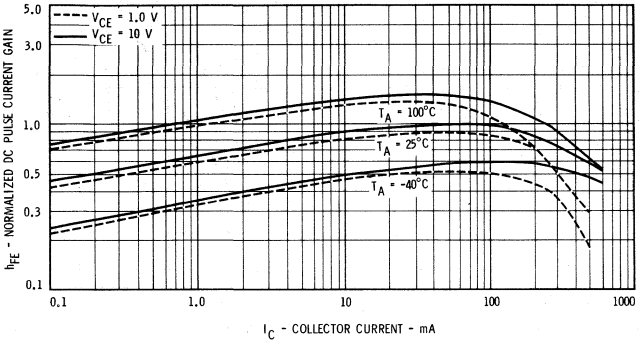
COLLECTOR CHARACTERISTICS



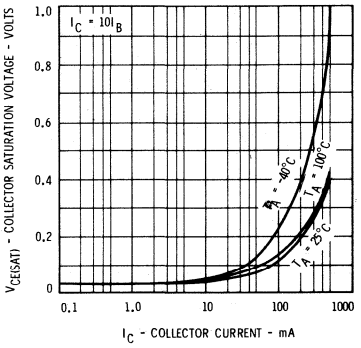
COLLECTOR CHARACTERISTICS



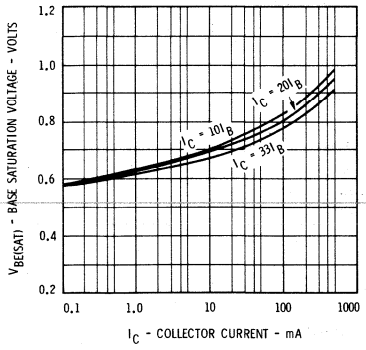
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



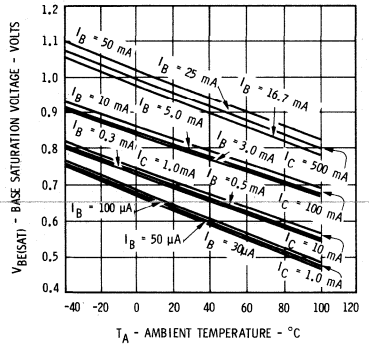
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



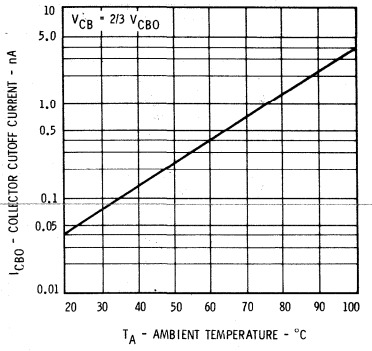
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



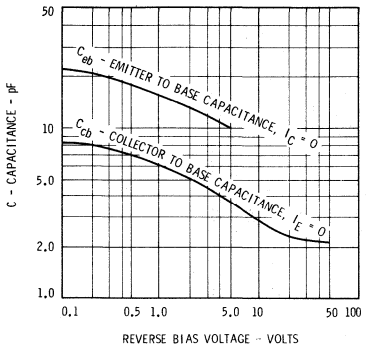
BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



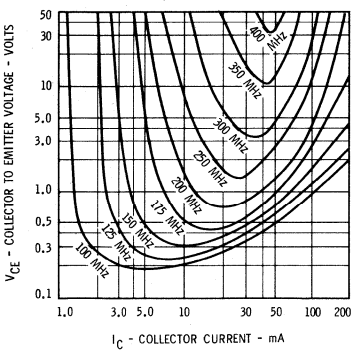
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



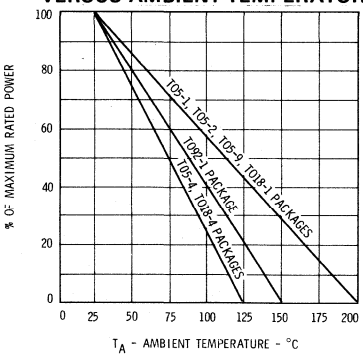
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

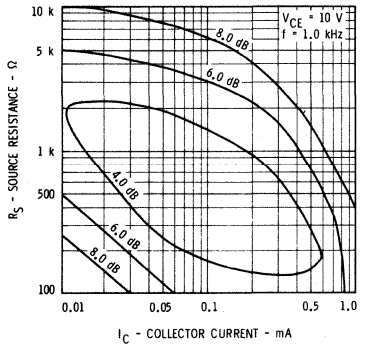


CURVE SET NUMBER SS15

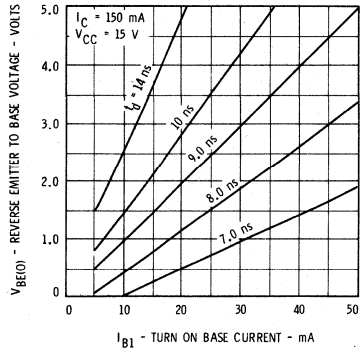
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

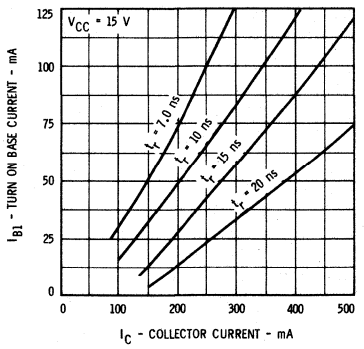
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



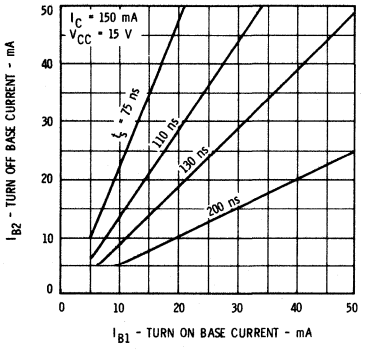
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE



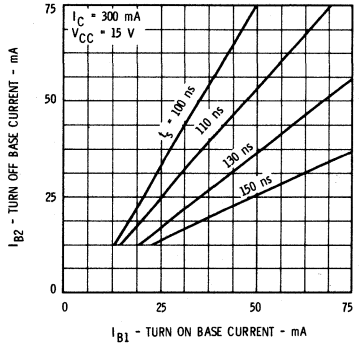
RISE TIME VERSUS COLLECTOR CURRENT AND TURN ON BASE CURRENT



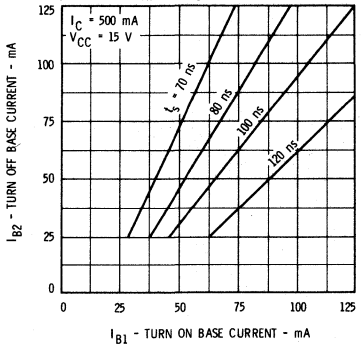
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



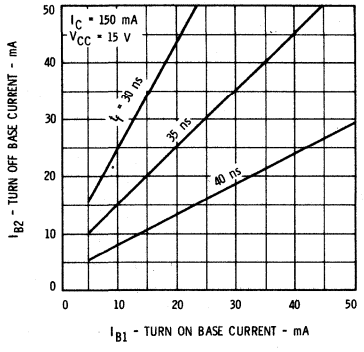
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



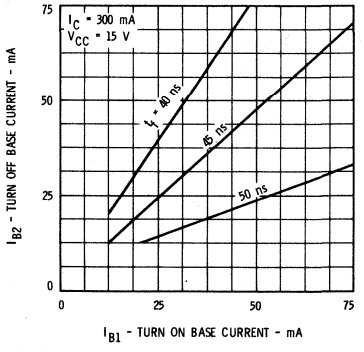
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



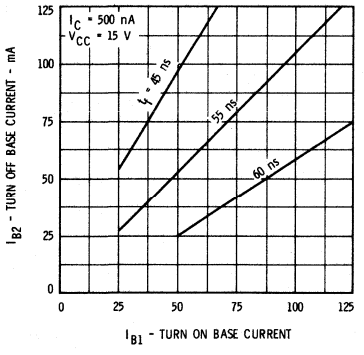
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



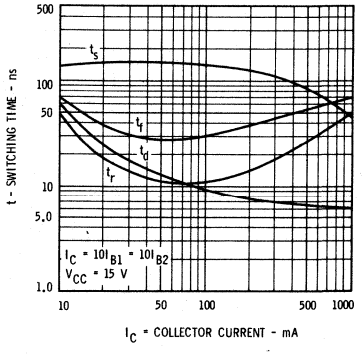
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



SWITCHING TIME VERSUS COLLECTOR CURRENT

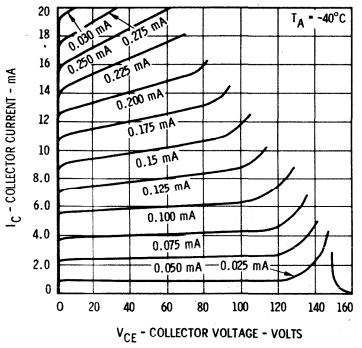


CURVE SET NUMBER SS16

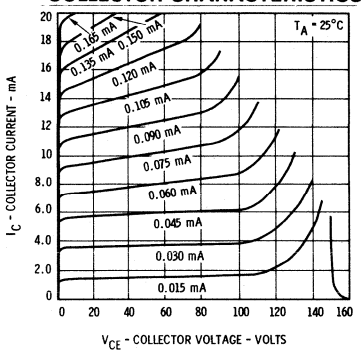
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

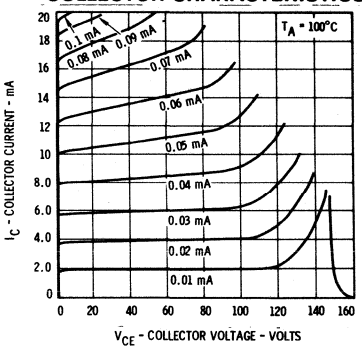
COLLECTOR CHARACTERISTICS



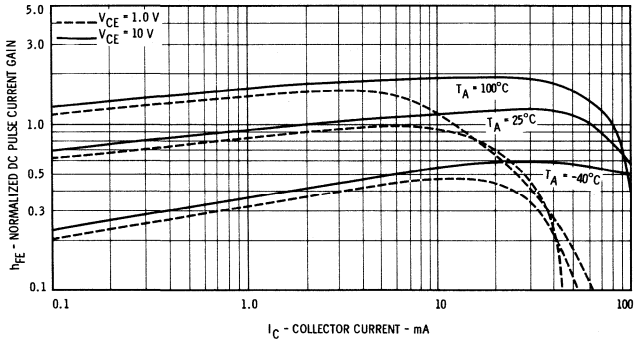
COLLECTOR CHARACTERISTICS



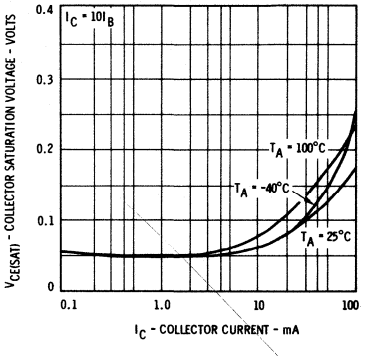
COLLECTOR CHARACTERISTICS



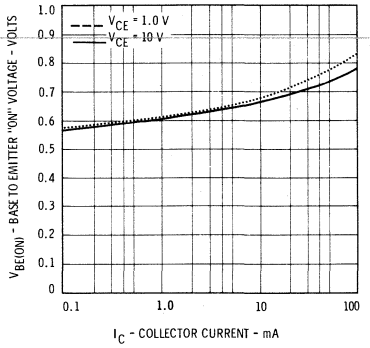
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



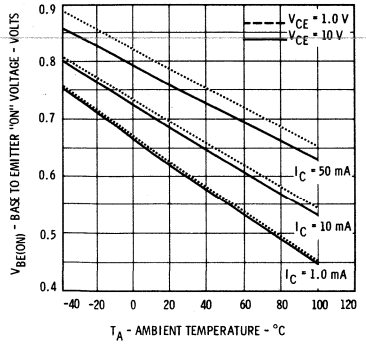
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



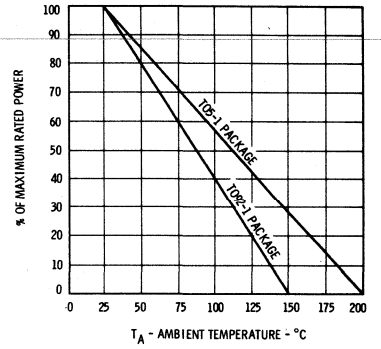
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS AMBIENT TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



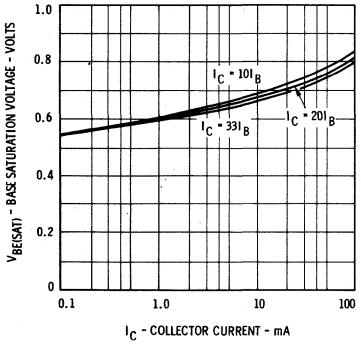
5

CURVE SET NUMBER SS16

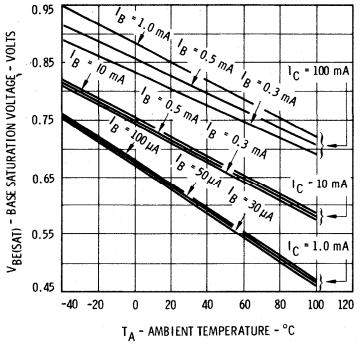
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

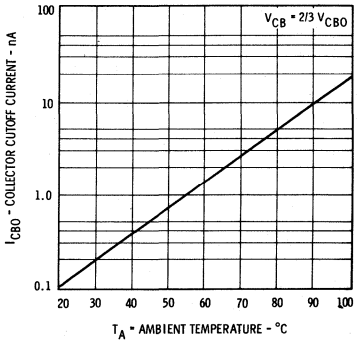
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



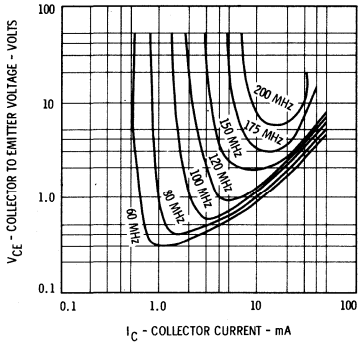
BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



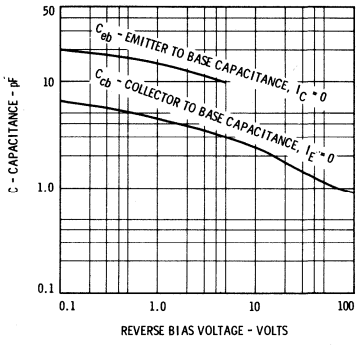
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



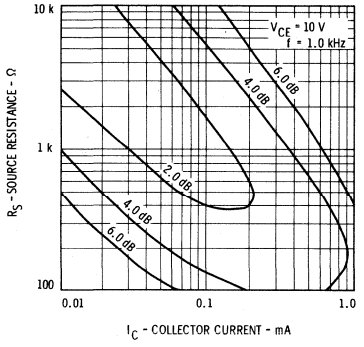
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



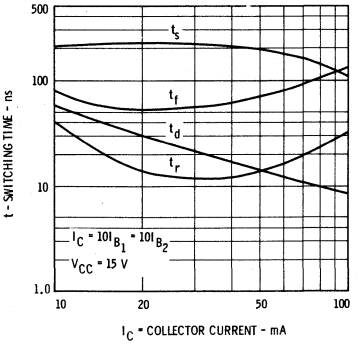
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



SWITCHING TIME VERSUS COLLECTOR CURRENT

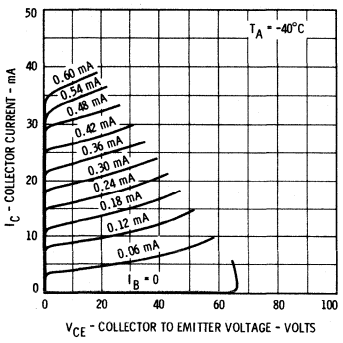


CURVE SET NUMBER SS17

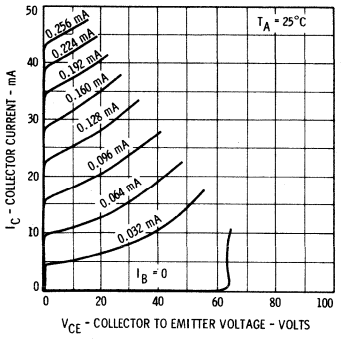
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

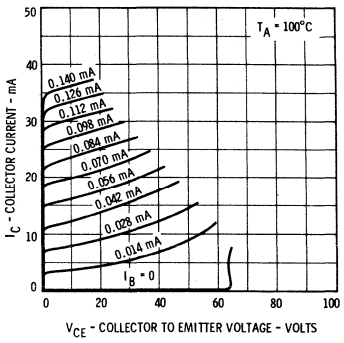
ACTIVE REGION



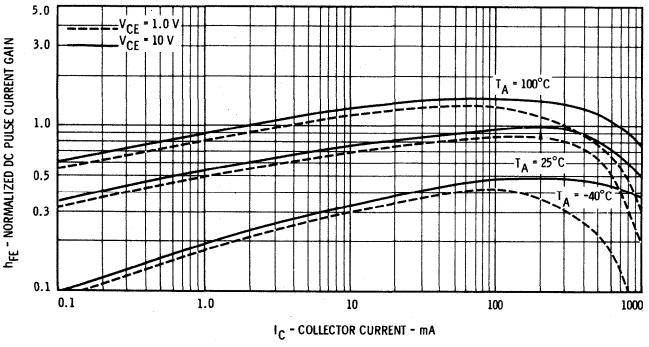
ACTIVE REGION



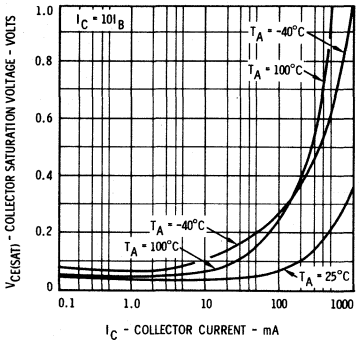
ACTIVE REGION



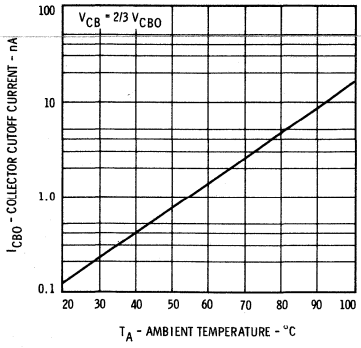
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



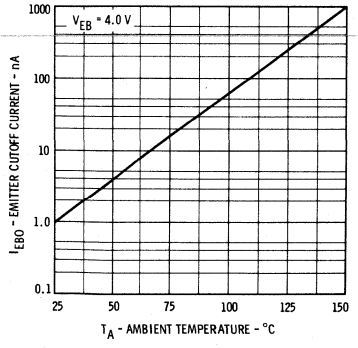
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



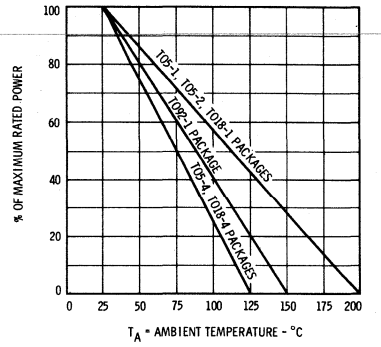
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



EMITTER CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



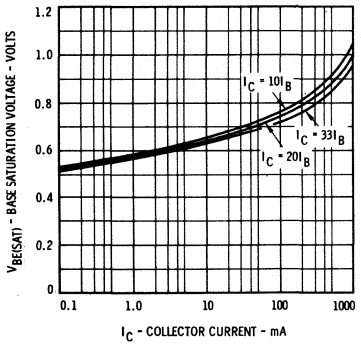
5

CURVE SET NUMBER SS17

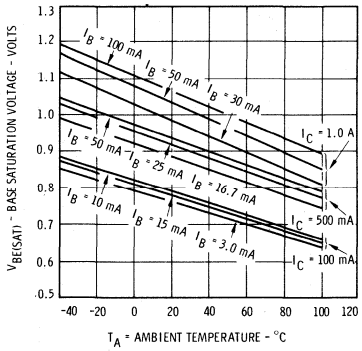
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

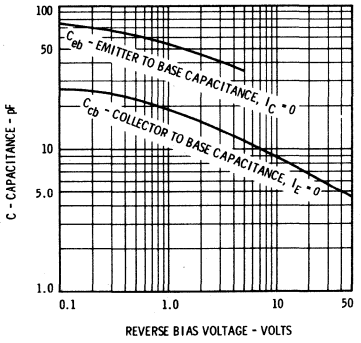
BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



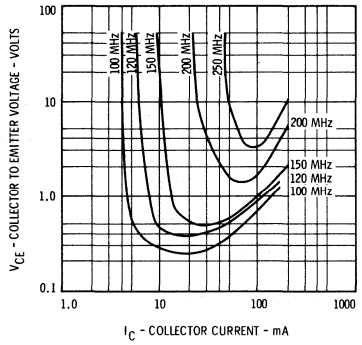
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



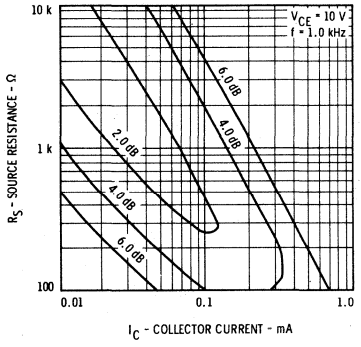
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



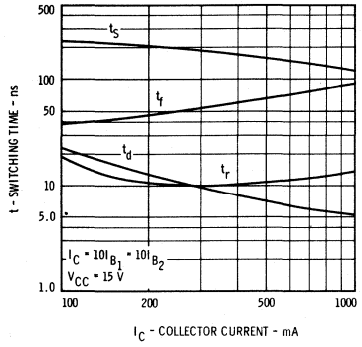
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



SWITCHING TIME VERSUS COLLECTOR CURRENT

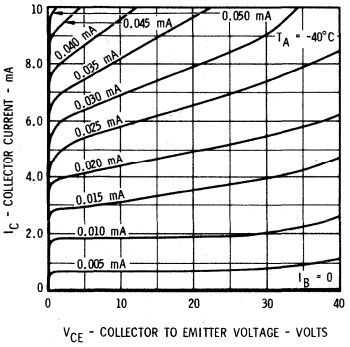


CURVE SET NUMBER SS18

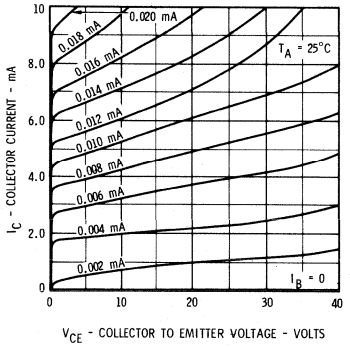
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

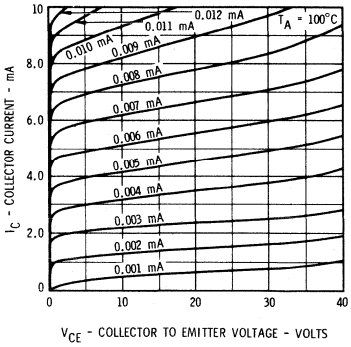
COLLECTOR CHARACTERISTICS



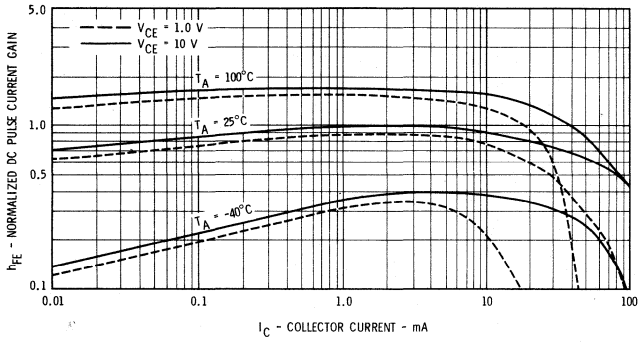
COLLECTOR CHARACTERISTICS



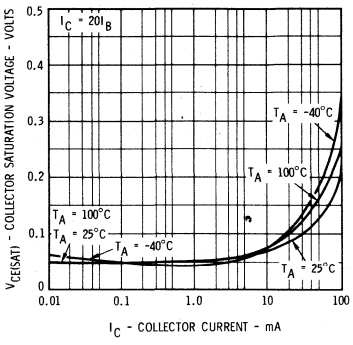
COLLECTOR CHARACTERISTICS



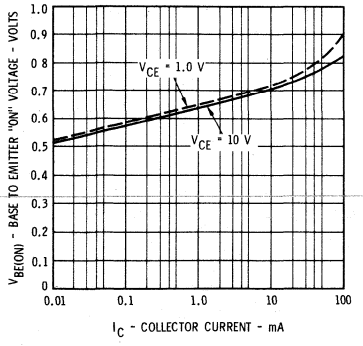
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



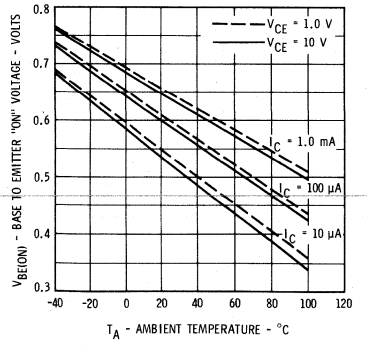
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



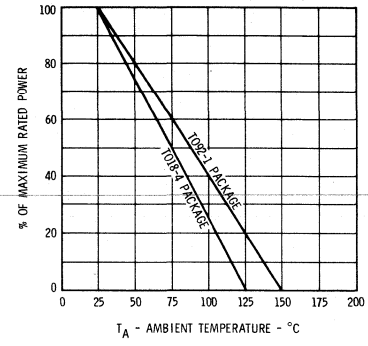
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



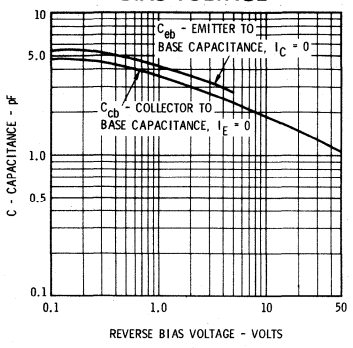
BASE TO EMITTER 'ON' VOLTAGE VERSUS AMBIENT TEMPERATURE



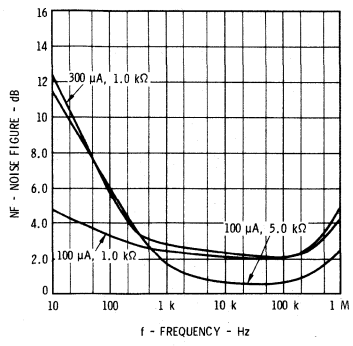
ALLOWABLE POWER DISSIPATION VERSUS TEMPERATURE



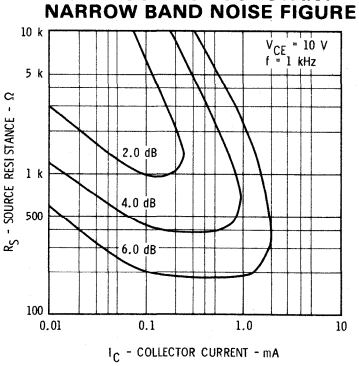
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



NOISE FIGURE VERSUS FREQUENCY



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



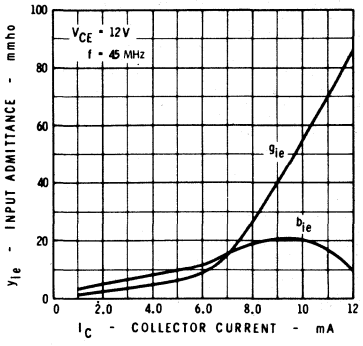
5

CURVE SET NUMBER SS19

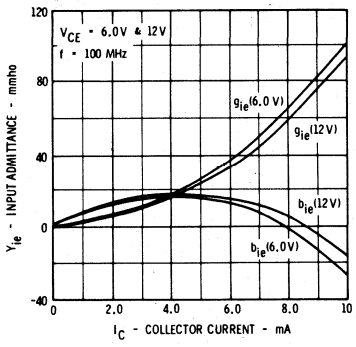
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

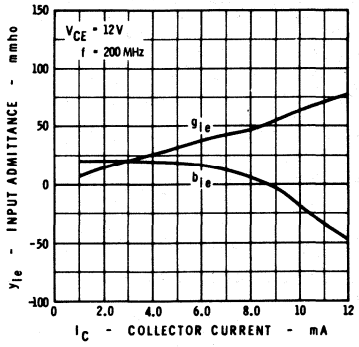
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



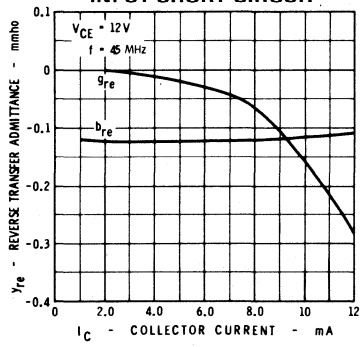
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



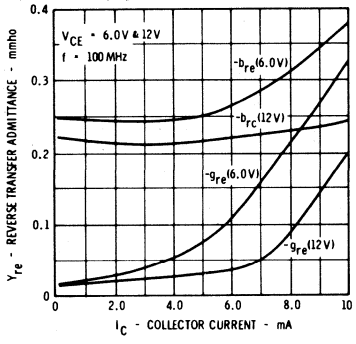
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



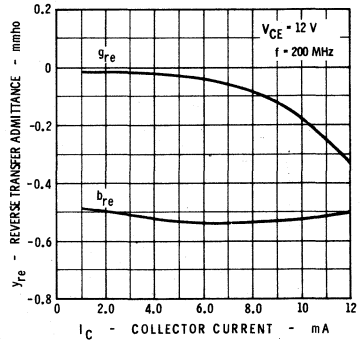
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



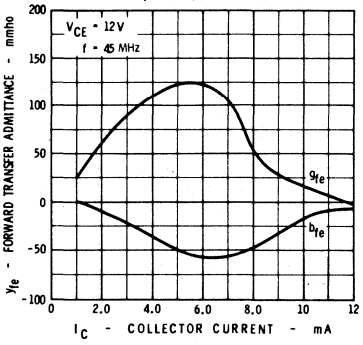
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



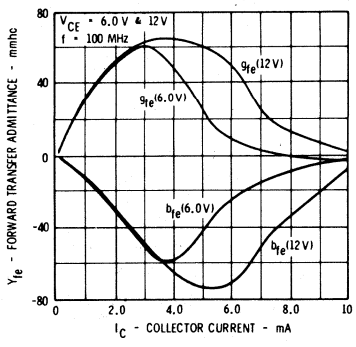
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



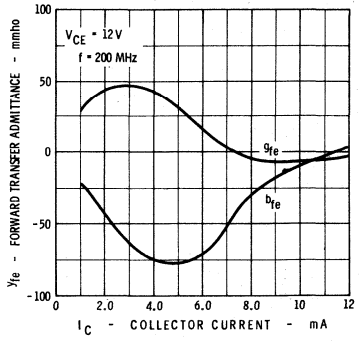
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



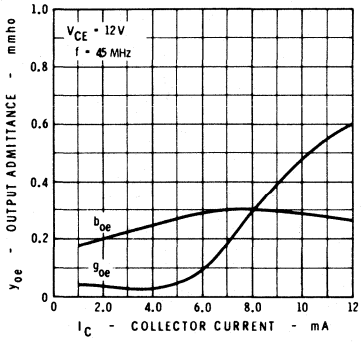
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



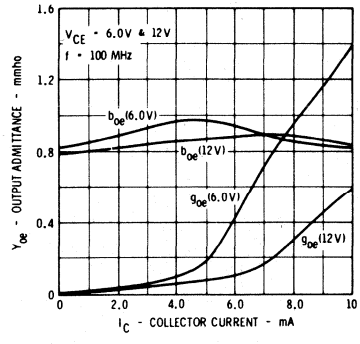
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



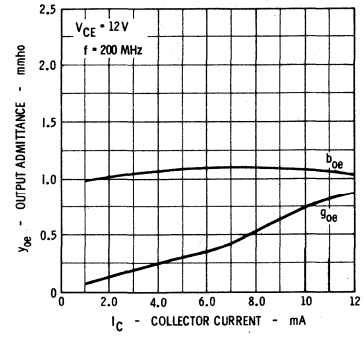
OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT



OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT INPUT SHORT CIRCUIT

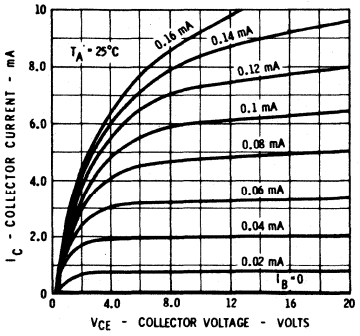


CURVE SET NUMBER SS19

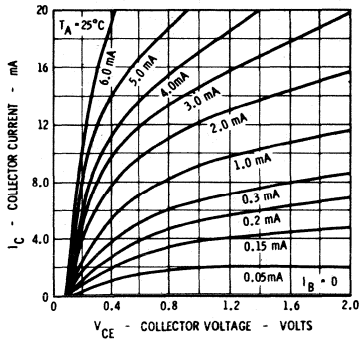
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

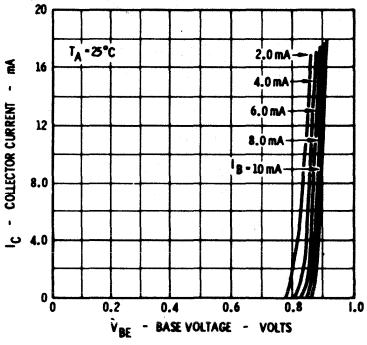
COLLECTOR CHARACTERISTICS



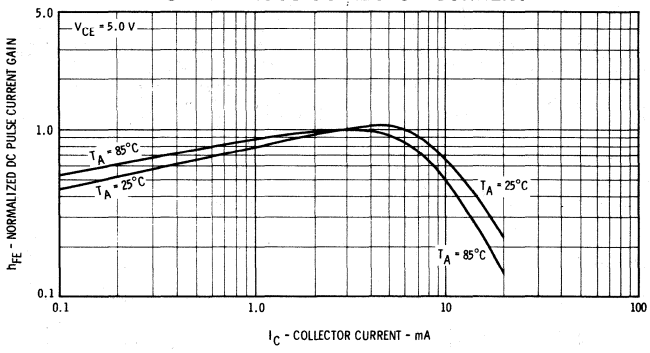
COLLECTOR CHARACTERISTICS



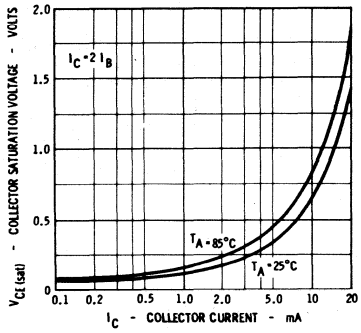
BASE CHARACTERISTICS



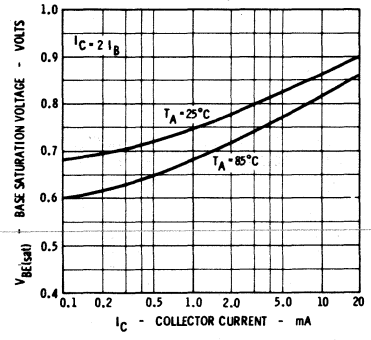
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



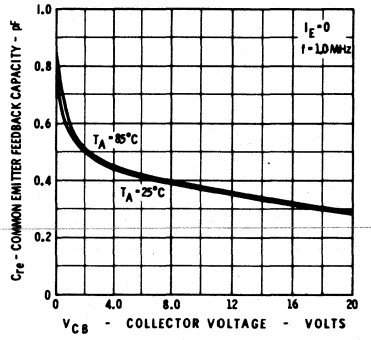
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



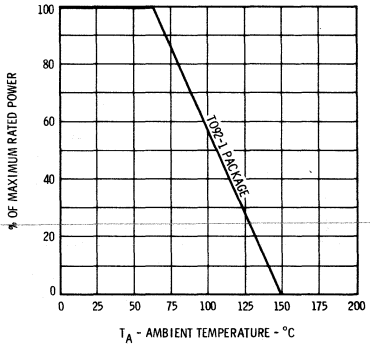
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



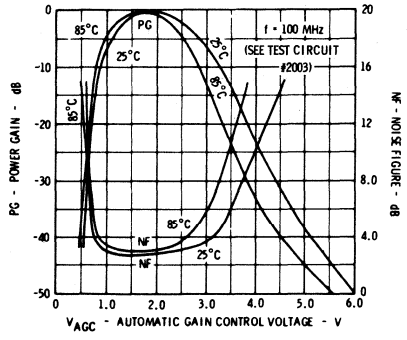
COMMON EMITTER FEEDBACK CAPACITY VERSUS COLLECTOR VOLTAGE



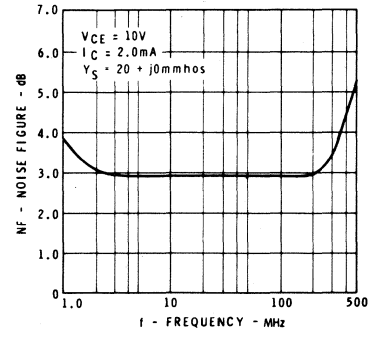
ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



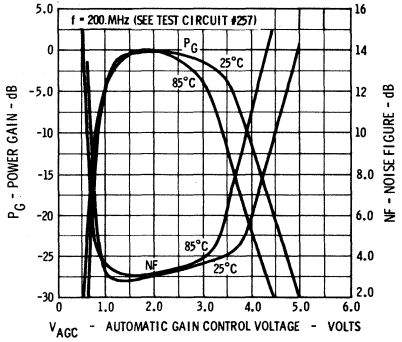
POWER GAIN AND NOISE FIGURE VERSUS GAIN CONTROL VOLTAGE



NOISE FIGURE VERSUS FREQUENCY



POWER GAIN AND NOISE FIGURE VERSUS AUTOMATIC GAIN CONTROL VOLTAGE



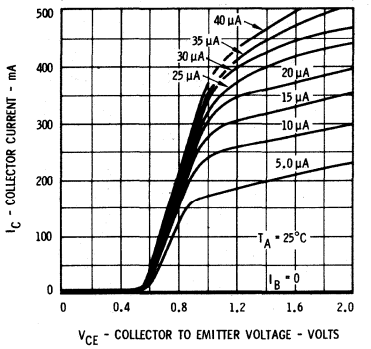
5

CURVE SET NUMBER SS20

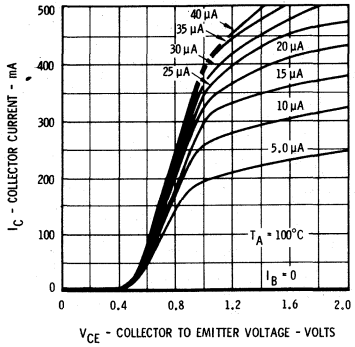
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

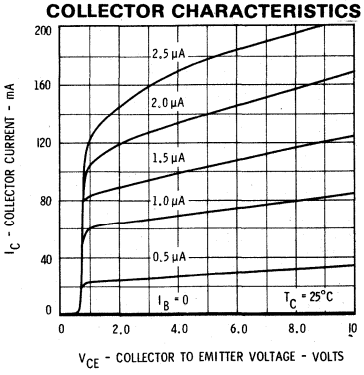
COLLECTOR CHARACTERISTICS



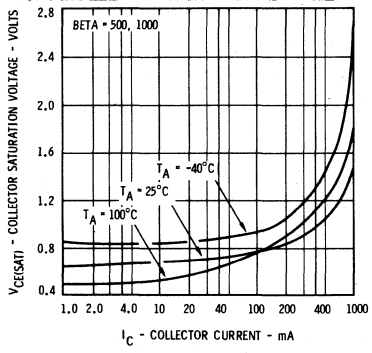
COLLECTOR CHARACTERISTICS



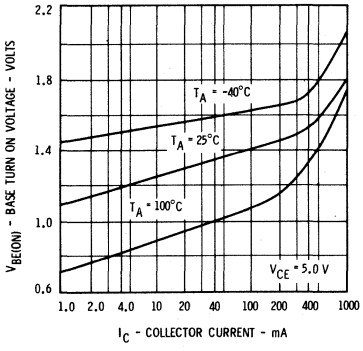
COLLECTOR CHARACTERISTICS



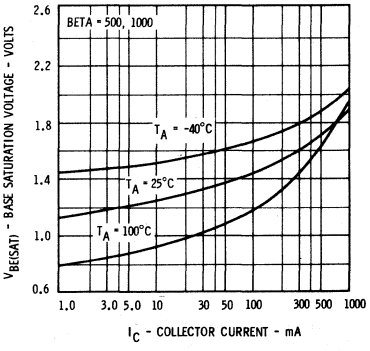
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



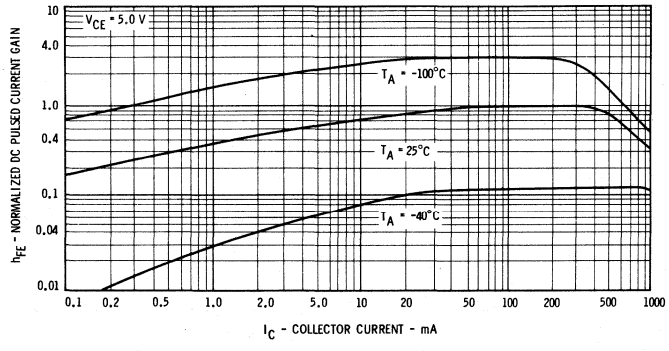
BASE TURN ON VOLTAGE VERSUS COLLECTOR CURRENT



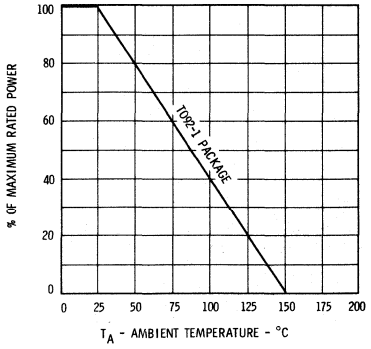
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



NORMALIZED DC PULSED CURRENT GAIN VERSUS COLLECTOR CURRENT



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

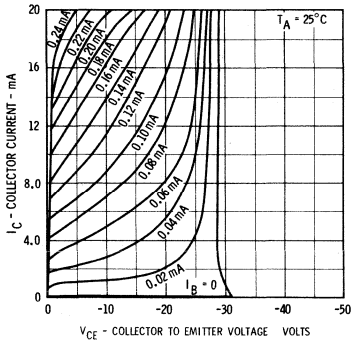


CURVE SET NUMBER SS21

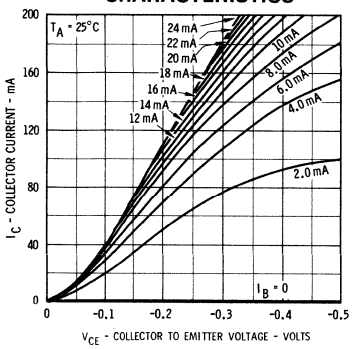
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

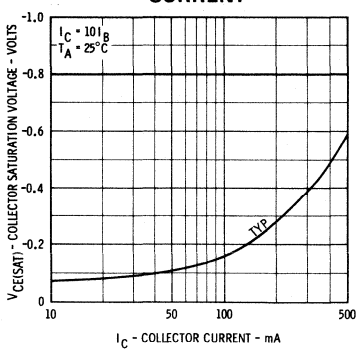
TYPICAL COLLECTOR CHARACTERISTICS



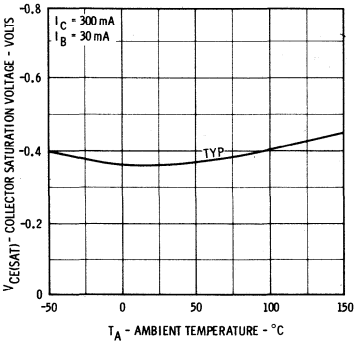
TYPICAL COLLECTOR CHARACTERISTICS



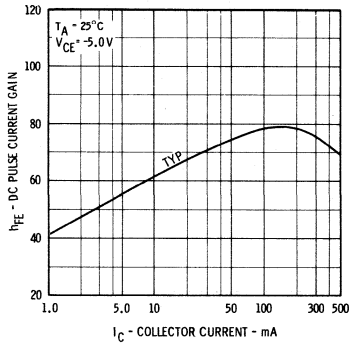
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



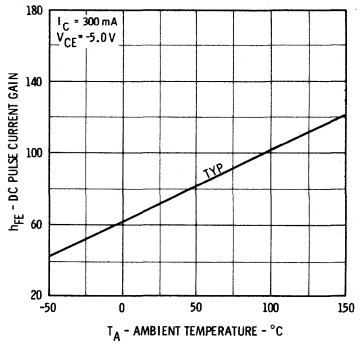
COLLECTOR SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



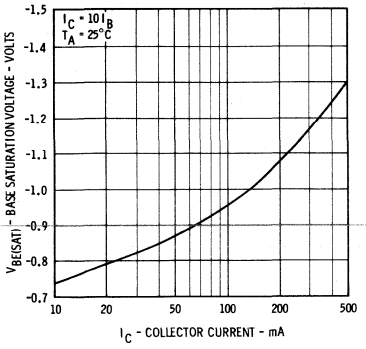
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



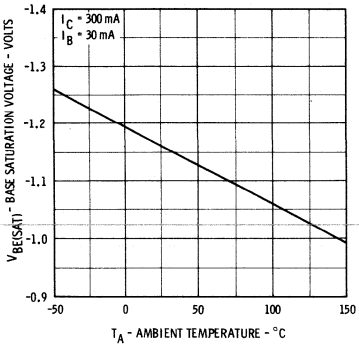
DC PULSE CURRENT GAIN VERSUS AMBIENT TEMPERATURE



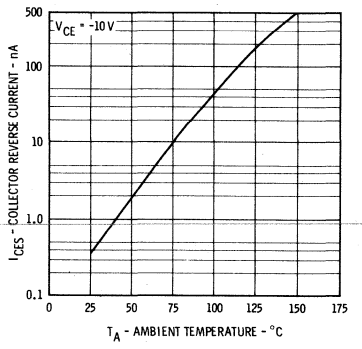
TYPICAL BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



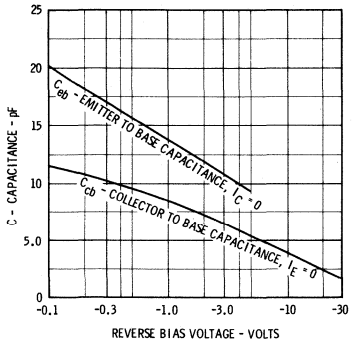
TYPICAL BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



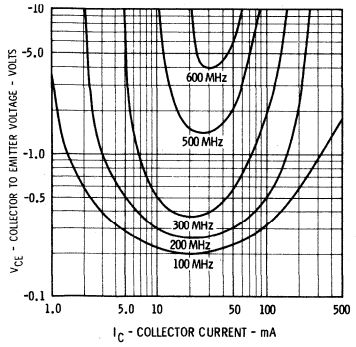
COLLECTOR REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



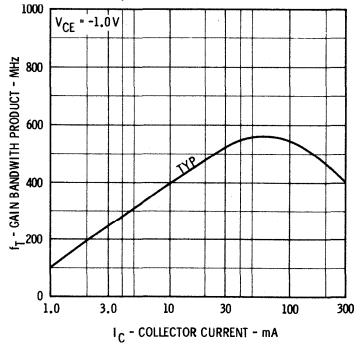
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



GAIN BANDWIDTH PRODUCT VERSUS COLLECTOR CURRENT



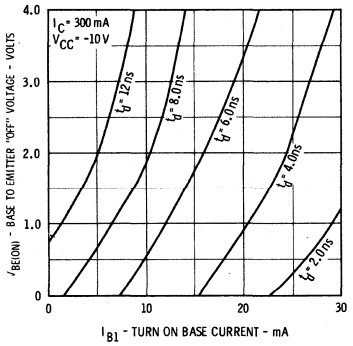
5

CURVE SET NUMBER SS21

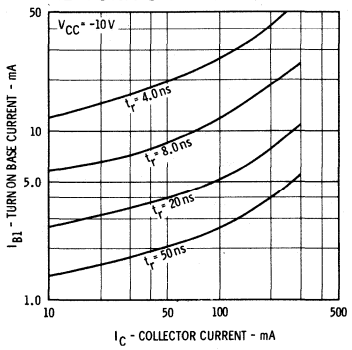
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

