ROHM

`97-`98

Data Book

Tr ICP

Transistors

(MOS FET· Bi-polar transistors· IC protector)

Foreword

Thank you for your continued support and purchase of RHOM products. We are pleased to announce the publication of the 1997-1998 Transistors edition of the ROHM Data Book.
All of ROHM CO., LTD.'s Transistors products are included in this book.
Our ambition is to see this book widely used in conjunction with other data books and publications issued by our company.
We have endeavored to make the document as easy as possible to use, but are aware that there may be places that could be improved. If you have any ideas that would make this data book easier for your to use, we would truely appreciate your comments.

ROHM CO., LTD.

21, Saiin Mizosaki-cho, Ukyo-ku, Kyoto 615, Japan
TEL:(075)311-2121 FAX:(075)315-0172

Notes

- The contents described in this catalogue are correct as of March 1997.
- No unauthorized transmission or reproduction of this book, either in whole or in part, is permitted.
- The contents of this book are subject to change without notice. Always verify before use that the contents are the latest specifications. If, by any chance, a defect should arise in the equipment as a result of use without verification of the specifications, ROHM CO., LTD., can bear no responsibility whatsoever.
- Application circuit diagrams and circuit constants contained in this data book are shown as examples of standard use and operation. When designing for mass production, please pay careful attention to peripheral conditions.
- Any and all data, including, but not limited to application circuit diagrams, information, and various data, described in this catalogue are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO., LTD., disclaims any warranty that any use of such device shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes absolutely no liability in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices; other than for the buyer's right to use such devices itself, resell or otherwise dispose of the same; no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by ROHM CO., LTD., is granted to any such buyer.

The products listed in this catalogue are designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys). Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers, or other safety devices) please be sure to consult with our sales representatives in advance.

- Notes when exporting
  - It is essential to obtain export permission when exporting any of the above products when it falls under the category of strategic material (or labor) as determined by foreign exchange or foreign trade control laws.
  - Please be sure to consult with our sales representatives to ascertain whether any product is classified as a strategic material.

Transistors

Table of Contents

Product List

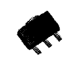
Surface mounting types

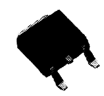
■MOS FET

- Automatic mounting is possible : Products are housed in a package which supports automatic mounting.
- 4V drive types : Direct drive from IC allows reduction of components (elimination of buffer transistor).
- Low ion-resistance : We have obtained a low ion-resistance through optimization of the pattern design.
  2SK2503 (ROHM : 60V, 5A) $R_{DS\,(on)}$: 0.135Ω (Max.)
  Previous product of same class (60V, 5A class) $R_{DS\,(on)}$: 0.19Ω (Max.)


SST3


SMT3


MPT3


CPT3

●SST3, SMT3 MPT3 and CPT3 packages

Application	Prodaet name				V_{DSS} (V)	I_D (A)	P_D (W)				$R_{DS(on)}$ Typ. (Ω)	
	Package						SST3	SMT3	MPT3*	CPT3		
	SST3	SMT3	MPT3	CPT3			Ta=25℃			Tc=25℃	V_{GS}=4V	V_{GS}=10V
Switching	—	**2SK2731** (147)	—	—	30	0.2	—	0.2	—	—	2.8	1.5
	—	—	**2SK2103** (99)	—	30	2	—	—	2*	—	0.38	0.25
	RK7002 (175)	—	—	—	60	0.115	0.2	—	—	—	—	7.5 Max.
	—	—	**2SK2463** (119)	—	60	2	—	—	2*	—	0.45	0.3
	—	—	—	**2SK2094** (91)	60	2	—	—	—	20	0.4	0.3
	—	—	—	**2SK2503** (123)	60	5	—	—	—	20	0.17	0.11
	—	—	—	**RK3055E** (171)	60	8	—	—	—	20	—	0.15 Max.
	—	—	—	**2SK2504** (127)	100	5	—	—	—	20	0.25	0.18
	—	—	—	**2SK2887** (167)	200	3	—	—	—	20	—	0.7
	—	—	—	**2SK2715** (143)	500	2	—	—	—	20	—	3

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. *; Mounted on 40 x 40 x 0.7 mm ceramic board

■Transistors

●EMT3, UMT3 and SMT3 packages

EMT3 is the world's smallest 1608 type, UMT3 is a 2125 type (SC-70), and SMT3 is a standard 2916 type (SC-59).
A series of transistors is available in each package.