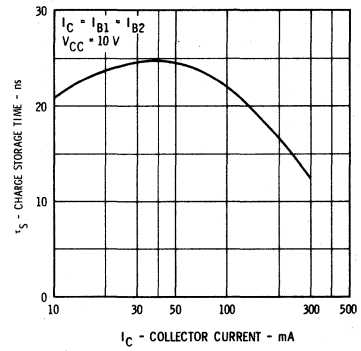
DELAY TIME VERSUS BASE TO EMITTER 'OFF' VOLTAGE AND TURN ON BASE CURRENT



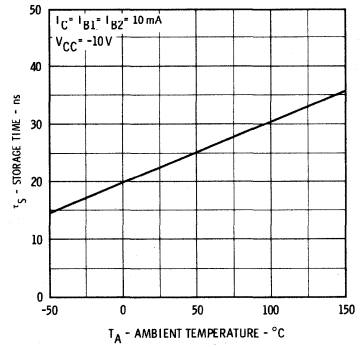
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENTS



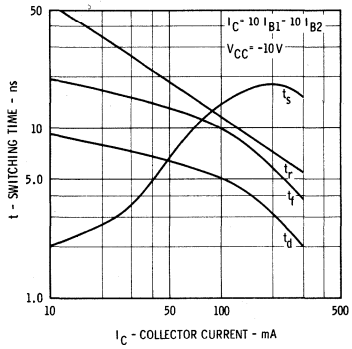
CHARGE STORAGE TIME VERSUS COLLECTOR CURRENT



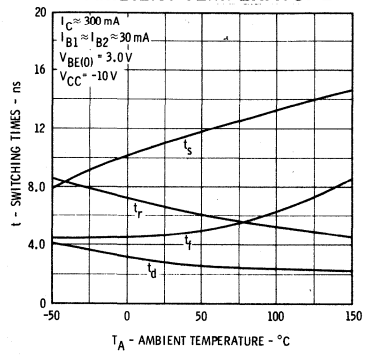
CHARGE STORAGE TIME VERSUS AMBIENT TEMPERATURE



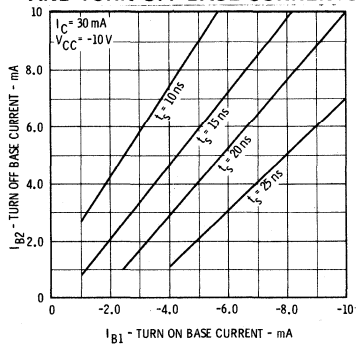
SWITCHING TIMES VERSUS COLLECTOR CURRENT



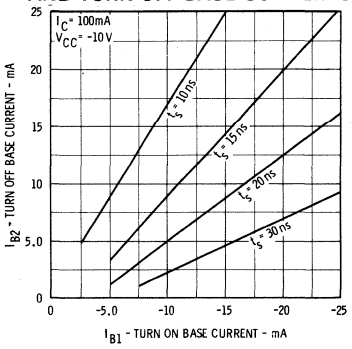
SWITCHING TIMES VERSUS AMBIENT TEMPERATURE



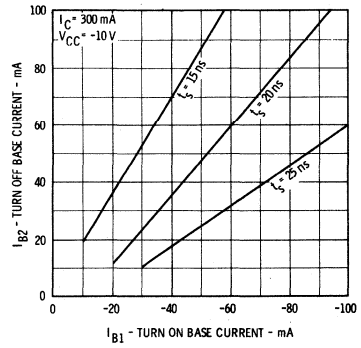
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



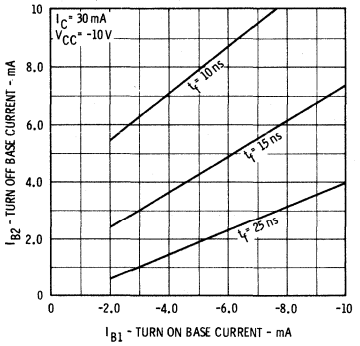
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



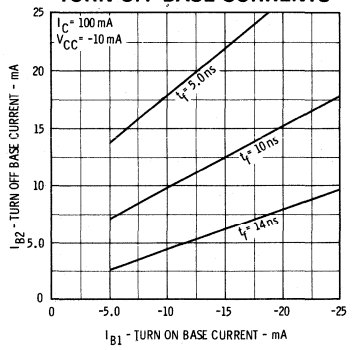
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



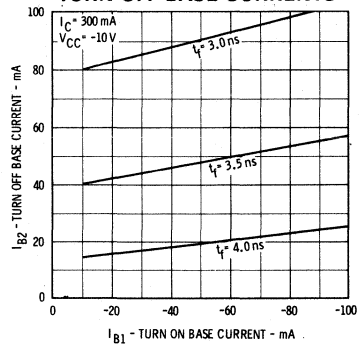
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS

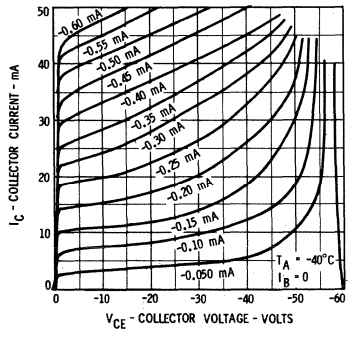


CURVE SET NUMBER SS22

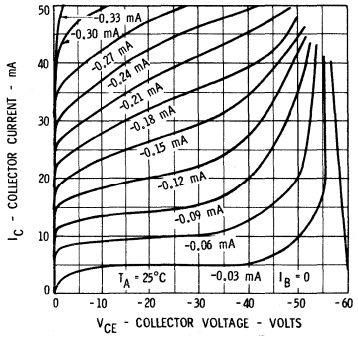
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

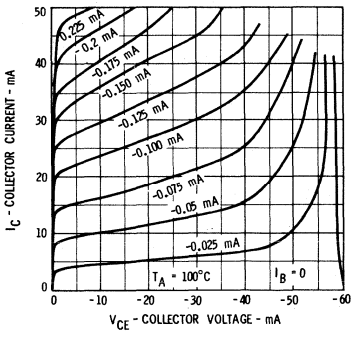
COLLECTOR AND BASE CHARACTERISTICS ACTIVE REGION



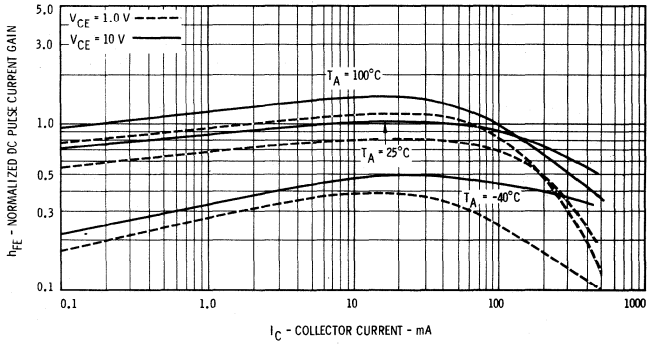
COLLECTOR AND BASE CHARACTERISTICS ACTIVE REGION



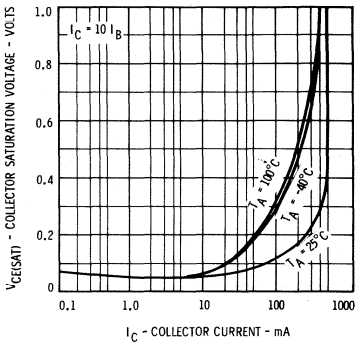
COLLECTOR AND BASE CHARACTERISTICS ACTIVE REGION



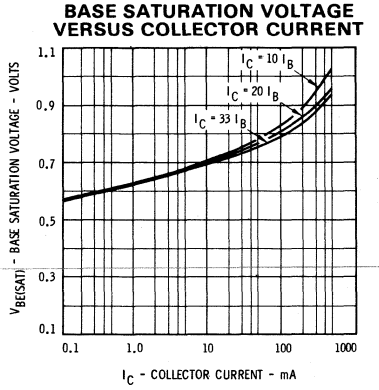
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



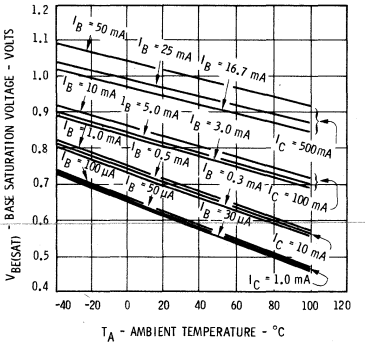
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



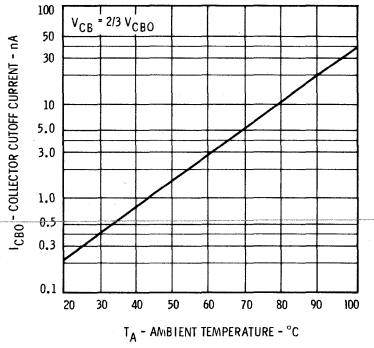
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



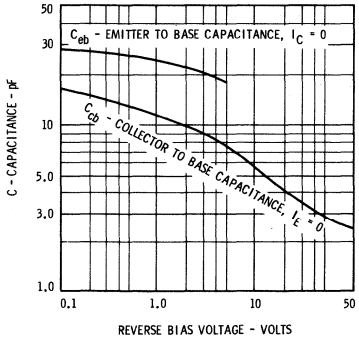
BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



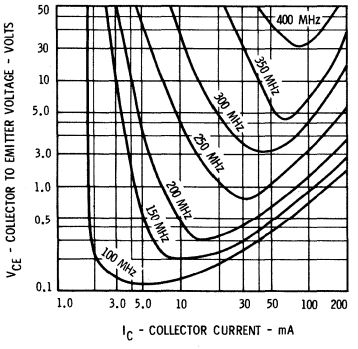
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



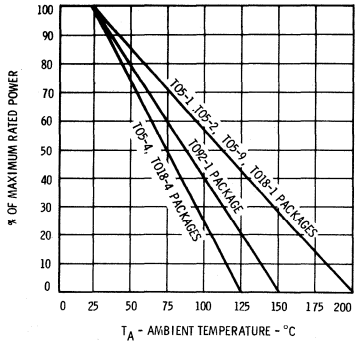
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



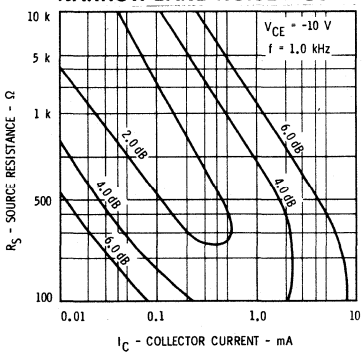
5

CURVE SET NUMBER SS22

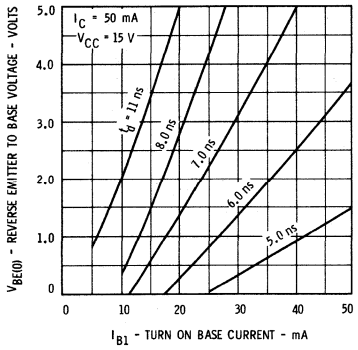
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

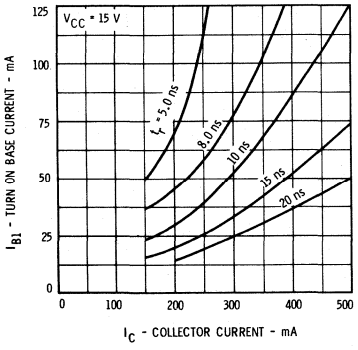
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



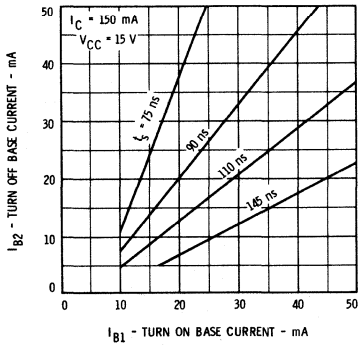
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE TO EMITTER VOLTAGE



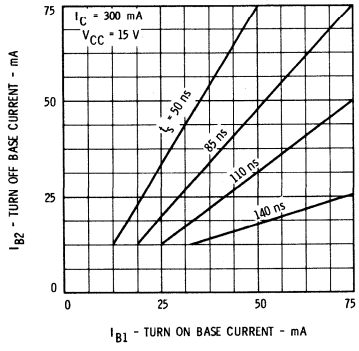
RISE TIME VERSUS COLLECTOR CURRENT AND TURN ON BASE CURRENT



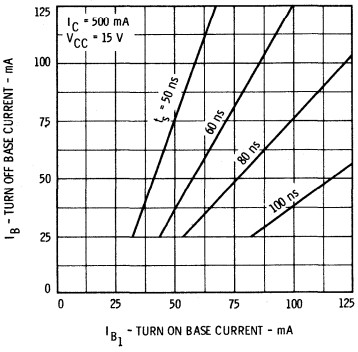
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



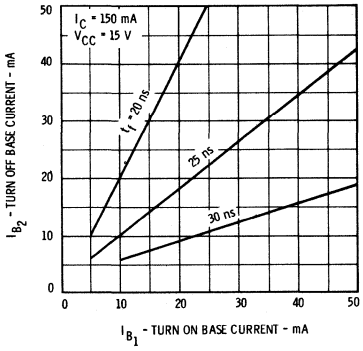
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



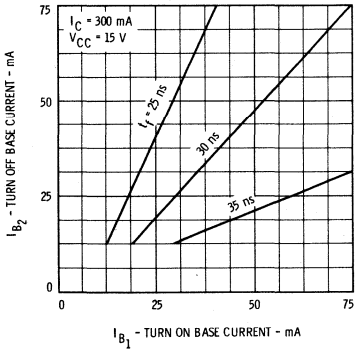
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



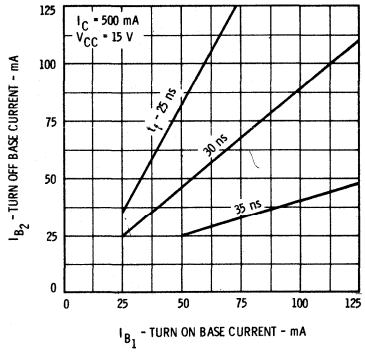
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



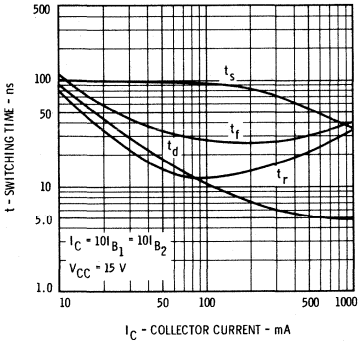
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



SWITCHING TIME VERSUS COLLECTOR CURRENT

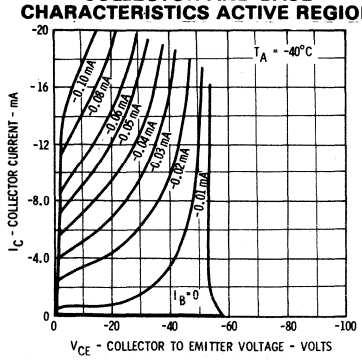


CURVE SET NUMBER SS23

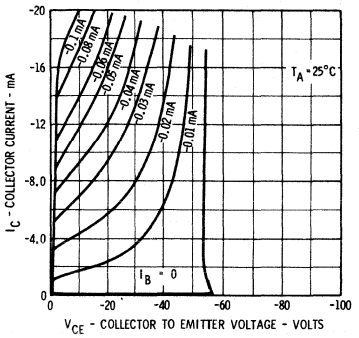
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

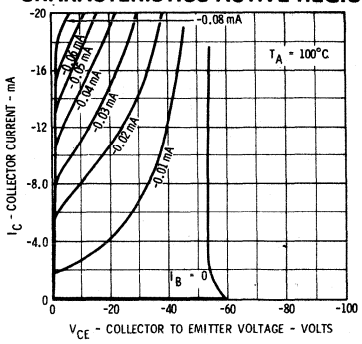
COLLECTOR AND BASE CHARACTERISTICS ACTIVE REGION



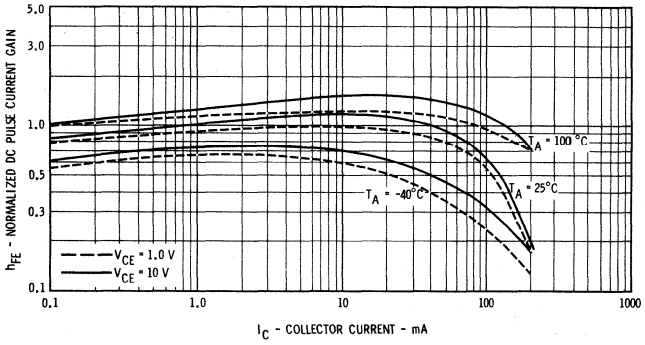
COLLECTOR AND BASE CHARACTERISTICS ACTIVE REGION



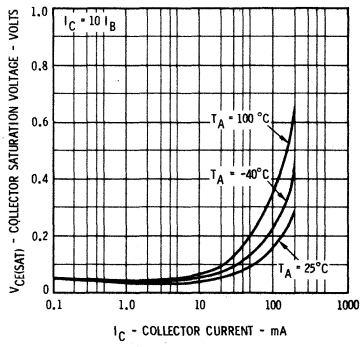
COLLECTOR AND BASE CHARACTERISTICS ACTIVE REGION



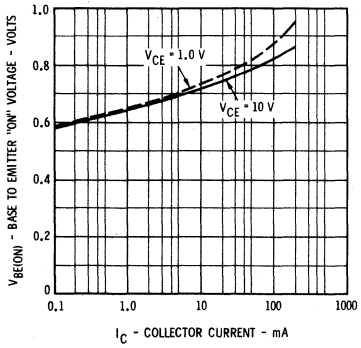
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



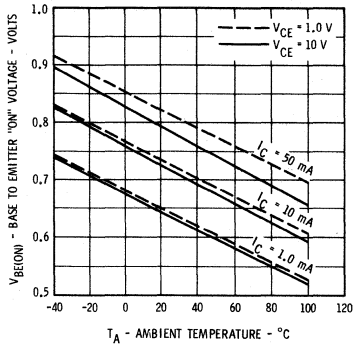
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



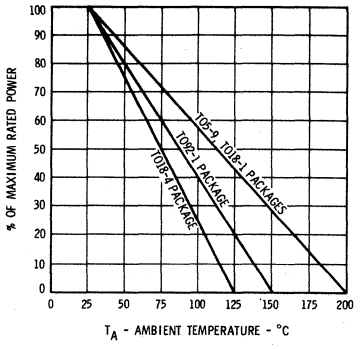
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS AMBIENT TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



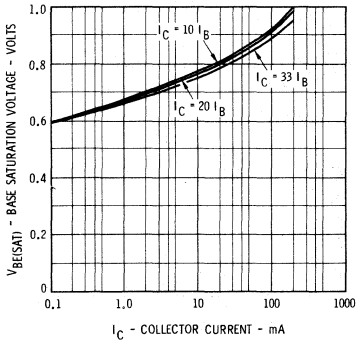
5

CURVE SET NUMBER SS23

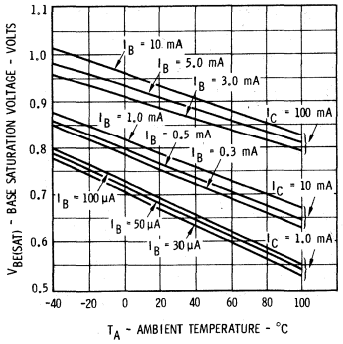
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

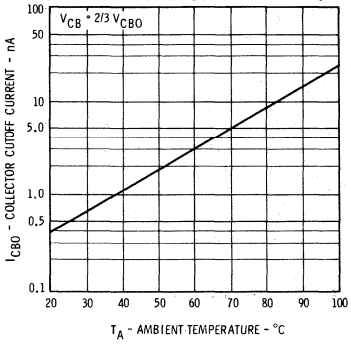
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



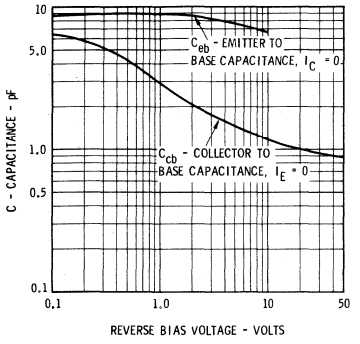
BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



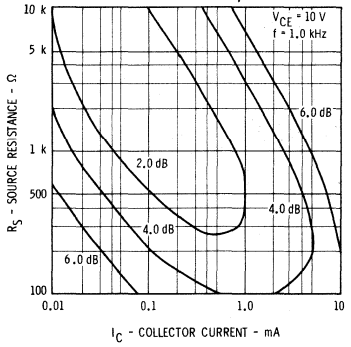
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



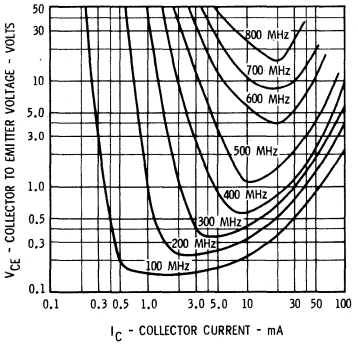
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



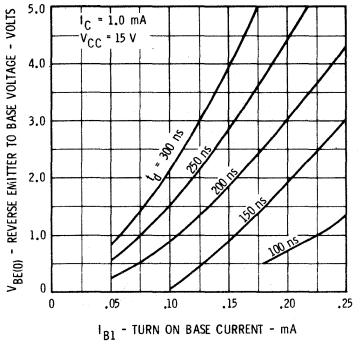
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



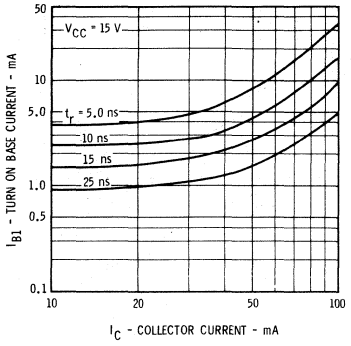
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



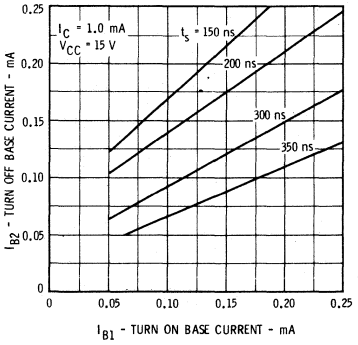
DELAY TIME VERSUS TURN ON BASE CURRENTS AND REVERSE BASE TO EMITTER VOLTAGE



RISE TIME VERSUS COLLECTOR CURRENT AND TURN ON BASE CURRENT



STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS

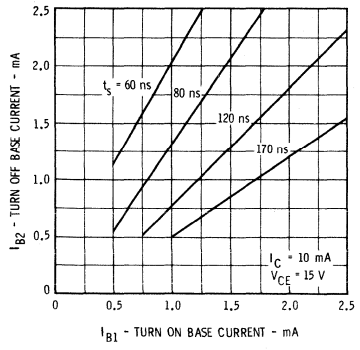


CURVE SET NUMBER SS23

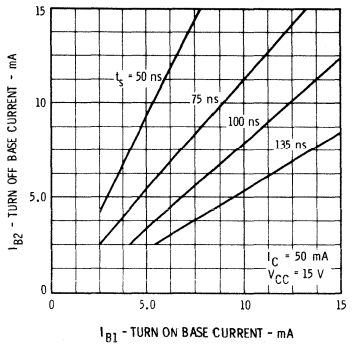
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

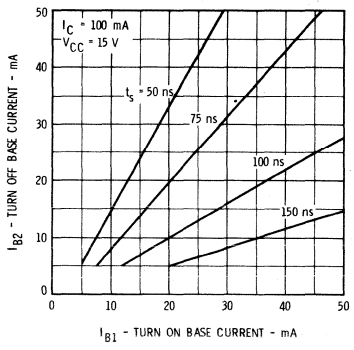
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



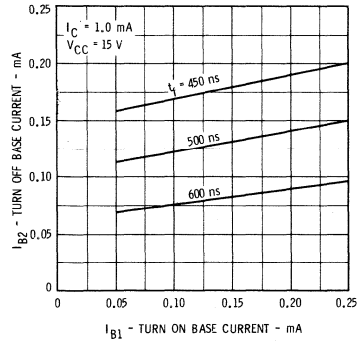
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



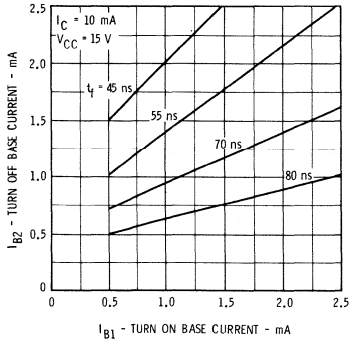
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



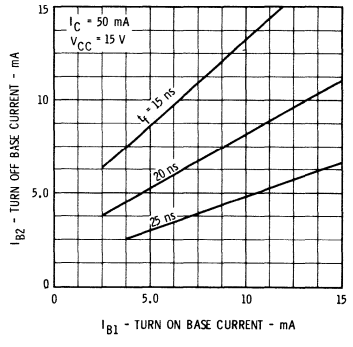
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



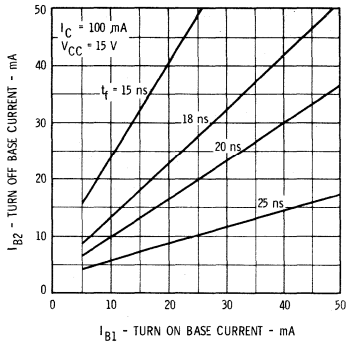
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



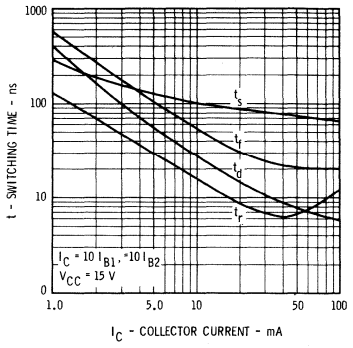
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



SWITCHING TIME VERSUS COLLECTOR CURRENT



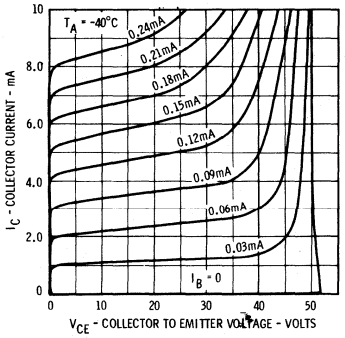
5

CURVE SET NUMBER SS24

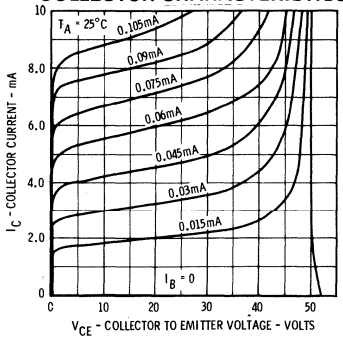
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

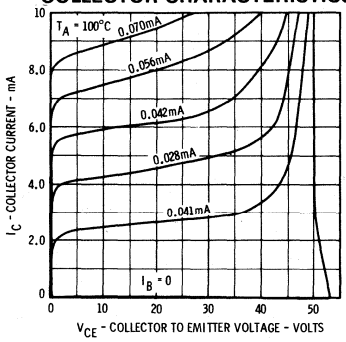
ACTIVE REGION COLLECTOR CHARACTERISTICS



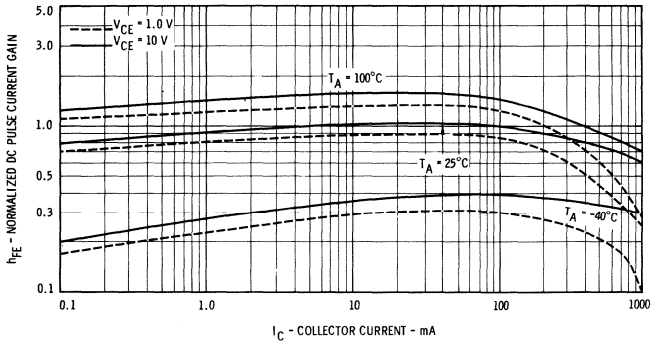
ACTIVE REGION COLLECTOR CHARACTERISTICS



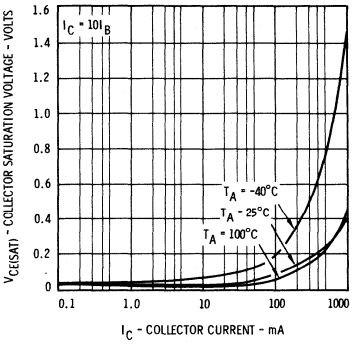
ACTIVE REGION COLLECTOR CHARACTERISTICS



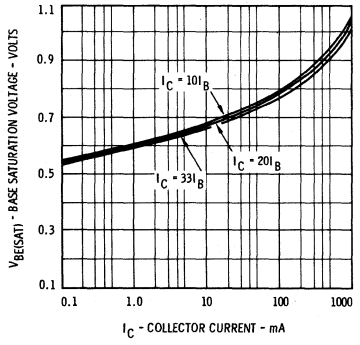
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



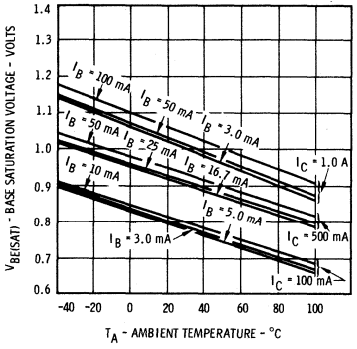
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE

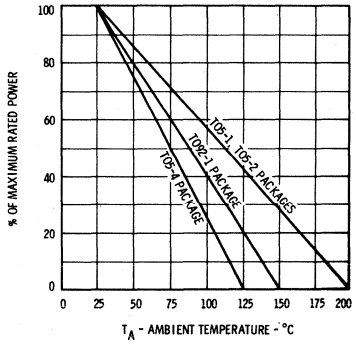


CURVE SET NUMBER SS24

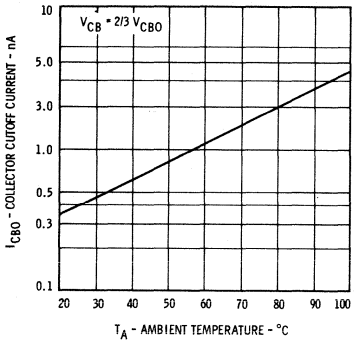
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

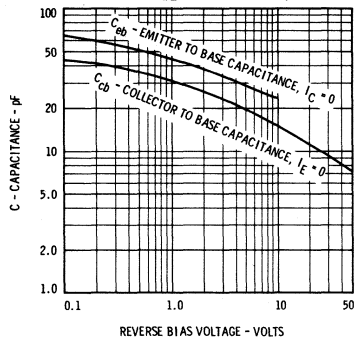
ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



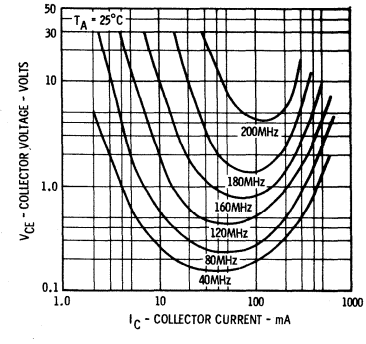
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



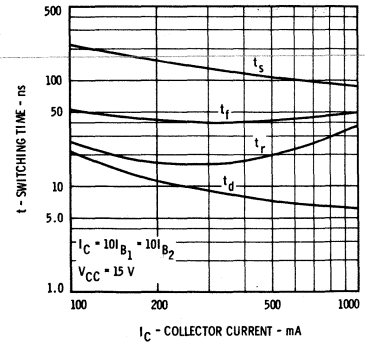
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



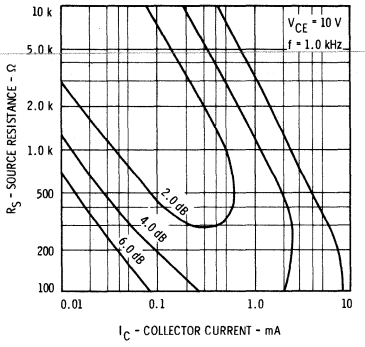
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



SWITCHING TIME VERSUS COLLECTOR CURRENT



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



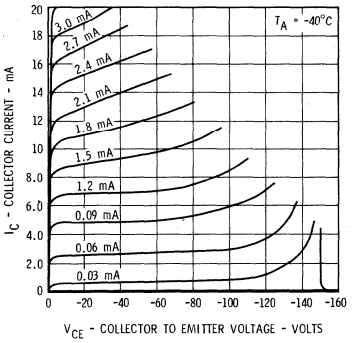
5

CURVE SET NUMBER SS25

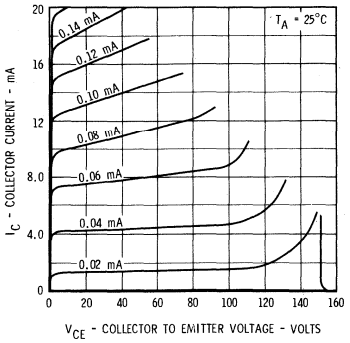
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

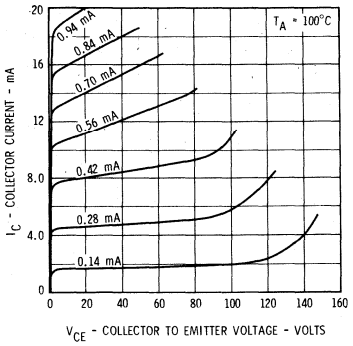
COLLECTOR CHARACTERISTICS



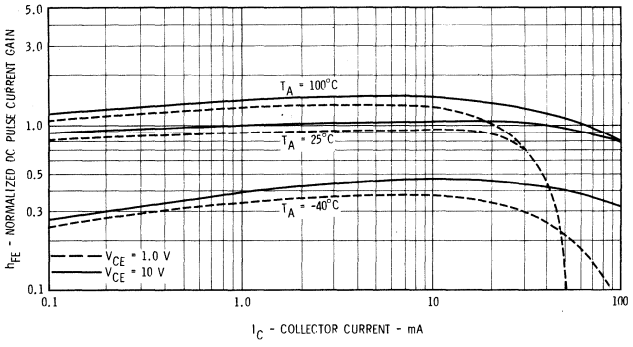
COLLECTOR CHARACTERISTICS



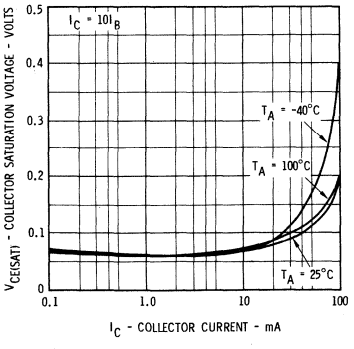
COLLECTOR CHARACTERISTICS



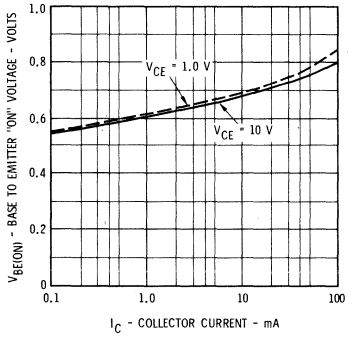
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



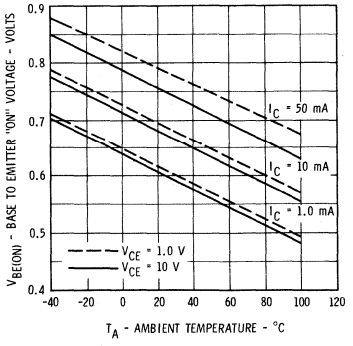
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



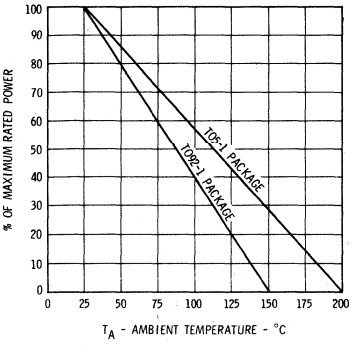
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS AMBIENT TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

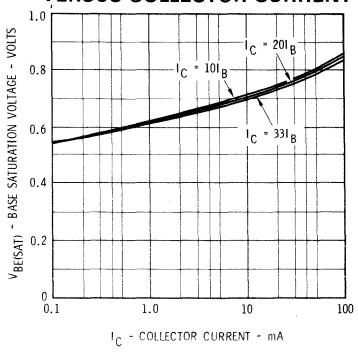


CURVE SET NUMBER SS25

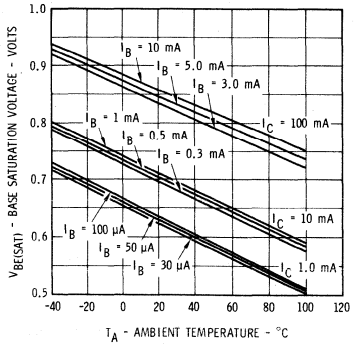
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

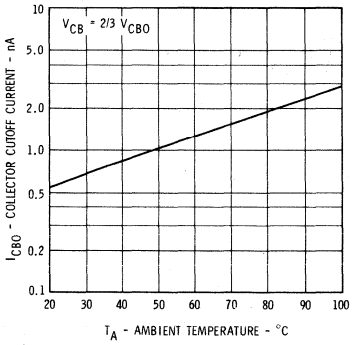
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



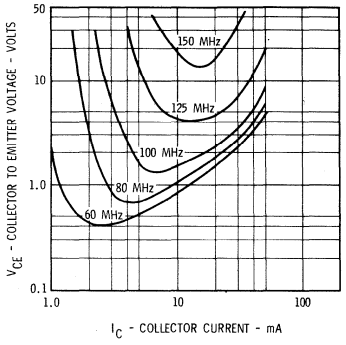
BASE SATURATION VOLTAGE VERSUS AMBIENT TEMPERATURE



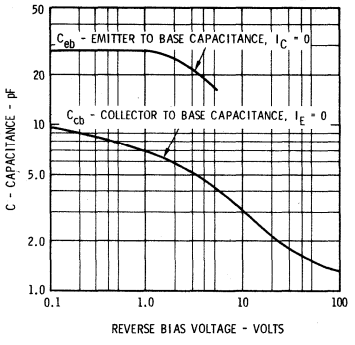
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



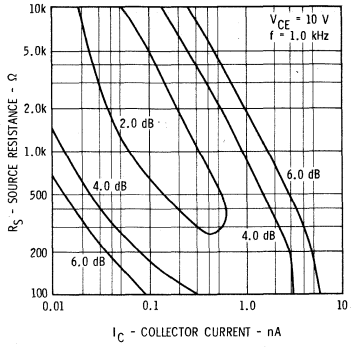
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



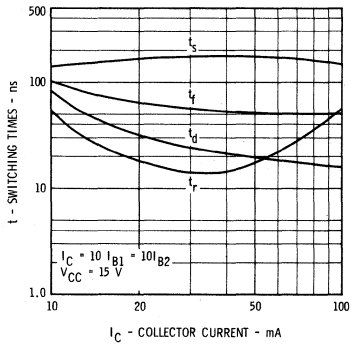
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



SWITCHING TIME VERSUS COLLECTOR CURRENT



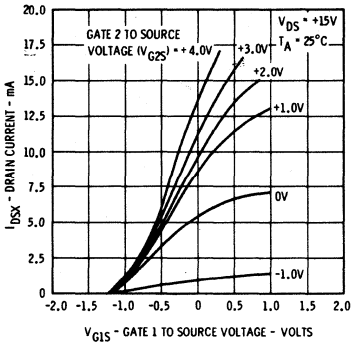
5

CURVE SET NUMBER SS26

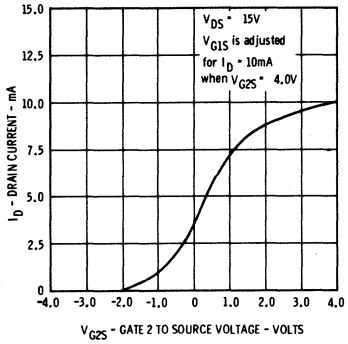
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

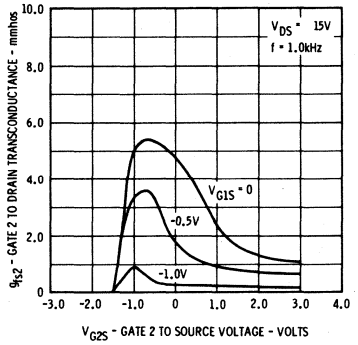
TYPICAL DRAIN CHARACTERISTICS



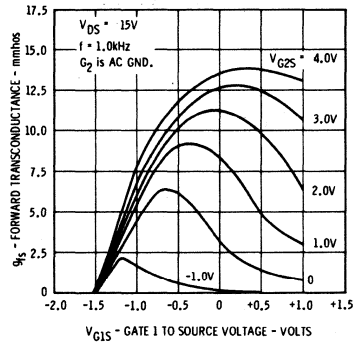
DRAIN CURRENT VERSUS GATE 2 TO SOURCE VOLTAGE



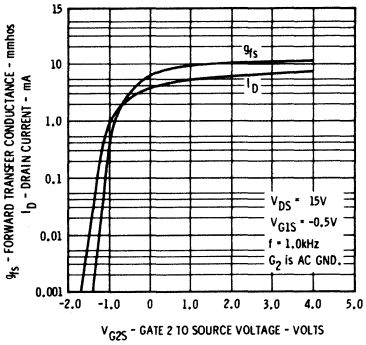
GATE 2 TO DRAIN TRANSCONDUCTANCE VERSUS GATE 2 TO SOURCE VOLTAGE



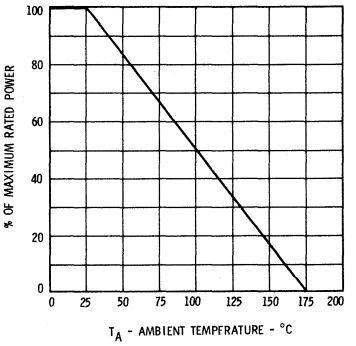
FORWARD TRANSCONDUCTANCE VERSUS GATE 1 TO SOURCE VOLTAGE



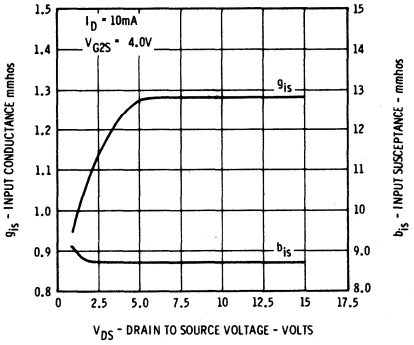
FORWARD TRANSCONDUCTANCE AND DRAIN CURRENT VERSUS GATE 2 TO SOURCE DC VOLTAGE



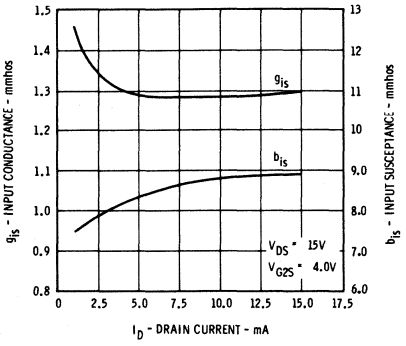
ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



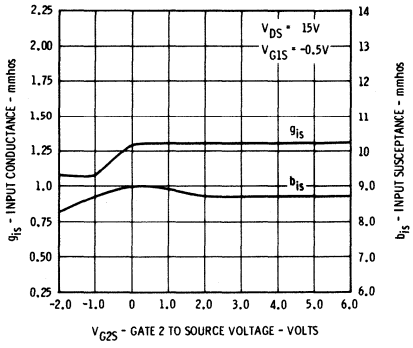
INPUT ADMITTANCE VERSUS DRAIN TO SOURCE VOLTAGE



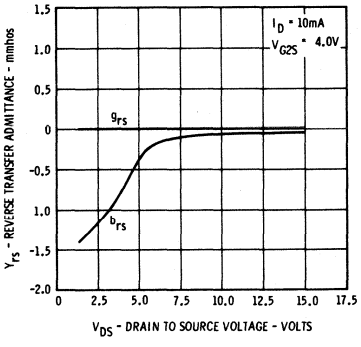
INPUT ADMITTANCE VERSUS DRAIN CURRENT



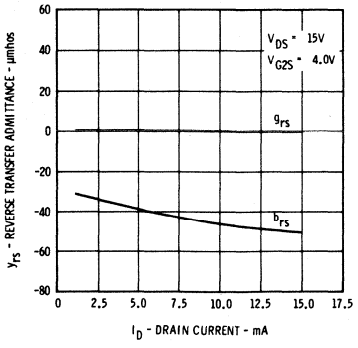
INPUT ADMITTANCE VERSUS GATE 2 TO SOURCE VOLTAGE



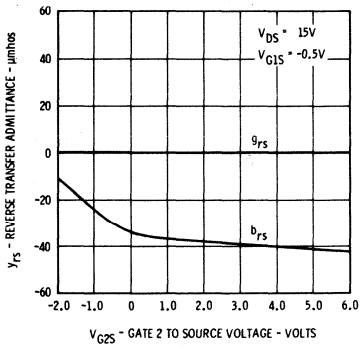
REVERSE TRANSFER ADMITTANCE VERSUS DRAIN TO SOURCE VOLTAGE



REVERSE TRANSFER ADMITTANCE VERSUS DRAIN CURRENT



REVERSE TRANSFER ADMITTANCE VERSUS GATE 2 TO SOURCE VOLTAGE

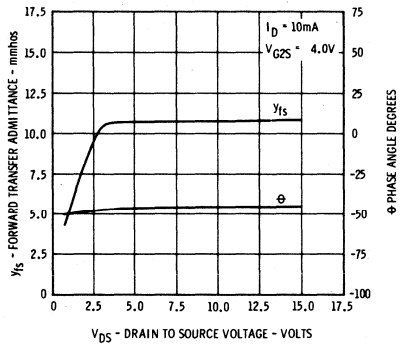


CURVE SET NUMBER SS26

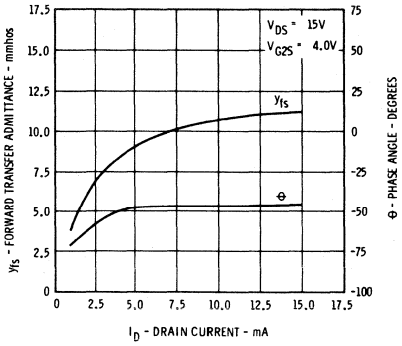
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

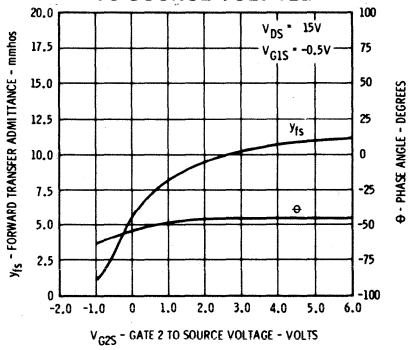
FORWARD TRANSFER ADMITTANCE VERSUS DRAIN TO SOURCE VOLTAGE



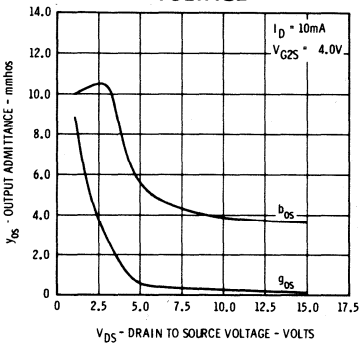
FORWARD TRANSFER ADMITTANCE VERSUS DRAIN CURRENT



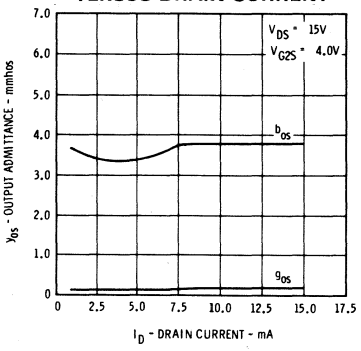
FORWARD TRANSFER ADMITTANCE VERSUS GATE 2 TO SOURCE VOLTAGE



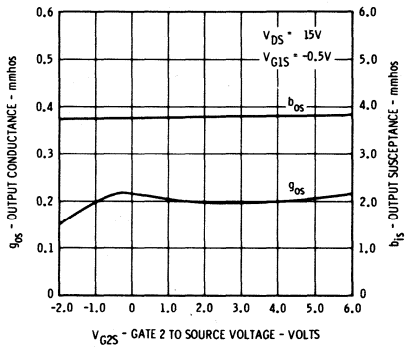
OUTPUT ADMITTANCE VERSUS DRAIN TO SOURCE VOLTAGE



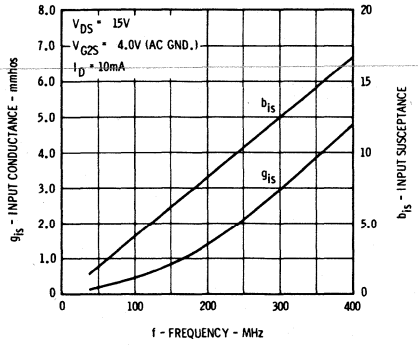
OUTPUT ADMITTANCE VERSUS DRAIN CURRENT



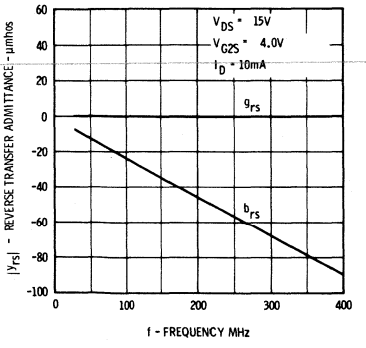
OUTPUT ADMITTANCE VERSUS GATE 2 TO SOURCE VOLTAGE



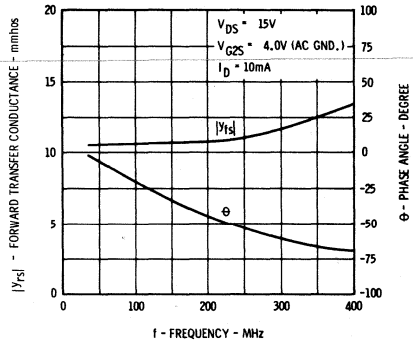
INPUT ADMITTANCE VERSUS FREQUENCE OUTPUT SHORT CIRCUIT



REVERSE TRANSFER ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



FORWARD TRANSFER ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



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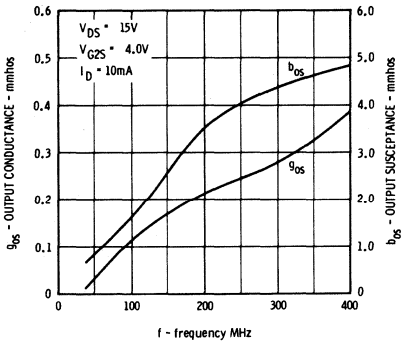
CURVE SET NUMBER SS26

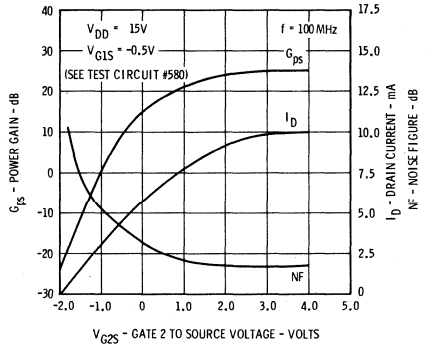
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

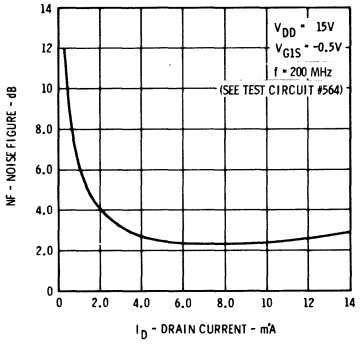
OUTPUT ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



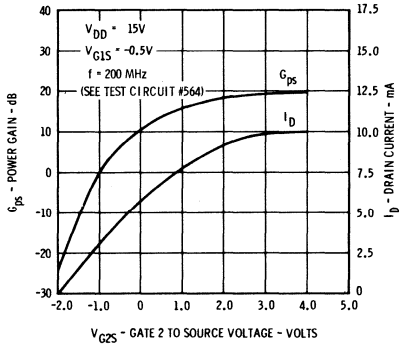
PG, NF AND DRAIN CURRENT VERSUS GATE 2 TO SOURCE VOLTAGE*



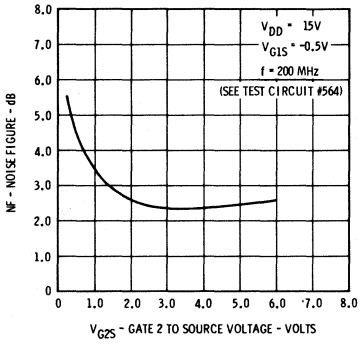
NOISE FIGURE VERSUS DRAIN CURRENT



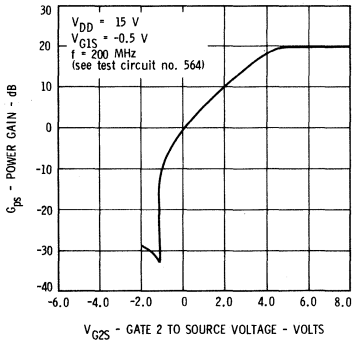
POWER GAIN AND DRAIN CURRENT VERSUS GATE 2 TO SOURCE VOLTAGE



NOISE FIGURE VERSUS GATE 2 SOURCE VOLTAGE



POWER GAIN VERSUS GATE 2 TO SOURCE VOLTAGE



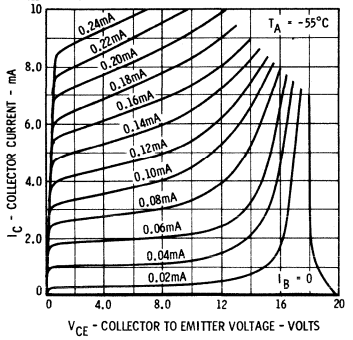
*For this graph, the gate self-bias (dc) circuits were disconnected and external supplies brought in as noted in the referenced test circuits.