EMT3


UMT3


SMT3

Application	Package EMT3 PNP	Package EMT3 NPN	Package UMT3 PNP	Package UMT3 NPN	Package SMT3 PNP	Package SMT3 NPN	V_{CEO} (V)	I_C (mA)	P_C (mW) Ta=25℃ EMT3*	P_C (mW) Ta=25℃ UMT3, SMT3	h_{FE} width (PNP/NPN)	h_{FE} Rank
	Product name											
RF SW	**2SA1855** (306)	**2SC4997** (296)	—	**2SC4998** (296)	—	—	10	100	150	200	180~560/ 560~2700	Q, R, S/ —
General purpose	**2SA1774** (179)	**2SC4617** (222)	**2SA1576A** (179)	**2SC4081** (222)	**2SA1037AK** (179)	**2SC2412K** (222)	50	150	150	200	120~560	Q, R, S
	—	—	**2SA1579** (261)	**2SC4102** (261)	**2SA1514K** (261)	**2SC3906K** (261)	120	50	—	200	180~560/ 180~820※	R, S/ R, S, E※
	—	**2SC5274** (290)	—	—	—	—	150	50	150	—	56~120	N
Driver	—	—	—	—	**2SB1590K** (279)	**2SD2444K** (279)	15	1000	—	200	120~270/ 180~390	Q/R
	—	—	**2SA1577** (185)	**2SC4097** (232)	**2SA1036K** (185)	**2SC2411K** (232)	32	500	—	200	82~390	P, Q, R
	—	—	—	—	**2SB1197K** (209)	**2SD1781K** (258)	32	800	—	200	120~390	Q, R
	—	—	—	**2SD1949** (304)		**2SD1484K** (304)	50	500	—	200	120~390	Q, R
	—	—	—	—	**2SB1198K** (211)	**2SD1782K** (257)	80	500	—	200	120~390	Q, R
Low $V_{CE(sat)}$	—	—	—	—	—	**2SD1757K** (303)	15	500	—	200	120~560	Q, R, S
Darlington	—	—	—	—	—	**2SD2142K** (302)	32	300	—	200	5k~	—
	—	—	—	—	**2SB852K** (266)	**2SD1383K** (266)	32 (V_{CES})	300	—	200	5k~	B
Telephones	—	—	—	—	—	**2SC4061K** (295)	300	100	—	200	56~180	N, P
High h_{FE}, High V_{EBO}	—	—	—	**2SD2351** (308)	—	**2SD2226K** (308)	50	150	—	200	820~2700	V, W
	—	—	—	—	—	**2SD2114K** (214)	20	500	—	200	820~2700	V, W

Notes) 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on PNP values has been abbrebiated.
3. *: Indicates value when mounted according to recommended land pattern.
4. ※: Only for 2SC3906K.

●EMT3, UMT3 and SMT3 high-frequency packages

Application	Package: EMT3 PNP	EMT3 NPN	UMT3 PNP	UMT3 NPN	SMT3 PNP	SMT3 NPN	V_{CEO} (V)	I_C (mA)	f_T (MHz)	Cob (pF)	h_{FE} Width	h_{FE} Rank
	Product name											
FM・IF/AM・RF	—	**2SC4618** (296)	—	**2SC4098** (296)	—	**2SC2413K** (296)	25	50	300	1.3	56~270	N, P, Q
RF SW	—	—	—	**2SC4774** (292)	—	**2SC4713K** (292)	6	50	800	1	270~560	S
TV Tuner/ Mix. Osc.	—	**2SC4725** (289)	—	**2SC4082** (289)	—	**2SC3837K** (289)	18	50	1500	0.9	56~180	N, P
	—	**2SC4726** (289)	—	**2SC4083** (289)	—	**2SC3838K** (289)	11	50	3200	0.8	56~180	N, P

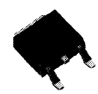
Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.

●MPT3 and CPT3

The MPT3 is a mini-mold power transistor with P_C = 0.5 to 2W (SC-62 class).

The CPT3 is a surface-mount power transistor with P_C = 10 to 15W (TC = 25℃) (SC-63 class).

MPT3



CPT3

Application	Package: MPT3 PNP	MPT3 NPN	CPT3 PNP	CPT3 NPN	V_{CEO} (V)	I_C (mA)	P_C (mW) Ta=25℃ MPT3 *	P_C (mW) Tc=25℃ CPT3	h_{FE} Width (PNP/NPN)	h_{FE} Rank
	Product name									
Driver	—	**2SD2167** (300)	—	—	31±4	2	0.5	—	56~270	N, P, Q
	2SB1132 (188)	**2SD1664** (235)	—	—	32	1	0.5	—	82~390	P, Q, R
	2SB1188 (196)	**2SD1766** (242)	**2SB1182** (196)	**2SD1758** (242)	32	2	0.5	10	82~390	P, Q, R
	2SB1189 (264)	**2SD1767** (264)	—	—	80	0.7	0.5	—	82~390	P, Q, R
	2SA1900 (283)	**2SC5053** (283)	—	—	50	1	0.5	—	120~270/ 120~390	Q/Q, R
	—	—	**2SB1184** (205)	**2SD1760** (250)	50	3	—	15	82~390	P, Q, R
	2SB1260 (201)	**2SD1898** (246)	**2SB1181** (201)	**2SD1733** (246)	80	1	0.5	10	82~390	P, Q, R
	—	**2SC4132** (262)	—	—	120	2	0.5	—	82~390	P, Q, R
	—	**2SD2211** (263)	**2SB1275** (263)	**2SD1918** (263)	160	1.5	0.5	10	56~180/ 120~390	N, P/ Q, R
Low $V_{CE(sat)}$	**2SB1424** (182)	**2SD2150** (229)	—	—	20	3	0.5	—	82~390/ 180~560	Q, R/ R, S
	2SB1308 (276)	**2SD1963** (276)	—	—	20	3	0.5	—	82~390/ 120~560	P, Q, R/ Q, R, S
	2SB1386 (192)	**2SD2098** (238)	**2SB1412** (192)	**2SD2118** (238)	20	5	0.5	10	82~390/ 120~390	P, Q, R/ Q, R
	2SB1561 (280)	**2SD2391** (280)	—	—	60	2	0.5	—	120~270	Q
	—	—	**2SA1834** (278)	**2SC5001** (278)	20	10	—	10	180~560/ 120~390	R, S/ Q, R
	2SA1797 (277)	**2SC4672** (277)	—	—	50	2	0.5	—	82~270	P, Q
	—	—	**2SA1952** (267)	**2SC5103** (267)	60	5	—	10	120~270/ 82~270	Q/P, Q

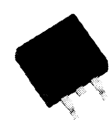
Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.
3. *: Value when mounted on a 40 x 40 x 0.7 mm ceramic board.