CURVE SET NUMBER SS27

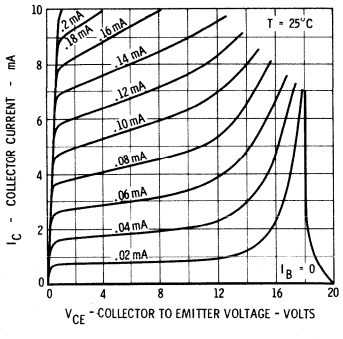
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

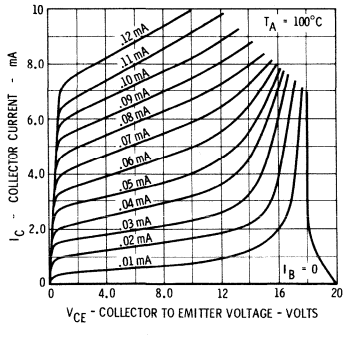
COLLECTOR CHARACTERISTICS



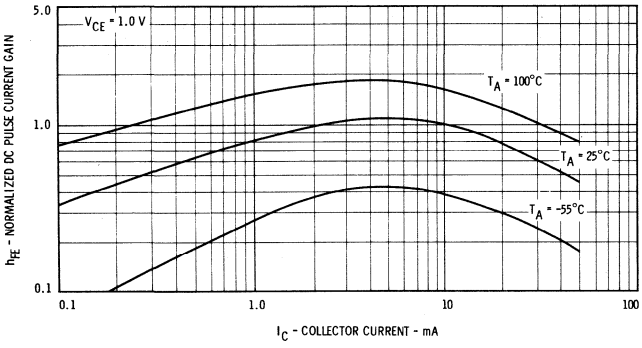
COLLECTOR CHARACTERISTICS



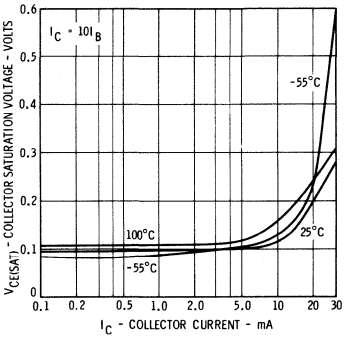
COLLECTOR CHARACTERISTICS



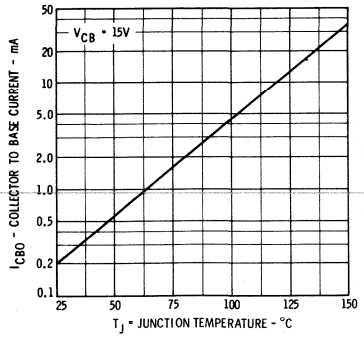
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



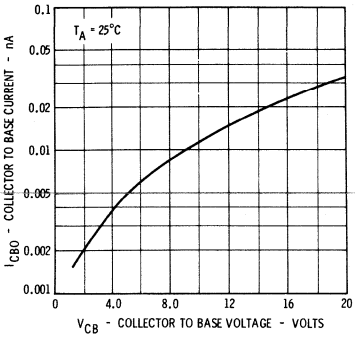
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



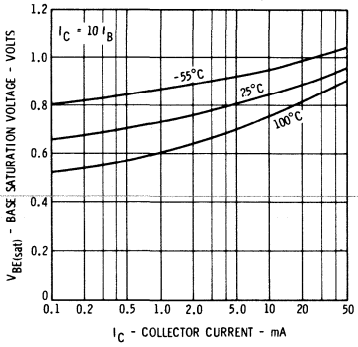
COLLECTOR TO BASE DIODE REVERSE CURRENT VERSUS TEMPERATURE



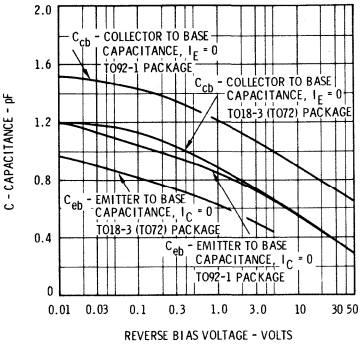
COLLECTOR CUTOFF CURRENT VERSUS REVERSE BIAS VOLTAGE



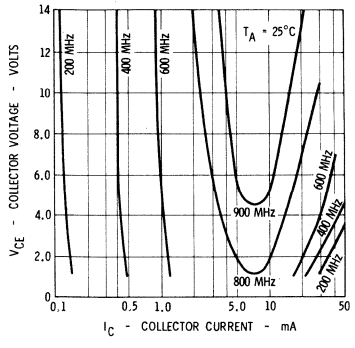
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



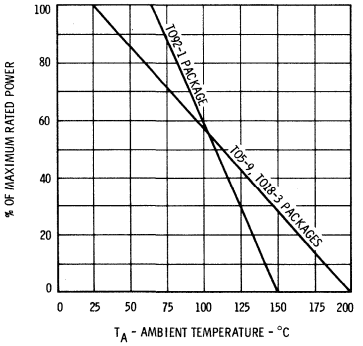
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

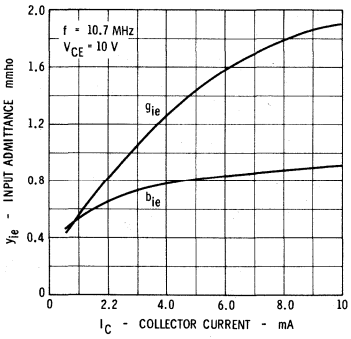


CURVE SET NUMBER SS27

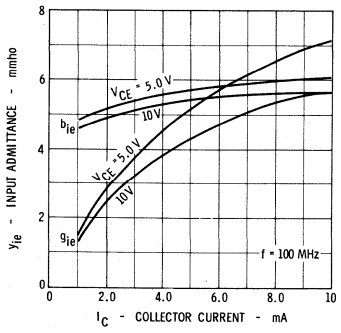
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

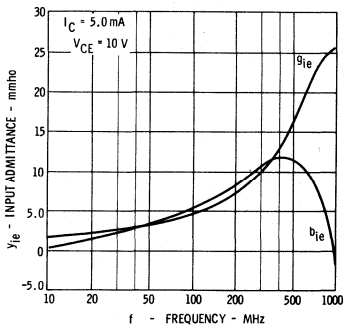
10.7 MHz INPUT ADMITTANCE OUTPUT SHORT CIRCUIT



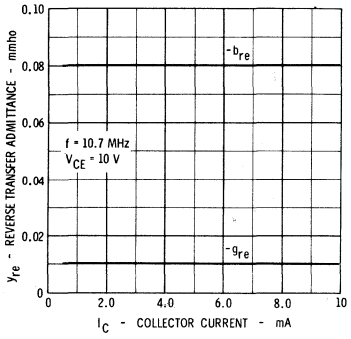
100 MHz INPUT ADMITTANCE VERSUS COLLECTOR CURRENT OUTPUT SHORT CIRCUIT



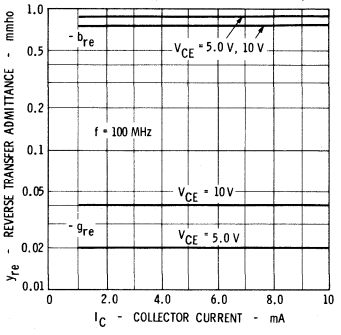
INPUT ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



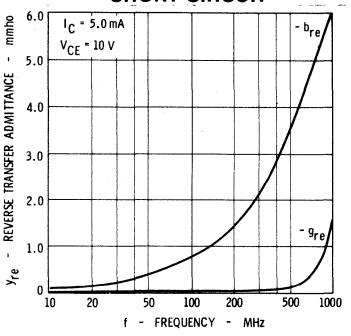
10.7 MHz REVERSE TRANSFER ADMITTANCE INPUT SHORT CIRCUIT



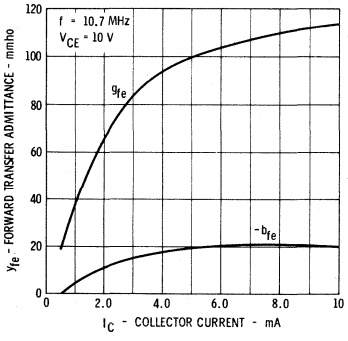
100 MHz REVERSE TRANSFER ADMITTANCE INPUT SHORT CIRCUIT



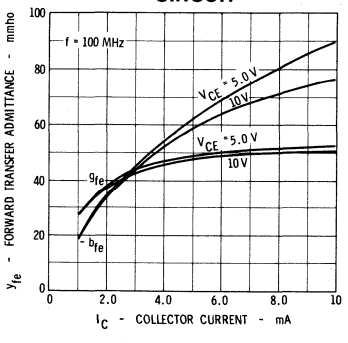
REVERSE TRANSFER ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



10.7 MHz FORWARD TRANSFER ADMITTANCE OUTPUT SHORT CIRCUIT



100 MHz FORWARD TRANSFER ADMITTANCE OUTPUT SHORT CIRCUIT

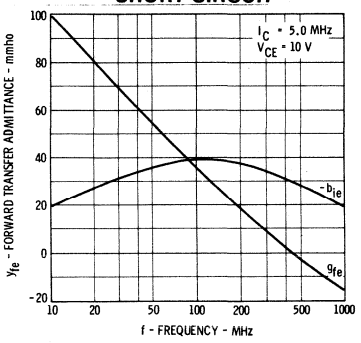


CURVE SET NUMBER SS27

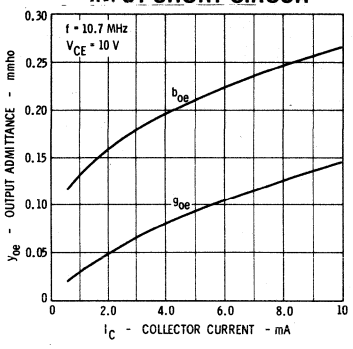
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

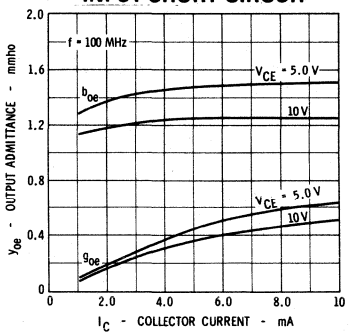
FORWARD TRANSFER ADMITTANCE VERSUS FREQUENCY OUTPUT SHORT CIRCUIT



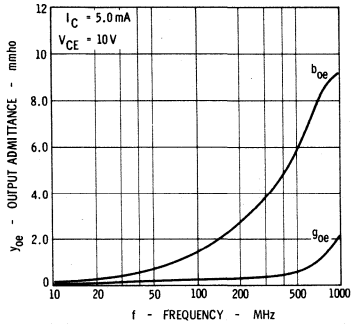
10.7 MHz OUTPUT ADMITTANCE INPUT SHORT CIRCUIT



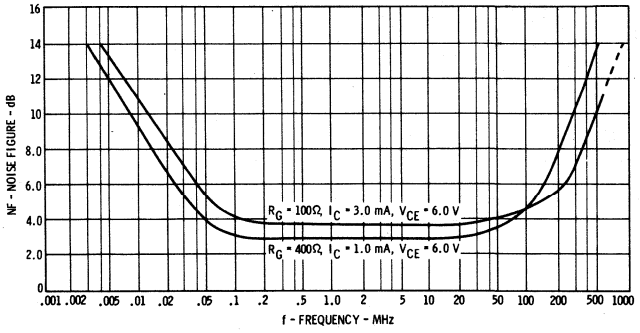
100 MHz OUTPUT ADMITTANCE INPUT SHORT CIRCUIT



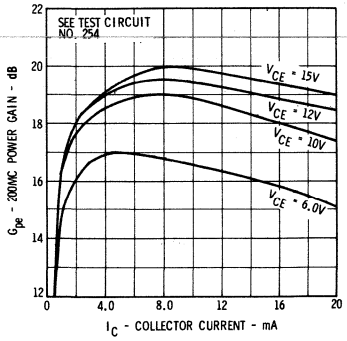
OUTPUT ADMITTANCE VERSUS FREQUENCY INPUT SHORT CIRCUIT



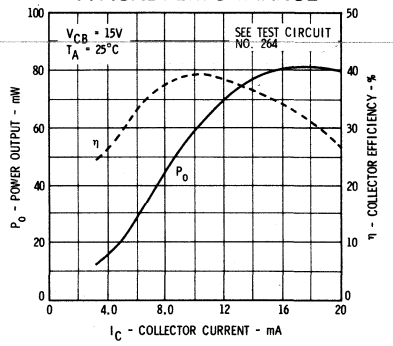
NOISE FIGURE VERSUS FREQUENCY



NEUTRALIZED 200 MHz POWER GAIN AMPLIFIER PERFORMANCE



500 MHz OSCILLATOR TYPICAL PERFORMANCE

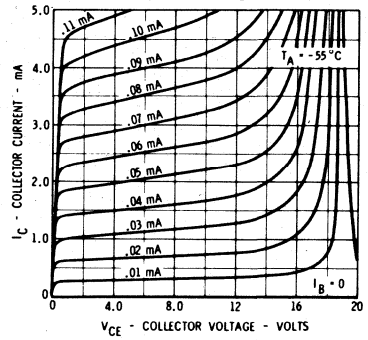


CURVE SET NUMBER SS28

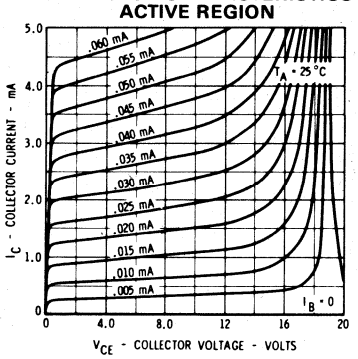
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

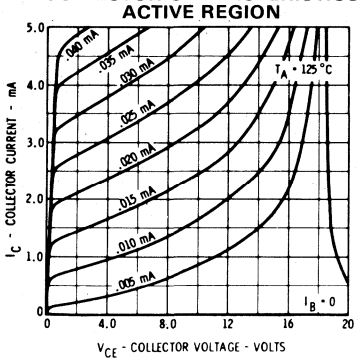
COLLECTOR CHARACTERISTICS ACTIVE REGION



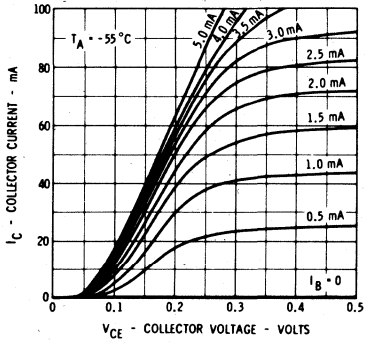
COLLECTOR CHARACTERISTICS ACTIVE REGION



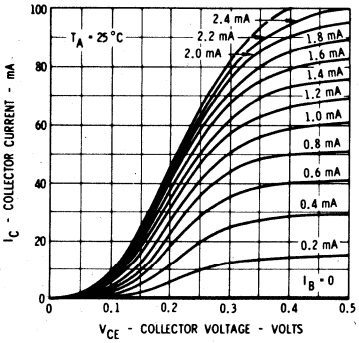
COLLECTOR CHARACTERISTICS ACTIVE REGION



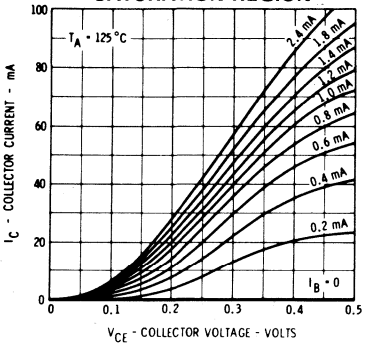
COLLECTOR CHARACTERISTICS SATURATION REGION



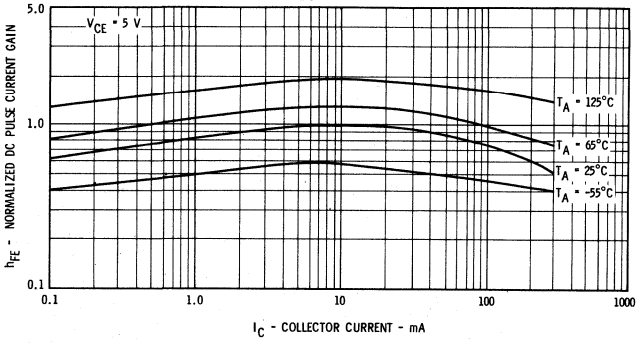
COLLECTOR CHARACTERISTICS SATURATION REGION



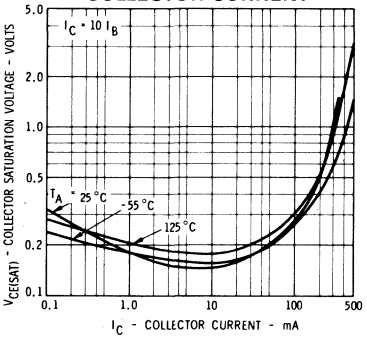
COLLECTOR CHARACTERISTICS SATURATION REGION



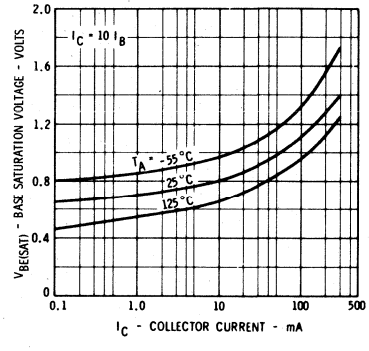
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



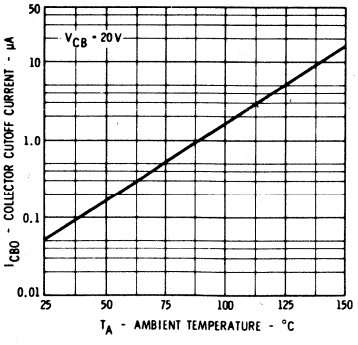
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



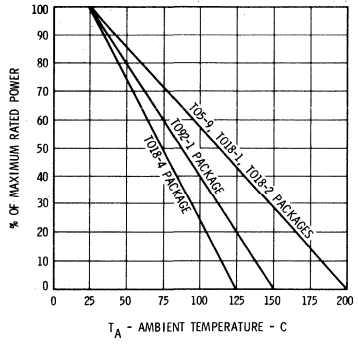
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

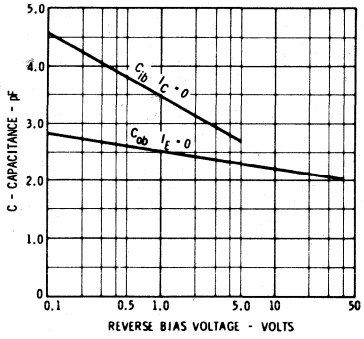


CURVE SET NUMBER SS28

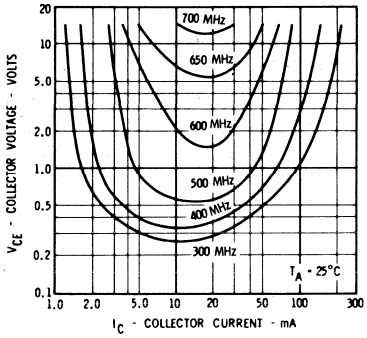
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

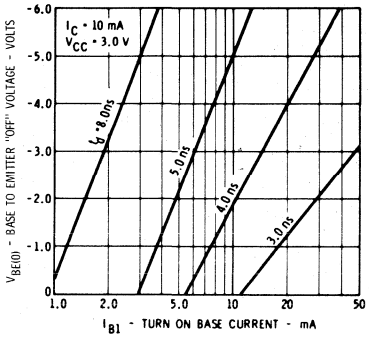
EMITTER TRANSITION AND OUTPUT CAPACITANCES VERSUS REVERSE BIAS VOLTAGE



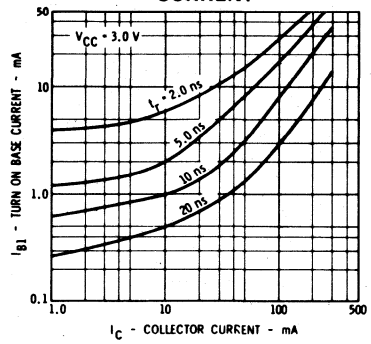
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



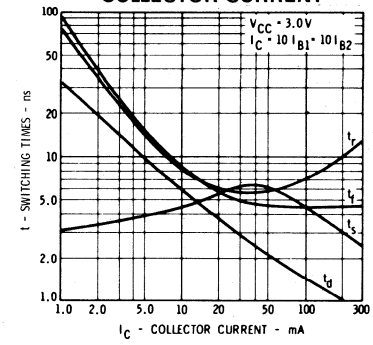
DELAY TIME VERSUS BASE TO EMITTER 'OFF' VOLTAGE AND TURN ON BASE CURRENT



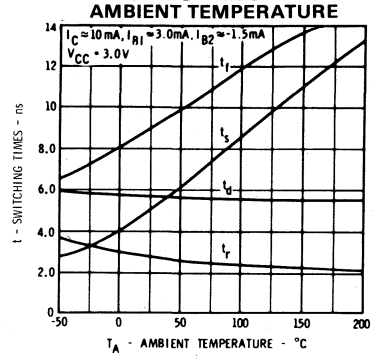
RISE TIME VERSUS TURN ON BASE CURRENT AND COLLECTOR CURRENT



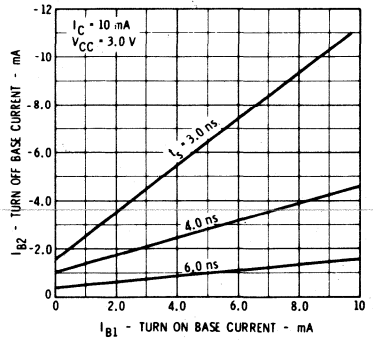
SWITCHING TIMES VERSUS COLLECTOR CURRENT



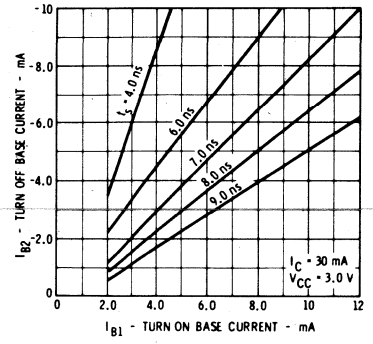
SWITCHING TIMES VERSUS AMBIENT TEMPERATURE



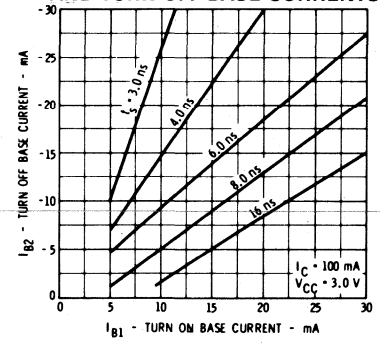
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



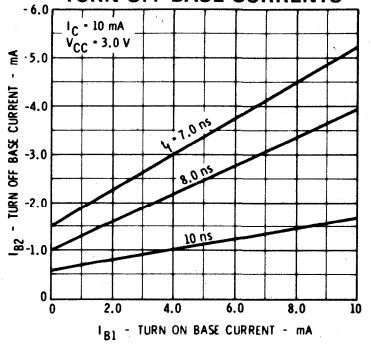
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



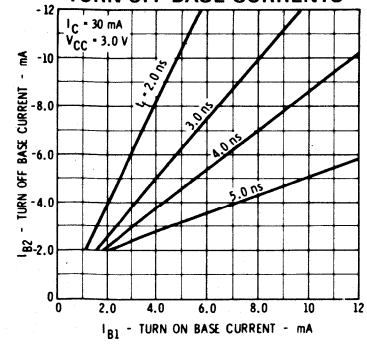
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



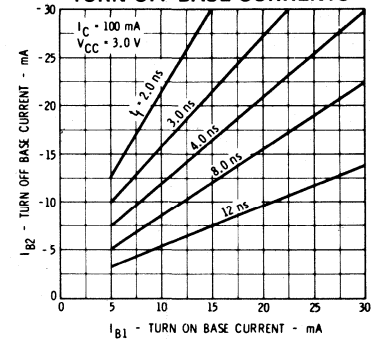
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS

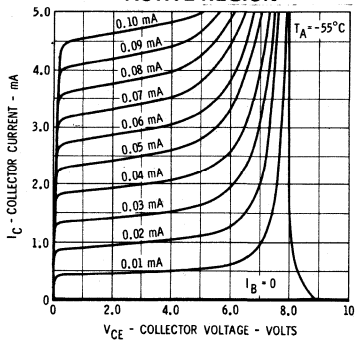


CURVE SET NUMBER SS29

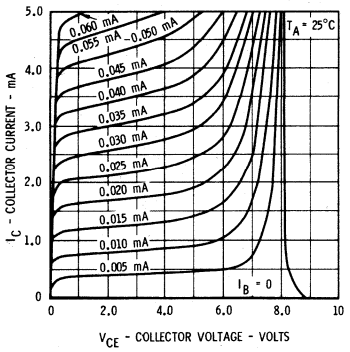
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

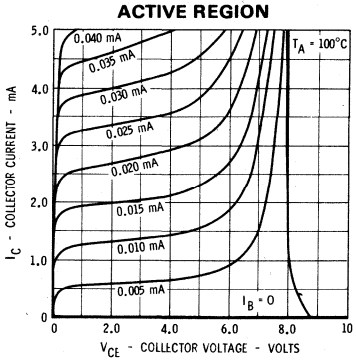
COLLECTOR CHARACTERISTICS ACTIVE REGION



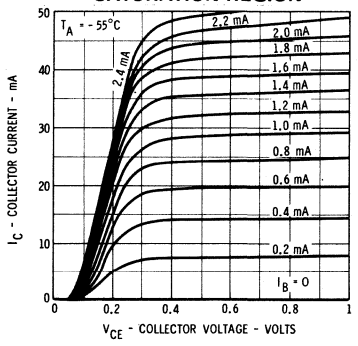
COLLECTOR CHARACTERISTICS ACTIVE REGION



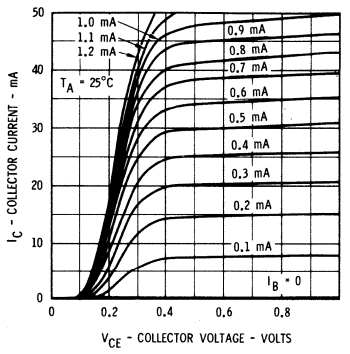
COLLECTOR CHARACTERISTICS ACTIVE REGION



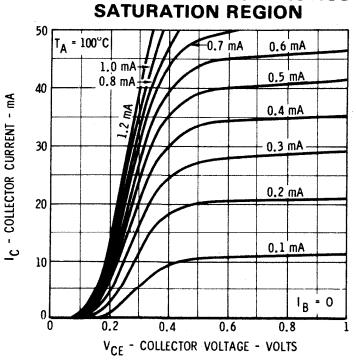
COLLECTOR CHARACTERISTICS SATURATION REGION



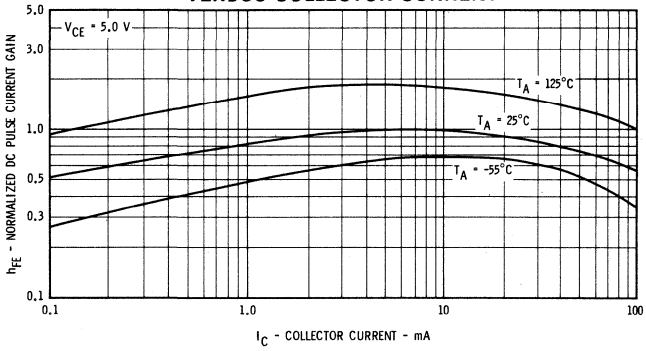
COLLECTOR CHARACTERISTICS SATURATION REGION



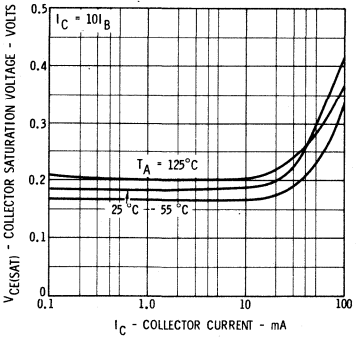
COLLECTOR CHARACTERISTICS SATURATION REGION



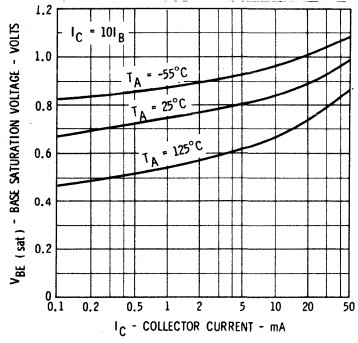
NORMALIZED DC PULSE CURRENT VERSUS COLLECTOR CURRENT



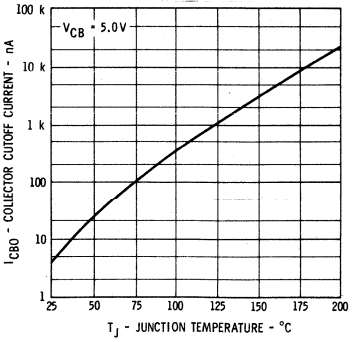
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



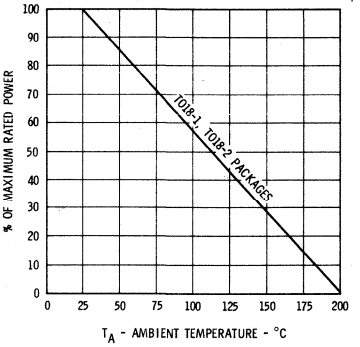
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



COLLECTOR CUTOFF CURRENT VERSUS JUNCTION TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

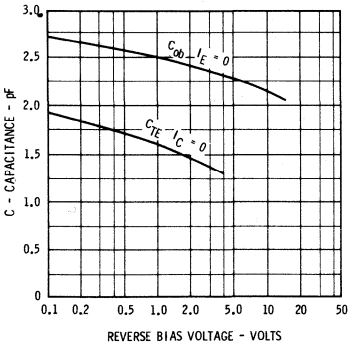


CURVE SET NUMBER SS29

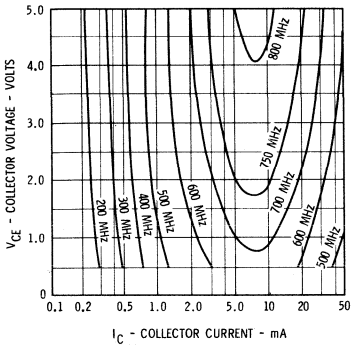
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

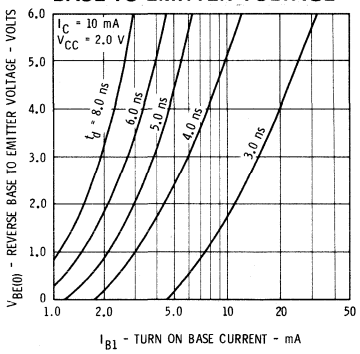
EMITTER TRANSITION AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



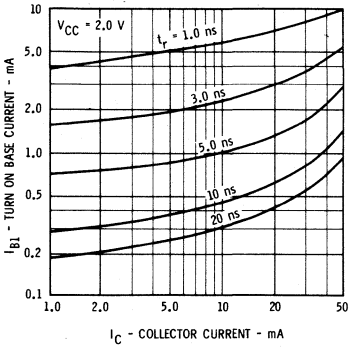
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



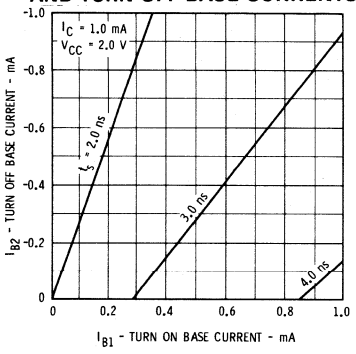
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE TO EMITTER VOLTAGE



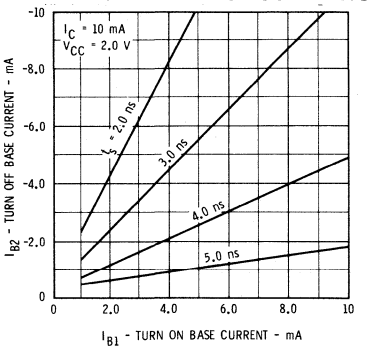
RISE TIME VERSUS COLLECTOR AND TURN 'ON' BASE CURRENT



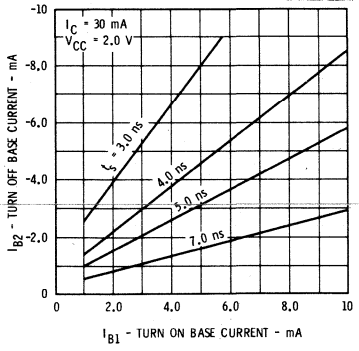
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



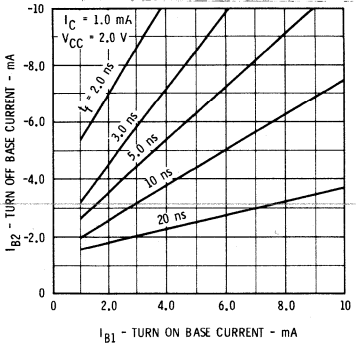
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



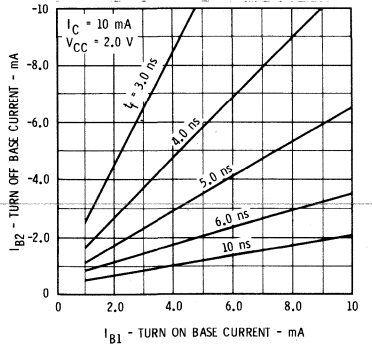
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



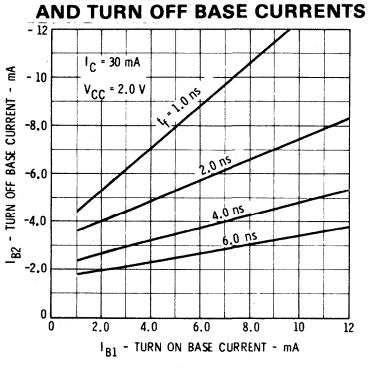
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



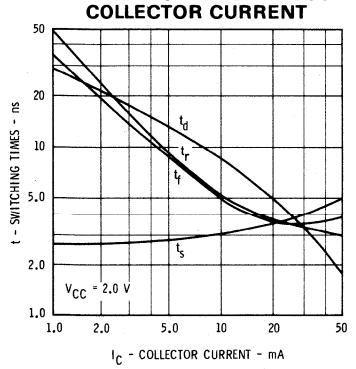
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



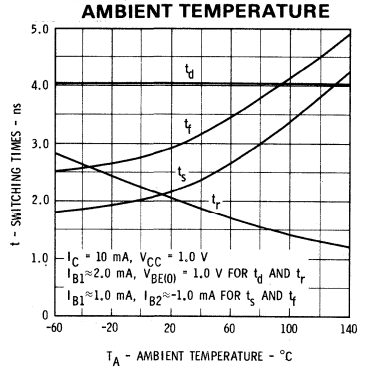
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



SWITCHING TIMES VERSUS COLLECTOR CURRENT



SWITCHING TIMES VERSUS AMBIENT TEMPERATURE

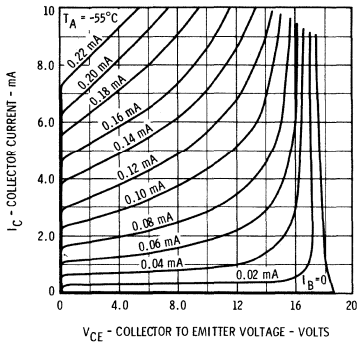


CURVE SET NUMBER SS30

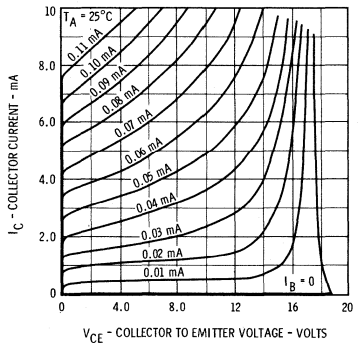
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

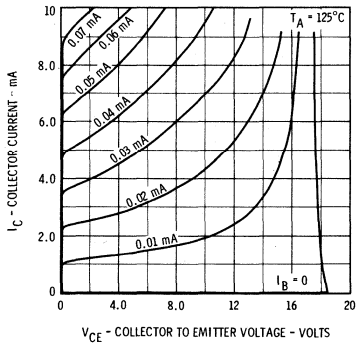
COLLECTOR CHARACTERISTICS ACTIVE REGION



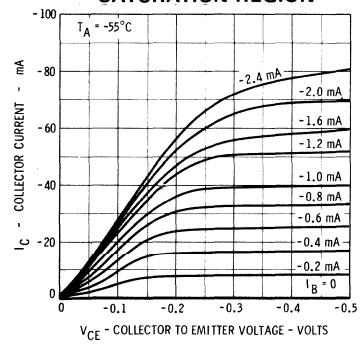
COLLECTOR CHARACTERISTICS ACTIVE REGION



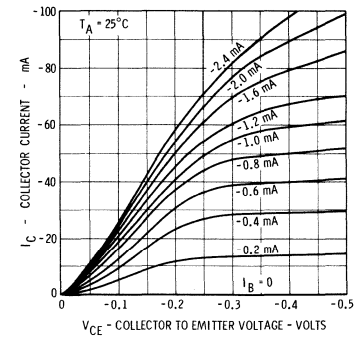
COLLECTOR CHARACTERISTICS ACTIVE REGION



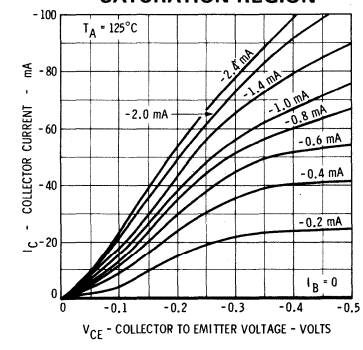
COLLECTOR CHARACTERISTICS SATURATION REGION



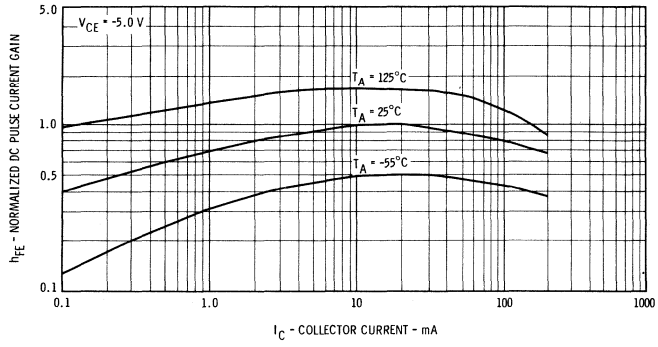
COLLECTOR CHARACTERISTICS SATURATION REGION



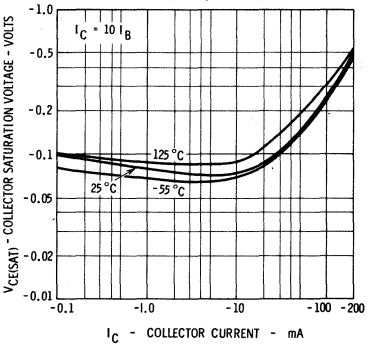
COLLECTOR CHARACTERISTICS SATURATION REGION



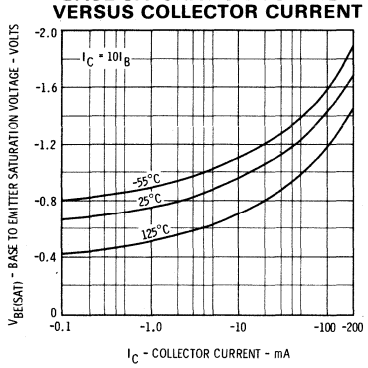
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



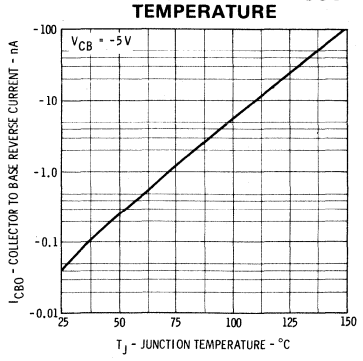
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



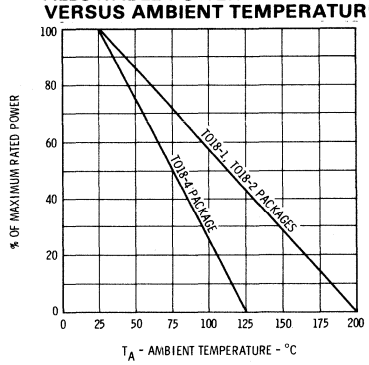
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



COLLECTOR TO BASE DIODE REVERSE CURRENT VERSUS TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

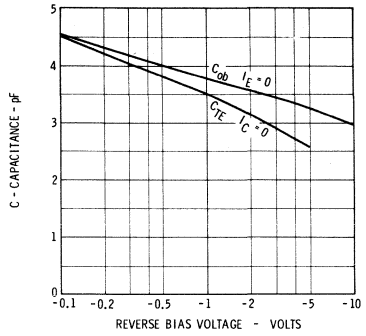


CURVE SET NUMBER SS30

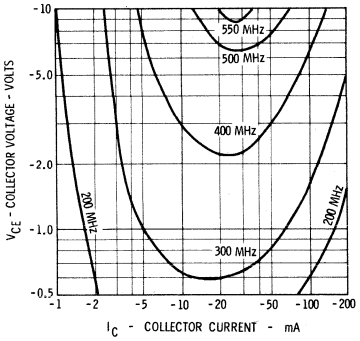
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

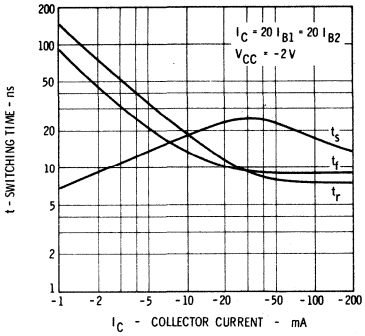
INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



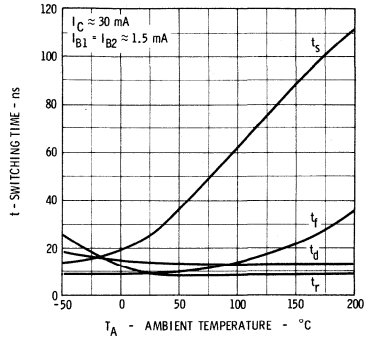
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