Application	Package				V_{CEO} (V)	I_C (mA)	P_C (mW)		h_{FE}	
	MPT3		CPT3				Ta=25℃	Tc=25℃	Width (PNP/NPN)	Rank
	PNP	NPN	PNP	NPN			MPT3 *	CPT3		
	Product name									
Darlington	—	—	**2SB1183** (269)	**2SD1759** (269)	40 (V_{CER})	2	—	10	1k~200k	—
	—	**2SD1834** (297)	—	—	60 (V_{CES})	1	0.5	—	2k~	—
	—	**2SD2212** (307)	—	**2SD2143** (307)	60±10	2	0.5	10	1k~10k	—
	—	—	**2SB1474** (284)	—	80	4	—	10	1k~10k	—
	—	**2SD2170** (299)	—	—	90 $^{+20}_{-10}$	2	0.5	—	1k~10k	—
	2SB1580 (273)	**2SD2195** (273)	**2SB1316** (273)	**2SD1980** (273)	100	2	0.5	10	1k~10k	—
High h_{FE}	**2SB1427** (270)	—	—	—	20	2	0.5	—	390~820	E
	—	**2SD2153** (270)	—	—	25	2	0.5	—	560~2700	U, V, W
	—	**2SD2537** (308)	—	—	20	1.2	0.5	—	820~2700	V, W
	—	—	—	**2SD2318** (281)	60	3	—	15	560~1800	U, V
High voltage switching	**2SA1759** (291)	**2SC4505** (291)	—	—	400	0.1	0.5	—	82~180/ 82~270	P/P, Q
	2SA1812 (306)	—	**2SA1727** (306)	—	400	0.5	—	10	82~270	P, Q
	—	—	**2SA1862** (293)	—	400	2	0.5	10	82~180	P
	—	—	**2SA1807** (293)	—	600	1	—	10	56~180	N, P
High voltage High speed SW	—	—	—	**2SC5161** (218)	400	2	—	10	25~50	B

Note: 1.The number in parentheses below the product name is the page on which datailed product data appears.
2. The minus sign (−) on PNP values has been abbrebiated.
3. *: Value when mounted on a 40 x 40 x 0.7 mm ceramic board.

●PSD3 package

The PSD3 is a TO-220 class surface-mount package with P_C = 35W (TC = 25℃).



PSD3

Application	PNP	NPN	V_{CEO} (V)	I_C (A)	P_C (W) Tc=25℃	h_{FE}	
	Product name					Width	Rank
Driver	**2SA1906** (267)	—	60	5	25	60~320	D, E, F
Low $V_{CE(sat)}$	**2SB1644** (298)	—	80	4	30	100~320	E, F
	2SA1870 (294)	—	60	12	30	100~320	E, F
High voltage switching	—	**2SC4938** (295)	400	5	35	25~50	B

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.

■Digital transistors

●UMT3, SMT3, SST3 and MPT3 packages

These are transistors with built-in resistors. A variety of built-in resistor values, packages, and application-types are available to meet a wide range of needs.

$R_1 = R_2$ Voltage divider type EMT3 UMT3 SMT3 SST3 MPT3

Application (I_C)	PNP	NPN	Resistauce		Package					V_{CC} (V)	I_O (mA)	G_I
	Product name		R_1 (kΩ)	R_2 (kΩ)	EMT3※	UMT3	SMT3	SST3	MPT3			
					Pd=150mW	Pd=200mW			Pd=500mW			
100mA	**DTA123E□A** (322)	**DTC123E□A** (388)	2.2	2.2	●	●	●	—	—	50	100	20~
	DTA143E□A (340)	**DTC143E□A** (406)	4.7	4.7	●	●	●	DTA only	—	50	100	20~
	DTA114E□A (313)	**DTC114E□A** (379)	10	10	●	●	●	●	—	50	50	30~
	DTA124E□A (331)	**DTC124E□A** (397)	22	22	●	●	●	●	—	50	30	56~
	DTA144E□A (352)	**DTC144E□A** (418)	47	47	●	●	●	—	—	50	30	68~
	DTA115E□A (459)	**DTC115E□A** (459)	100	100	●	●	●	—	—	50	20	82~
500mA	**DTB113EK** (358)	**DTD113EK** (433)	1	1	—	—	●	—	—	50	500	33~
	DTB123EK (364)	**DTD123EK** (440)	2.2	2.2	—	—	●	—	—	50	500	39~
	DTB143E□ (371)	**DTD143E□** (446)	4.7	4.7	—	—	●	●	—	50	500	47~
	DTB114EK (362)	**DTD114EK** (438)	10	10	—	—	●	—	—	50	500	56~
Muting	—	**DTC363E□** (427)	6.8	6.8	—	●	●	—	—	20	600	70~
□ : Package code					E	U	K	C	P			

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.