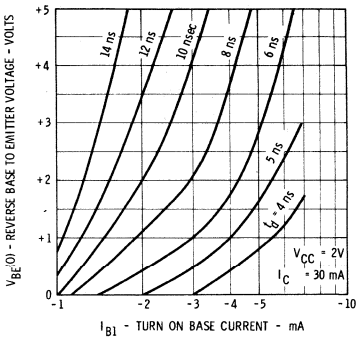
SWITCHING TIMES VERSUS COLLECTOR CURRENT



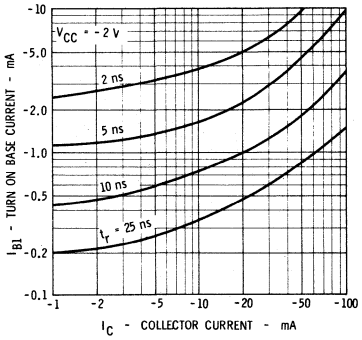
SWITCHING TIMES VERSUS TEMPERATURE



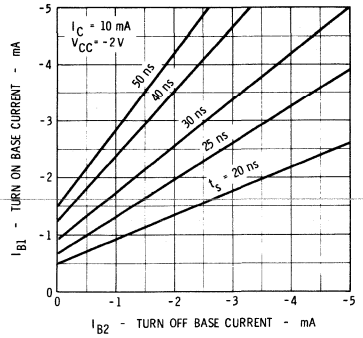
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE



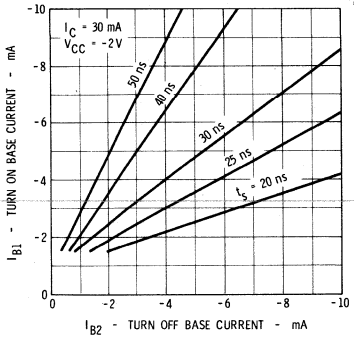
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENTS



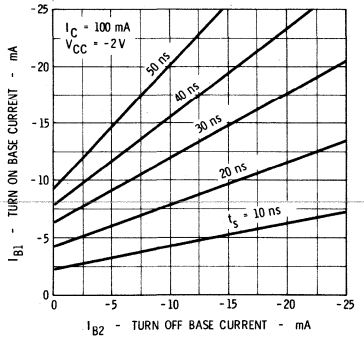
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



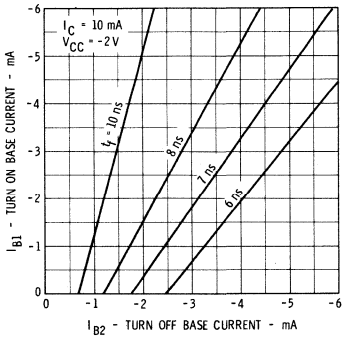
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



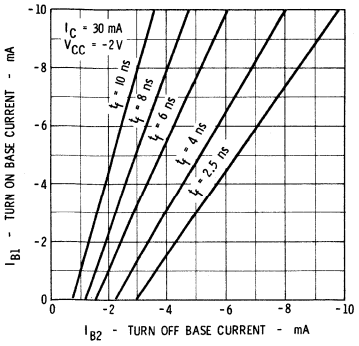
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



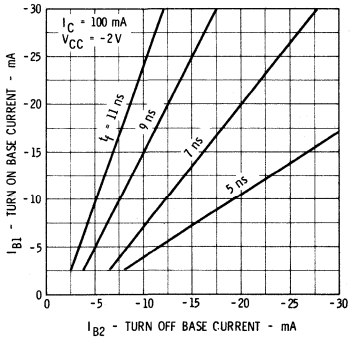
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



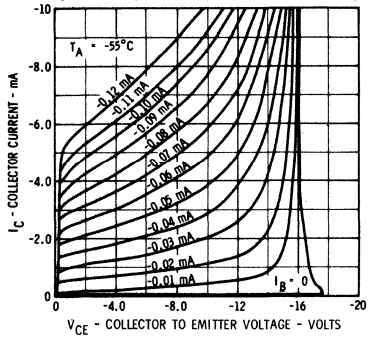
5

CURVE SET NUMBER SS31

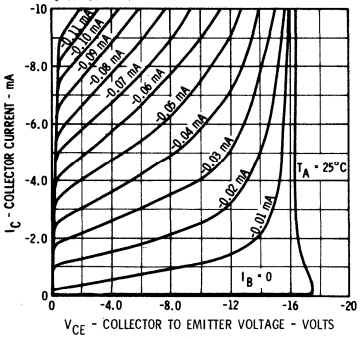
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

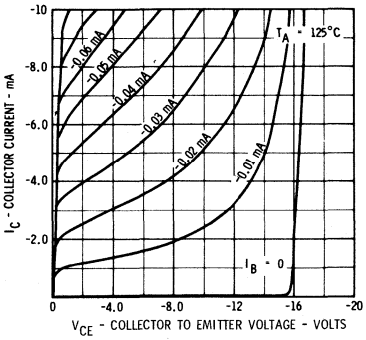
COLLECTOR CHARACTERISTICS



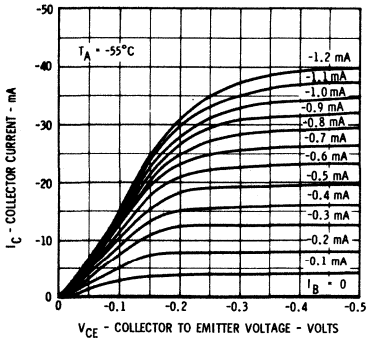
COLLECTOR CHARACTERISTICS



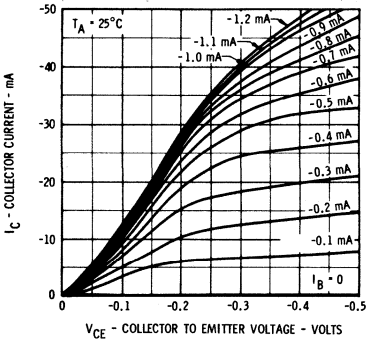
COLLECTOR CHARACTERISTICS



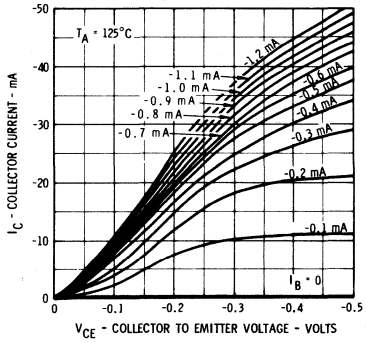
COLLECTOR CHARACTERISTICS



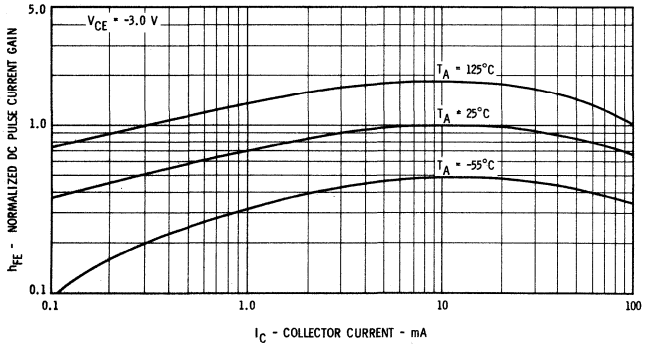
COLLECTOR CHARACTERISTICS



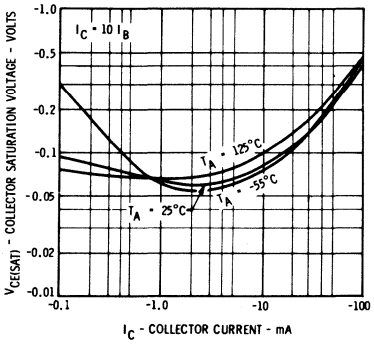
COLLECTOR CHARACTERISTICS



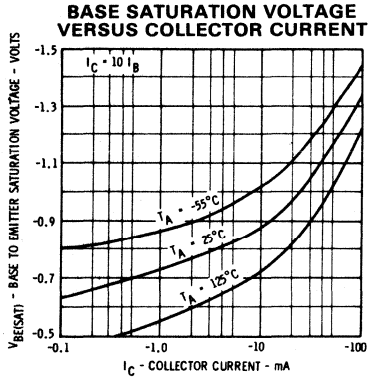
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



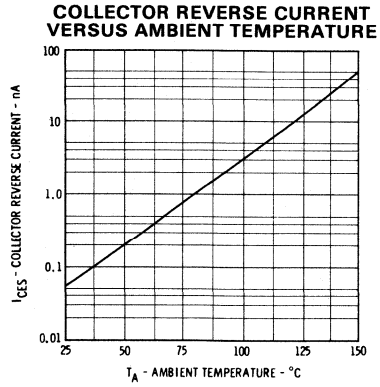
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



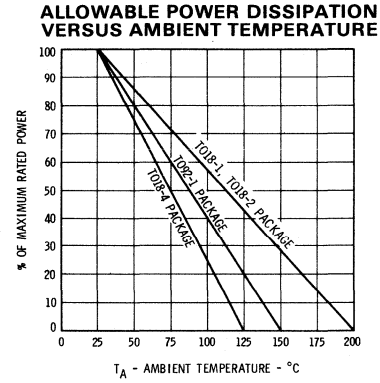
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



COLLECTOR REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

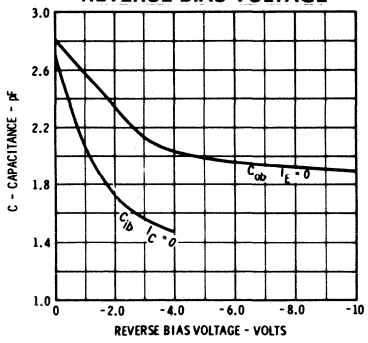


CURVE SET NUMBER SS31

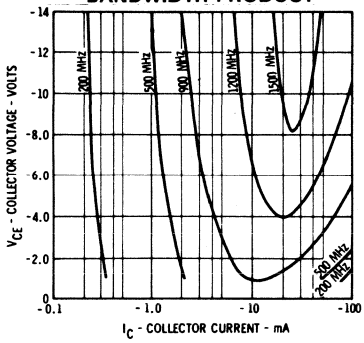
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

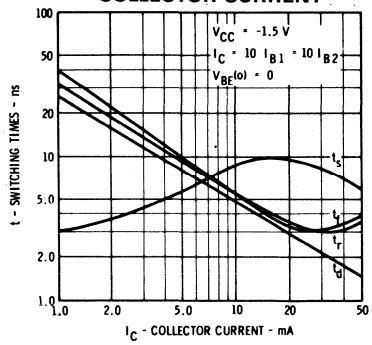
INPUT AND OUTPUT CAPACITANCES VERSUS REVERSE BIAS VOLTAGE



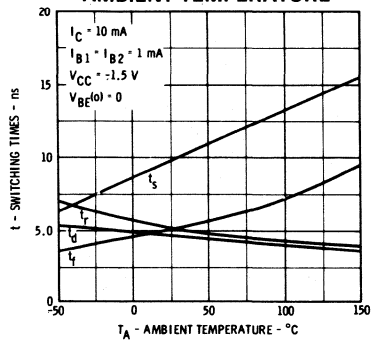
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



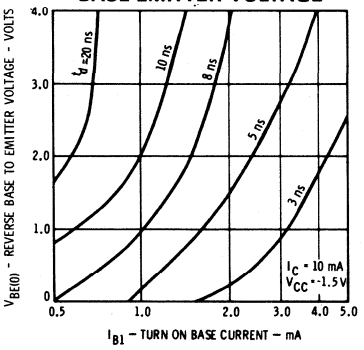
SWITCHING TIMES VERSUS COLLECTOR CURRENT



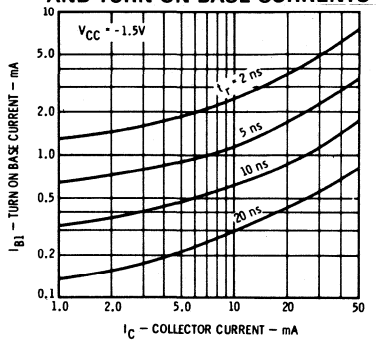
SWITCHING TIMES VERSUS AMBIENT TEMPERATURE



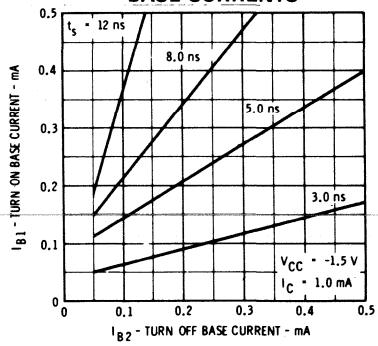
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE



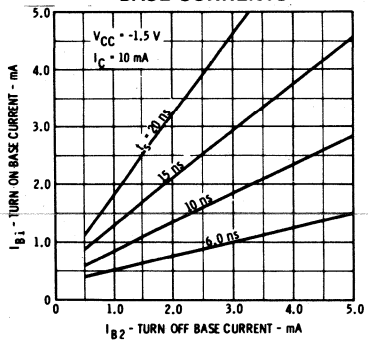
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENTS



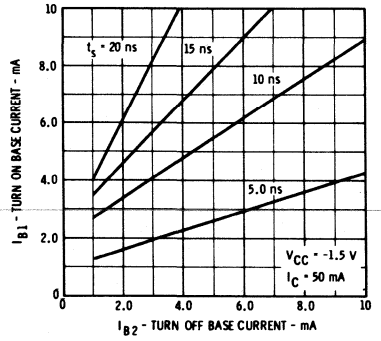
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



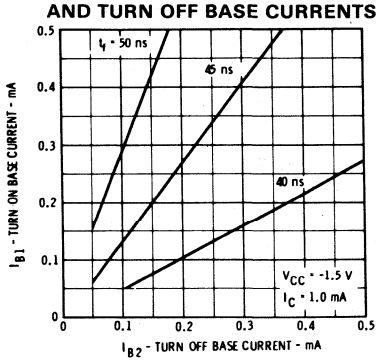
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



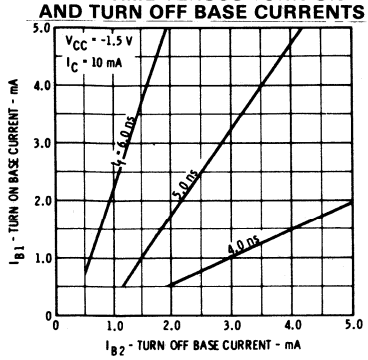
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



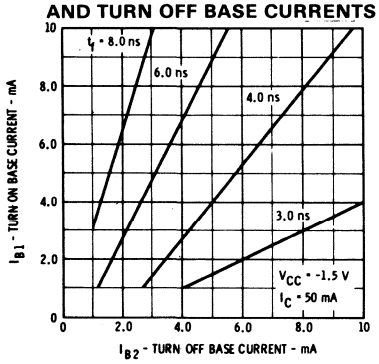
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



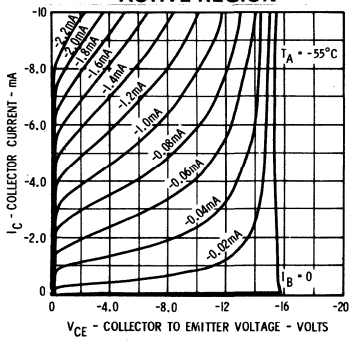
5

CURVE SET NUMBER SS32

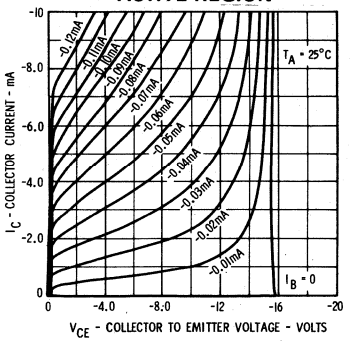
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

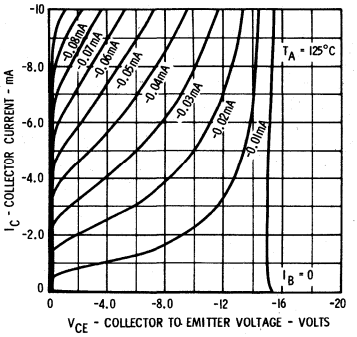
COLLECTOR CHARACTERISTICS ACTIVE REGION



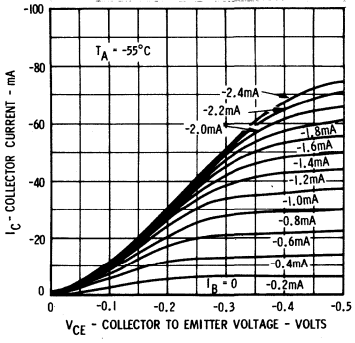
COLLECTOR CHARACTERISTICS ACTIVE REGION



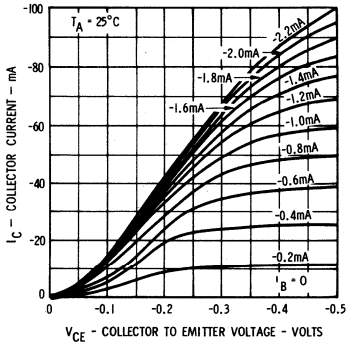
COLLECTOR CHARACTERISTICS ACTIVE REGION



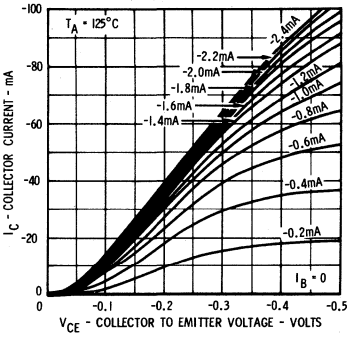
COLLECTOR CHARACTERISTICS SATURATION REGION



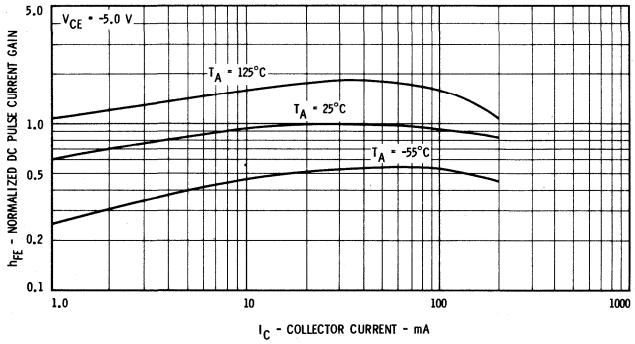
COLLECTOR CHARACTERISTICS SATURATION REGION



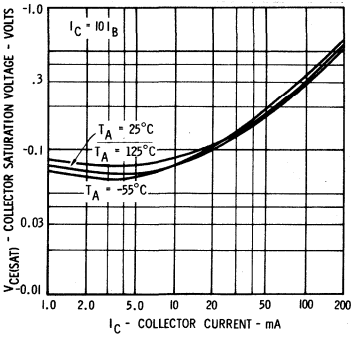
COLLECTOR CHARACTERISTICS SATURATION REGION



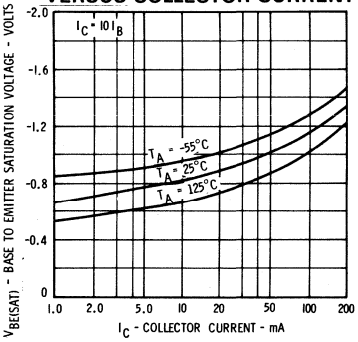
NORMALIZED DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



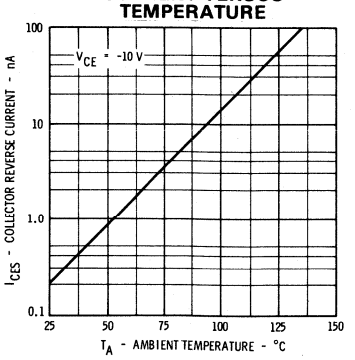
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



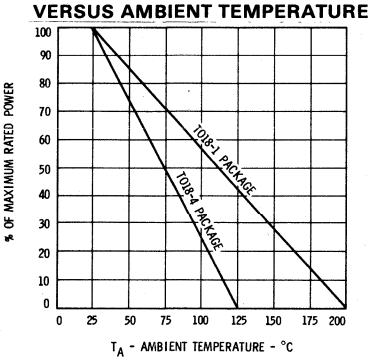
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



COLLECTOR REVERSE CURRENT VERSUS TEMPERATURE



ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

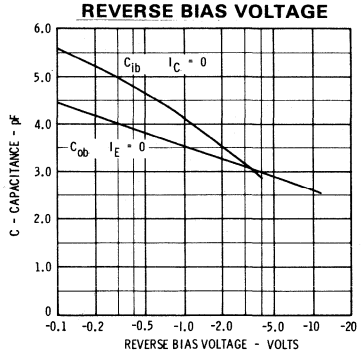


CURVE SET NUMBER SS32

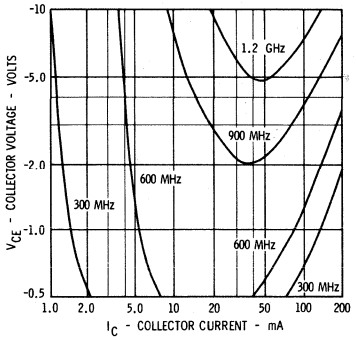
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

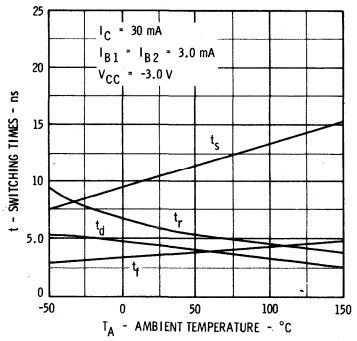
INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



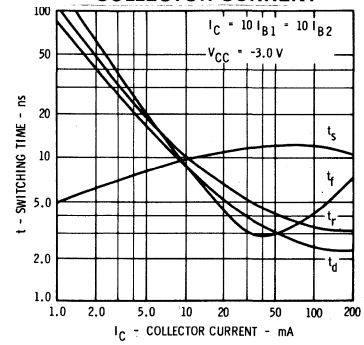
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



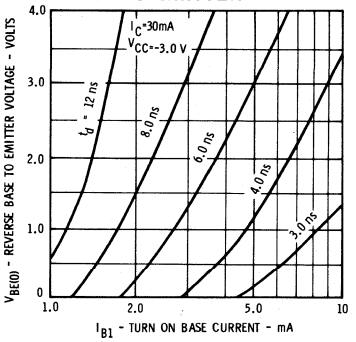
SWITCHING TIMES VERSUS TEMPERATURE



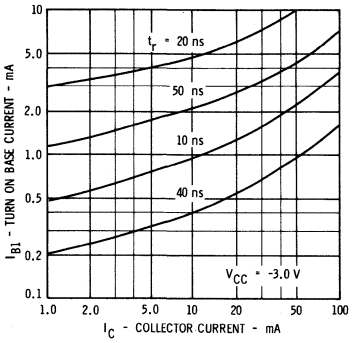
SWITCHING TIMES VERSUS COLLECTOR CURRENT



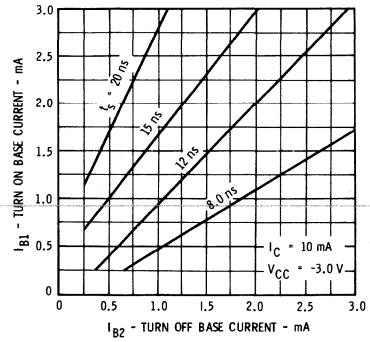
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE TO EMITTER VOLTAGE



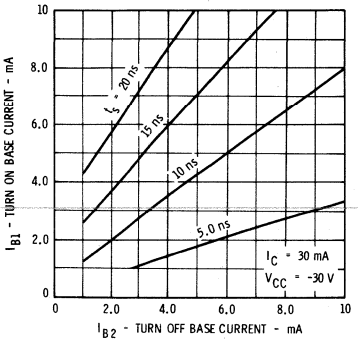
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENTS



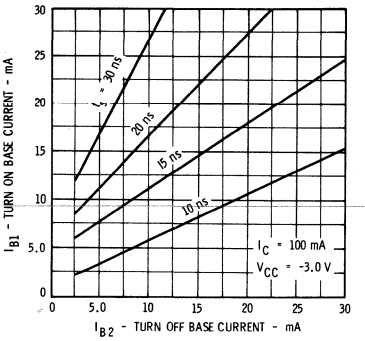
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



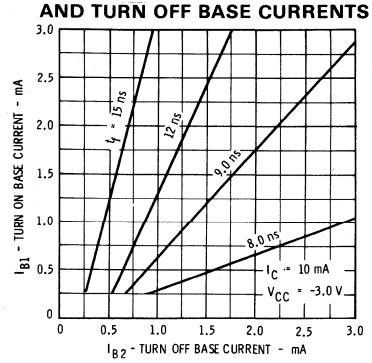
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



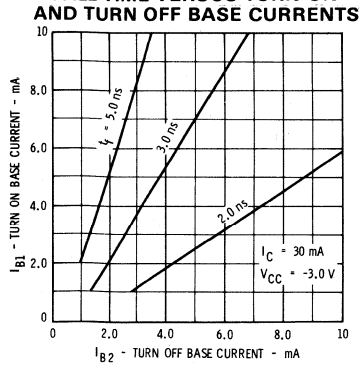
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



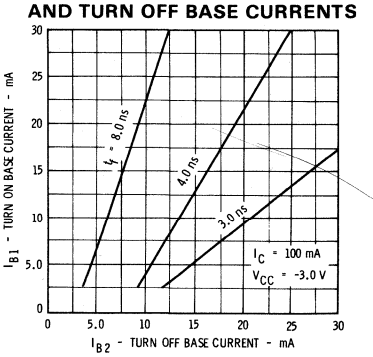
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



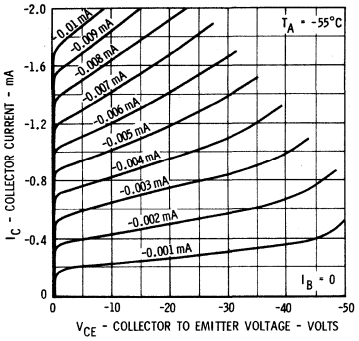
5

CURVE SET NUMBER SS33

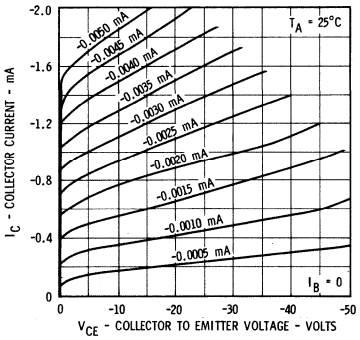
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

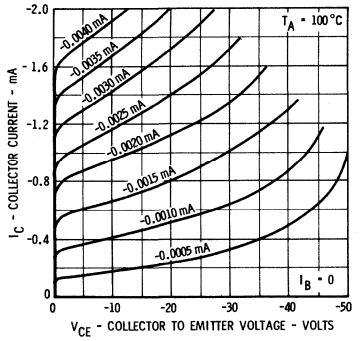
COLLECTOR CHARACTERISTICS



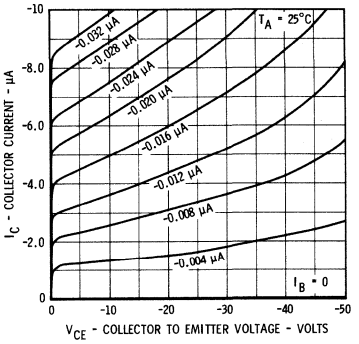
COLLECTOR CHARACTERISTICS



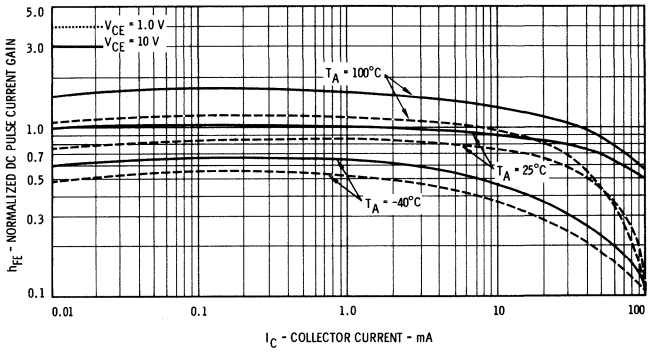
COLLECTOR CHARACTERISTICS



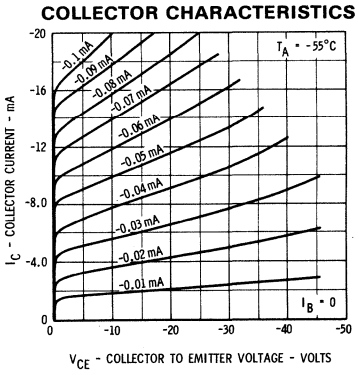
COLLECTOR CHARACTERISTICS



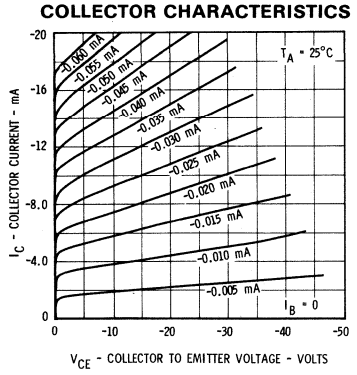
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



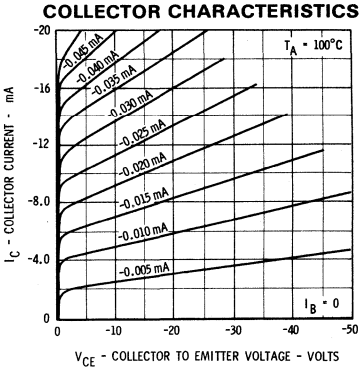
COLLECTOR CHARACTERISTICS



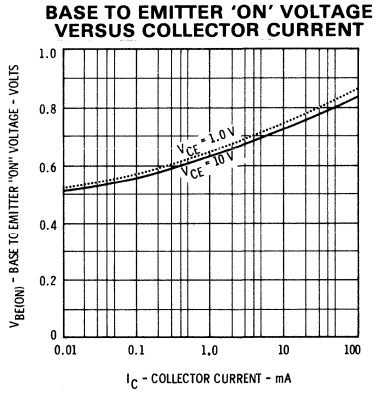
COLLECTOR CHARACTERISTICS



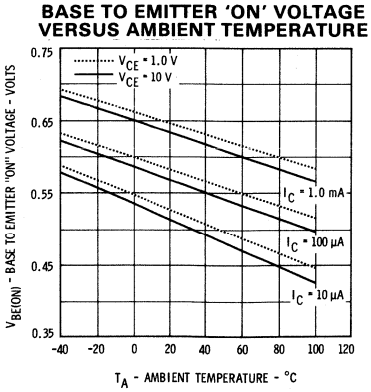
COLLECTOR CHARACTERISTICS



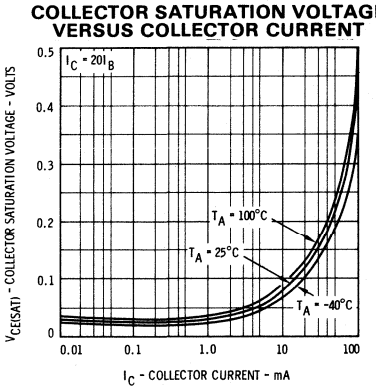
BASE TO EMITTER 'ON' VOLTAGE VERSUS COLLECTOR CURRENT



BASE TO EMITTER 'ON' VOLTAGE VERSUS AMBIENT TEMPERATURE



COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

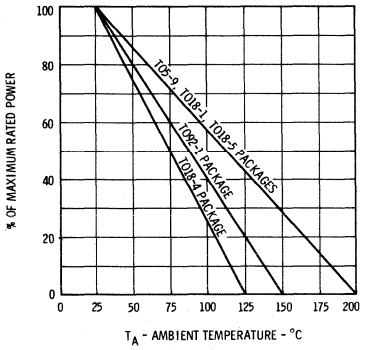


CURVE SET NUMBER SS33

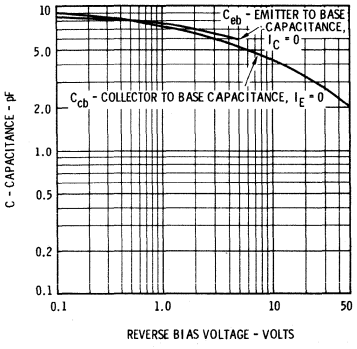
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

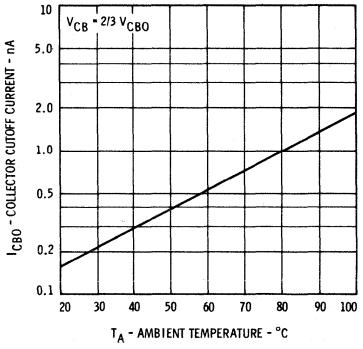
ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE



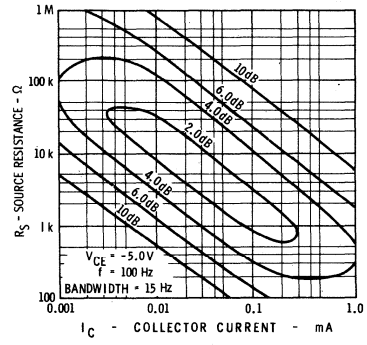
CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



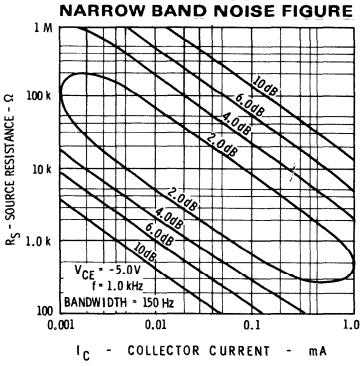
COLLECTOR CUTOFF CURRENT VERSUS AMBIENT TEMPERATURE



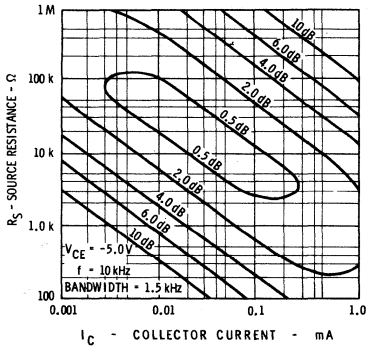
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



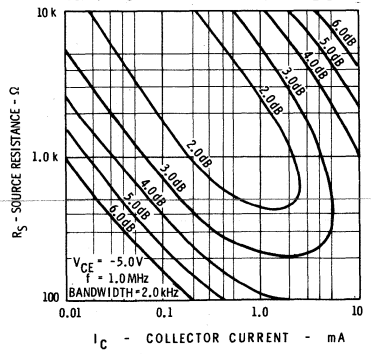
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



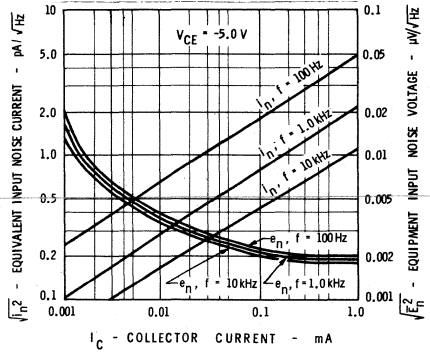
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



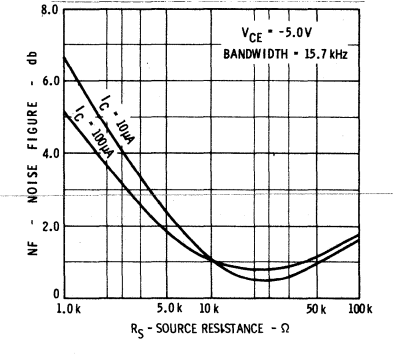
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



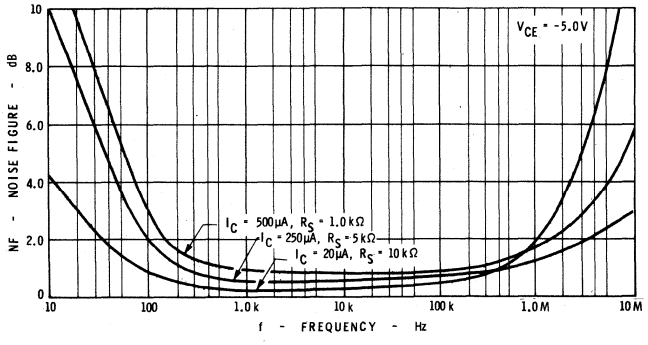
EQUIVALENT INPUT NOISE VOLTAGE AND NOISE CURRENT VERSUS COLLECTOR CURRENT



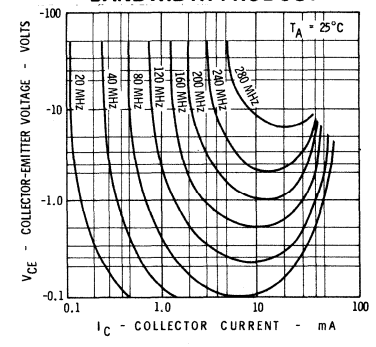
WIDE BAND NOISE FIGURE VERSUS SOURCE RESISTANCE



NOISE FIGURE VERSUS FREQUENCY



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



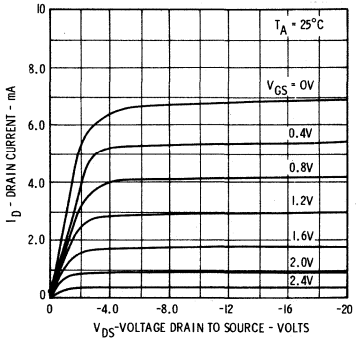
5

CURVE SET NUMBER SS34

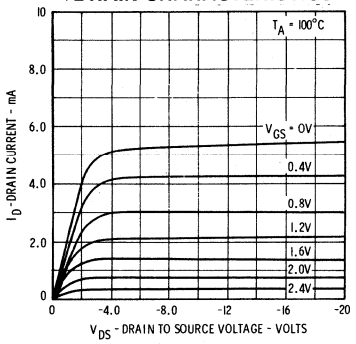
TYPICAL ELECTRICAL CHARACTERISTIC CURVES

AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

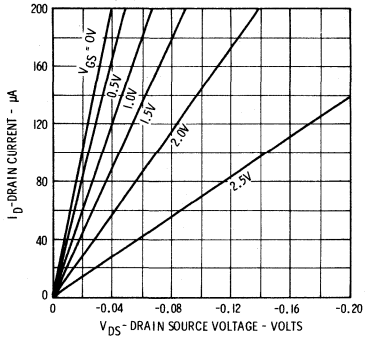
DRAIN CHARACTERISTICS



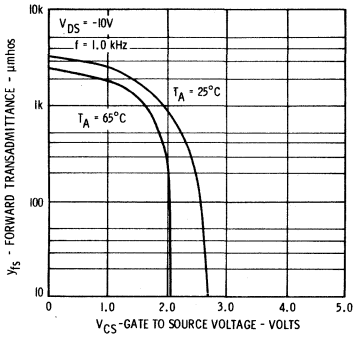
DRAIN CHARACTERISTICS



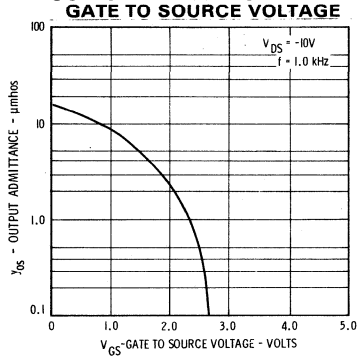
LOW VOLTAGE DRAIN CHARACTERISTICS



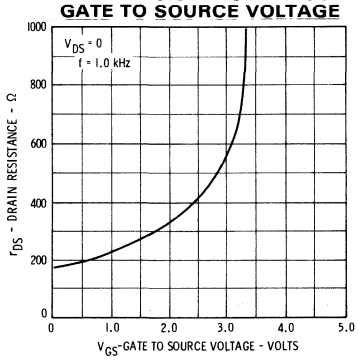
FORWARD TRANSADMITTANCE VERSUS GATE TO SOURCE VOLTAGE



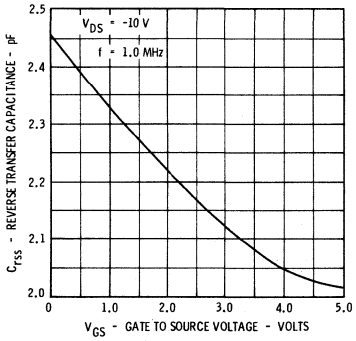
OUTPUT ADMITTANCE VERSUS GATE TO SOURCE VOLTAGE



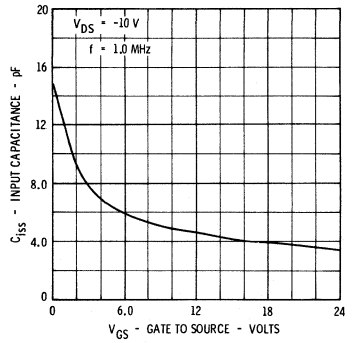
DRAIN RESISTANCE VERSUS GATE TO SOURCE VOLTAGE



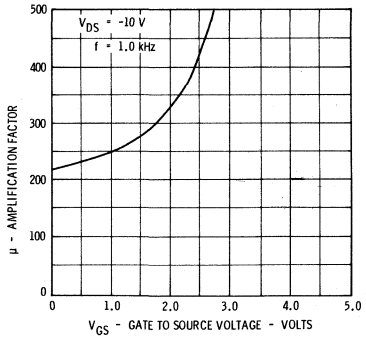
REVERSE TRANSFER CAPACITANCE VERSUS GATE TO SOURCE VOLTAGE



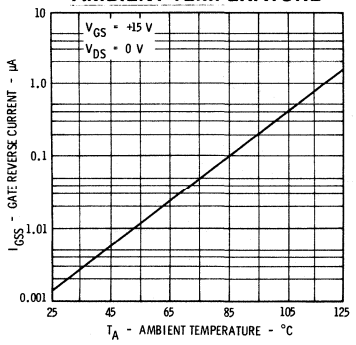
INPUT CAPACITANCE VERSUS GATE TO SOURCE VOLTAGE



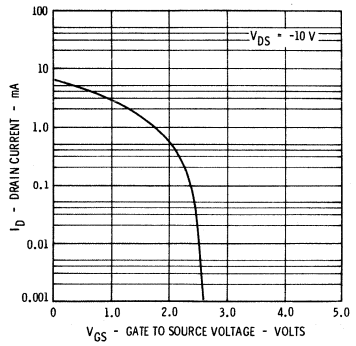
AMPLIFICATION FACTOR VERSUS GATE TO SOURCE VOLTAGE



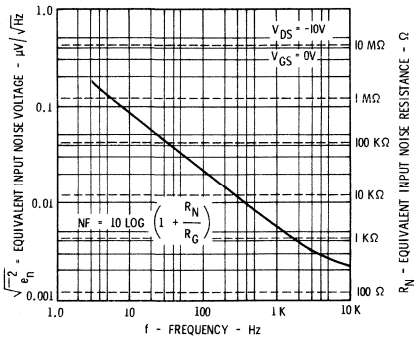
GATE REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



DRAIN CURRENT VERSUS GATE TO SOURCE VOLTAGE



EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



DISCRETE PRODUCTS

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INTRODUCTION	1
INDEX AND DEVICE CROSS REFERENCE	2
SELECTION GUIDE BY APPLICATION	3
DATA SHEETS	4
CURVES	5
TEST CIRCUITRY	6
PACKAGE OUTLINES AND ORDER INFORMATION	7
FAIRCHILD TO92 THERMAL CONSIDERATIONS	8
DICE INFORMATION	9

INTRODUCTION

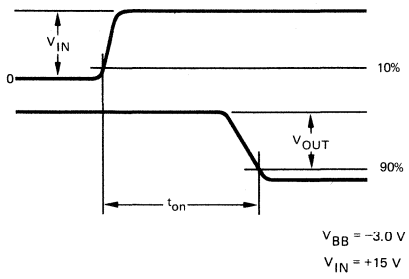
TEST CIRCUITRY

This section contains, in numeric order, the circuits used for special tests. The circuit number is indicated on the data sheet in the electrical characteristics table. These circuits will be useful to designers as an indication of optimum device conditions.

Fairchild cannot assume responsibility for use of any circuitry described other than circuitry entirely embodied in a Fairchild product. No other circuit patent licenses are implied.

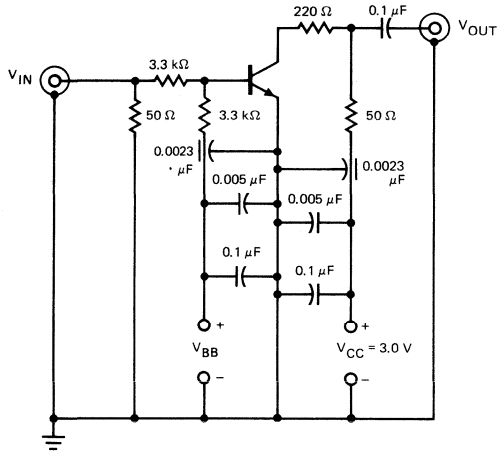
TEST CIRCUITS

210

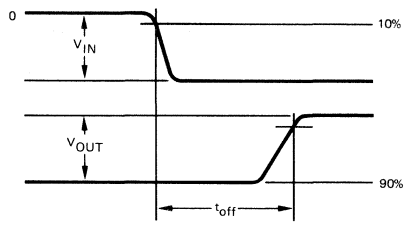


V_{BB} = −3.0 V
V_{IN} = +15 V

PULSE GENERATOR
V_{IN} t_r < 1.0 ns
SOURCE IMPEDANCE = 50 Ω
PW ⩾ 300 ns
DC < 2%



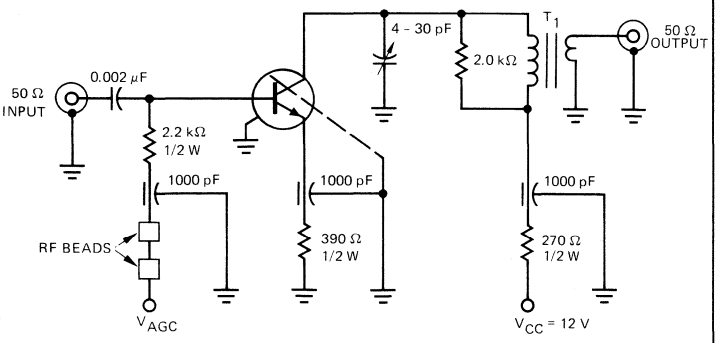
t_{on} - t_{off} SWITCHING



t_{off}
V_{BB} = +12 V
V_{IN} = −15 V

TO OSCILLOSCOPE
INPUT IMPEDANCE = 50 Ω
t_r ⩽ 1.0 ns

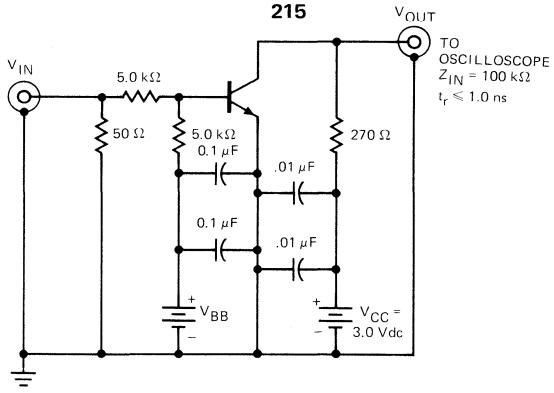
211



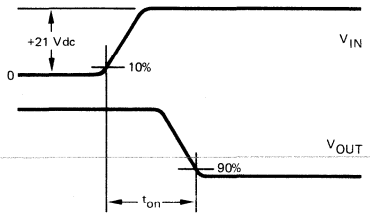
T_1 : Q_3 TOROID 4:1 RATIO
8T-PRI 2T-S } #22 WIRE

45 MHz, AGC, POWER GAIN AND NOISE FIGURE TEST

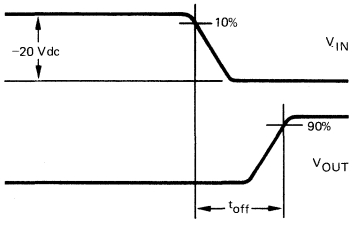
215



PULSE GENERATOR
SOURCE IMPEDANCE = 50 Ω



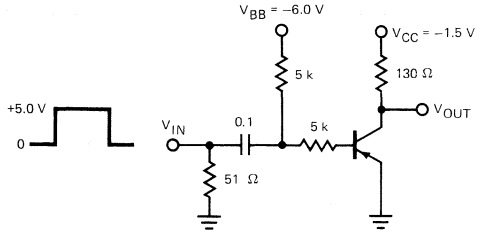
t_{on}
V_{BB} = −4.0 Vdc
V_{IN} = +21 Vp-p



t_{off}
V_{BB} = −17 Vdc
V_{IN} = −20 Vp-p

t_{on} - t_{off} SWITCHING

219



PW = 100 ns
Z_{IN} = 50 Ω
t_r, t_f < 1.0 ns

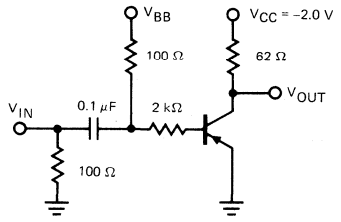
TO OSCILLOSCOPE
Z_{IN} ⩾ 100 kΩ
t_r < 1.0 ns

I_C ≈ 10 mA, I_{B1} ≈ 0.5 mA, I_{B2} ≈ −0.5 mA

t_{on} - t_{off} SWITCHING

TEST CIRCUITS

220



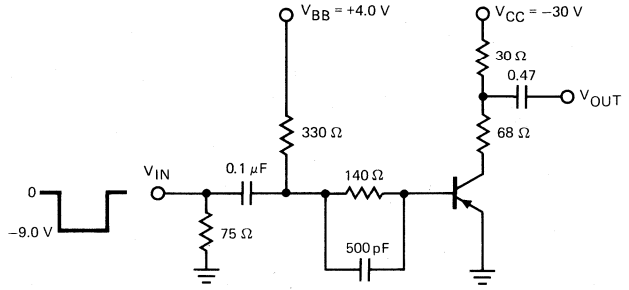
PULSE GENERATOR
$t_r \leqslant 1.0$ ns
PW = 400 ns
PPS = 150
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
$t_r \leqslant 1.0$ ns
$Z_{IN} \geqslant 100$ kΩ

t_{on} V_{BB} = +3.0 V, V_{IN} = −7.0 V
t_{off} V_{BB} = −4.0 V, V_{IN} = +6.0 V

SWITCHING TIME TEST

222

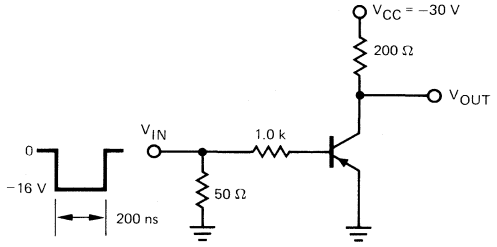


PULSE GENERATOR
t_r, $t_f \leqslant 6.0$ ns
PW = 0.5 μs
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
$t_r < 1.0$ ns
$Z_{IN} \geqslant 0.1$ MΩ

t_{on} - t_{off} SWITCHING

224

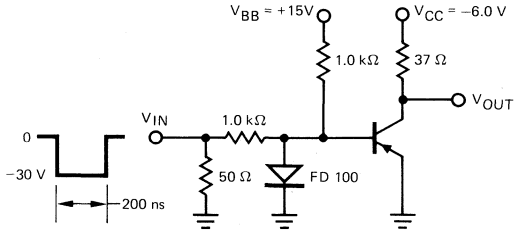


Z_O = 50 Ω
PRF = 150 PPS
$t_r \leqslant 2.0$ ns

TO OSCILLOSCOPE
$t_r \leqslant 5.0$ ns
Z_{IN} = 10 MΩ

t_d - t_r SWITCHING

225

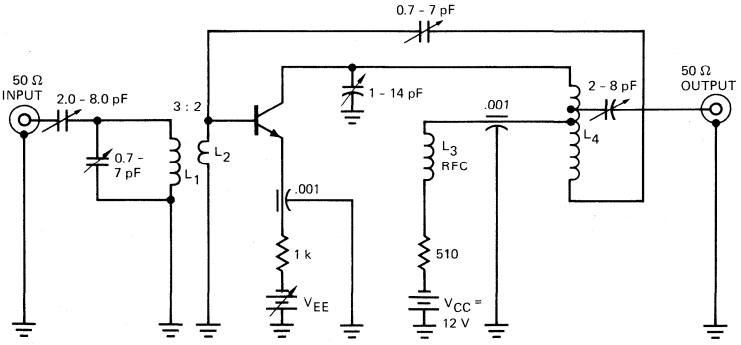


Z_O = 50 Ω
PRF = 150 PPS
$t_r \leqslant 2.0$ ns

TO OSCILLOSCOPE
$t_r \leqslant 5.0$ ns
Z_{IN} = 10 MΩ

t_s - t_f SWITCHING

226A

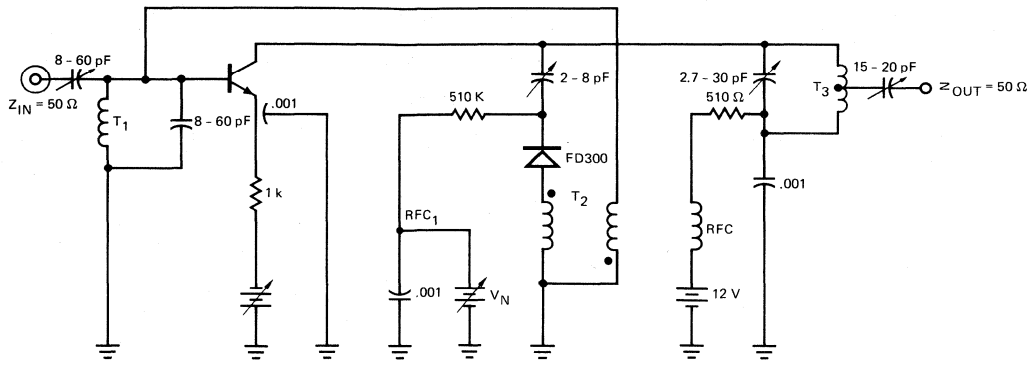


INPUT IMPEDANCE REFERRED TO TRANSISTOR IS 100 Ω.
L_1 = 3 TURNS #18 WIRE ON ¼" CERAMIC CORE
L_2 = 2 TURNS #18 WIRE INTERWOUND AT COLD END WITH L_1
L_3 = RFC
L_4 = 4 TURNS .076" DIAM. SILVER TUBING SPACE WOUND (3/8" I.D., NO CORE). OUTPUT TAP AT ½ TURN FROM COLLECTOR END GROUND TAP AT 2 TURNS FROM COLLECTOR END

200 MHz AGC

TEST CIRCUITS

227



T_1 8 TURNS #16 TINNED COPPER WIRE 1/4 INCH I.D. X 1/2 INCH LONG.

T_2 7 TURNS #32 BIFILAR WIRE WOUND ON TOROID, I.D. = .120 INCH, O.D. = .230 INCH, .060 THICK.

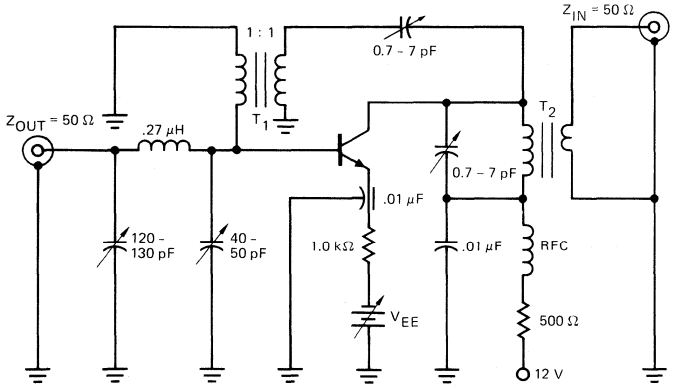
$\frac{1}{\mu_o Q}$ = .00017 AT 50 MHz μ_o = 40 AT 1 MHz

T_3 8 1/2 TURNS #26 ENAMELED WIRE, CENTER-TAPPED, WOUND ON TOROID, I.D. = .187 INCH, O.D. = .375 INCH, .125 THICK.

$\frac{1}{\mu_o Q}$ = .00042 AT 150 MHz μ_o = 16 AT 1MHz

60 MHz AGC

228A

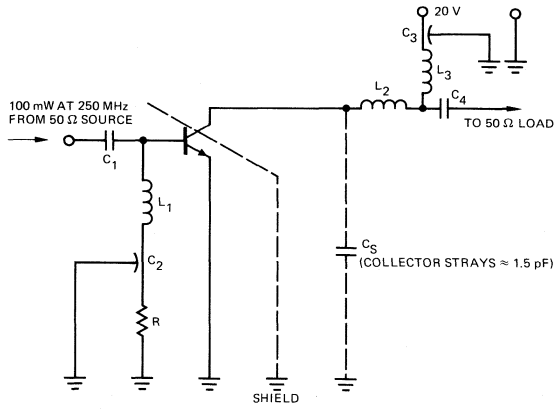


T_1: 12T #32 BIFILAR WIRE ON Q2 TOROID (μ = 115)

T_2: PRIMARY: 10T #36 ENAMELED WIRE WOUND ON MICROMETALS L-52-6 SHIELDED COIL FORM SECONDARY: 2T #36 ENAMELED WIRE TIGHTLY COUPLED TO PRIMARY

45 MHz AGC

230



C_1 = 120 pF

C_2, C_3, C_4 = 1000 pF BUTTON MICA

C_S (COLLECTOR STRAYS) ≈ 1.5 pF

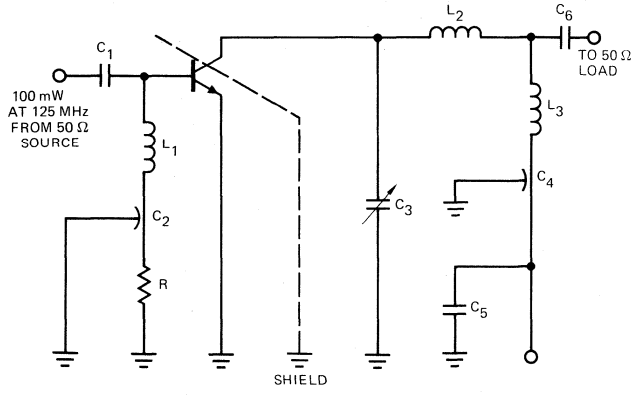
L_1 L_3 = .47 μH (RF CHOKE) fr > 250 MHz

L_2 = −5.5 pF

R = 200 Ω

250 MHz POWER AMPLIFIER

230-125



C_1, C_2, C_4, C_6 = 1000 pF BUTTON MICA

C_3 = 2 - 8 pF

C_5 = 6 μF AT 50 V

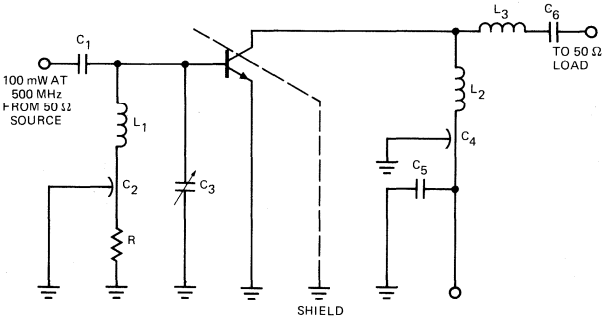
L_1, L_3 = RFC rf > 125 MHz

L_2 = 16 pF

R = 200 Ω

125 MHz POWER AMPLIFIER

230-500



C_1 = 10 pF

C_2, C_4, C_6 = 1000 pF BUTTON MICA

C_5 = 6 μF AT 50 V C_3 = 1 - 10 pF

L_1 = - 9 pF

L_2 = - 3.5 pF

L_3 = - 7.5 pF

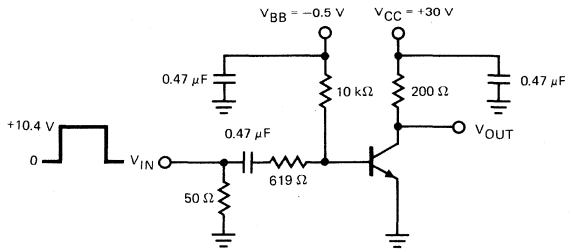
R = 20 Ω

500 MHz POWER AMPLIFIER

6

TEST CIRCUITS

231

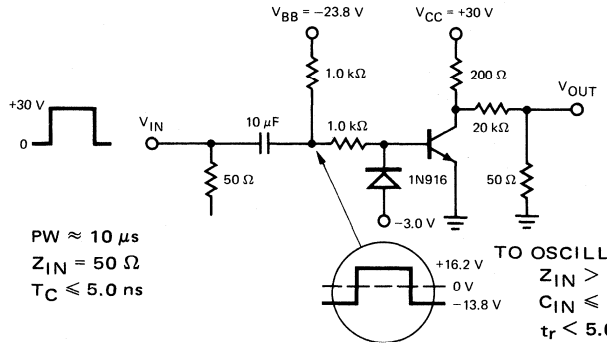


PW ⩽ 200 ns
t_r ⩽ 2.0 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
Z_{IN} < 100 kΩ
C_{IN} ⩽ 12 pF
t_r ⩽ 5.0 ns

t_{on} SWITCHING

232



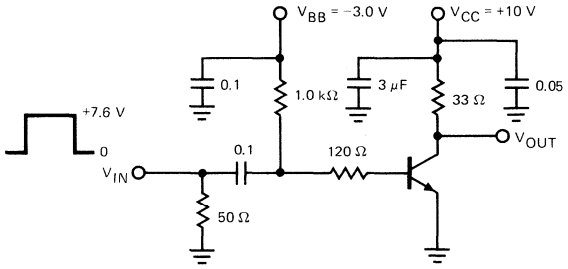
PW ≈ 10 μs
Z_{IN} = 50 Ω
T_C ⩽ 5.0 ns

TO OSCILLOSCOPE
Z_{IN} > 100 kΩ
C_{IN} ⩽ 12 pF
t_r < 5.0 ns

The 20 kΩ and 50 Ω resistors on the output of the test circuit are normally omitted, due to the excessive attenuation of the collector waveform. The collector voltage is monitored directly with a high impedance oscilloscope probe.

t_{off} SWITCHING

233

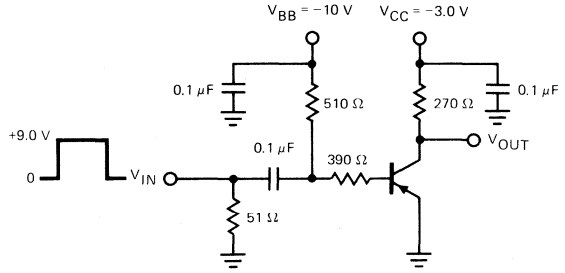


PW ⩾ 240 ns
t_r, t_f < 1.0 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
t_r < 1.0 ns
Z_{IN} ≈ 100 kΩ

t_{on} - t_{off} SWITCHING

234



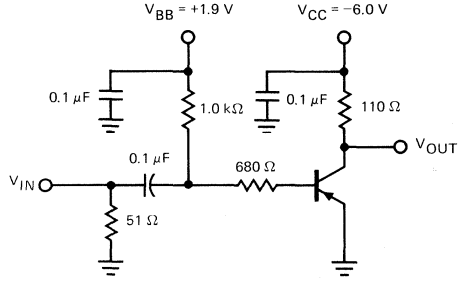
PW = 240 ns
Z_{IN} = 50 Ω
t_r ⩽ 1.0 ns

TO OSCILLOSCOPE
Z_{IN} ⩾ 100 kΩ
t_r < 1.0 ns

I_C ≈ 10 mA, I_{B1} ≈ 10 mA, I_{B2} ≈ 10 mA

CHARGE STORAGE TIME

235



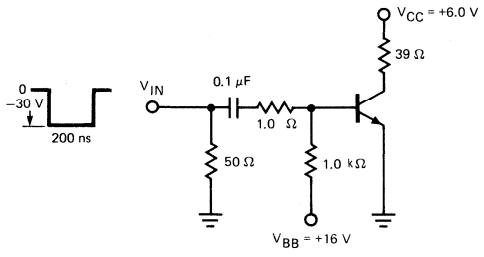
PULSE SOURCE
t_r ⩽ 1.0 ns
PW ⩾ 100 ns
Z_{IN} = 50 Ω
t_r ⩽ 1.0 ns

TO OSCILLOSCOPE
Z_{IN} ⩾ 100 kΩ
t_r ⩽ 1.0 ns

COLLECTOR CURRENT = 50 mA, t_{on} AND t_{off}
BASE CURRENTS = 5.0 mA

SWITCHING TIME

236

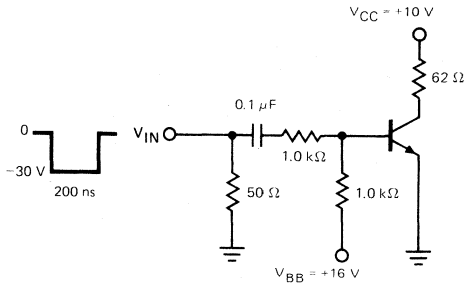


t_r INPUT PULSE < 2.0 ns

t_{off} SWITCHING

TEST CIRCUITS

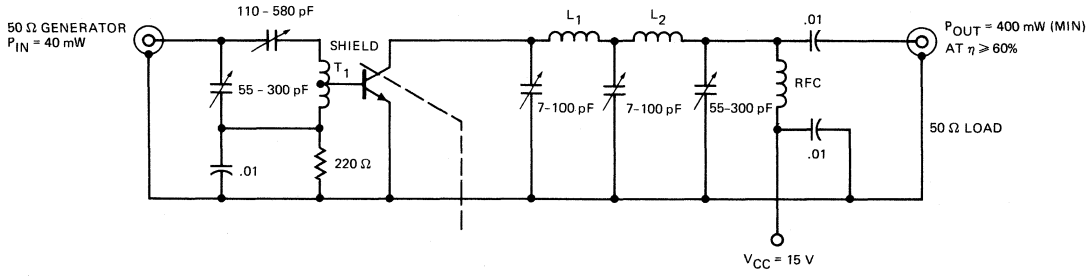
237



t_r OF INPUT PULSE < 2.0 ns

t_{off} SWITCHING

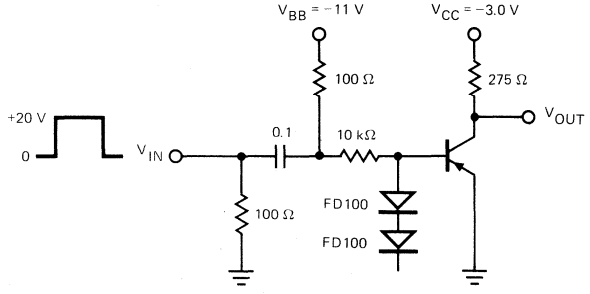
238



T_1 - 4 TURNS NO. 20 WIRE, 3/4" DIA. X ¼" LONG, MIDTAPPED.
L_1 AND L_2 - 4 TURNS NO. 20 WIRE, ½" DIA. X ¼" LONG.
VARIABLE CAPACITORS ARE COMPRESSION MICA.

30 MHz AMPLIFIER

239

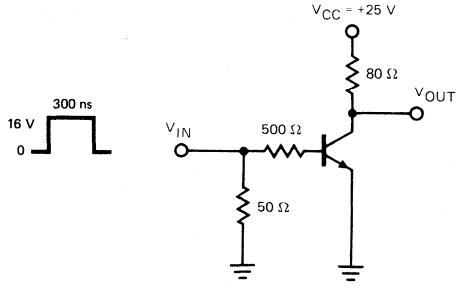


PW ≈ 300 ns
t_r ≤ 1.0 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
t_r ≤ 1.0 ns
Z_{IN} = 100 kΩ

t_{off} SWITCHING

241



PULSE SOURCE
t_r ≤ 1.0 ns
Z_{IN} = 50 Ω

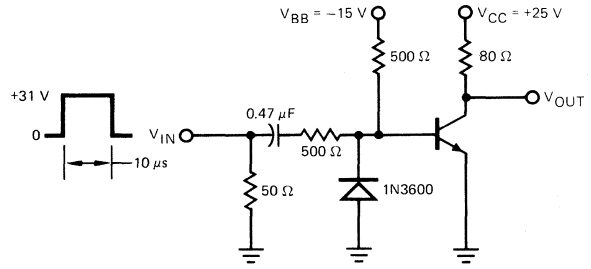
TO OSCILLOSCOPE
t_r ≤ 1.0 ns
Z_{IN} ≈ 100 kΩ

t_{on} SWITCHING

6

TEST CIRCUITS

242

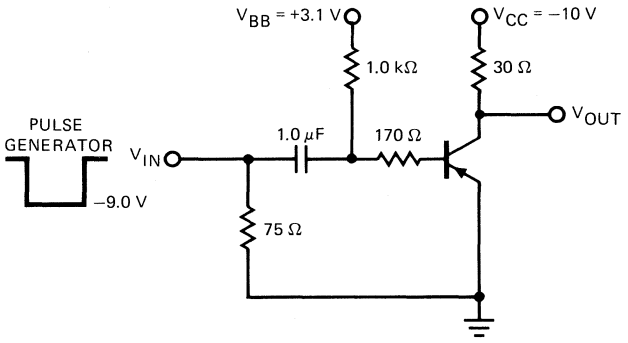


PULSE SOURCE
$t_r \leqslant 20$ ns
$Z_{IN} = 50\ \Omega$

TO OSCILLOSCOPE
$t_r \leqslant 1.0$ ns
$Z_{IN} \approx 100$ kΩ

t_{off} SWITCHING

245

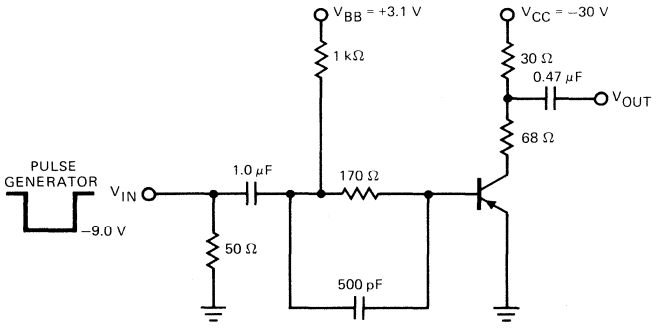


$t_r, t_f \leqslant 15$ns
PW = 0.5μs
$Z_{IN} = 50\Omega$

TO OSCILLOSCOPE
$t_r \leqslant 1.0$ ns
$Z_{IN} \geqslant 0.1$ mΩ

t_{on} - t_{off} SWITCHING

246

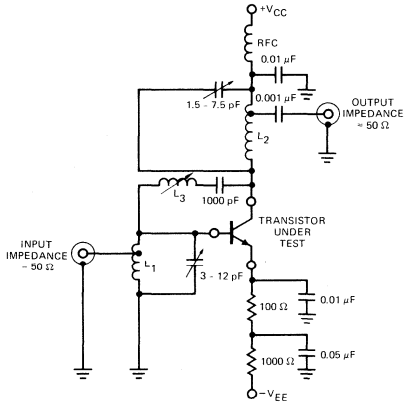


$t_r, t_f \leqslant 6$ns
PW = 0.5μs
$Z_{IN} = 50\Omega$

TO OSCILLOSCOPE
$t_r < 1.0$ ns
$Z_{IN} \geqslant 0.1$ MΩ

t_{on} - t_{off}

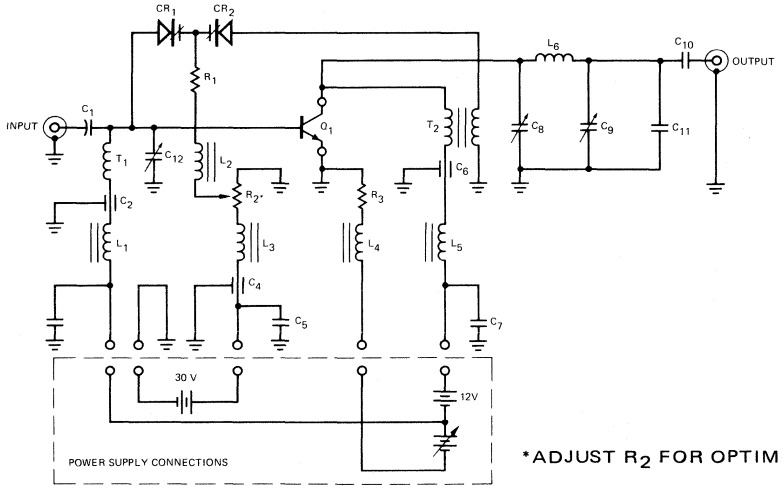
254



L_1 - 3.5 TURNS #16 WIRE; 5/16" DIA.; 7/16" LONG.
TURNS RATIO 4 TO 2
L_2 - 8 TURNS #16 WIRE; 1/8" DIA.; 7/8" LONG.
TURNS RATIO 8 TO 1
L_3 - 0.4-0.65 μH, ADJUSTABLE CORE

GAIN AMPLIFIER

255

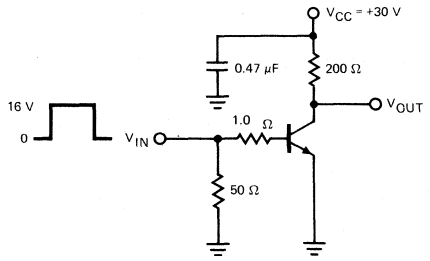


*ADJUST R_2 FOR OPTIMUM NEUTRALIZATION

NEUTRALIZED 200 MHz POWER GAIN AMPLIFIER

TEST CIRCUITS

256

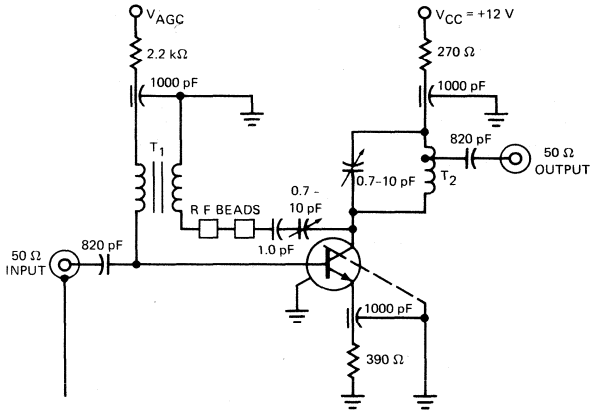


PW ⩽ 200 ns
Z_{IN} = 50 Ω
t_r = ⩽ 2.0 ns

TO OSCILLOSCOPE
Z_{IN} = 10 MΩ
t_r ⩽ 1.0 ns

t_{on} SATURATED SWITCHING

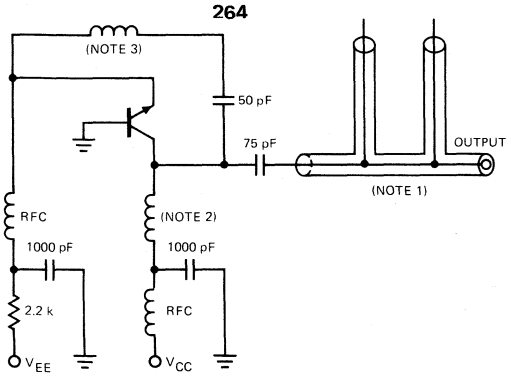
257



T_1 : FERRITE CORE INDIANA GEN. CORP. F-684-Q_3
T_2 : 6 TURNS #16 BUSS WIRE ID = 1/4" L = 3/4"

200 MHz AGC, POWER GAIN AND NOISE FIGURE TEST

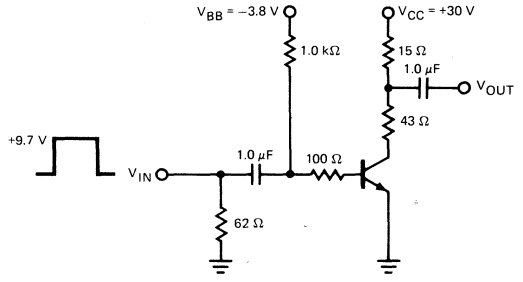
264



NOTES:
(1) COAX PLUMBING CONSISTS OF THE FOLLOWING GR AIR LINES:
2 TYPE 874 TEE
1 TYPE 874 - D20 ADJUSTABLE STUB
1 TYPE 874 - LA ADJUSTABLE LINE
1 TYPE 874 - WN3 SHORT - CIRCUIT TERMINATION
(2) 2 TURNS #16 AWG WIRE, 3/8 INCH OD, 1-1/4 INCH LONG
(3) 9 TURNS #22 AWG WIRE, 3/16 INCH OD, 1/2 INCH LONG

500 MHz OSCILLATOR

265



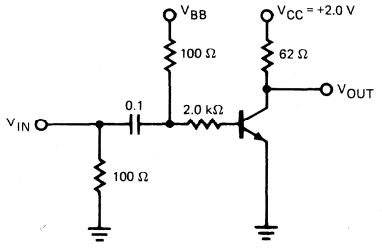
t_r AND t_f ⩽ 1.0 ns
PW ≈ 1.0 μs
Z_{IN} = 50 Ω
DC < 2%

TO OSCILLOSCOPE
t_r < 1.0 ns
Z_{IN} ⩾ 100 kΩ

I_C ≈ 500 mA, I_{B_1} ≈ 50 mA, I_{B_2} ≈50 mA

SWITCHING TIME

286



PULSE SOURCE
t_r < 1.0 ns
PW > 200 ns
Z_{IN} = 50 Ω

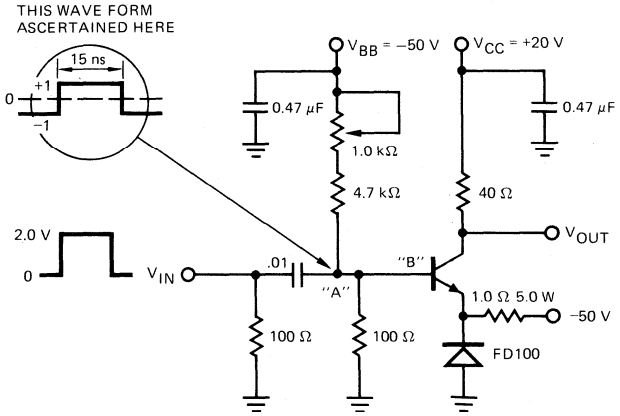
TO OSCILLOSCOPE
t_r < 1.0 ns
Z_{IN} ≈ 100 kΩ

t_{on}: V_{CC} = 2.0 V
V_{BB} GROUNDED
V_{IN} = 7.0 V

t_{off}: V_{CC} = 2.0 V
V_{BB} = 7.0 V
V_{IN} = −13 V

t_{on} - t_{off} SWITCHING

287



PW = 15 ns
t_f ⩽ 1.0 ns
Z_{IN} = 50 Ω

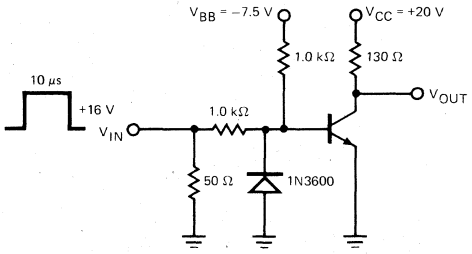
TO OSCILLOSCOPE
t_r = < 1.0 ns
Z_{IN} = 10 MΩ

t_{on} - t_{off} SWITCHING

6

TEST CIRCUITS

288 A

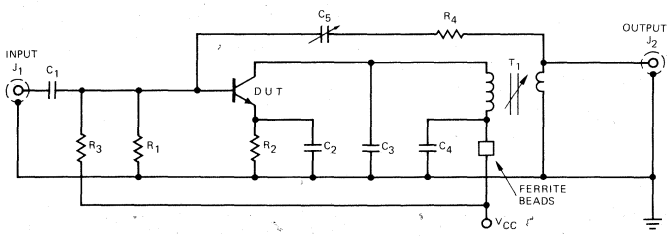


t_r OF INPUT PULSE < 15 ns
t_f OF INPUT PULSE < 15 ns

TO OSCILLOSCOPE
t_r > 15 ns
Z_{IN} ≈ 100 kΩ

t_{on} - t_{off} SWITCHING

320

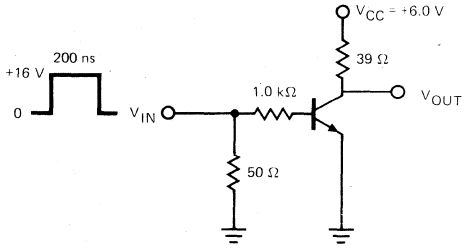


PARTS LIST

C_1, C_2 – .01 μF
C_3 – 27 pF (DURA MICA)
C_4 – .02 μF
C_5 – 0.7 TO 10 pF (JOHANSON – JMC 2951) VARIABLE CAPACITOR
R_1 – 470 Ω, ¼ W, 5%, CARBON
R_2 – 220 Ω, ¼ W, 5%, CARBON
R_3 – 1.5 kΩ, ¼ W, 5%, CARBON
R_4 – 30 Ω, ¼ W, 5%, CARBON
J_1, J_2 – BNC PANEL MOUNT CONNECTORS
T_1 – ¼" DIAMETER CERAMIC FORM. PRIMARY, 8 TURNS #26 WIRE CLOSE WOUND. SECONDARY, 2 TURNS #26 WIRE CLOSE WOUND IN CENTER OF PRIMARY. THE PRIMARY INDUCTANCE Lp = 0.4 TO 0.6 μH. CORE IS A WHITE DOT OR Q_3 FERRITE. SECONDARY IS INTERLACED WITH PRIMARY WINDING.

THIRD VIDEO IF POWER GAIN

327

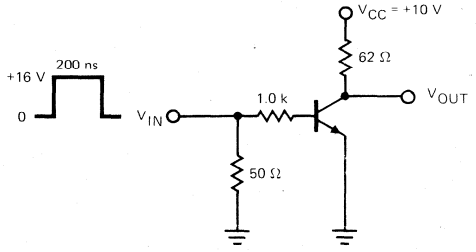


t_r OF INPUT PULSE < 2.0 ns

OSCILLOSCOPE INPUT
IMPEDANCE ≈ 100 kΩ
t_r < 2.0 ns

t_{on} SWITCHING

328

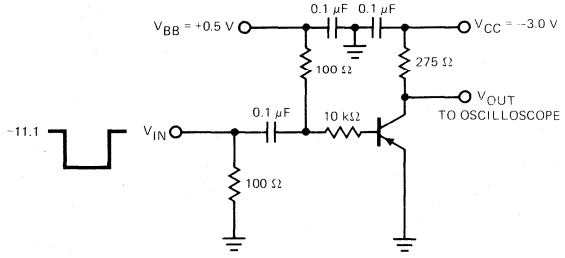


t_r OF INPUT PULSE < 2.0 ns

OSCILLOSCOPE INPUT
IMPEDANCE ≈ 100 kΩ
t_r < 2.0 ns

t_{on} SWITCHING

333



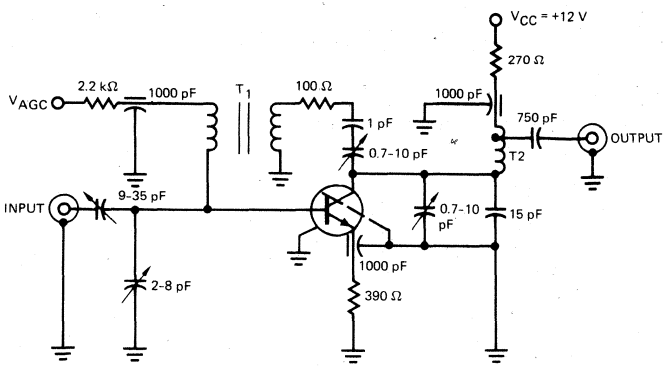
PW 300 ns
t_r ⩽ 1.0 ns
Z_{IN} = 50 Ω

OSCILLOSCOPE INPUT
t_r ⩽ 1.0 ns
Z_{IN} = 100 kΩ

t_{on} SWITCHING

TEST CIRCUITS

334

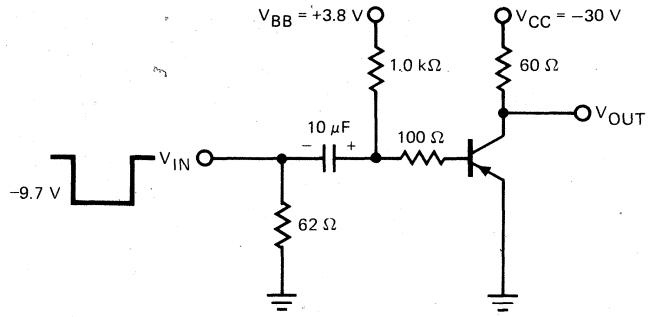


T_1 - BALLUN CORE
1T-PRI, 1T-SEC
#32 BIFILAR WIRE

T_2 - 1/4" I.D.
5-1/2T, TAPPED UP 1/2T
#16 BUSS WIRE

100 MHz AGC, POWER GAIN, AND NOISE FIGURE

341

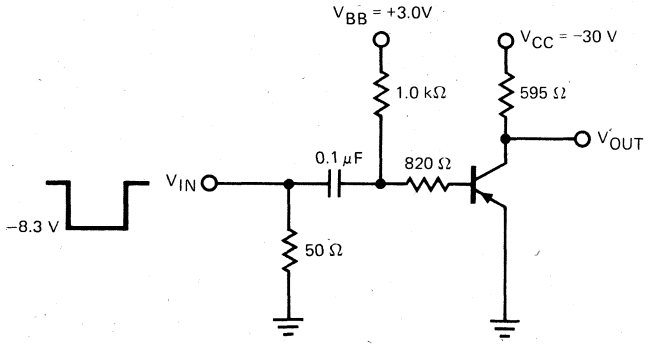


PULSE SOURCE
t_r, t_f < 20 ns
Z_{IN} = 50 Ω
PW = 10 μs
DC < 2%

TO OSCILLOSCOPE
Z_{IN} > 100 kΩ
t_r ≈ 10 ns

t_{on} - t_{off} SWITCHING

342

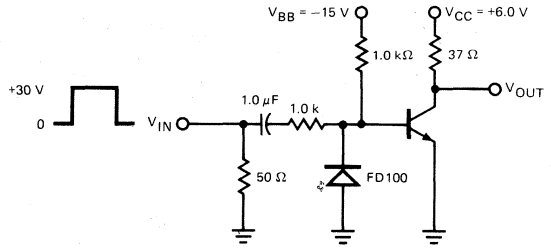


PW = 500 ns
t_r AND t_f = 1.0 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
t_r < 1.0 ns
Z_{IN} ≃ 100 kΩ

SWITCHING TIME

347

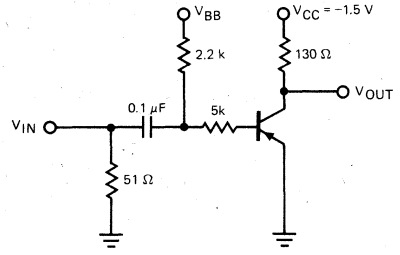


PW ⩽ 200 ns
t_r ⩽ 2.0 ns
Z_{IN} = 50 Ω
DC ⩽ 2%

TO OSCILLOSCOPE
Z_{IN} > 100 kΩ
t_r ⩽ 5.0 ns

t_{off} SWITCHING

348



I_C ≈ 10 mA, I_{B1} ≈ 1.0 mA, I_{B2} ≈ 1.0 mA

V_{IN}
PW = 240 ns
Z_{IN} = 50 Ω
t_r ⩽ 1.0 ns

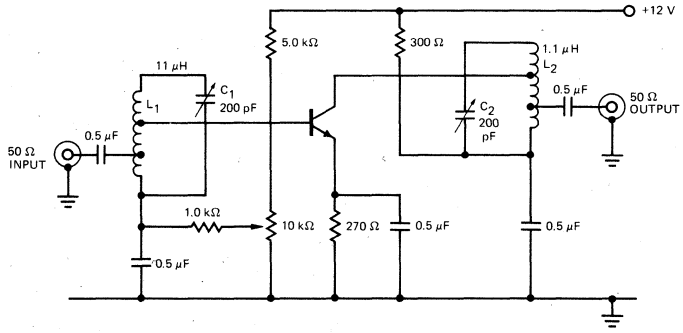
TO OSCILLOSCOPE
Z_{IN} ⩾ 100 kΩ
t_r < 1.0 ns

t_{off}
V_{BB} = −8.0 V
V_{IN} = +9.8 V

t_{on}
V_{BB} = GROUND
V_{IN} = −5.8 V

t_{on} − t_{off} SWITCHING

352



C_1 AND C_2 ARCO #465
L_1 = 11 μH (0.9 INCH OF #632 AIRDUX COIL)
INPUT TAP AT 2.9T FROM COLD SIDE
OUTPUT TAP AT 3.66T FROM COLD SIDE

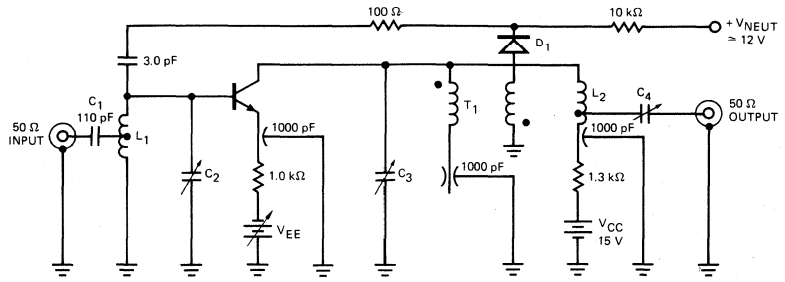
L_2 = 1.1 μH (1.5 INCHES OF #608 AIRDUX COIL)
INPUT TAP AT 2.3T FROM COLD SIDE
OUTPUT TAP AT 0.5T FROM COLD SIDE
ALL RESISTORS ARE ½ W
TYPICAL GAIN AT IC = 4 mA IS 34 dB.

10.7 MHz UNNEUTRALIZED AMPLIFIER

6

TEST CIRCUITS

353



L_1 = #14 BUSS WIRE – 3T – 3/8" I.D. – 5/12" LONG
TAP AT 1-1/2T FROM COLD END

L_2 = #18 ENAMELED – 5T – 3/8" I.D. – 5/16" LONG
TAP AT 1-1/2T FROM COLD END

T_1 = #36 BIFILAR – 1T IN BALUM CORE Q_3

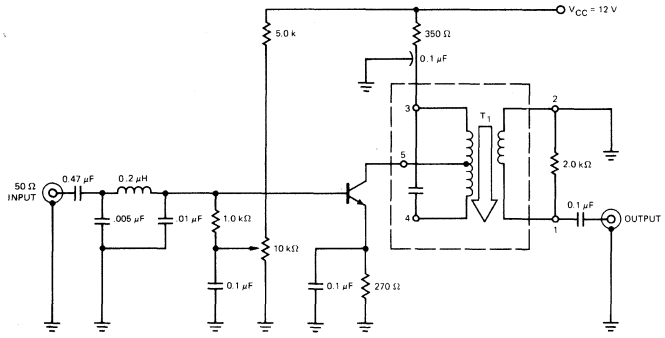
C_2 = 1 TO 35 pF JOHANSON #803 (OR EQUIVALENT)

C_3, C_4 = 1 TO 35 pF JOHANSON #803 (OR EQUIVALENT)

D_1 – FD 300

100 MHz AGC AND NF

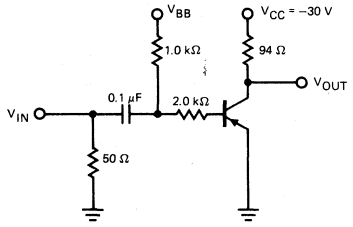
354



T_1 = TRW #17794R1

455 kHz UNNEUTRALIZED AMPLIFIER

378



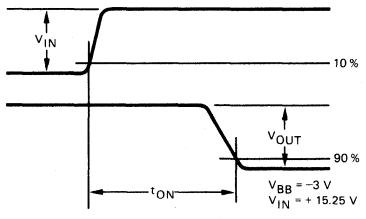
PULSE GENERATOR
$t_r \leq 1.0$ ns
PW = 400 ns
PPS = 150
$Z_{IN} = 50\ \Omega$

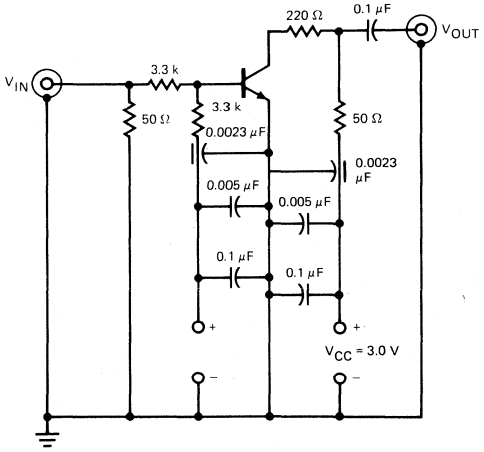
TO OSCILLOSCOPE
$t_r \leq 1.0$ ns
$Z_{IN} \geq 100\ k\Omega$

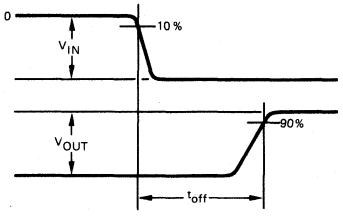
t_{on} $V_{BB} = 0$, $V_{IN} = -6.85$ V
t_{off} $V_{BB} = -9.85$ V, $V_{IN} = +11.7$ V

SWITCHING TIME

381







t_{off} : $V_{BB} = +12$V
$V_{IN} = -20.9$V

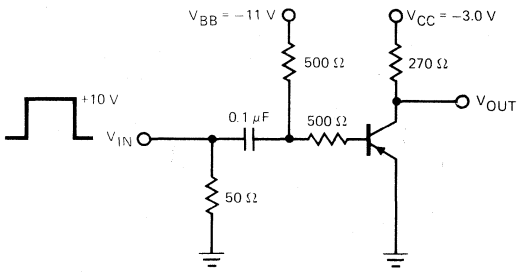
PULSE GENERATOR
$V_{IN} = t_r < 1.0$ ns
SOURCE IMPEDANCE = 50 Ω
PW ≥ 300 ns
DC < 2%

t_{on} - t_{off} SWITCHING

TO OSCILLOSCOPE
$Z_{IN} = 50\ \Omega$
$t_r \leq 1.0$ ns

TEST CIRCUITS

384

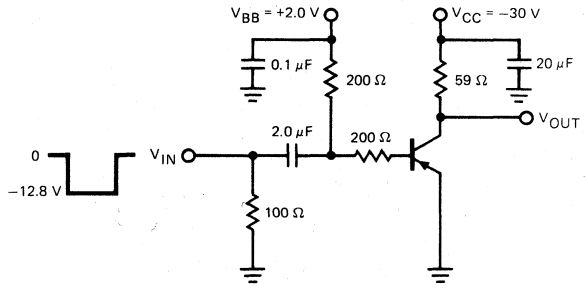


PULSE GENERATOR
$t_r \leq 1.0$ ns
PW = 400 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
$t_r \leq 1.0$ ns
$Z_{IN} \geq 100$ kΩ

STORAGE TIME

386

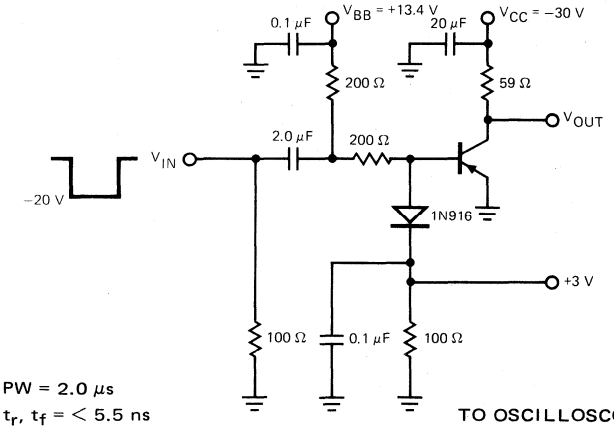


t_r = < 1.0 ns
PW = 250 ns
Z_{IN} = 50 Ω
DC < 2.0%

TO OSCILLOSCOPE
t_r < 1.0 ns
Z_{IN} = 100 kΩ

t_{on} SWITCHING

387

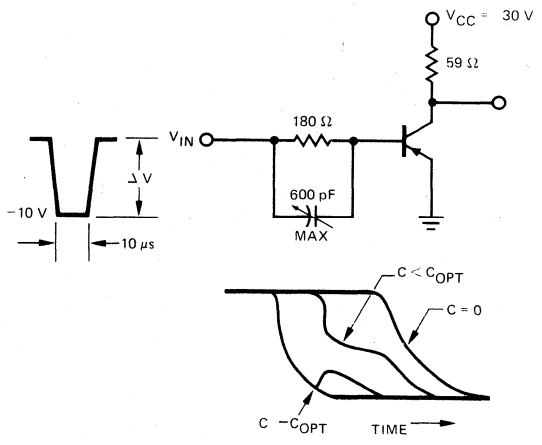


PW = 2.0 μs
t_r, t_f = < 5.5 ns
Z_{IN} = 50 Ω
DC < 2.0%

TO OSCILLOSCOPE
t_r < 1.0 ns
Z_{IN} = 100 kΩ

t_{off} SWITCHING TIME

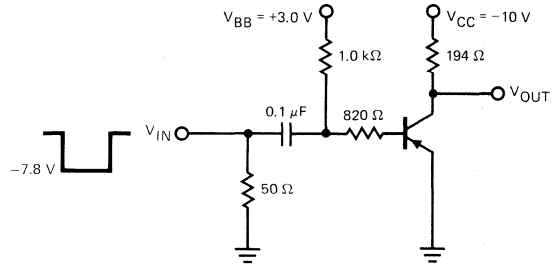
388



DC = 2%

Q_T

407

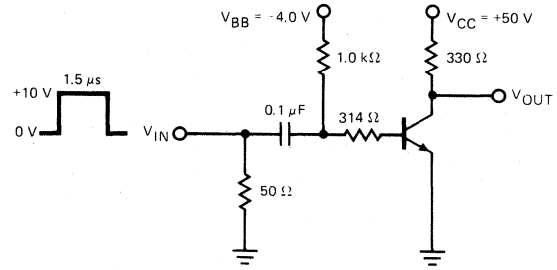


PW = 500 ns
t_r AND t_f = 1.0 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
t_r < 1.0 ns
Z_{IN} = 100 kΩ

SWITCHING TIME

417



PULSE SOURCE
$t_r \leq 5.0$ ns
$t_f \leq 10$ ns

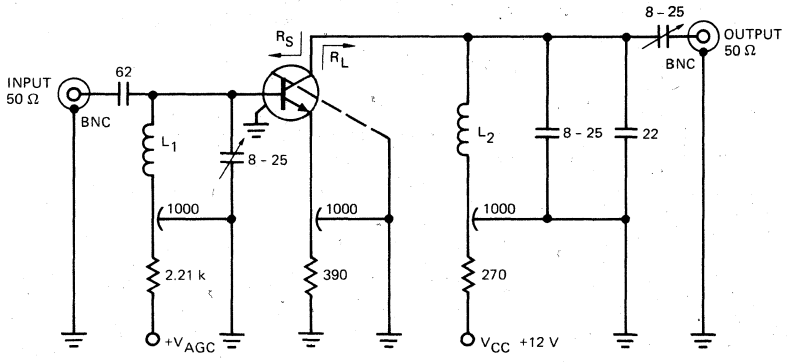
TO OSCILLOSCOPE
$t_r \leq 1.0$ ns
$Z_{IN} \approx 100$ kΩ

t_{on} − t_{off} SWITCHING

6

TEST CIRCUITS

422



L_1 – 7 TURNS NO. 16 BUSS WIRE
5/8" L X 5/16" I.D.