2. The minus sign (−) on values of PNP types has been abbreviated.

3. "A" is not indicated at the end of "EMT3".

4. Indicates value when mounted according to recommended land pattern.

$R_1 \neq R_2$ Leak absorption type

Application (I_C)	PNP	NPN	Resistaull R1 (kΩ)	R2 (kΩ)	Package EMT3※ Pd=150mW	UMT3 Pd=200mW	SMT3 Pd=200mW	SST3 Pd=200mW	MPT3 Pd=500mW	V_{CC} (V)	I_O (mA)	G_I
100mA	**DTA113Z□A** (310)	**DTC113Z□A** (376)	1	10	DTA only	●	●	—	—	50	100	33~
	DTA123Y□A (328)	**DTC123Y□A** (394)	2.2	10	●	●	●	—	—	50	100	33~
	DTA123J□A (325)	**DTC123J□A** (391)	2.2	47	●	●	●	—	—	50	100	80~
	DTA143X□A (346)	**DTC143X□A** (412)	4.7	10	●	●	●	—	—	50	100	30~
	DTA143Z□A (349)	**DTC143Z□A** (415)	4.7	47	●	●	●	DTC only	—	50	100	80~
	DTA114W□A (458)	**DTC11W□A** (458)	10	4.7	●	●	●	—	—	50	100	24~
	DTA114Y□A (319)	**DTC114Y□A** (385)	10	47	●	●	●	—	—	50	70	68~
	DTA124X□A (337)	**DTC124X□A** (403)	22	47	●	●	●	—	—	50	50	68~
	DTA144V□A (465)	**DTC144V□A** (465)	47	10	—	●	●	—	—	50	100	33~
	DTA144W□A (466)	**DTC144W□A** (466)	47	22	●	●	●	—	—	50	30	56~
500mA	**DTB122JK** (469)	**DTD122JK** (469)	0.22	4.7	—	—	●	—	—	50	500	47~
	DTB113ZK (360)	**DTD113Z□** (435)	1	10	—	DTC only	●	—	—	50	500	56~
	DTB123Y□ (368)	**DTD123YK** (444)	2.2	10	—	—	●	DTC only	—	50	500	56~
	DTB133HK (470)	**DTD133HK** (470)	3.3	10	—	—	●	—	—	50	500	80~
1A	—	**DTDG23YP** (471)	2.2	10	—	—	—	—	●	60±10	1000	300~
□ : Package code					E	U	K	C	P			

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.
3. "A" is not indicated at the end of "EMT3".
4. ※: Indicates value when mounted according to recommended land pattern.