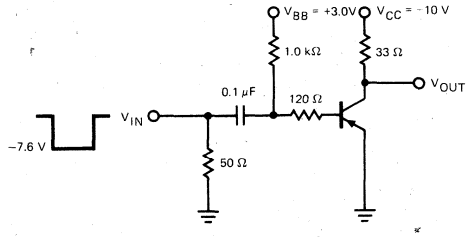
L_2 – 4 TURNS NO. 16 BUSS WIRE
1/2" L X 1/2" I.D.

ALL CAPACITIES IN pF.
ALL RESISTANCE IN Ω, 1/2 W, 1% TOL.

ERIE TUNEABLES P/N N300
ERIE FEEDTHRU P/N 370CB102J
R_g = 120 Ω
R_L = 750 Ω

45 MHz GAIN, NOISE FIGURE, AGC

470

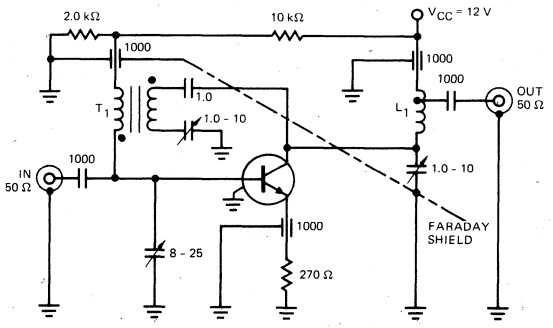


t_r, t_f ⩽ 1.0 ns
PW = 240 ns
DC ⩽ 2%
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
t_r ⩽ 1.0 ns
Z_{IN} = 10 mΩ

t_{on} - t_{off} SWITCHING

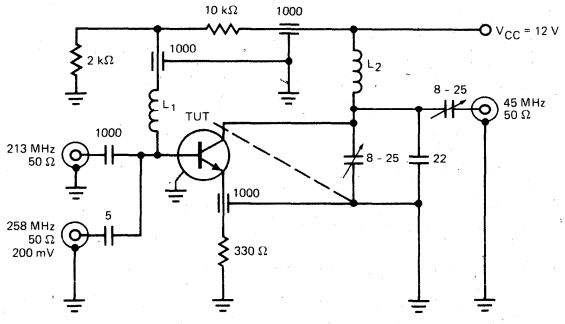
520



L_1 = 5T #14 WIRE, 5/16" I.D. X 1" L, TAPPED UP 1 TURN
TI = P-IT #18 FORMVAR
S-IT #14 WIRE INDIANA GENERAL
P/N F-684-Q3
f_{bw} ≃ 10.0 MHz
ALL CAPACITIES IN pF

200 MHz POWER GAIN FIXTURE

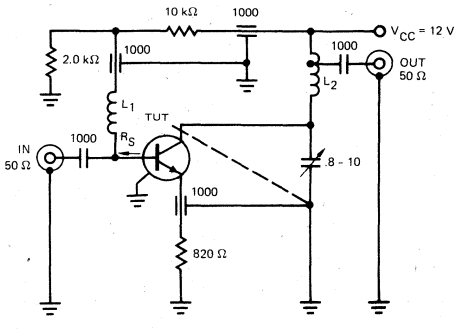
520-45



L_1 = OHMITE Z235 RF CHOKE
L_2 = 4T #14 WIRE, ½" I.D., ½" L
f_{bw} = > 6.0 MHz
ALL CAPACITIES IN pF

45 MHz CONVERSION GAIN

520-200

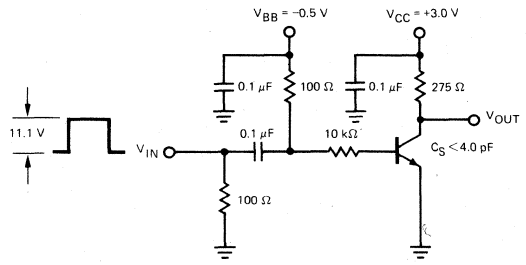


L_1 = OHMITE Z235 RF CHOKE
L_2 = 5T #14 WIRE, 5/16" I.D. X 1" L, TAPPED UP 1 TURN
f_{bw} ≃ 6.0 MHz
R_S = 75 Ω
ALL CAPACITIES IN pF

200 MHz G_{PE}, NOISE FIGURE

TEST CIRCUITS

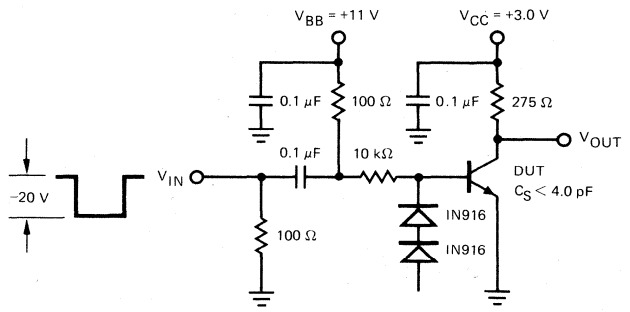
526



t_r = < 1.0 ns
PW ⩾ 300 ns
DC = 2%

t_{on} SWITCHING

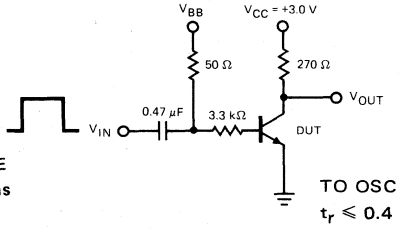
527



t_r = < 9.0 ns
PW ⩾ 300 ns
DC = 2%

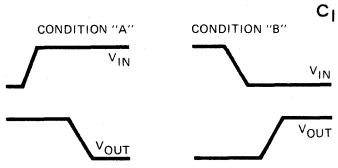
t_{off} SWITCHING

531



INPUT PULSE
$t_r = t_f \leqslant 2.0$ ns
PW ≈ 300 ns
Z_{IN} = 50 Ω
DC ≈ 2%

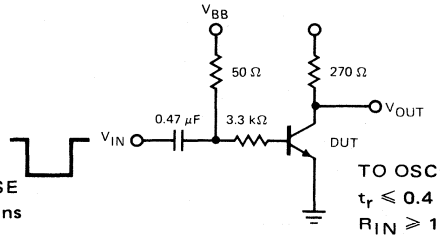
TO OSCILLOSCOPE
$t_r \leqslant 0.4$ ns
$R_{IN} \geqslant 100$ kΩ
$C_{IN} \leqslant 4.0$ pF



CONDITION "A" = t_d, t_r, t_{on} 10/3 mA
V_{BB} = −1.5 V V_{IN} = +12.05 V
CONDITION "B" = t_s, t_f, t_{off} 10/3/1.5 mA
V_{BB} = −4.15 V V_{IN} = +14.85 V
CONDITION "C" = t_s, t_f, t_{off} 10/3/ 3 mA
V_{BB} = −9.1 V V_{IN} = +19.8 V

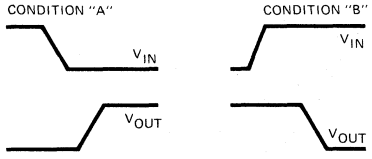
t_{on} - t_{off} SWITCHING

532



INPUT PULSE
$t_r = t_f \leqslant 2.0$ ns
PW ≈ 300 ns
Z_{IN} = 50 Ω
DC ≈ 2%

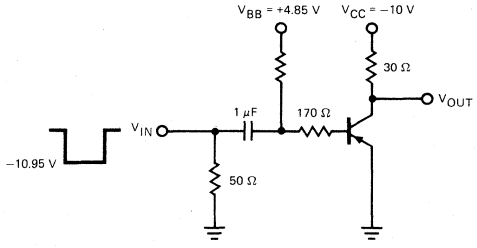
TO OSCILLOSCOPE
$t_r \leqslant 0.4$ ns
$R_{IN} \geqslant 100$ kΩ
$C_{IN} \leqslant 4.0$ pF



CONDITION "A" = t_d, t_r, t_{on}
V_{BB} = +1.5 V V_{IN} = −12.05 V
CONDITION "B" = t_s, t_f, t_{off}
V_{BB} = +9.1 V V_{IN} = −19.8 V

t_{on} - t_{off} SWITCHING

536



INPUT PULSE
t_r, t_f < 6.0 ns
Z_{IN} = 50 Ω
PW = 0.5 μs

300/30/30 mA

BASE CURRENTS WILL BE EXACT WHEN THE ABOVE VOLTAGES ARE USED. THESE VOLTAGES TAKE THE TERMINATING RESISTOR AND GENERATOR IMPEDANCE INTO ACCOUNT WHEN THE CURRENTS ARE CALCULATED. $V_{BE\ (sat)}$ IS A NOMINAL 1.0 V.

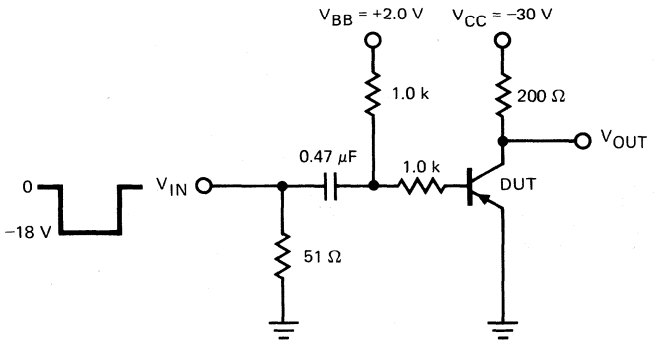
TO OSCILLOSCOPE
t_r < 1.0 ns
$Z_{IN} \geqslant 100$ kΩ

t_{on} - t_{off} SWITCHING

6

TEST CIRCUITS

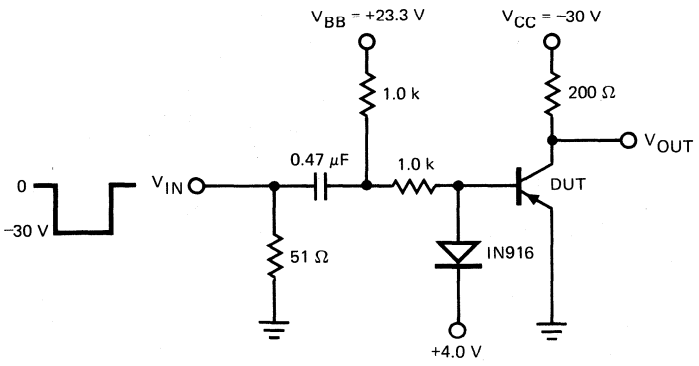
557



$t_r < 2.0$ ns
PW = 1.0 μs
DC = 2%

t_{on} SWITCHING

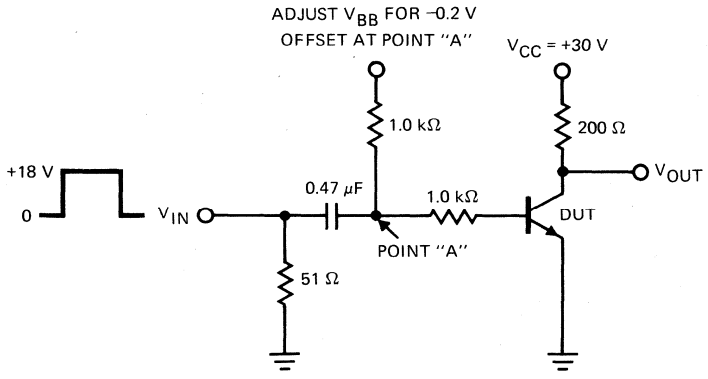
558



$t_r \leqslant 2.0$ ns
PW ⩾ 1.0 μs
DC = 2%

t_{off} SWITCHING

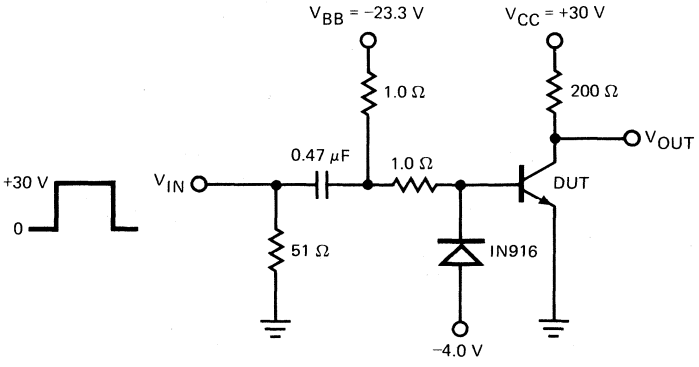
559



$t_r < 2.0$ ns
PW = 1.0 μs
DC = 2%

t_{on} SWITCHING

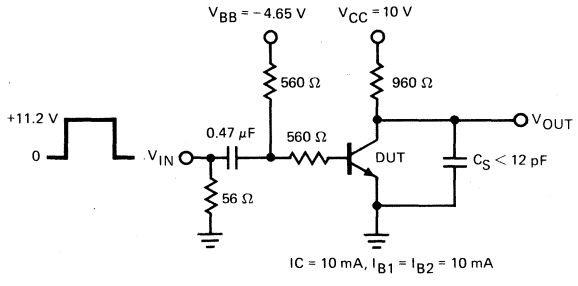
560



$t_r \leqslant 2.0$ ns
PW = 1.0 μs
DC = 2%

t_{off} SWITCHING

561



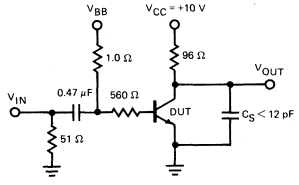
PW = 300 ns
$t_r < 2.0$ ns
DC ≈ 2%
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
$t_r < 0.4$ ns
R_{IN} ⩾ 100 kΩ

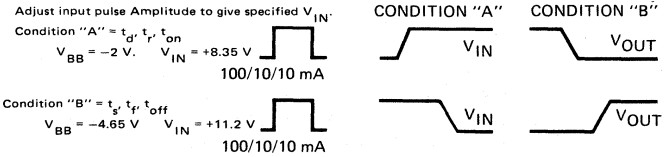
I_C = 10 mA, I_{B1} = I_{B2} = 10 mA
τ_s SWITCHING

562

INPUT PULSE
$t_f \leqslant 2.0$ ns
$t_r < 2.0$ ns
PW = 300 ns
DC ≈ 2%
Z_{IN} = 50 Ω



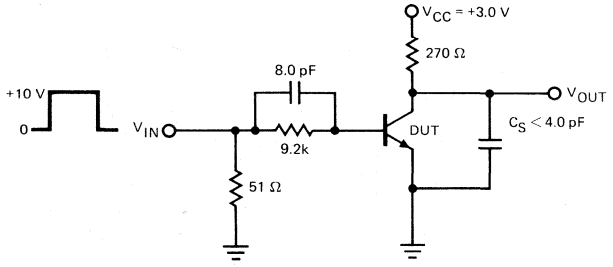
TO OSCILLOSCOPE
$t_r < 1.0$ ns
R_{IN} ⩾ 100 kΩ



t_{on} – t_{off} SWITCHING

TEST CIRCUITS

563



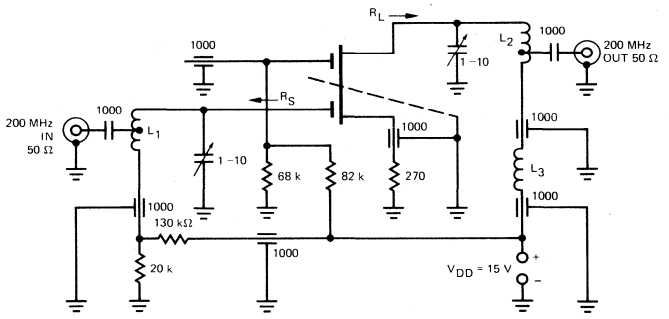
I_C = 10 mA, I_B = 1.0 mA

PW = 5 μs
DC = 2%
t_f < 1.0 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
t_r < 1.0 ns
R_{IN} ⩾ 100 kΩ

Q_t

564



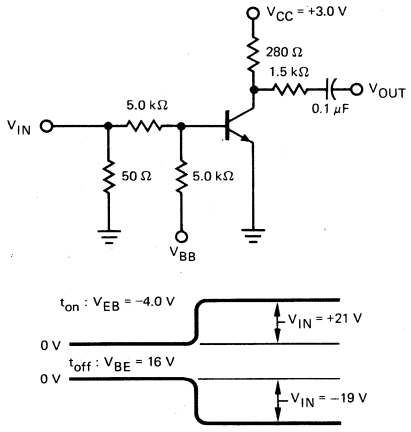
R_S = 500 Ω
R_L = 1.5 k

ALL CAPACITANCE IN pF.
ALL RESISTANCE IN Ω

f_{bw} ⩾ 12 MHz
L_1 = 2½ T #14 WIRE, TAPPED 1 T FROM COLD SIDE ½" L
L_2 = 4½ T #14 WIRE, TAPPED 1 T FROM COLD SIDE ¼" I.D.
L_3 = RFC, OHMITE Z-235 OR EQUIVALENT

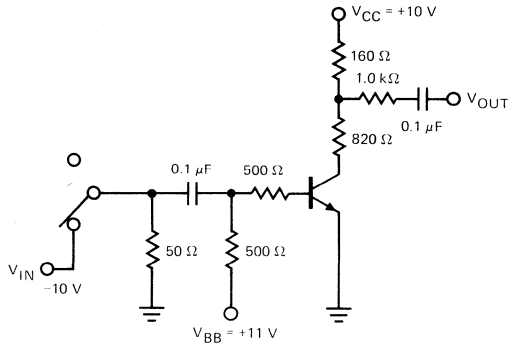
POWER GAIN, NOISE FIGURE 200 MHz

566



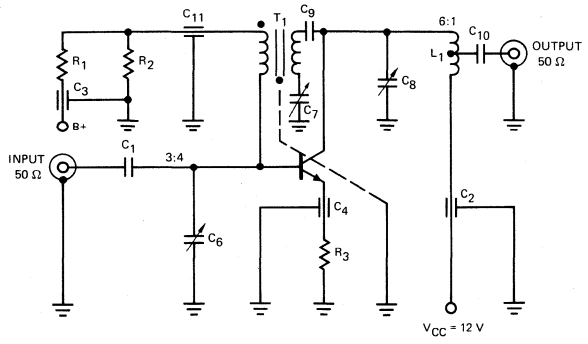
t_{on} – t_{off} SWITCHING

567



CHARGE STORAGE TIME

573



C_1, C_{10} = 1000 pF DURAMICA
C_2, C_3, C_4, C_5, C_{11} = 1000 pF FEEDTHRU
C_6 = 8 – 25 pF
C_7, C_8 = 0.7 – 10 pF
C_9 = 2.0 pF DURAMICA

R_1 = 10 kΩ
R_2 = 2.0 kΩ
R_3 = 270 Ω
L_1 = 5 TURNS #14 WIRE, 5/16" I.D. X 1" LONG

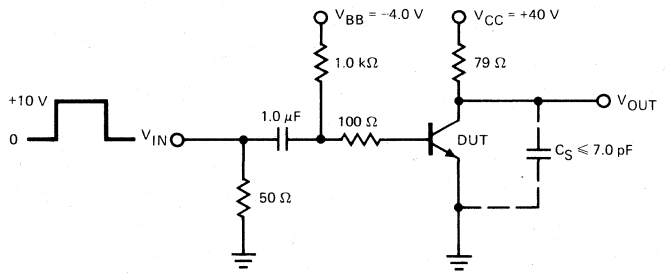
T_1 = 1 TURN #14 WIRE– PRIMARY
1 TURN #16 WIRE ENAMEL, SECONDARY. WOUND ON BALUN FORM FERRITE CORE INDIANA GEN. CORP. F-684-Q3

200 MHz POWER GAIN

6

TEST CIRCUITS

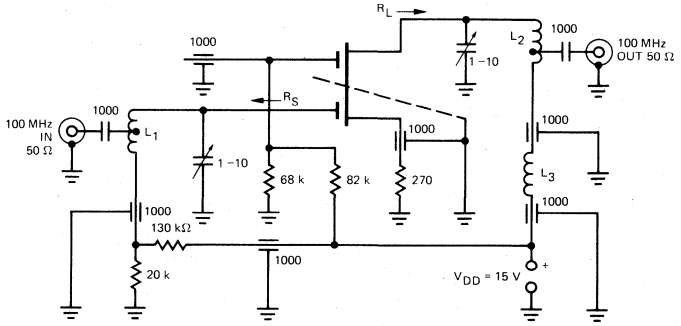
579



$t_r \leqslant 2.0$ ns
PW = 1.0 μs
DC = 2%

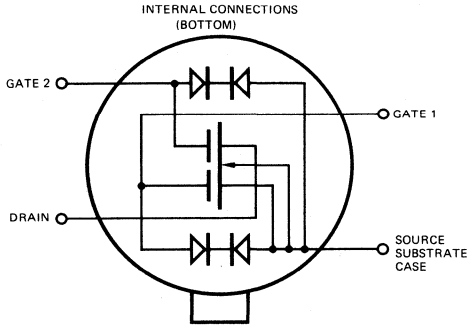
t_{on} - t_{off} SWITCHING

580



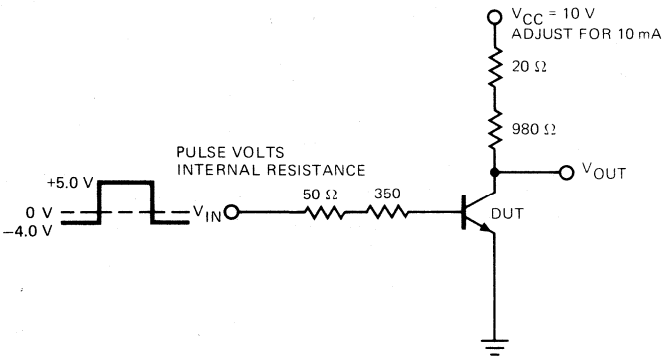
R_S = 1.0 kΩ
R_L = 2.0 kΩ
ALL CAPACITANCE IN pF.
ALL RESISTANCE IN Ω

L_1 = 3½ T #14 WIRE, TAPPED 1 T FROM COLD SIDE ½" L
L_2 = 6½ T #14 WIRE, TAPPED 1 T FROM COLD SIDE ¾" I.D.
L_3 = RFC, OHMITE Z-144 OR EQUIVALENT



POWER GAIN, NOISE FIGURE 100 MHz

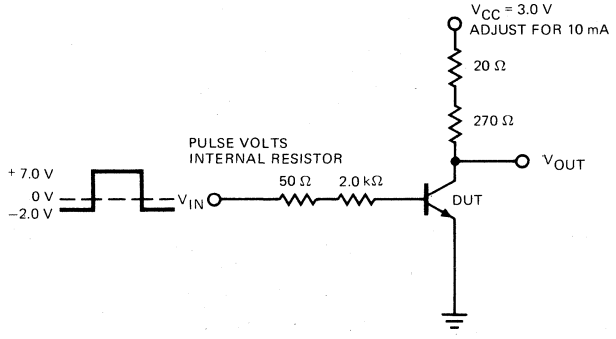
588



TYPE R SAMPLING RESISTOR
I_C = 10 mA, I_{B1} = I_{B2} = 10 mA

τ_s SWITCHING

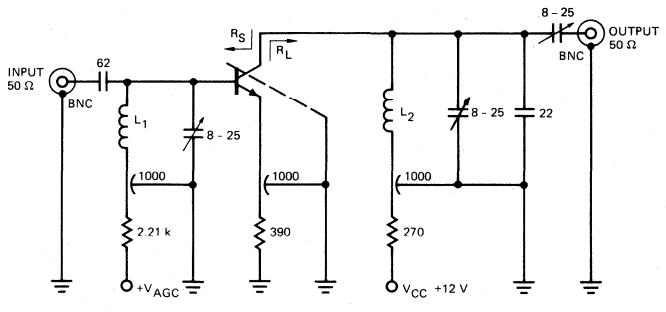
589



TYPE R SAMPLING RESISTOR
I_C = 10 mA, I_{B1} = 3.0 mA, I_{B2} = 1.5 mA

t_{on} – t_{off} SWITCHING

592



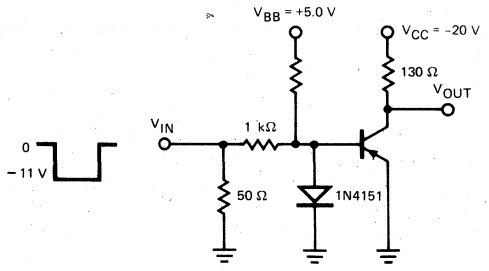
L_1 – 7 TURNS NO. 16 BUSS WIRE
5/8" L X 5/16" I.D.
L_2 – 4 TURNS NO. 16 BUSS WIRE
½" L X ½" I.D.
ALL RESISTANCE IN Ω, ½ W, 1% TOL.

ALL CAPACITIES IN pF
R_S = 120 Ω
R_L = 750 Ω

45 MHz GAIN, NOISE FIGURE

TEST CIRCUITS

593

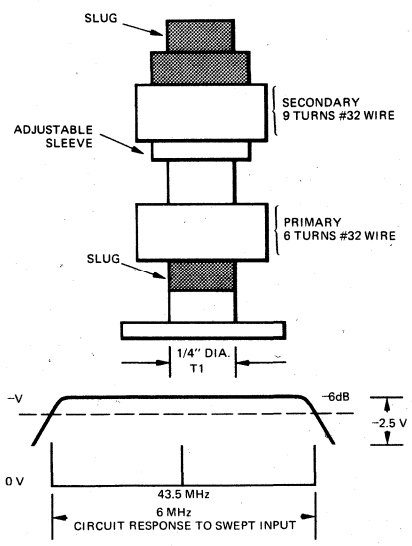


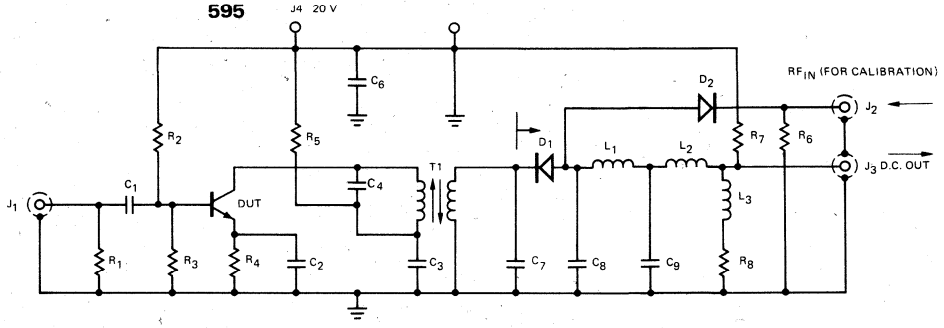
PW = 10 μs
$t_r = t_f \leq 15$ ns
$Z_{IN} = 50\Omega$

TO OSCILLOSCOPE
t_r = 15 ns
$Z_{IN} = 100\ k\Omega$

$t_{on} - t_{off}$ SWITCHING

595

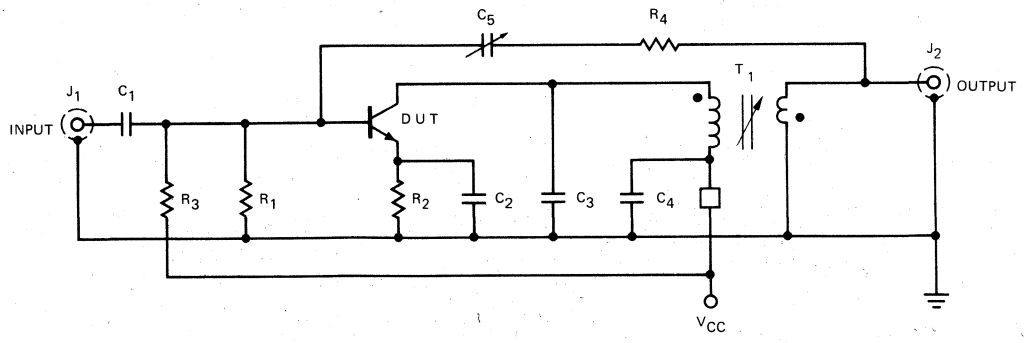




C_1	.002 μF	L_1	15 μH	COILCRAFT LPFS TYPE III	R_1	51 Ω	J_1	
C_2	.002 μF	L_2	5 μH	COILCRAFT LPFS TYPE III	R_2	7.5 kΩ	J_2	BNC PANELMOUNT
C_3	.002 μF	L_3	180 μH	COILCRAFT LPFS TYPE III	R_3	1.8 kΩ	J_3	
C_4	24 pF	D_1			R_4	390 Ω	J_4	BANANA JACK – RED
C_6	.002 μF	D_2	FH1100		R_5	100 Ω	J_5	BANANA JACK – BLACK
C_7	12 pF				R_6	51 Ω		
C_8	10 pF				R_7	180 kΩ		
C_9	10 pF				R_8	3.9 kΩ		

THIRD VIDEO IF VOLTAGE GAIN AND DISTORTION

596

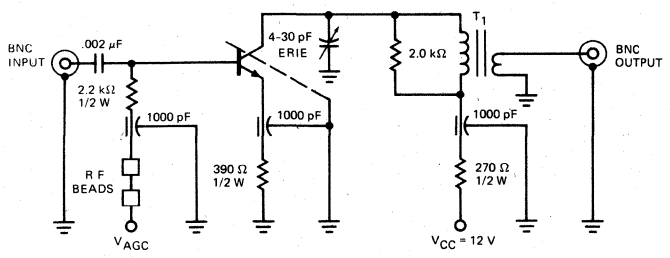


C_1	.01 μF	R_1	470 Ω, 1/4 W, 5%, CARBON	T_1	1/4" DIAMETER CERAMIC FORM. PRIMARY, 8 TURNS NO. 26 WIRE CLOSE WOUND. SECONDARY, 2 TURNS NO. 26 WIRE CLOSE WOUND IN CENTER OF PRIMARY. THE PRIMARY INDUCTANCE L_p = 0.4 TO 0.6 μH. CORE IS A WHITE DOT OR Q_3 FERRITE. SECONDARY IS INTERLACED WITH PRIMARY WINDING.
C_2	.01 μF	R_2	220 Ω, 1/4 W, 5%, CARBON		
C_3	27 pF (DURA MICA)	R_3	1.5 kΩ, 1/4 W, 5%, CARBON		
C_4	.02 μF	R_4	30 Ω, 1/4 W, 5%, CARBON		
C_5	0.7 TO 10 pF (JOHANSON – JMC 2951) VARIABLE CAPACITOR	J_1	BNC PANEL MOUNT CONNECTORS		
		J_2	BNC PANEL MOUNT CONNECTORS		

THIRD VIDEO IF POWER GAIN

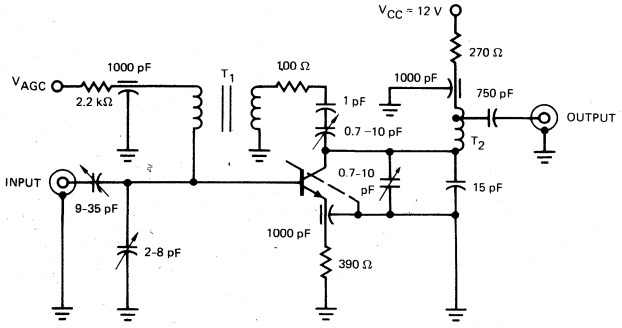
TEST CIRCUITS

2003



45 MHz AGC AND NOISE FIGURE

2009

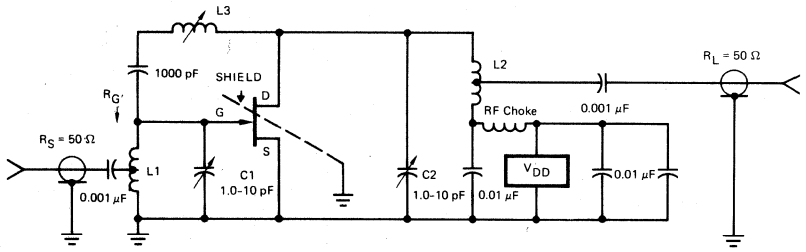


T_1 - BALLUN CORE
1T-PRI, 1T-SEC
#32 BIFILAR WIRE

T_2 - 1/4" I.D.
5-1/2T, TAPPED UP 1/2T
#16 BUSS WIRE

100 MHz AGC, POWER GAIN, AND NOISE FIGURE

2010



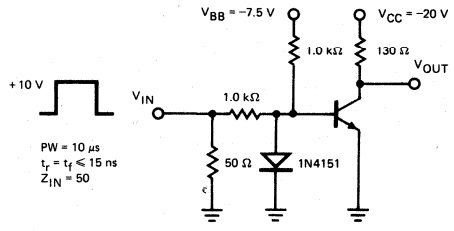
L_1 ≈ 8.5 TURNS OF #14 AWG TINNED COPPER, DIA. ≈ 3/8", ≈ 0.9" LONG. TAPPED AT ≈ 2-1/2 TURNS (ADJUST TO GIVE R_G ≈ 1.0 kΩ). PARALLEL RESISTANCE ≈ 40 kΩ, TUNES AT ≈ 8.0 pF.

L_2 ≈ 13.5 TURNS #16 AWG TINNED COPPER, DIA. ≈ 3/8", ≈ 1.2" LONG TAPPED AT ≈ 5 TURNS, PARALLEL RESISTANCE ≈ 40 kΩ. TUNES AT ≈ 4.0 pF

L_3 ≈ 17 TURNS OF #28 AWG ENAMELED COPPER WIRE, CLOSE WOUND ON 9/32" CERAMIC FORM, TUNING PROVIDED BY A POWERED IRON SLUG.

100 MHz, POWER GAIN AND NOISE FIGURE

2011

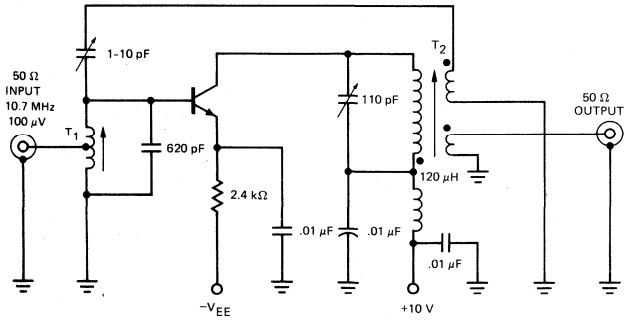


PW = 10 μs
$t_r = t_f \leq 15$ ns
Z_{IN} = 50Ω

$t_{on} - t_{off}$ SWITCHING

TO OSCILLOSCOPE
t_r = 15 ns
Z_{IN} = 100 kΩ

2012



ADJUST FOR 7.0 mA I_C

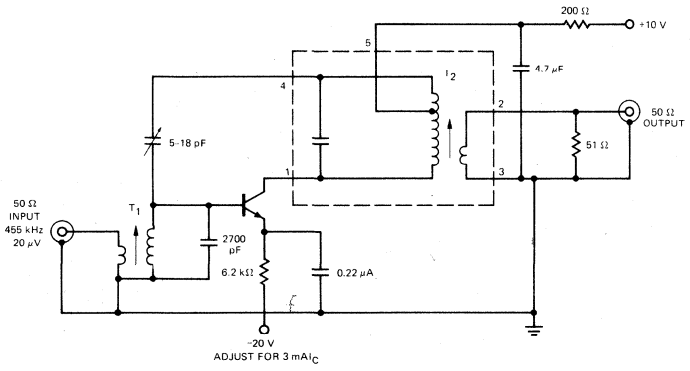
T_1 MILLER COIL FORM
MILLER CORE NO. 30-106
4 TURNS NO. 28 ENAMELED WIRE TAPPED 1.5 TURNS FROM GND.

T_2 MILLER COIL FORM
MILLER CORE NO. 30-106
PRIMERY . . . 10 TURNS NO. 36 ENAMELED WIRE.
NEUT. SEC . . . 5 TURNS NO. 36 ENAMELED WIRE (BIFILAR).
OUTPUT SEC . . . 1.33 TURNS NO. 28 ENAMELED WIRE (OVERWIND).

10.7 MHz NEUTRALIZED POWER GAIN

TEST CIRCUITS

2013



T_1 13 T PRIMARY NO. 26 NYCLAD
54 T SECONDARY NO. 36 NYCLAD MILLER NO. 30-106 CORE
.043 mH

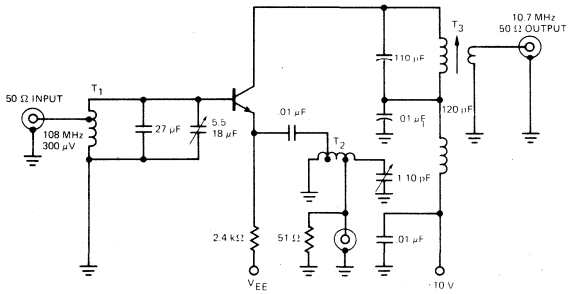
T_2 MILLER MIN. IF TRANSFORMER NO. 2032.

TYPICAL GAIN = 55 dB

I_C = 3.0 mA V_{CE} = 10 V

455 kHz NEUTRALIZED AM IF AMPLIFIER

2014



T_1 2.5 TURNS NO. 16 TINNED COPPER WIRE TAPPED 2 TURNS FROM GND. COIL DIA. 3/8" (INSIDE DIA.).

T_2 4 TURNS NO. 16 TINNED COPPER WIRE TAPPED 3/4 TURN FROM GND. AND 1-1/4 TURNS FROM GND. COIL DIA. 1/4" (INSIDE DIA.)

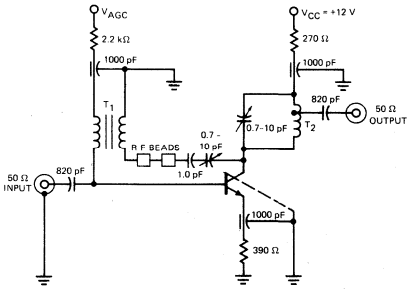
T_3 MILLER COIL FORM
MILLER CORE NO. 30-106
PRIMERY . . . 10 TURNS NO. 36 ENAMELED WIRE.
SECONDARY . . . 1-1/3 TURNS NO. 28 ENAMELED WIRE.

TYPICAL CONVERSION GAIN = 20 dB

I_C = 7.0 mA V_{CE} = 10 V

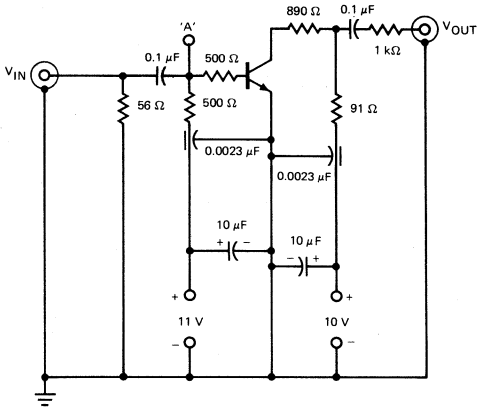
108 MHz TO 10.7 MHz CONVERSION GAIN

2015

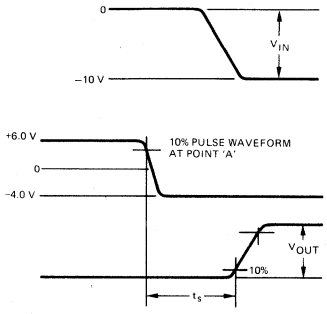


200MHz AGC, POWER GAIN AND NOISE FIGURE TEST

3111

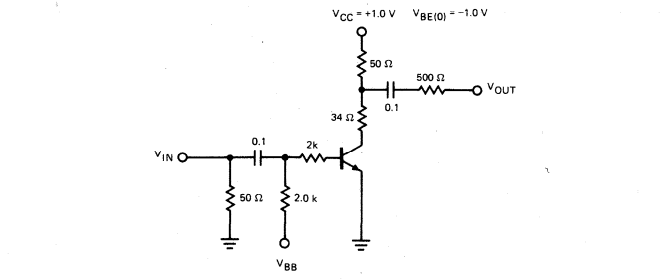


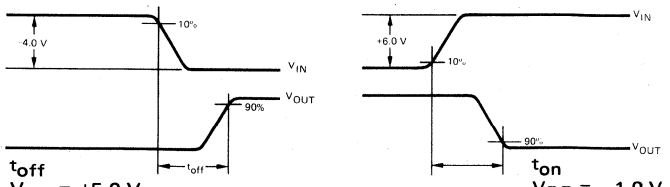
CHARGE STORAGE TIME



TO OSCILLOSCOPE
Z_{IN} = 50 Ω
$t_r \leq$ 1.0 ns
PULSE GENERATOR
V_{IN} t_r < 1.0 ns
SOURCE IMPEDANCE = 50 Ω
PW ⩾ 300 ns
DC < 2.0%

3161





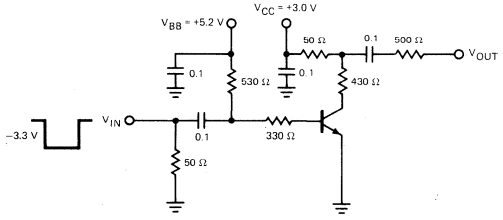
t_{off}
V_{BB} = +5.0 V
V_{IN} = −4.0 V

V_{IN} $t_r \leq$ 1.0 ns

t_{on} - t_{off} SWITCHING

t_{on}
V_{BB} = −1.0 V
V_{IN} = +6.0 V

3162



MERCURY TYPE PULSER
t_r < 1.0 ns
Z_{OUT} = 50 Ω
PW ⩾ 200 ns

TO OSCILLOSCOPE
t_r = 0.4 ns
Z_{IN} = 50 Ω

CHARGE STORAGE TIME

DISCRETE PRODUCTS

CONTENTS AND SECTION SELECTOR

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CURVES	5
TEST CIRCUITRY	6
PACKAGE OUTLINES AND ORDER INFORMATION	7
FAIRCHILD TO92 THERMAL CONSIDERATIONS	8
DICE INFORMATION	9

INTRODUCTION

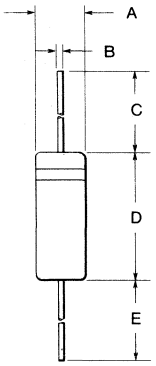
PACKAGE OUTLINES AND ORDER INFORMATION

This section contains package outlines with dimensions given in inches and millimeters. Also included are the standard lead bends for packages commonly requiring lead forming. Designers will save money and delivery time if they purchase units with standard bends.

The final page of this section contains information for ordering Fairchild devices.

PHYSICAL DIMENSIONS

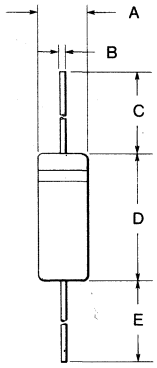
DO7-1 in accordance with JEDEC (DO-7) outline
Glass Diode



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A			0.105			2.67
B		0.02			0.508	
C	1.0			25.40		
D	0.230		0.300	5.84		7.62
E	1.0			25.40		

NOTES: See table for dimensions in inches and millimeters
.020 diameter dumet leads, tinned or gold-plated
Hermetically sealed glass
Package weight is 0.25 grams

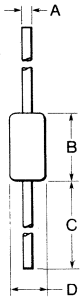
DO7-2 in accordance with JEDEC (DO-7) outline
Glass Diode



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A			0.105			2.67
B		0.02			0.508	
C	1.0			25.40		
D			0.300			7.62
E	1.0			25.40		

NOTES: See table for dimensions in inches amd millimeters
.020 diameter dumet leads, tinned or gold-plated
Hermetically sealed glass
Package weight is 0.25 grams

DO34-1 in accordance with JEDEC (DO-34) outline
FDN Glass Nanodiode

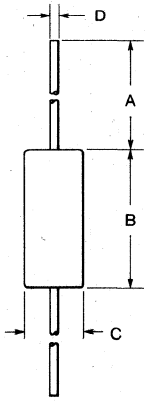


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A		.02			.508	
B			.120			3.05
C	1.0			25.40		
D			.065			1.65

NOTES: See table for dimensions in inches and millimeters
.020 diameter dumet leads, tinned or gold-plated
Hermetically sealed glass
Package weight is 0.12 grams

PHYSICAL DIMENSIONS

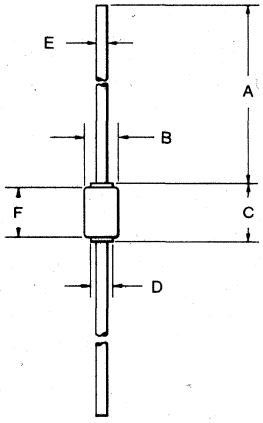
DO35-1 in accordance with JEDEC (DO-35) outline
FDH Glass Microdiode



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	1.0			25.40		
B			.180			4.57
C			.075			1.91
D		.020			0.508	

NOTES: See table for dimensions in inches and millimeters
.020 diameter dumet leads, tinned or gold-plated
Hermetically sealed glass
Package weight is 0.14 grams

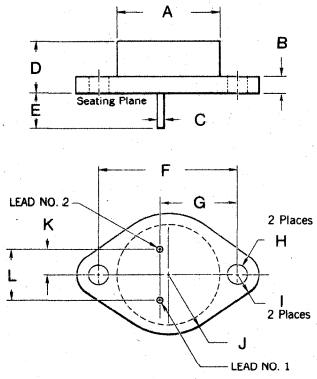
DO41-1 in accordance with JEDEC (DO-41) outline



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	1.10		1.20	27.9		30.5
B	.090		.100	2.29		2.54
C	.165		.175	4.19		4.45
D	.055		.057	1.40		1.45
E	.029		.031	.737		.787
F	.145		.155	3.68		3.94

NOTES: See table for dimensions in inches and millimeters
Dumet leads, tinned or gold-plated
Hermetically sealed glass
Package weight is 0.14 grams

TO3-1 in accordance with JEDEC (TO-3) outline

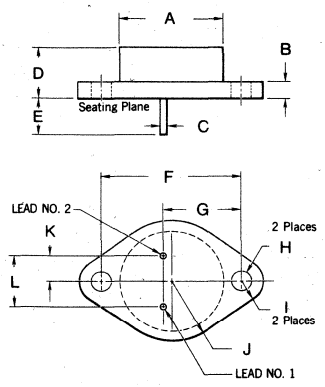


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.805		.835	20.45		31.21
B			.135			3.43
C	.038		.048	0.965		1.12
D	.205		.225	5.20		5.71
E	.312			7.92		
F	1.177		1.197	29.90		30.40
G	.655		.675	16.64		17.15
H	.151		.161	3.79		3.84
I			.188			4.78
J			.525			13.34
K	.205		.225	5.20		5.71
L	.420		.440	9.67		10.08

NOTES: See table for dimensions in inches and millimeters
Leads 1 and 2 electrically isolated from case
Case is third electrical connection
Leads are gold-plated copper cored kovar
Aluminum package with copper slug
Package weight is 7.4 grams

PHYSICAL DIMENSIONS

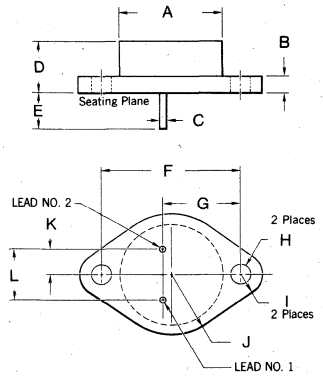
TO3-2 in accordance with JEDEC (TO-3) outline



DIM.	INCHES MIN.	TYP.	MAX.	MILLIMETERS MIN.	TYP.	MAX.
A	.870		.880	22.10		22.35
B			.135			3.43
C	.038		.043	0.965		1.09
D	.250		.325	6.35		8.26
E	.312			7.92		
F	1.177		1.197	29.90		30.40
G	.655		.675	16.64		17.15
H	.151		.161	3.79		3.84
I			.188			4.78
J			.525			13.34
K	.205		.225	5.20		5.71
L	.420		.440	9.67		10.08

NOTES: See table for dimensions in inches and millimeters
Leads 1 and 2 electrically isolated from case
Case is third electrical connection
Copper base with soldered in pins
Leads are nickel alloy
Aluminum cap
Package weight is 17.9 grams

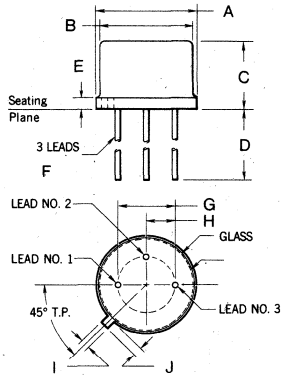
TO3-3 in accordance with JEDEC (TO-3) outline



DIM.	INCHES MIN.	TYP.	MAX.	MILLIMETERS MIN.	TYP.	MAX.
A			.875			22.23
B			.135			3.43
C	.038		.043	0.965		1.09
D	.250		.450	6.35		11.43
E	.312			7.92		
F	1.177		1.197	29.90		30.40
G	.655		.675	16.64		17.15
H	.151		.161	3.79		3.84
I			.188			4.78
J			.525			13.34
K	.205		.225	5.20		5.71
L	.420		.440	9.67		10.08

NOTES: See table for dimensions in inches and millimeters
Leads 1 and 2 electrically isolated from case
Case is third electrical connection
Leads are nickel alloy
Copper base with 400 mil diameter moly disc, soldered in pins
Package weight is 18.0 grams

TO5-1 in accordance with JEDEC (TO-39) outline (15 mil kovar header)

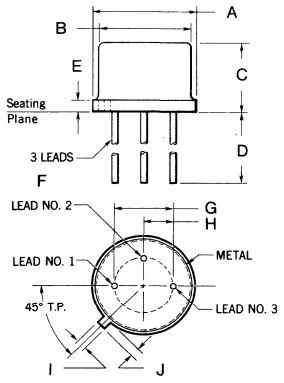


DIM.	INCHES MIN.	TYP.	MAX.	MILLIMETERS MIN.	TYP.	MAX.
A	.350		.370	8.51		9.39
B	.315		.335	8.00		8.51
C	.240		.260	6.10		6.60
D	.500			12.70		
E			.030			0.762
F	.016		.019	0.406		0.483
G		.200			5.08	
H		.100			2.54	
I	.028		.034	0.711		0.864
J	.029		.040	0.737		1.02

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
Lead No. 3 connected to case
Package weight is 1.11 grams

PHYSICAL DIMENSIONS

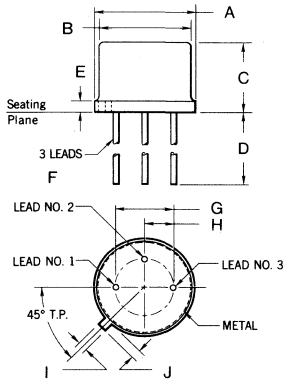
TO5-2 in accordance with JEDEC (TO-39) outline



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.350		.370	8.51		9.39
B	.315		.335	8.00		8.51
C	.240		.260	6.10		6.60
D	.500			12.70		
E			.030			0.762
F	.016		.019	0.406		0.483
G		.200			5.08	
H		.100			2.54	
I	.028		.034	0.711		0.864
J	.029		.040	0.737		1.02

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated over nickel-flash on steel
Lead No. 3 connected to case
Low RTH
Package weight is 0.76 grams
This is a standard package and does not fall into the special classification

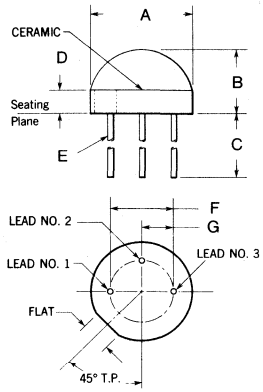
TO5-3 in accordance with JEDEC (TO-5) outline (60 mil steel header)



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.335		.370	8.51		9.39
B	.305		.335	7.75		8.51
C	.240		.260	6.10		6.60
D	.500			12.70		
E			.030			0.762
F	.016		.019	0.406		0.483
G		.200			5.08	
H		.100			2.54	
I	.028		.034	0.711		0.864
J	.029		.045	0.737		1.14

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
Lead No. 3 connected to case
Moly disc
High reliability, low thermal resistance
Package weight is 2.9 grams

TO5-4 in accordance with JEDEC (TO-105) outline Plastic Package

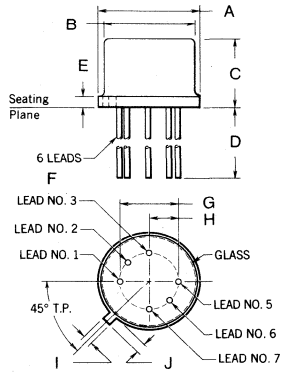


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.305		.325	7.75		8.25
B			.220			5.58
C	.500			12.70		
D		.080			2.032	
E	.016		.019	0.406		0.483
F		.200			5.08	
G		.100			2.54	
H		.080			2.032	

NOTES: See table for dimensions in inches and millimeters
Internal lead No. 3 length is H
Leads 1 and 2 are gold-plated nickel
Lead No. 3 is gold-plated kovar
Package weight is 0.5 grams

PHYSICAL DIMENSIONS

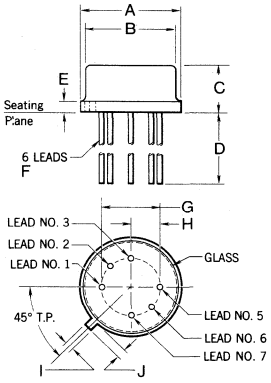
TO5-7 in accordance with JEDEC (TO-77) outline
(15 mil kovar header)
Adjacent Two Island Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.335		.370	8.51		9.39
B	.305		.335	7.75		8.51
C	.240		.260	6.10		6.60
D	.500			12.70		
E			.040			0.916
F	.016		.019	0.406		0.483
G		.200			5.08	
H		.100			2.54	
I	.028		.034	0.711		0.864
J	.029		.045	0.737		1.14

NOTES: See table for dimensions in inches and millimeters
Leads No. 4 and 8 are omitted
Lead No. 1 internally connected to one island,
Lead No. 7 internally connected to other island
Leads are gold-plated kovar
Kovar island thickness = 15 mils
Package weight is 1.23 grams

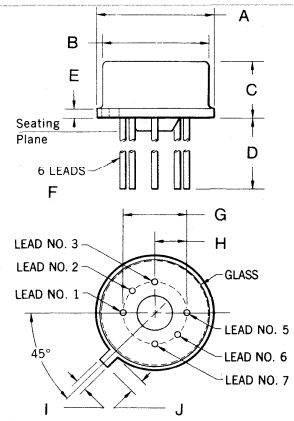
TO5-8 in accordance with JEDEC (TO-78) outline
(15 mil kovar header)
Adjacent Two Island Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.335		.370	8.51		9.39
B	.305		.335	7.75		8.51
C	.165		.185	4.19		4.69
D	.500			12.70		
E			.040			0.916
F	.016		.019	0.406		0.483
G		.200			5.08	
H		.100			2.54	
I	.028		.034	0.711		0.864
J	.029		.045	0.737		1.14

NOTES: See table for dimensions in inches and millimeters
Leads 4 and 8 omitted
Lead No. 1 internally connected to one island
Lead No. 2 internally connected to other island
Leads are gold-plated kovar
Kovar island thickness = 15 mils
Package weight is 1.08 grams

TO5-9 Similar* to JEDEC (TO-78) outline
(15 mil kovar header)
Adjacent Two Island Package

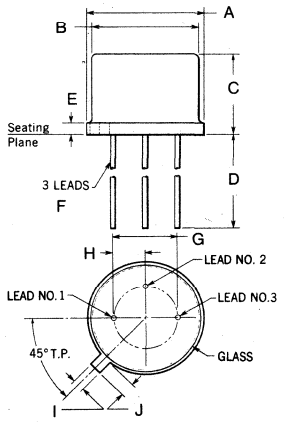


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.335		.370	8.51		9.39
B	.305		.335	7.75		8.51
C	.165		.260	4.19		6.60
D	.500			12.70		
E			.040			0.916
F	.016		.019	0.406		0.483
G		.200			5.08	
H		.100			2.54	
I	.028		.034	0.711		0.864
J	.029		.045	0.737		1.14

NOTES: See table for dimensions in inches and millimeters
Leads 4 and 8 are omitted
Lead No. 1 internally connected to one island
Lead No. 7 internally connected to other island
Leads are gold-plated kovar
Kovar island thickness = 15 mils
Package weight is 1.08 grams
*Dimensions similar to JEDEC TO-78 except for lead length

PHYSICAL DIMENSIONS

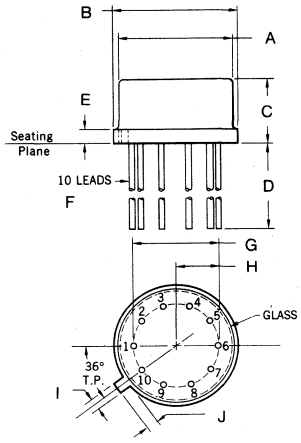
TO5-10 in accordance with JEDEC (TO-5) outline (15 mil kovar header)



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.335		.370	8.51		9.39
B	.305		.335	7.75		8.51
C	.240		.260	6.10		6.60
D	1.5			38.1		
E			.030			0.762
F	.016		.019	0.406		0.483
G		.200			5.08	
H		.100			2.54	
I	.028		.034	0.711		0.864
J	.029		.045	0.737		1.14

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
Lead No. 3 connected to case
Package weight is 1.11 grams

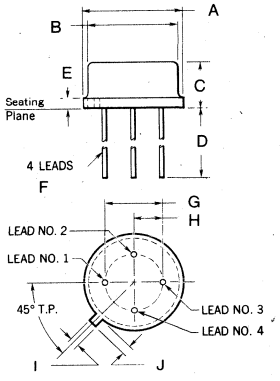
TO5-11 Similar* to JEDEC (TO-96) outline (15 mil kovar header)



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.335		.370	8.51		9.39
B	.305		.335	7.75		8.51
C	.165		.185	6.10		6.60
D	.500			12.70		
E			.040			0.916
F	.016		.019	0.406		0.483
G		.230			5.84	
H		.115			2.94	
I	.028		.034	0.711		0.864
J	.029		.045	0.737		1.14

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
No leads connected to case
*Dimensions similar to JEDEC TO-96 except for can height

TO5-12 Similar* to JEDEC (TO-33) outline

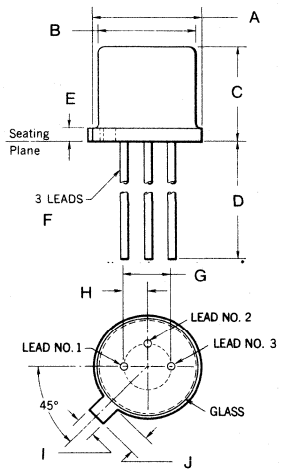


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.335		.370	8.51		9.39
B	.305		.335	7.75		8.51
C	.165		.185	4.19		4.69
D	0.5			12.70		
E			.040			1.02
F	.016		.019	0.406		0.483
G		.230			5.84	
H		.115			2.94	
I	.028		.034	0.711		0.864

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
Package weight is 1.22 grams
*Dimensions similar to JEDEC (TO-33) except for can height

PHYSICAL DIMENSIONS

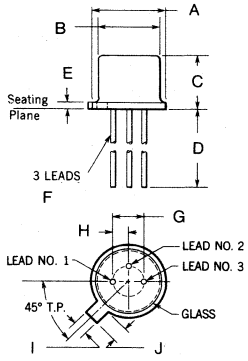
TO18-1 in accordance with JEDEC (TO-18) outline (8 mil kovar header)



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.209		.230	5.31		5.84
B	.178		.195	4.52		4.95
C	.170		.210	4.32		5.33
D	.500			12.70		
E			.030			0.762
F	.016		.019	0.406		0.483
G		.100			2.54	
H		.050			1.27	
I	.036		.046	0.914		1.17
J	.028		.048	0.711		1.22

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
Lead No. 3 connected to case
Package weight is 0.44 grams

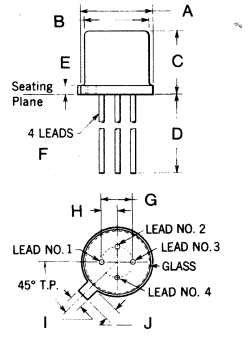
TO18-2 in accordance with JEDEC (TO-52) outline (8 mil kovar header)



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.209		.230	5.31		5.84
B	.178		.195	4.52		4.95
C	.115		.150	2.95		3.81
D	.500			12.70		
E			.030			0.762
F	.016		.019	0.406		0.483
G		.100			2.54	
H		.050			1.27	
I	.036		.046	0.914		1.17
J	.028		.048	0.711		1.22

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
Lead No. 3 connected to case
Package weight is 0.31 grams

TO18-3 in accordance with JEDEC (TO-72) outline (8 mil kovar header)

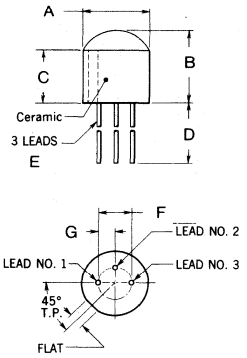


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.209		.230	5.31		5.84
B	.178		.195	4.52		4.95
C	.170		.210	4.32		5.33
D	.500			12.70		
E			.030			0.762
F	.016		.019	0.406		0.483
G		.100			2.54	
H		.050			1.27	
I	.036		.046	0.914		1.70
J	.028		.048	0.711		1.22

NOTES: See table for dimensions in inches and millimeters
Lead No. 4 connected to case
Leads are gold-plated kovar
Collector electrically isolated from case
Package weight is 0.36 grams

PHYSICAL DIMENSIONS

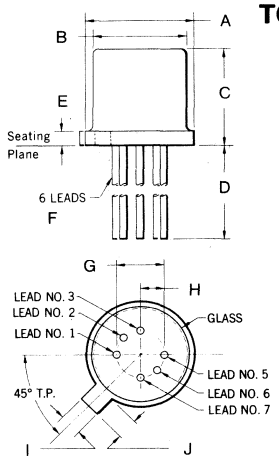
TO18-4 in accordance with JEDEC (TO-106) outline
Plastic Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.192		.222	4.88		5.64
B			.240			5.90
C	.100		.120	2.54		3.05
D	.500			12.40		
E	.016		.019	0.406		0.483
F		.100			2.54	
G		.050			1.27	

NOTES: See table for dimensions in inches and millimeters
Leads 4 and 8 omitted
Internal lead No. 3 length is 110 mils
Lead No. 3 club head length is 85 mils
Leads 1 and 2 are gold-plated nickel
Lead No. 3 is gold-plated copper alloy
Packaged weight is 0.31 grams

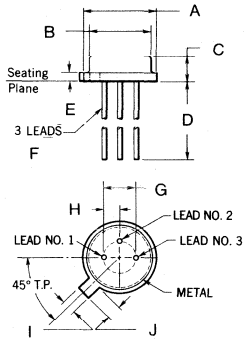
TO18-5 in accordance with JEDEC (TO-71) outline
(8 mil kovar header)
Opposed Two Island Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.209		.230	5.31		5.84
B	.178		.195	4.45		4.95
C	.170		.210	4.32		5.33
D	.500			12.70		
E			.030			0.762
F	.016		.019	0.406		0.483
G		.100			2.54	
H		.050			1.27	
I	.036		.046	0.914		1.17
J	.028		.048	0.711		1.22

NOTES: See table for dimensions in inches and millimeters
Lead No. 3 internally connected to one island
Lead No. 7 internally connected to other island
Leads are gold plated kovar
Kovar island thickness = 15 mils
Package weight is 0.60 grams

TO18-6 in accordance with JEDEC (TO-46) outline
(45 mil kovar header)

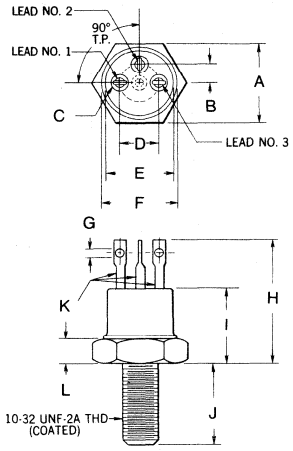


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.209		.230	5.31		5.84
B	.178		.195	4.52		4.94
C	.065		.085	1.65		2.16
D	.500			12.70		
E			.030			0.762
F	.012		.019	0.305		0.483
G		.100			2.54	
H		.050			1.27	
I	.036		.046	0.914		1.17
J	.028		.048	0.711		1.22

NOTES: See table for dimensions in inches and millimeters
Lead No. 3 connected to case
Leads are gold-plated kovar
Package weight is 0.35 grams

PHYSICAL DIMENSIONS

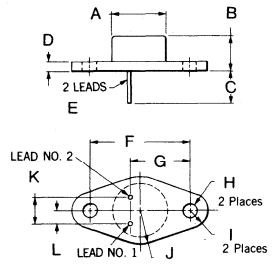
TO59-1 in accordance with JEDEC (TO-59) outline
Isolated Collector (Lead no. 3)



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.424		.437	10.77		11.10
B	.090		.110	2.29		2.79
C	.079		.105	2.01		2.67
D	.185		.215	4.70		5.46
E	.318		.380	8.08		9.65
F	.380		.437	9.65		11.10
G	.040		.065	1.02		1.65
H	.570		.763	14.48		19.38
I	.320		.468	8.13		11.89
J	.400		.455	10.16		10.56
K	.038		.065	.965		1.65
L	.090		.150	2.29		3.81

NOTES: See table for dimensions in inches and millimeters
Stud and header are gold-plated copper
Cap is gold-plated kovar
All leads electrically isolated from case by beryllia disc
Package weight is 5.45 grams

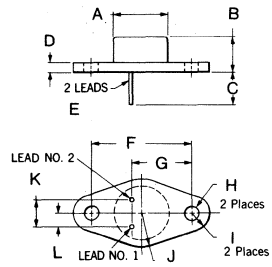
TO66-1 in accordance with JEDEC (TO-66) outline



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.470		.500	11.94		12.70
B	.250		.340	6.35		8.64
C	.360			9.14		
D	.050		.075	1.27		1.91
E	.028		.034	0.710		0.864
F	.958		.962	24.33		24.43
G	.570		.590	14.48		14.99
H	.142		.152	3.61		3.86
I			.145			3.68
J			.350			8.89
K	.190		.210	4.83		5.33
L	.093		.107	2.36		2.72

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
Leads 1 and 2 electrically isolated from case
Case is third electrical connection
Nickel-plated steel base and cap
Package weight is 6.5 grams

TO66-2 in accordance with JEDEC (TO-66) outline

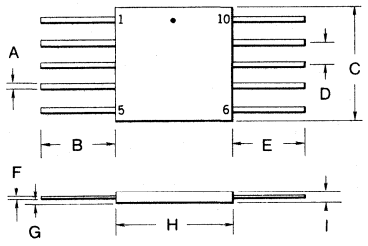


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.470		.500	11.94		12.70
B	.250		.340	6.35		8.64
C	.360			9.14		
D	.050		.075	1.27		1.91
E	.028		.034	0.710		0.864
F	.958		.962	24.33		24.43
G	.570		.590	14.48		14.99
H	.142		.152	3.61		3.86
I			.145			3.68
J			.350			8.89
K	.190		.210	4.83		5.33
L	.093		.107	2.36		2.72

NOTES: See table for dimensions in inches and millimeters
Leads are gold-plated kovar
Leads 1 and 2 electrically isolated from case
Case is third electrical connection
Nickel-plated steel base and cap
Package weight is 6.6 grams

PHYSICAL DIMENSIONS

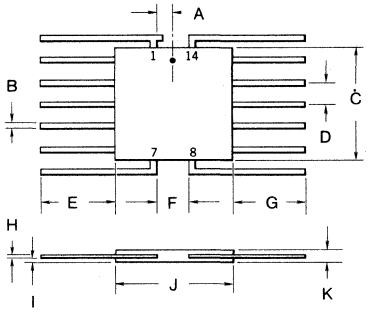
TO85-1 Similar* to JEDEC (TO-85) outline
10 Lead CERPAK



DIM.	INCHES			MILLIMETERS		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	.015		.019	.381		.483
B	.250		.370	6.35		9.39
C	.240		.260	6.10		6.60
D		.050			1.27	
E	.250		.370	6.35		9.39
F	.004		.006	.092		.152
G		.035			.889	
H	.240		.260	6.10		6.60
I	.067		.090	1.70		2.28

NOTES: See table for dimensions in inches and millimeters
Alternate marking of dot in upper left hand corner is also acceptable
Leads are gold-plated kovar
Package weight is 0.26 grams
*Dimensions similar to JEDEC TO-91 except for package thickness

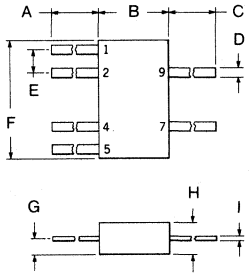
TO86-1 Similar* to JEDEC (TO-86) outline
14 Lead CERPAK



DIM.	INCHES			MILLIMETERS		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		.016			.406	
B	.015		.019	.381		.483
C	.240		.260	6.10		6.60
D		.050			1.27	
E	.250		.370	6.35		9.39
F	.045		.055	1.04		1.40
G	.250		.370	6.35		9.39
H	.004		.006	.092		.152
I		.035			.889	
J	.240		.260	6.10		6.60
K	.067		.090	1.70		2.28

NOTES: See table for dimensions in inches and millimeters
Alternate marking of dot in upper left hand corner is also acceptable
Leads are gold-plated kovar
Package weight is 0.26 grams
*Dimensions similar to JEDEC TO-86 except for package thickness

TO89-1 Similar* to JEDEC (TO-89) outline
Network Package

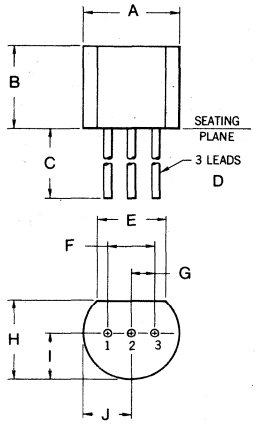


DIM.	INCHES			MILLIMETERS		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	.070			1.78		
B	.120		.150	3.05		3.81
C	.070			1.78		
D	.010		.019	.254		.482
E	.045		.055	1.04		1.40
F	.240		.290	6.10		7.36
G	.005		.035	.127		.889
H	.030		.070	.762		1.78
I	.003		.006	.076		.152

NOTES: See table for dimensions in inches and millimeters
Leads are nickel-gold-plated kovar
Base material is nickel-gold-plated kovar
4 mils in thickness. Chips are mounted on a 4 mil thick nickel-gold-plated kovar slab which is separated from the base material by a 10 to 12 mil alumina insulator
Package weight is 0.09 grams
*Dimensions similar to JEDEC TO-89 except package width

PHYSICAL DIMENSIONS

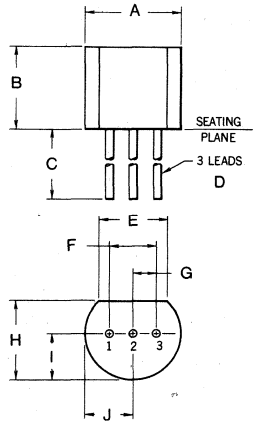
TO92-1 in accordance with JEDEC (TO-92) outline



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.175		.205	4.45		5.20
B	.170		.210	4.32		5.33
C	.500			12.70		
D	.016		.019	0.406		0.483
E	.135			.343		
F		.100			2.54	
G		.050			1.27	
H	.125		.165	3.18		4.19
I	.080		.105	2.03		2.67
J	.080		.105	2.03		2.67

NOTES: See table for dimensions in inches and millimeters
Leads are tin-plated copper
Package material is transfer molded thermosetting plastic
Package weight is 0.25 grams

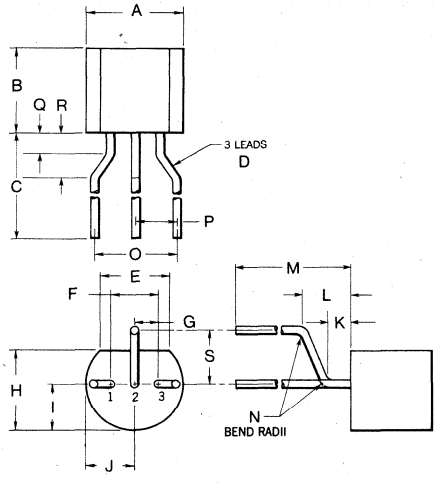
TO92-2 in accordance with JEDEC (TO-92) outline



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.175		.205	4.45		5.20
B	.170		.210	4.32		5.33
C	.500			12.70		
D	.016		.019	0.406		0.483
E	.135			.343		
F		.100			2.54	
G		.050			1.27	
H	.125		.165	3.18		4.19
I	.080		.105	2.03		2.67
J	.080		.105	2.03		2.67

NOTES: See table for dimensions in inches and millimeters
Leads are nickel-plated
Package material is transfer molded thermosetting plastic
Package weight is 0.25 grams

TO92-5 in accordance with JEDEC (TO-92) outline

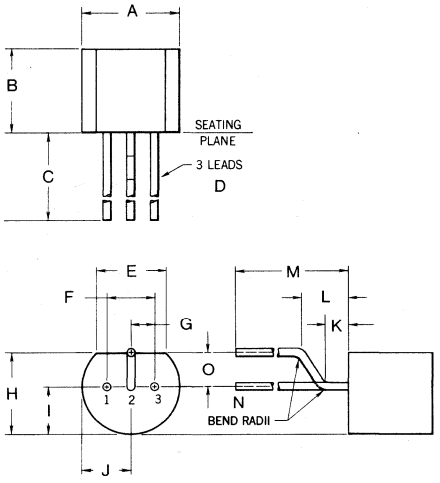


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.175		.205	4.45		5.20
B	.170		.210	4.32		5.33
C	.500			12.70		
D	.016		.019	0.406		0.483
E	.135			.343		
F		.100			2.54	
G		.050			1.27	
H	.125		.165	3.18		3.19
I	.080		.105	2.03		2.67
J	.080		.105	2.03		2.67
K		.030			.762	
L		.090			2.29	
M	.200		.750	5.08		19.1
N	.010			.254		
O		.200			5.08	
P		.100			2.54	
Q		.030			.762	
R		.040			2.29	
S		.100			2.54	

NOTES: See table for dimensions in inches and millimeters
Package material is transfer molded thermosetting plastic
Package weight is 0.25 grams

PHYSICAL DIMENSIONS

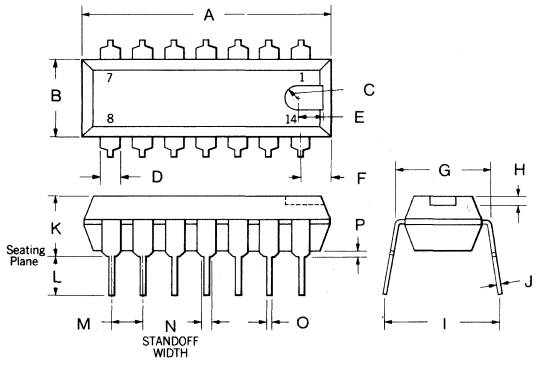
TO92-18 in accordance with JEDEC (TO-92) outline



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.175		.205	4.45		5.20
B	.170		.210	4.32		5.33
C	.500			12.70		
D	.016		.019	0.406		0.483
E	.135			.343		
F		.100			2.54	
G		.050			1.27	
H	.125		.165	3.18		4.19
I	.080		.105	2.03		2.67
J	.080		.105	2.03		2.67
K		.030			.762	
L		.090			2.29	
M	.200		.750	5.08		19.1
N	.010			2.54		
O		.050			1.25	

NOTES: See table for dimensions in inches and millimeters
Package material is transfer molded thermosetting plastic
Package weight is 0.25 grams

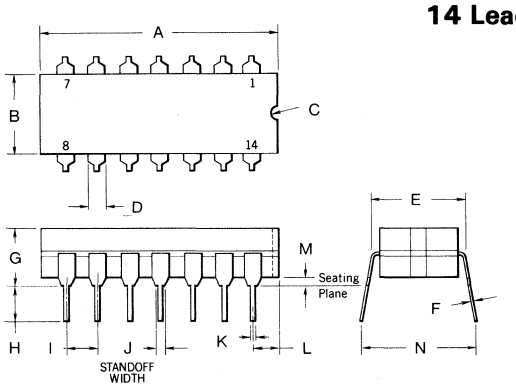
TO-116-1 in accordance with JEDEC (TO-116) outline
14 Lead Silicone Dual In-line



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.740		.760	18.96		19.30
B	.240		.260	6.10		6.60
C	.035		.045	.889		.104
D	.045		.065	1.04		1.65
E	.075		.085	1.91		2.16
F	.070		.080	1.78		2.03
G	.290		.310	7.37		7.87
H	.010		.020	.254		.508
I		.375			9.52	
J	.009		.011	.229		.279
K			.200			5.08
L	.100		.150	2.54		3.81
M	.090	.110		2.29	2.79	
N	.025		.037	.686		.940
O	.016		.020	.406		.508
P		.015			.381	

NOTES: See table for dimensions in inches and millimeters
Leads are intended for insertion in hole rows .300" centers
They are purposely shipped with a "positive" misalignment to facilitate insertion
Board drilling dimensions should equal your practice for a .030" diameter lead
Leads are tin-plated kovar
Package weight is 0.9 grams

TO116-2 in accordance with JEDEC (TO-116) outline
14 Lead SSI Dual In-line

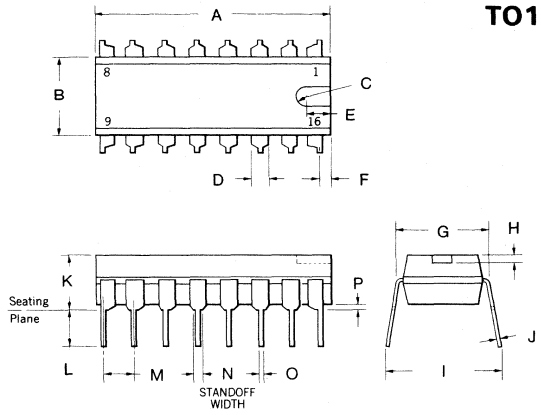


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.750		.785	19.05		19.94
B	.245		.271	6.12		6.88
C		.025			.635	
D	.045		.065	1.04		1.65
E	.290		.310	7.37		7.87
F	.009		.011	.229		.279
G			.200			5.08
H	.100		.165	2.54		4.19
I	.090	.110		2.29	2.79	
J	.027		.037	.686		.940
K	.016		.020	.406		.508
L	.065		.095	1.65		2.41
M	.015			.381		
N		.375			9.52	

NOTES: See table for dimensions in inches and millimeters
Leads are intended for insertion in hole rows on .300" centers
They are purposely shipped with "positive" misalignment to facilitate insertion
Board drilling dimensions should equal your practice for .020" diameter lead
Hermetically sealed alumina ceramic package
Leads are tin-plated kovar
Package weight is 2.0 grams

PHYSICAL DIMENSIONS

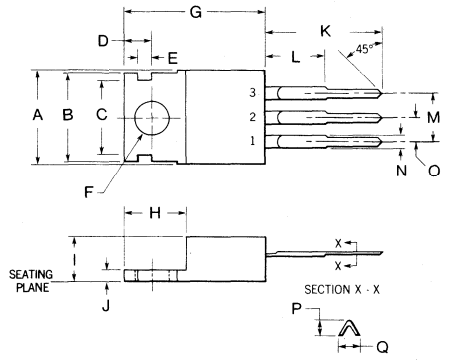
TO116-3 16 Lead DIP



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.740		.760	18.96		19.30
B	.240		.260	6.10		6.60
C	.035		.045	.889		.104
D	.045		.065	1.04		1.65
E	.075		.085	1.91		2.16
F		.025			.635	
G		.300			7.62	
H	.010		.020	.254		.508
I		.375			9.52	
J	.009		.011	.229		.279
K			.200			5.08
L	.100		.150	2.54		3.81
M	.090	.110		2.29	2.79	
N	.025		.037	.686		.940
O	.016		.020	.406		.508
P		.015			.381	

NOTES: See table for dimensions in inches and millimeters
Leads are intended for insertion in hole rows on .300" centers
They are purposely shipped with "positive" misalignment to facilitate insertion
Board drilling dimensions should equal your practice for a .020" diameter lead
Leads are tin-plated kovar
Package weight is 0.9 grams
*The .037/.027 dimension does not apply to the corner leads

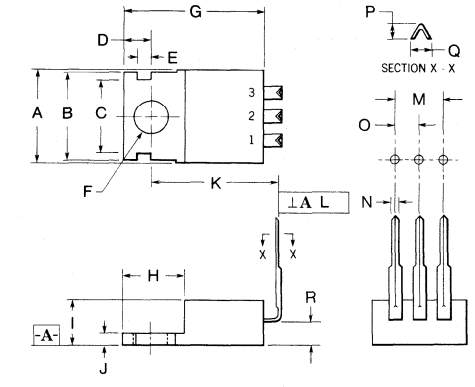
TO220-00 in accordance with JEDEC (TO-220) outline
*Plastic Power Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	.508		1.40
K	.500			12.70		
L			.250			6.35
M	.190		.210	4.83		5.33
N	.045		.055	1.05		1.40
O	.095		.105	2.41		2.66
P	.015		.030	.381		.762
Q	.020		.045	.508		1.43

NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel-plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

TO220-01 in accordance with JEDEC (TO-220) outline
*Plastic Power Package

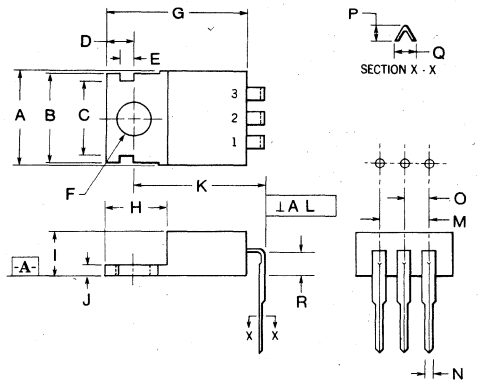


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	.508		1.40
K	.580		.610	14.7		15.5
L		.005			.127	
M		.200			5.08	
N	.045		.055	1.05		1.40
O,R		.100			2.54	
P	.015		.030	.381		.762
Q	.020		.045	.508		1.43

NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel-plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

PHYSICAL DIMENSIONS

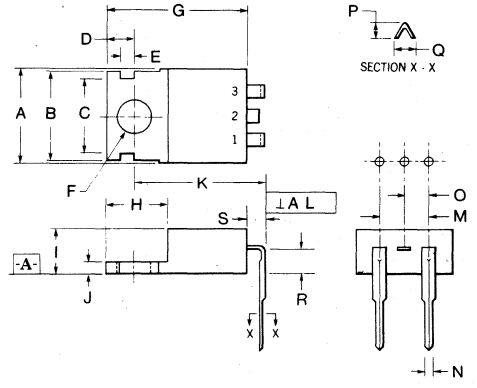
TO220-02 in accordance with JEDEC (TO-220) outline
*Plastic Power Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	.508		1.40
K	.580		.610	14.7		15.5
L,R		.005			.127	
M		.200			5.08	
N	.045		.055	1.05		1.40
O		.100			2.54	
P	.015		.030	.381		.762
Q	.020		.045	.508		1.43

NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel-plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

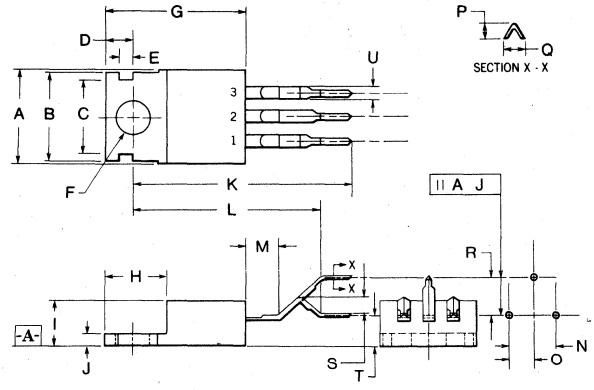
TO220-03 in accordance with JEDEC (TO-220) outline
*Plastic Power Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	.508		1.40
K	.580		.610	14.7		15.5
L		.005			.127	
M		.200			5.08	
N	.045		.055	1.05		1.40
O,R		.100			2.54	
P	.015		.030	.381		.762
Q	.020		.045	.508		1.43
S		.080			2.03	

NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel-plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

TO220-04 in accordance with JEDEC (TO-220) outline
*Plastic Power Package

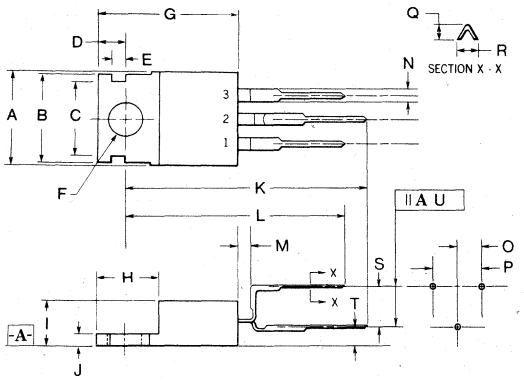


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	.508		.140
K	.910			23.11		
L			.800			20.32
M		.130			3.30	
N		.200			5.08	
O,T		.100			2.54	
P	.015		.030	.381		.762
Q	.020		.045	.508		1.43
R		.150			3.81	
S	.032			.813		
U	.045		.055	1.05		1.40

NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel-plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

PHYSICAL DIMENSIONS

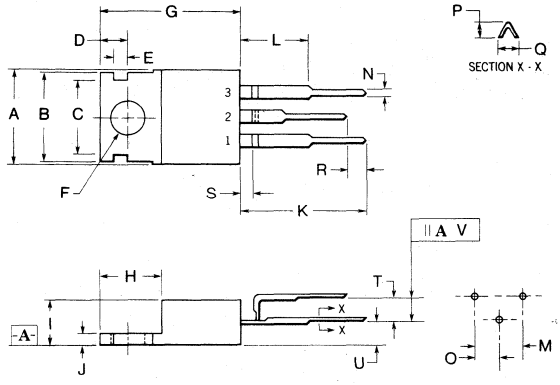
TO220-05 in accordance with JEDEC (TO-220) outline
*Plastic Power Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	.508		.140
K		1.013			25.73	
L		.915			23.24	
M		.113			2.87	
N	.045		.055	1.05		1.40
O		.100			2.54	
P		.200			5.08	
Q	.015		.030	.381		.762
R	.020		.045	.508		1.43
S	.190		.210	4.83		5.33
T		.050			1.27	
U		.005			.127	

NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel-plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

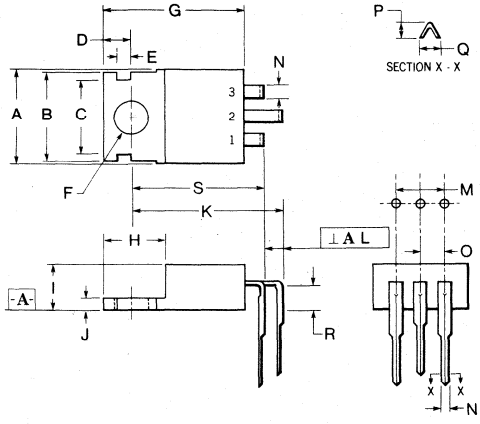
TO220-06 in accordance with JEDEC (TO-220) outline
*Plastic Power Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	.508		1.40
K	.500			12.70		
L			.250			6.35
M		.200			5.08	
N	.045		.055	1.05		1.40
O,T,U		.100			2.54	
P	.015		.030	.381		.762
Q	.020		.045	.508		1.43
R			.051			1.30
S	.1025			2.60		
V		.005			.127	

NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

TO220-07 in accordance with JEDEC (TO-220) outline
*Plastic Power Package

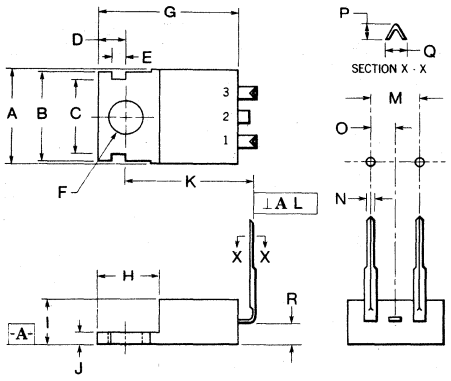


DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	.508		1.40
K	.620		.650	15.7		16.5
L		.005			.127	
M		.200			5.08	
N	.045		.055	1.05		1.40
O,R		.100			2.54	
P	.015		.030	.381		.762
Q	.020		.045	.508		1.43
S	.580		.610	14.7		15.5

NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel-plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

PHYSICAL DIMENSIONS

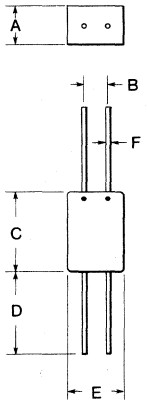
TO220-08 in accordance with JEDEC (TO-220) outline
*Plastic Power Package



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.395		.410	10.03		10.41
B	.365		.385	9.27		9.77
C	.300		.320	7.62		8.13
D	.100		.120	2.54		3.05
E	.040		.060	1.02		1.52
F	.141		.145	3.58		3.68
G	.575		.600	14.6		15.24
H	.235		.265	5.97		6.73
I	.160		.190	4.06		4.83
J	.020		.055	508		.140
K	.580		.610	14.7		15.5
L		.005			.127	
M		.200			5.08	
N	.045		.055	1.05		1.40
O,R		.100			2.54	
P	.015		.030	.381		.762
Q	.020		.045	.508		1.43

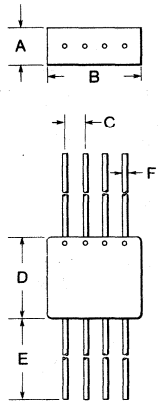
NOTES: See table for dimensions in inches and millimeters
Center lead is electrical contact with the mounting tab
Package weight is silicone plastic with nickel-plated copper tab and leads
Package weight is 2.1 grams
*Mechanically interchangeable with TO66

TO308-1



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.162		.182	4.11		4.62
B	.104		.112	2.64		2.84
C	.435		.455	10.05		10.56
D	1.00			25.40		
E	.280		.300	7.11		7.62
F	.019		.021	.483		.533

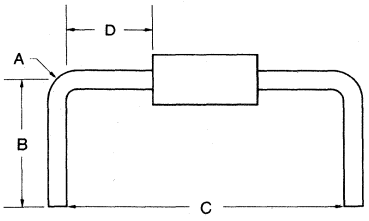
TO310-1



DIM.	INCHES MIN.	INCHES TYP.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS TYP.	MILLIMETERS MAX.
A	.162		.182	4.11		4.62
B	.480		.500	10.12		12.70
C	.104		.112	2.64		2.84
D	.435		.455	10.05		10.56
E	1.0			25.40		
F	.019		.021	.483		.533

PACKAGING

TYPICAL FORMED DIODE

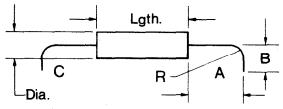


DIM.	DO34-1 INCHES MIN.	DO34-1 INCHES MAX.	DO34-1 MILLIMETERS MIN.	DO34-1 MILLIMETERS MAX	DO35-1/DO41-1 INCHES MIN.	DO35-1/DO41-1 INCHES MAX.	DO35-1/DO41-1 MILLIMETERS MIN.	DO35-1/DO41-1 MILLIMETERS MAX.	DO7-1/DO7-2 INCHES MIN.	DO7-1/DO7-2 INCHES MAX.	DO7-1/DO7-2 MILLIMETERS MIN.	DO7-1/DO7-2 MILLIMETERS MAX.
A	.040		.916		.040		.916		.040		.916	
B*	.187		4.75		.500		12.70		.750		19.05	
C**	.220		5.59		.275		6.99		.395		10.03	
Tolerance "C"	+.030 −.015		+.762 −.381		+.040 −.020		+.916 −.508		+.060 −.030		+1.52 −.762	
D***		.060		1.52		.060		1.52		.060		1.52

*Tolerance + .020/ + .508
**Tolerance of C depends on length of "B" dimension
***Tolerance + .015/ + .381

POSSIBLE FORMED DIODES
SERIES "200"
All Dimensions are I.D.

STYLE C BEND

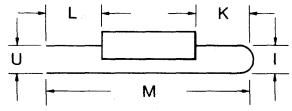


	INCHES A	A1	B	R	Dia.	Lgth.	MILLIMETERS A	A1	B	R	Dia.	Lgth.
Min.	.090	.050	.187	.040	.090	.218	2.28	1.27	4.79	.916	2.28	5.54
Max.	Adj.	Adj.	Adj.		1.00	2.00	Adj.	Adj.	Adj.		25.40	50.80

.125-A-Min. on all components with over 5/16 body diameter.

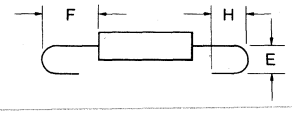
3.18-A-Min. on all components with over 7.94 body diameter.

STYLE V BEND



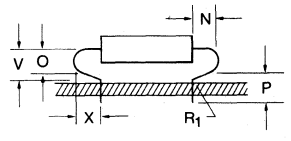
	INCHES I	K	L	M	U	MILLIMETERS I	K	L	M	U
Min.	.062	.135	.187	1¼xI	.062	1.57	3.42	4.79	31.75xI	1.57
Max.	.125	Adj.	Adj.	Adj.	Adj.	3.18	Adj.	Adj.	Adj.	Adj.