R_1 only Input resistor type

Application (IC)	PNP	NPN	Resistance R1 (kΩ)	Resistance R2 (kΩ)	EMT3※ Pd=150mW	UMT3 Pd=200mW	SMT3 Pd=200mW	SST3 Pd=200mW	MPT3 Pd=500mW	VCEO (V)	IC (mA)	hFE
100mA	DTA113TKA (456)	—	1	None	—	—	●	—	—	50	100	100~600
100mA	—	DTC123TKA (456)	2.2	None	—	—	●	—	—	50	100	100~600
100mA	DTA143T□A (343)	DTC143T□A (409)	4.7	None	●	●	●	—	—	50	100	100~600
100mA	DTA114T□A (316)	DTC114T□A (382)	10	None	●	●	●	DTC only	—	50	100	100~600
100mA	DTA124T□A (334)	DTC124T□A (400)	22	None	●	●	●	—	—	50	100	100~600
100mA	DTA144T□A (355)	DTC144T□A (421)	47	None	●	●	●	DTC only	—	50	100	100~600
100mA	DTA115T□A (461)	DTC115T□A (461)	100	None	DTA only	●	●	—	—	50	100	100~600
100mA	DTA125T□A (463)	DTC125T□A (463)	200	None	—	●	●	—	—	50	100	100~600
500mA	DTB123TK (366)	DTD123TK (442)	2.2	None	—	—	●	—	—	40	500	100~600
500mA	DTB143TK (374)	DTD143TK (449)	4.7	None	—	—	●	—	—	40	500	100~600
500mA	DTB114TK (471)	—	10	None	—	—	●	—	—	40	500	100~600
Muting	—	DTC323T□ (467)	2.2	None	—	●	●	—	—	15	600	100~600
Muting	—	DTC343TK (467)	4.7	None	—	—	●	—	—	15	600	100~600
Muting	—	DTC363TK (430)	6.8	None	—	—	●	—	—	15	600	100~600
Muting	—	DTC314T□ (424)	10	None	—	●	●	—	—	15	600	100~600
□ : Package code					E	U	K	C	P			

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.
3. "A" is not indicated at the end of "EMT3".
4. Indicates value when mounted according to recommended land pattern.

R_2 only Bleeder resistor type

Application (Ic)	PNP	NPN	Resistance R1 (kΩ)	Resistance R2 (kΩ)	EMT3※ Pd=150mW	UMT3 Pd=200mW	SMT3 Pd=200mW	SST3 Pd=200mW	MPT3 Pd=500mW	VCEO (V)	IC (mA)	hFE
100mA	DTA114G□A (457)	DTC114G□A (457)	None	10	DTA only	●	●	—	—	50	100	68~
100mA	DTA124GKA (462)	DTC124GKA (462)	None	22	—	DTC only	●	—	—	50	100	68~
100mA	DTA144G□A (464)	DTC144G□A (464)	None	47	DTC only	●	●	—	—	50	100	68~
100mA	DTA115G□A (460)	DTC115G□A (460)	None	100	—	●	●	—	—	50	100	68~
500mA	DTB114GK (468)	DTD114GK (468)	None	10	—	—	●	—	—	50	500	56~
1A	—	DTG14GP (451)	None	10	—	—	—	—	●	60±10	1000	300~
2A	—	DTDS14GP (453)	None	10	—	—	—	—	●	60±10	2000	1000~
□ : Package code					E	U	K	C	P			

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.
3. "A" is not indicated at the end of "EMT3".
4. Indicates value when mounted according to recommended land pattern.

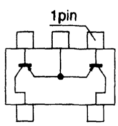
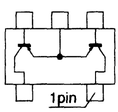
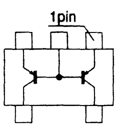
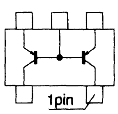
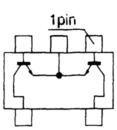
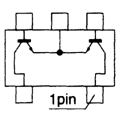
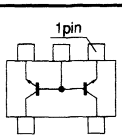
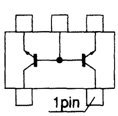
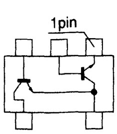
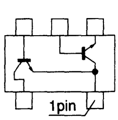
■Dual built-in circuit types

●UMT5 and SMT5 packages

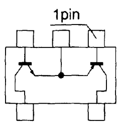
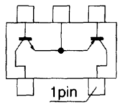
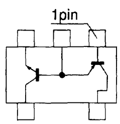
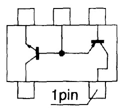
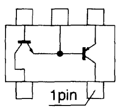
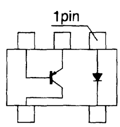
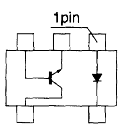
Two circuits are housed in a 2125 type package (UMT5) and a 2916 type package (SMT5).
The circuit configuration has been completed within the chip, eliminating the need for connections and saving space.