STYLE J BEND



	INCHES E	F	H	C	MILLIMETERS E	F	H	C
Min.	.062	.135	1¼xE	Adjustable	1.57	3.42	31.75xE	Adjustable
Max.	.125	Adj.	Adj.	to 180°	3.18	Adj.	Adj.	to 180°

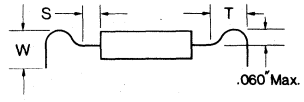
STYLE A BEND



	INCHES N	P	P	X	R_1	MILLIMETERS N	P	P	X	R_1
Min.	.125	.125	.125	Adj.	.125	3.18	3.18	3.18	Adj.	3.18
Max.	Adj.	Adj.	.350			Adj.	Adj.	8.89		

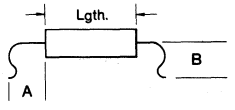
Optional Anvils : Anvils made to your specifications. Examples shown below.

STYLE D BEND



	INCHES S	S+T	W	MILLIMETERS S	S+T	W
Min.	.125	.210	.187	3.18	5.33	4.79
Max.	Adj.	Adj.	Adj.	Adj.	Adj.	Adj.

SNAP-IN

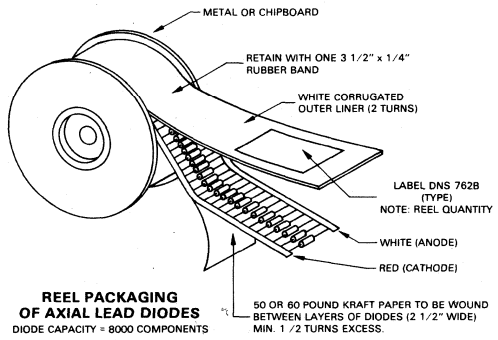


The "snap-in" configuration can be formed on axial leads up to .030-inch in diameter.

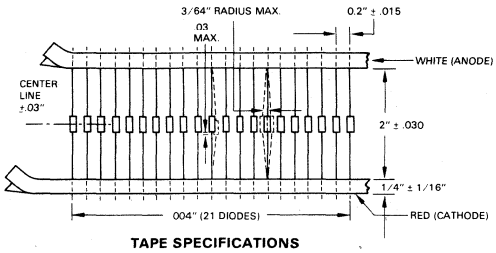
The "snap-in" configuration can be formed on axial leads up to .762-inch in diameter.

7

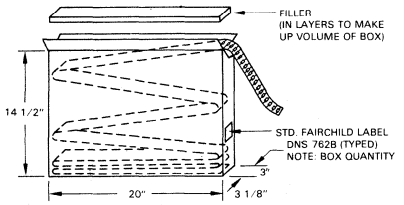
PACKAGING



REEL PACKAGING OF AXIAL LEAD DIODES
DIODE CAPACITY = 8000 COMPONENTS



TAPE SPECIFICATIONS OF AXIAL LEAD DIODES



AMMO PACKAGING
DIODE CAPACITY = 40,000 — 55,000 COMPONENTS

ORDER INFORMATION

DIODES

Ordering Information:
Diodes may be purchased only in increments of minimum quantities.

Military Approved Devices:
All Fairchild devices, which indicate military approval, are qualified to the current revisions of Military Specification 19500.

Mixing Privileges:
There is no Diode mixing privilege for price advantage.

TRANSISTORS

Ordering Information:
Devices may be purchased only in increments of minimum quantities.

Military Approved Devices:
All Fairchild devices, which indicate military approval, are approved to the current revisions of Military Specification 19500.

Transistor Dice:
Transistor dice are packaged in cavity packs of 25 and 100 units. All orders must be in multiples of 25. Special packaging is available on request.

Lead Forming on TO92 Plastic Transistors:
Lead forming to TO5 or TO18 outline dimensions is available on all standard small signal plastic TO92 transistors for a price adder of $.01 per unit. To order lead formed devices, simply add a dash five (-5) or dash eighteen (-18) to the standard device type number. For example, a 2N3906-18 would be a 2N3906 with the leads formed to the TO18 outline.

Diode Family Designations:
FD.4,5, 6 & 7 = Switching Diode Families
FD 3 = Low Leakage Diode
HCD = Hot Carrier Diode
MONO = Monolithic Array
R = Reference Diode
RF = Radio Frequency Band Switching Diode
VVC = Voltage Variable Capacitor
Z = Zener Diode

Transistor Abbreviations:
DIE = Unencapsulated transistor (chip)
DARL = Darlington
DU = Dual Transistor
CD = Core Driver
NJF = N-Channel Junction Field Effect Transistor
PJF = P-Channel Junction Field Effect Transistor
GPA = General Purpose Amplifier
MET = Metal
PLA = Plastic
PWR = Power
R&I = RF & IF Amplifier
SW = Switch

DISCRETE POWER

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INTRODUCTION

FAIRCHILD TO92 THERMAL CONSIDERATIONS

Included is a short description of the thermal characteristics of the TO92 package. A complete App Note will soon be available.

The Fairchild TO92 plastic package has a very high thermal dissipation capability due to the low thermal resistance lead material and lead-frame design. While thermal resistance is normally specified for the device mounted 1.0 cm above an infinite heat sink, options are available to improve on the conservatively rated thermal capability.

First, it is necessary to explain the thermal paths and relative magnitudes of the fixed and variable resistances of the TO92 plastic package. Secondly, a simple thermal model of the package-chip combination serves as an example in presenting two independent ways of achieving maximum thermal dissipation. The designer will then have a tool to determine the thermal stress he may apply to Fairchild TO92 devices in his circuit and no longer have to rely on rules of thumb or rough assumptions.

THERMAL RESISTANCES

When a transistor die is attached directly to the base of a metal package, the thermal equivalent circuit is often represented simply as a series connection of the junction to case thermal resistance θ_{JC} and the case to ambient thermal resistance θ_{CA}.

The electrical analog is completed by a current source equivalent to the thermal energy source and referring to the existing temperatures as equivalent to a voltage in the analog. This is illustrated in *Figure 1.*

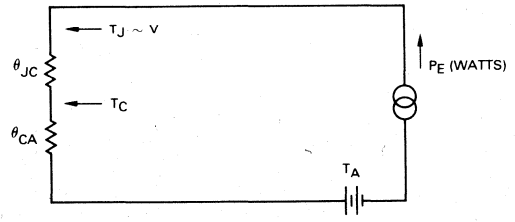

Fig. 1. Thermal Equivalent Circuit (Die Attached to Metal Package Base)

Power dissipations are then determined by inserting the manufacturer's data into the thermal equation:

$$T_J - T_A = \theta \cdot Pwr = (\theta_{JC} + \theta_{CA})\, Pwr$$

The thermal equivalent circuit of a TO92 package is somewhat more complex. In addition to the thermal path through the molding compound to the ambient air, there is a parallel path through the collector lead. The thermal equivalent circuit for a TO92 package is approximated in *Figure 2.*

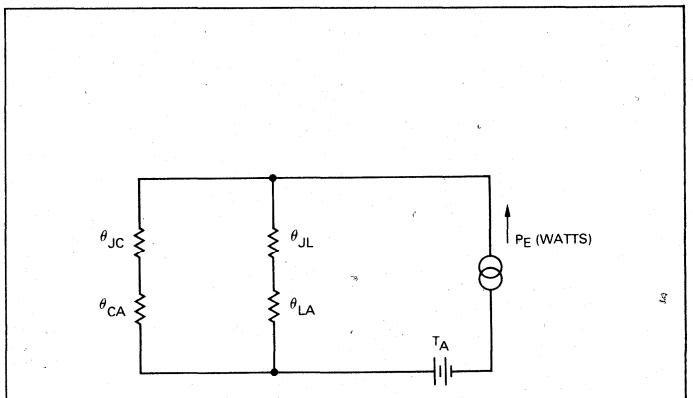

Fig. 2. TO92 Thermal Equivalent Circuit

Here, the lead cooling path is shown as parallel to the cooling path through the molding compound. In this configuration, two segments of the lead cooling path are identified. The first, θ_{JL}, is the thermal resistance between the junction and a point on the collector lead $\simeq$ 0.06" below the body of the transistor. The second resistance, θ_{LA}, is the thermal resistance from this point to a point on the collector lead 0.4" (1.0 cm) below the body of the transistor. Note that this circuit approach implies that the collector lead is attached 0.4" from the body to an infinite heat sink held at ambient temperature.

When the transistor is inserted into a socket or a circuit board which is not at ambient temperature, another resistance must be added to the collector lead resistance string. This is shown in *Figure 3* where θ_{SA} is the thermal resistance of the socket and θ_{LS} is the thermal resistance of the lead between package and socket.

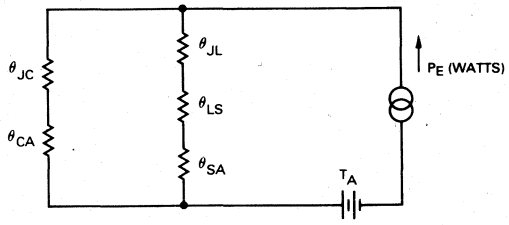

Fig. 3. TO92 Thermal Equivalent Circuit (Other than Ambient Temperature)

The basic heat flow control problem now is indeterminate unless the relative values of the thermal resistances are known.

Since θ_{JC} and θ_{JL} are internal to the device, and neither can be affected by the circuit designer or production engineer, the variability of θ_{CA}, θ_{LS}, and θ_{SA} must be examined. Fortunately, in the Fairchild TO92 package, all but the low power, small chips have relatively small θ_{JC}s and θ_{JL}s. To illustrate the point, *Figure 4* shows an experimental device with typical values of thermal resistances and $\theta_{LA} = \theta_{LS} + \theta_{SA}$.

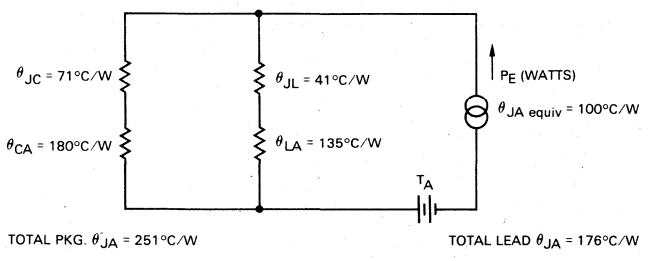

Fig. 4. Thermal Equivalent Circuit, Experimental Device

The two most significant thermal resistances, θ_{CA} and θ_{LA}, are outside the package and controllable by the user. For instance, θ_{CA} can be changed from 180°C/W to as low as 45°C/W by using a commercial heat sink for an inserted cost of 1.5 to 3.0 cents. Similarly, by pushing the transistor extremely close to the circuit board, θ_{LA} can be reduced in direct proportion to the change in lead length. An alternative technique for lowering the junction temperature is to insert the leads into a hollow rivet in the P.C. board. The increased metal mass aids in the heat transfer and effectively lowers θ_{SA}.

The use of a socket in high dissipation applications can work against the designer since the thermal resistance of the socket is not specified or known by the manufacturer. One socket type was measured as high as 270°C/W in the Fairchild laboratories.

Once the above information is known, what can a designer do, since most data sheets assume a "normal" application with 0.4" of collector lead length? While requiring either the transistor to be no more than 0.2" off the circuit board or putting a commercial heat sink on the package will decrease the die temperature for a fixed power level, the actual gain in dissipation capability is unknown, since the amount of heat loss through the collector lead is not known. Following is a discussion of a practical technique for evaluating designs and readily determining the amount of heat sinking required for each socket. The optimum approach would require the designer to know the thermal equivalent circuit of each device being evaluated. These values would be unique to each vendor's part and therefore the alternate suppliers' devices should also be evaluated in the application—a minor inconvenience relative to the design confidence achieved.

THE GENERAL MODEL

For general purposes, a model for all Fairchild devices covering the typical case requiring a high dissipation was selected. It becomes a more conservative model as chip size increases. *Figure 5* illustrates the relative values for the case and lead cooling paths.

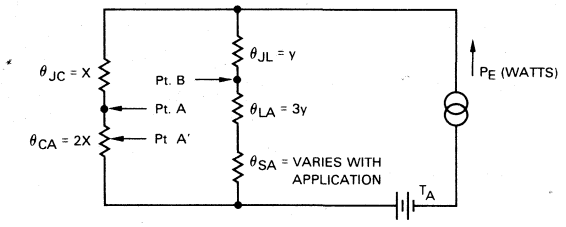

Fig. 5. Thermal Equivalent Circuit, General Model

The technique requires a measurement of the case temperature at Pt. A without a case heat sink. This is assumed to be 67% of the junction temperature. Lead cooling methods, such as increasing the area of P.C. board copper in the collector circuit, or reducing the distance between the P.C. board and the transistor can be used to achieve the lowest possible case temperature. Next, the collector lead temperature is measured at a point approximately 0.06" below the case — Pt. B in *Figure 5*. θ_{CA} is then varied by using heat sinks such as the Staver F1-7 or F5 series. The percent change in temperature at Pt. B is equal to the percent change of the junction temperature. Thus, the operating junction temperature can be determined in all practical applications and the effectiveness of all proposed heat sinking methods evaluated. Life test thermal stresses can also be evaluated by reading the case temperature. The effect of the socket thermal impedances can also be determined. Obviously, as θ_{SA} goes from the zero implied in the ratings to a very high value, the effective total thermal resistance will approach the significantly higher value of $\theta_{JC} + \theta_{CA}$ only. Case temperature measurements can be made with a thermocouple, using 30 guage or finer wire, attached to a 93 mil diameter copper disc secured to the top surface of the package. Securing the

copper disc to the top of the package effectively moves the monitor point from Pt. A to Pt. A^1 in *Figure 5.* The advantage of this consistent and convenient measuring point requires the establishment of a ratio of T_J to T_C based upon this point.

EXAMPLE

Using the above technique, the following steps are taken to evaluate a Fairchild MPS6562 in an 800 mW application.

1. *Compute maximum allowable case temperature.* The case temperature increase above ambient is 50% of the temperature *gradient* in the model. Using 150°C maximum junction temperature as given on the Fairchild data sheet, the maximum allowable case temperature at Pt. A is 0.5 (150°C - 25°C) = 6.25°C (Delta above base temperature.)

   $\therefore$ T_C allowable = 62.5°C + 25°C = 87.5°C.

2. *Measure the actual case temperature and calculate the junction temperature.* The measured case temperature is proportional to the junction to ambient temperature differential. The proportionality factor is 0.5 in the general case. The measured case temperature in this example was 105°C. The junction temperature is then calculated by the following equation:

   $$T_C = 0.5\,(T_J - T_A) + T_A$$
   $$105°C = 0.5\,(T_J - 25°C) + 25°C$$
   $$T_J = \frac{92.5}{0.5}$$
   $$T_J = 185°C$$

   With a junction temperature 35°C above the maximum rating of the Fairchild MPS6562, the designer is faced with the problem of reducing the junction temperature by improved heat dissipation.

   With the Fairchild TO92 product line's superior thermal dissipation capabilities, the power dissipation can be greater then the registered 500 mW without exceeding the 150°C maximum junction temperature rating. This is good engineering practice since device reliability is a function of junction temperature, and junction temperature is limited by the physical properties of the package for encapsulated transistors. The maximum power rating reflects, then, the thermal resistance of the package and the limitations of the molding compounds and die attach methods. Phenolics deteriorate before silicones, and solder die attach degrades at much lower temperatures than gold-silicon eutectic.

3. *Reduce the junction temperature.*
   a) Vary the collector lead length.
      The first and simplest approach is to insert the device farther into the P.C. board and repeat the measurement in Step 2. The output load is a heat sink and should be attached during these measurements. Since the external resistance is relatively high, the transistor will be sensitive to production *variation* of the collector lead as inserted into the P.C. board. If the production tolerances do not permit sufficiently short collector lead and, therefore, low junction temperature to be obtained, proceed to Step b.

   b) Add an external heat sink.
      Since at least a 35°C drop in the collector junction temperature is required, an external heat sink must be added and its effect evaluated. The temperature at Pt. B is proportional to the junction temperature *(Figure 5);* therefore, an X% change in junction temperature will produce an X% change in Pt. B temperature. The equation is

      $$\frac{(T_{B1} - 25) - (T_{B2} - 25)}{T_{B1} - 25} = \frac{(T_{J1} - 25) - (T_{J2} - 25)}{T_{J1} - 25}$$

      Various heat sinks were slipped over the case of the transistor to measure the effect of each on junction temperature. The Staver F1-7 gave the best results with a T_J of 132°C. This heat sink has a thermal resistance of 72°C/W replacing the original 180°C/W of the package. Thus, new thermal resistance θ_{CA} is 72°C/W, 40% of the effective case to ambient thermal resistance.

      The exact change in junction temperature is calculated by reading the lead temperature at Pt. B before and after applying the heat sink and performing the indicated math. The measured values of T_{B1} and T_{B2} are 158°C and 114°C respectively.

      $$\text{Percent change} = \frac{(T_{B1} - 25) - (T_{B2} - 25)}{T_{B1} - 25} \times 100 = \frac{(T_{J1} - 25) - (T_{J2} - 25)}{T_{J1} - 25} \times 100\ ;$$
      $$\frac{133 - 89}{133} = \frac{160 - (T_{J2} - 25)}{160}$$
      $$-T_{J2} = (0.331 \times 160) - 185$$
      $$-T_{J2} = 53 - 185$$
      $$T_{J2} = 132°C$$

This example shows how easy it is to change the collector junction temperature and to evaluate the amount of change. With this method, the optimum price/performance trade off can be determined for every socket design in a matter of a few hours. The heat sink in the illustration has a θ_{SA} of 72°C/W, is inexpensive and yet permits a 53°C drop in the junction temperature. The designer could obviously get a greater *drop* in T_J with a heat sink rated at 45°C/W. He is, in either case, faced with the pleasant choice of designing for higher power output or being content with the higher reliability of his design due to the lower junction temperature.

A thorough analysis of the above example shows that the circuit board contributes at least 350°C/W to the lead cooling path. While this is not significant in illustrating the technique, it is important to realize that this parasitic thermal resistance can range from 50° to 350°C/W and is controllable by the design engineer. Through these techniques, the designer can, for instance, achieve significantly higher power dissipation in the device without exceeding the maximum ratings.

DISCRETE POWER

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INTRODUCTION

DICE SECTION

All information necessary when ordering dice is contained in this section. Included are the available device types, short form information, geometry layouts, packaging methods and a IN/2N versus dice cross reference chart.

PURPOSE

This document covers the general requirements for the procurement of unencapsulated silicon small signal transistors and diodes.

GENERAL INFORMATION:

The small signal transistor and diode chips described in this document have the following characteristics:

- All are of silicon planar construction
- Topside metalization is aluminum approximately 1 micron thick - excellent for all wire bonding techniques
- Backside metalization is gold approximately 8,000 angstroms - offers ease of die bonding with good thermal characteristics
- Die thickness is 3.5 mils ± .5 mils

VISUAL INSPECTION:

Fairchild transistor and diode dice go through extensive visual inspection during die processing (see flow chart). Die are visualed at 40X to 100X magnification using Fairchild's standard visual inspection criteria and Mil-Standard 883 Method 2010 depending on the packaging method. Copies of the visual inspection documents are available upon request.

OPTIONS:

All transistor and diode dice can be procured in any one of the three following forms

1. CAVITY PACK - wafers are 100% tested, reject dice are inked and removed. Good dice are cleaned, visualed, and shipped in individual cavities (see Figure 1)
2. VIAL PACK - wafers are tested, dice are cleaned, visualed, and poured into a FREON* filled vial (see Figure 2)
3. WAFER PACK - wafer is tested, reject dice are inked, wafer is scribed and fractured. Entire wafer is shipped in wafer form (see Figure 3)

STANDARD DICE SPECIFICATIONS:

Twenty four popular JEDEC device types were selected to cover hybrid microcircuit applications. The Transistors bear a "DN" nomenclature and diodes bear a "FDC" nomenclature. The dice are identical to those used in the corresponding Fairchild assembled device.

The summary charts will give you a brief description from which to select the device type suited for your application. The parameters and limits shown are 25°C low level dc parameters identical to those on the corresponding JEDEC 1N and 2N specification. For more detailed characteristic data, please refer to the corresponding Fairchild data sheet.

PARAMETER GUARANTEES:

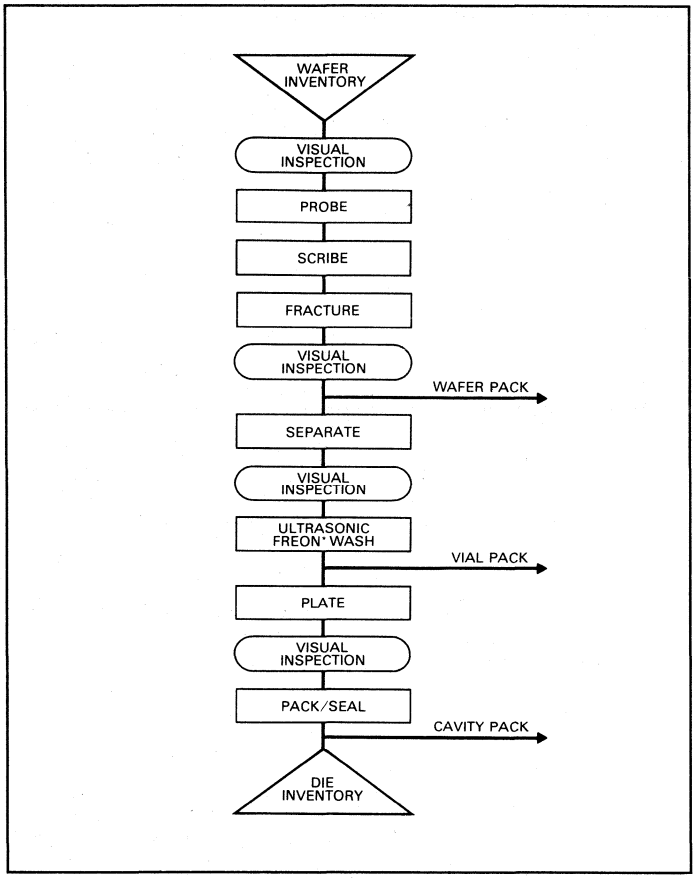
Probing in die form limits testing to 25°C low level dc parameters only. The dc parameters shown in the charts are identical to those of the corresponding JEDEC type and are guaranteed to an LTPD of 10%.

The ac parameters which are similar to those in the standard Fairchild data sheets, have been correlated to selected dc probe parameters and are guaranteed to an LTPD of 20%.

STANDARD DICE PROCESSING:

The small signal transistor and diode dice listed are produced on the same well-proven production lines that produce Fairchild's standard encapsulated devices.

The following flow chart will show the additional steps that are done once a wafer is selected for processing in die form:



ORDERING INFORMATION:

When ordering, be sure to call out the DN and/or FDC number —not the 2N and/or 1N number. Just specify the device type, quantity and the packaging method preferred.

HANDLING PRECAUTIONS:

Extreme care must be used in handling unencapsulated semiconductors to avoid damage to the chip surface. The following precautions apply:

1. WAFER PACK - Wafers should only be handled near the edge with round ended stainless steel or teflon tweezers.
2. VIAL PACK - Dice and FREON* should be poured out onto filter paper. Dice should be handled with a smooth tipped vacuum wand only. Do not use tweezers.
3. CAVITY PACK - Lid and anti-static mylar should be removed slowly and with extreme care to avoid disturbing the position of the dice. Dice should be handled with a smooth tipped vacuum wand only. Do not use tweezers.

In addition, devices should be stored in an environment of not more than 30% relative humidity. Die and wire bonding should not exceed 400°C in an inert atmosphere or 100°C in a non-inert atmosphere.

*DuPont's registered trademark for its fluorocarbon solvent

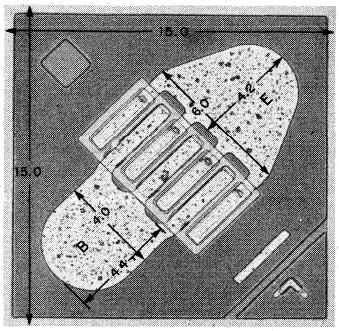
TRANSISTOR DICE SELECTION GUIDE (BY ASCENDING V_{CEO})

Device Type	Polarity	Geometry	V_{CEO} (MIN) @ I_C	BV_{CBO} (MIN) @ I_C	BV_{EBO} (MIN) @ I_E	I_{CBO} (MAX) @ V_{CB}	h_{FE} (MIN) @ I_C, V_{CE}	h_{FE} (MIN-MAX) @ I_C, V_{CE}	h_{FE} (MIN-MAX) @ I_C, V_{CE}	APPLICATION
DN2369A	NPN	1312	15V 10mA	40V 10µA	4.5V 10µA	400nA 20V		40-120 10mA, 1V	20- 100mA, 1V	HIGH SPEED SAT SWITCH
DN4209	PNP	1902	15V 3mA	15V 100µA	4.5V 100µA	20nA 8V	35 1mA, 1V			
DN3014	NPN	0062	20V 10mA	40V 100µA	5V 100µA	300nA 20V	25 10mA, 1V	30-120 30mA, 1V	25- 100mA, 1V	HIGH SPEED SAT SWITCH
DN5455	PNP	0204	20V 10mA	20V 100µA	4.5V 100µA	50nA 15V	20 10mA, 1V	30-120 30mA, 1V	30- 100mA, 1V	
DN918	PNPN	1211	15V 3mA	30V 1µA	3V 10µA	20nA 15V	20 3mA, 1V			RF AMPLIFIER
DN3250	PNP	0215	40V 10mA	50V 10µA	5V 10µA	20nA 40V		50-300 10mA, 1V		
DN3904	NPN	0144	40V 1mA	60V 10µA	6V 10µA	50nA 30V	40 0.1mA, 1V	100-300 10mA, 1V	30- 100mA, 1V	GENERAL PURPOSE AMPLIFIER
DN3906	PNP	0215	40V 1mA	40V 10µA	5V 10µA	50nA 30V	60 0.1mA, 1V	100-300 10mA, 1V	30- 100mA, 1V	
DN2222A	NPN	0145	40V 10mA	75V 10µA	6V 10µA	20nA 60V	35 0.1mA, 10V	75 10mA, 10V	100-300 100mA, 10V	GENERAL PURPOSE AMPLIFIER
DN2907	PNP	0212	40V 10mA	60V 10µA	5V 10µA	20nA 50V	35 0.1mA, 10V	75 10mA, 10V	100-300 100mA, 10V	AND SWITCH
DN3725	NPN	0139	50V 10mA	80V 10µA	6V 10µA	1700nA 60V	30 10mA, 1V	60-150 100mA, 1V		HI CURRENT CORE DRIVER
DN3468	PNP	0064	50V 10mA	50V 10µA	5V 10µA	100nA 30V	25 100mA, 1V			
DN2484	NPN	0107	60V 10mA	60V 10µA	6V 10µA	20nA 45V	175 0.1mA, 5V	250- 1mA, 5V	-800 10mA, 5V	LOW LEVEL LOW NOISE
DN3962	PNP	2019	60V 5mA	60V 10µA	6V 10µA	20nA 50V	100 0.1mA, 5V	100-450 1mA, 5V		HIGH GAIN AMPLIFIER
DN3019	NPN	0149	80V 10mA	140V 100µA	7V 100µA	20nA 90V	50 0.1mA, 5V	100-300 100mA, 5V		GENERAL PURPOSE AMPLIFIER
DN4033	PNP	0224	80V 10mA	80V 10µA	5V 10µA	50nA 60V	75 0.1mA, 5V	100-300 100mA, 5V		AND SWITCH
DN3923	NPN	0147	150V 10mA	150V 100µA	6V 100µA	20nA 100V	15 0.1mA, 10V	30-120 25mA, 10V		HI VOLT AMPLIFIER
DN3930	PNP	0232	180V 2mA	180V 10µA	6V 10µA	20nA 100V		80-300 10mA, 10V		AND SWITCH

DIODE DICE SELECTION GUIDE (BY ASCENDING B_V)

Device	Geometry	B_V (MIN) @ I_R	I_R (MIN) @ V_R	V_F (MIN-MAX) @ I_F	V_F (MAX) @ I_F	T_{RR} (TYP) @ $I_F = I_R$	C_O (TYP) @ V_R	APPLICATION
FDC4376	1700	20V 5µA	100nA 10V	.77-.88V 10mA	1.1V 50mA	0.8ns 10mA	1.2pF 0	ULTRA HIGH SPEED SWITCHING DIODE
FDC3600	1600	75V 5µA	100nA 50V	.66-.74V 10mA	1.0V 100mA	4ns 10mA	2.5pF 0	GENERAL PURPOSE SWITCHING DIODE
FDC485B	1500	200V 100µA	25nA 175V	.66-.80V 10mA	1.0V 100mA	500ns 10mA	5.0pF 0	HIGH VOLTAGE LOW LEAKAGE DIODE
FDC3070	1400	200V 100µA	100nA 175V	.66-.74V 10mA	1.0V 100mA	50ns 10mA	2.5pF 0	HIGH VOLTAGE GENERAL PURPOSE SWITCHING DIODE

GEOMETRY LAYOUTS



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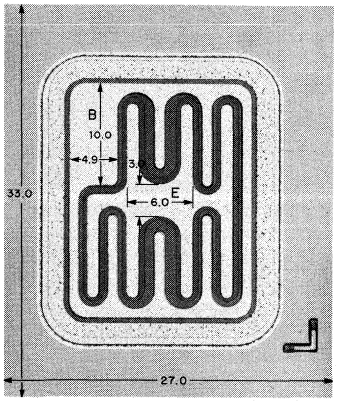

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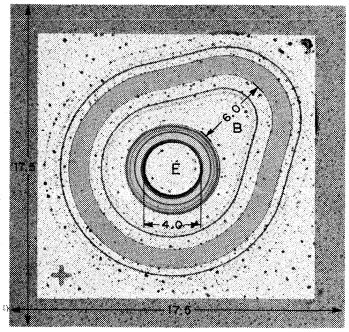

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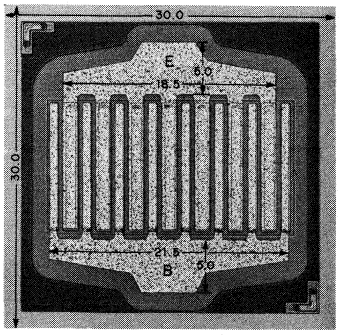

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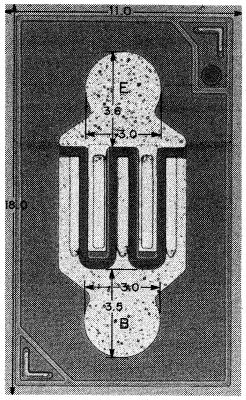

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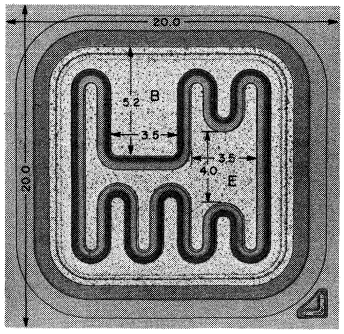

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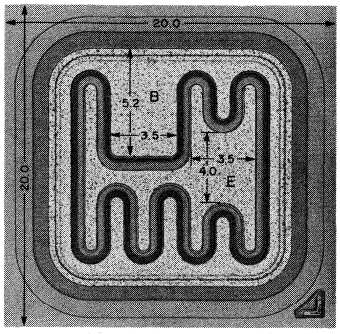

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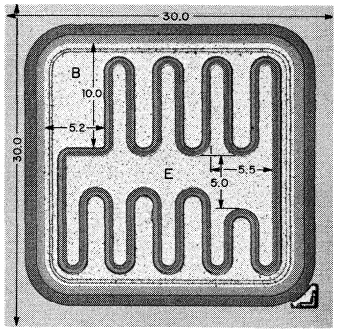

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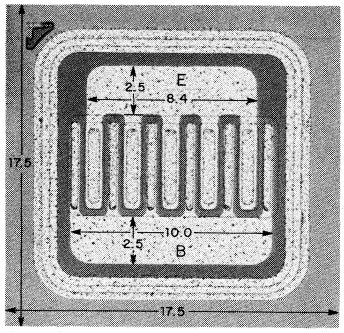

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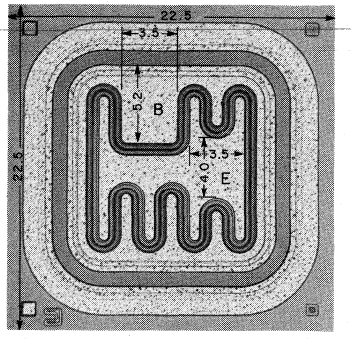

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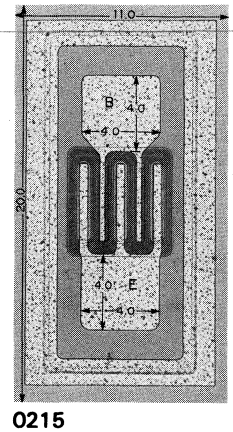

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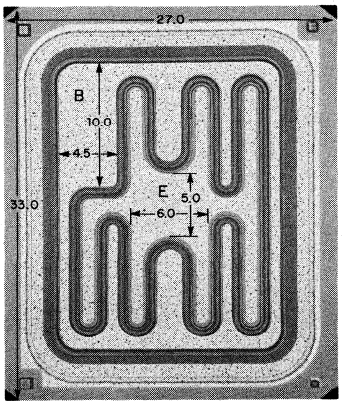
GEOMETRY LAYOUTS



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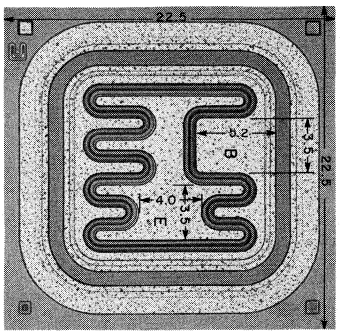

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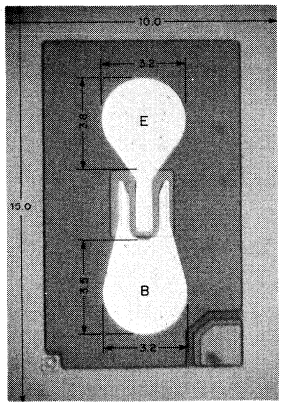

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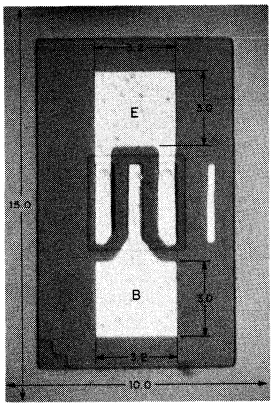

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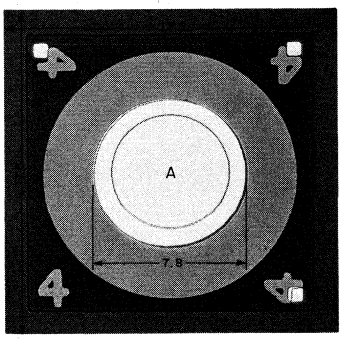

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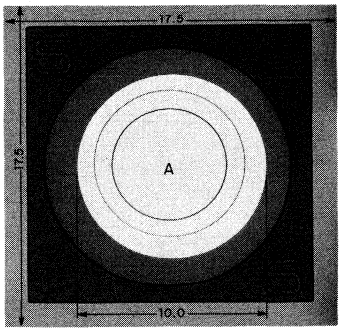

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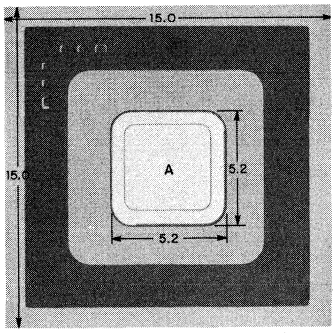

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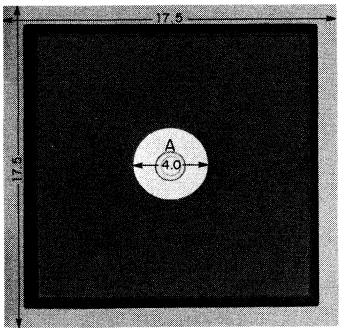

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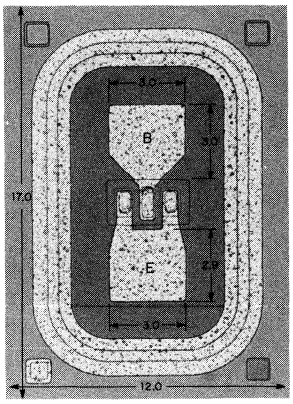

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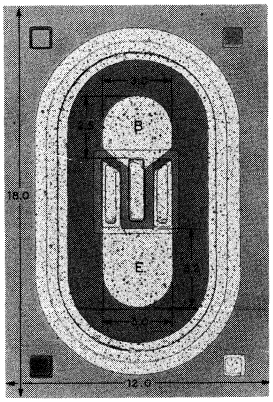

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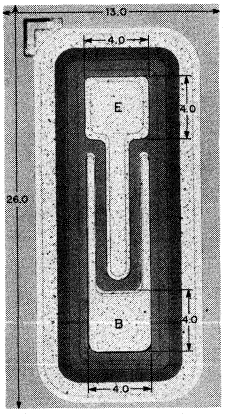

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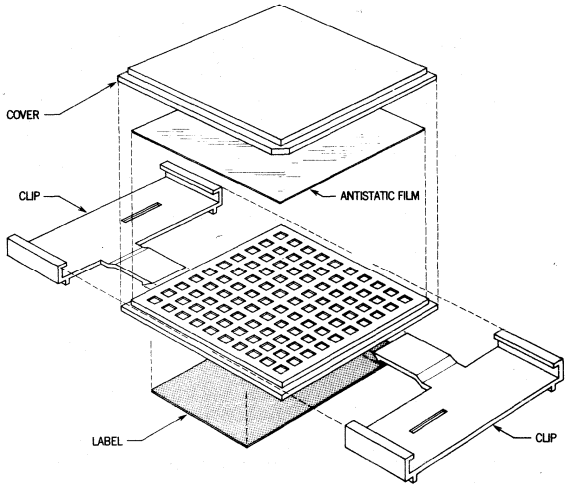

Fig. 1. CAVITY PACK

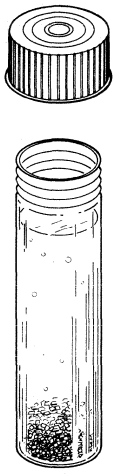

Fig. 2. VIAL PACK

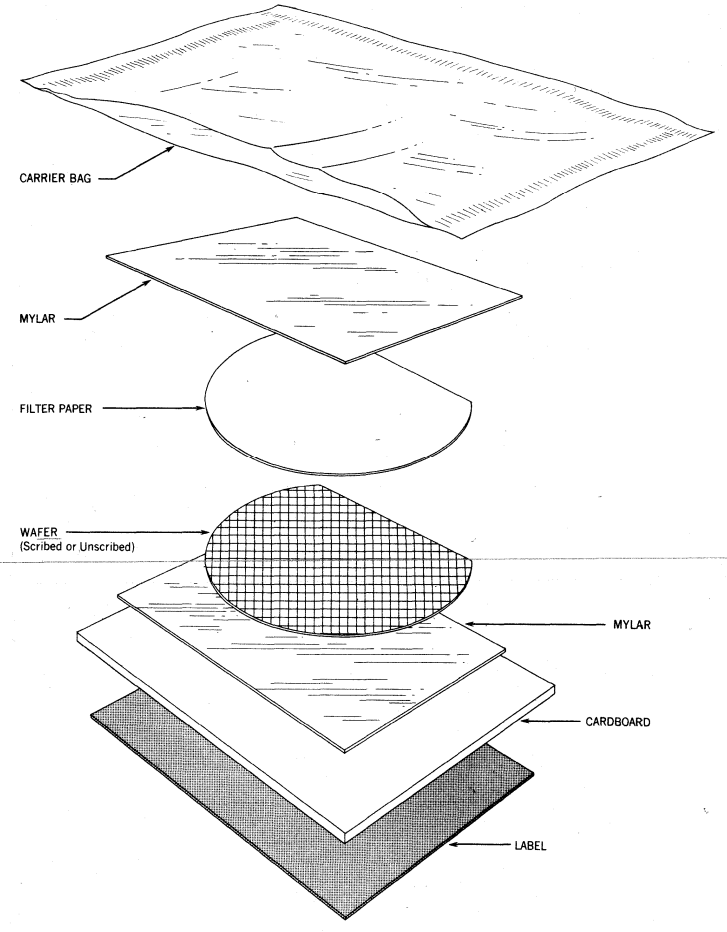

Fig. 3. WAFER PACK

Fig. 1. **CAVITY PACK - Dice are Placed in Individual Compartments. The Plastic Snap Clips Permit Inspection and Resealing.**

Fig. 2. **VIAL PACK - The Vial is Filled with FREON TF and a Plastic Cap Seals the Vial. The Freon Acts as a Motion Retarder and Cleansing Agent.**

Fig. 3. **WAFER PACK - Entire Wafer is Sandwiched Between Two Pieces of Mylar and Vacuum Sealed in a Plastic Envelope.**

1N DICE CROSS REFERENCE GUIDE

This chart references the closest die device type for the popular JEDEC devices. In each case, the closest die type is referenced based on the device function.

1N DEVICE	RECOMMENDED FDC DEVICE	1N DEVICE	RECOMMENDED FDC DEVICE	1N DEVICE	RECOMMENDED FDC DEVICE
1N457	FDC485B	1N483	FDC485B	1N3064	FDC3600
1N457A	FDC485B	1N483A	FDC485B	1N3070	FDC3070
1N458	FDC485B	1N483B	FDC485B	1N3595	FDC485B
1N458A	FDC485B	1N485	FDC485B	1N3600	FDC3600
1N459	FDC485B	1N485A	FDC485B	1N4148	FDC3600
1N459A	FDC485B	1N485B	FDC485B	1N4151	FDC3600
1N463	FDC485B	1N643	FDC3070	1N4152	FDC3600
1N463A	FDC485B	1N914	FDC3600	1N4376	FDC4376
1N464	FDC485B	1N914A	FDC3600	1N4448	FDC3600
1N464A	FDC485B	1N914B	FDC3600	1N4454	FDC3600

2N DICE CROSS REFERENCE GUIDE

This chart references the closest die device type for the popular JEDEC devices. In each case, the closest die type is referenced based on the device function.

2N DEVICE	RECOMMENDED DN DEVICE	2N DEVICE	RECOMMENDED DN DEVICE	2N DEVICE	RECOMMENDED DN DEVICE
2N656	DN3019	2N918	DN918	2N2369A	DN2369A
2N656A	DN3019	2N929	DN2484	2N2410	DN3725
2N657	DN3019	2N929A	DN2484	2N2411	DN3250
2N657A	DN3019	2N930	DN2484	2N2412	DN3250
2N696	DN2222A	2N930A	DN2484	2N2481	DN2369A
2N696A	DN2222A	2N930B	DN2484	2N2484	DN2484
2N697	DN2222A	2N956	DN2222A	2N2501	DN3014
2N697A	DN2222A	2N995	DN3250	2N2605	DN3962
2N698	DN3019	2N1131	DN2907	2N2845	DN3725
2N699	DN3019	2N1131A	DN2907	2N2846	DN3725
2N699A	DN3019	2N1132	DN2907	2N2847	DN3725
2N699B	DN3019	2N1132A	DN2907	2N2848	DN3725
2N706	DN2369A	2N1132B	DN2907	2N2894	DN4209
2N706A	DN2369A	2N1420	DN2222A	2N2894A	DN4209
2N706B	DN2369A	2N1613	DN2222A	2N2904	DN2907
2N706C	DN2369A	2N1613A	DN2222A	2N2904A	DN2907
2N708	DN2369A	2N1711	DN2222A	2N2905	DN2907
2N708A	DN2369A	2N1711A	DN2222A	2N2905A	DN2907
2N709	DN2369A	2N1711B	DN2222A	2N2906	DN2907
2N709A	DN2369A	2N1890	DN3019	2N2906A	DN2907
2N718	DN2222A	2N1893	DN3019	2N2907	DN2907
2N718A	DN2222A	2N1893A	DN3019	2N2907A	DN2907
2N720	DN3019	2N1990	DN3019	2N3009	DN3014
2N720A	DN3019	2N1991	DN2907	2N3010	DN2369A
2N722	DN2907	2N2192	DN2222A	2N3011	DN2369A
2N722A	DN2907	2N2193	DN2222A	2N3012	DN2894A
2N743	DN2369A	2N2194	DN2222A	2N3013	DN3014
2N743A	DN2369A	2N2195	DN2222A	2N3014	DN3014
2N744	DN2369A	2N2217	DN2222A	2N3019	DN3019
2N744A	DN2369A	2N2218	DN2222A	2N3020	DN3019
2N834	DN2369A	2N2218A	DN2222A	2N3053	DN3019
2N834A	DN2369A	2N2219	DN2222A	2N3117	DN2484
2N835	DN3014	2N2219A	DN2222A	2N3250	DN3250
2N869	DN5455	2N2221	DN2222A	2N3250A	DN3250
2N869A	DN5455	2N2221A	DN2222A	2N3251	DN3250
2N870	DN3019	2N2222	DN2222A	2N3251A	DN3250
2N871	DN3019	2N2222A	DN2222A	2N3252	DN3725
2N910	DN3019	2N2270	DN2222A	2N3253	DN3725
2N914	DN3014	2N2297	DN3019	2N3300	DN2222A
2N914A	DN3014	2N2303	DN2907	2N3301	DN2222A
2N915	DN3904	2N2368	DN2369	2N3302	DN2222A
2N916	DN3904	2N2369	DN2369A	2N3303	DN3725

2N DICE CROSS REFERENCE GUIDE

This chart references the closest die device type for the popular JEDEC devices. In each case, the closest die type is referenced based on the device function.

2N DEVICE	RECOMMENDED DN DEVICE	2N DEVICE	RECOMMENDED DN DEVICE	2N DEVICE	RECOMMENDED DN DEVICE
2N3304	DN4209	2N3640	DN4209	2N4047	DN3725
2N3402	DN3904	2N3641	DN2222A	2N4122	DN3906
2N3403	DN2484	2N3642	DN2222A	2N4123	DN3904
2N3405	DN3904	2N3643	DN2222A	2N4124	DN3904
2N3406	DN2484	2N3644	DN2907	2N4125	DN3906
2N3414	DN3904	2N3645	DN2907	2N4126	DN3906
2N3415	DN2484	2N3646	DN3014	2N4208	DN4209
2N3416	DN3904	2N3693	DN3904	2N4209	DN4209
2N3417	DN2484	2N3694	DN3904	2N4248	DN3962
2N3426	DN3725	2N3722	DN3725	2N4249	DN3962
2N3444	DN3725	2N3723	DN3725	2N4265	DN2369A
2N3467	DN3468	2N3724	DN3725	2N4275	DN2369A
2N3468	DN3468	2N3725	DN3725	2N4354	DN4033
2N3485	DN2907	2N3903	DN3904	2N4355	DN4033
2N3485A	DN2907	2N3904	DN3904	2N4400	DN2222A
2N3486	DN2907	2N3905	DN3906	2N4401	DN2222A
2N3486A	DN2907	2N3906	DN3906	2N4402	DN2907
2N3494	DN3930	2N3923	DN3923	2N4403	DN2907
2N3495	DN3930	2N3930	DN3930	2N4409	DN3923
2N3496	DN3930	2N3931	DN3930	2N4410	DN3923
2N3497	DN3930	2N3962	DN3962	2N5022	DN3468
2N3498	DN3923	2N3963	DN3962	2N5023	DN3468
2N3500	DN3923	2N3964	DN3962	2N5086	DN3962
2N3501	DN3923	2N3965	DN3962	2N5087	DN3962
2N3502	DN2907	2N4013	DN3725	2N5088	DN2484
2N3503	DN2907	2N4014	DN3725	2N5089	DN2484
2N3504	DN2907	2N4026	DN4033	2N5200	DN2484
2N3505	DN2907	2N4027	DN4033	2N5210	DN2484
2N3565	DN2484	2N4028	DN4033	2N5455	DN5455
2N3567	DN2222A	2N4029	DN4033	2N5769	DN2369A
2N3568	DN3919	2N4030	DN4033	2N5771	DN4209
2N3569	DN2222A	2N4031	DN4033	2N5845	DN3725
2N3638	DN2907	2N4032	DN4033	2N5845A	DN3725
2N3638A	DN2907	2N4033	DN4033	2N5910	DN4209
2N3639	DN4209	2N4046	DN3725		

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