UMT5


SMT5

Internal circuit(TOP VIEW) UMT5	Internal circuit(TOP VIEW) SMT5	Application	Package UMT5 Product name	Package SMT5 Product name	Equivalent	V_{CEO} (V)	I_C (mA)	h_{FE}	V_{CE}(V)	I_C(mA)
		Pre Amp	**UMS1N** (542)	**FMS1A** (542)	2SA1037AK×2	−50	−150	120~	−6	−1
			—	**FMS3** (567)	2SA1514K×2	−120	−50	180~	−6	−2
			**UMS2N** (584)	**FMS2A** (584)	2SA1037AK×2	−50	−150	120~	−6	−1
			—	**FMS4** (567)	2SA1514K×2	−120	−50	180~	−6	−2
			**UMW1N** (548)	**FMW1** (548)	2SC2412K×2	50	150	120~	6	1
			—	**FMW3** (567)	2SC3906K×2	120	50	180~	6	2
		TV Tuner Mix. Osc.	**UMW8N** (585)	**FMW8** (585)	2SC3838K×2	11	50	27~	10	5
			UMW10N (585)	**FMW10** (585)	2SC3837K×2	18	50	27~	10	10
		Pre Amp	**UMW2N** (584)	**FMW2** (584)	2SC2412K×2	50	150	120~	6	1
			—	**FMW4** (567)	2SC3906K×2	120	50	180~	6	2
		TV Tuner Mix. Osc.	**UMW6N** (585)	**FMW6** (585)	2SC3837K×2	18	50	27~	10	10
			UMW7N (585)	**FMW7** (585)	2SC3838K×2	11	50	27~	10	5

Note: The number in parentheses below the product name is the page on which detailed product data appears.

Internal circuit UMT5	Internal circuit SMT5	Application	Package UMT5 Product name	Package SMT5 Product name	Equivalent	V_{CEO} (V)	I_C (mA)	h_{FE}	V_{CE}(V)	I_C(mA)
		Single End	**UMY1N** (554)	**FMY1A** (554)	2SA1037AK	−50	−150	120∼	−6	−1
					2SC2412K	50	150		6	1
			—	**FMY5** (568)	2SA1514K	−120	−50	180∼	−6	−2
					2SC3906K	120	50		6	2
			—	**FMY6** (568)	2SA1036K	−32	−500	120∼	−3	−10
					2SC2411K	32	500		3	10
		Inverter Driver	**UMY3N** (586)	**FMY3A** (586)	2SA1037AK	−50	−150	120∼	−6	−1
					2SC2412K	50	150		6	1
—			—	**FMY4A** (586)	2SA1037AK	−50	−150	120∼	−6	−1
					2SC2412K	50	150		6	1
	—	Pre Amp	**UML1N** (582)	—	2SA1037AK	−50	−150	120∼	−6	−1
					DAN212K	Diode characteristics V_R=80V, I_O=100mA, C_T=3.5pF, trr=4.0ns				
	—		**UML2N** (583)	—	2SC2412K	50	150	120∼	6	1
					DAN212K	Diode characteristics V_R=80V, I_O=100mA, C_T=3.5pF, trr=4.0ns				

Note: The number in parentheses below the product name is the page on which detailed product data appears.

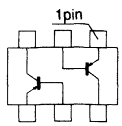
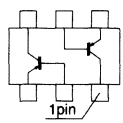
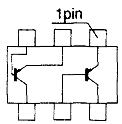
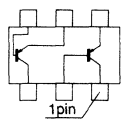
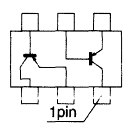
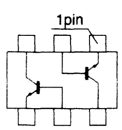
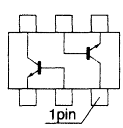
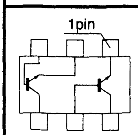
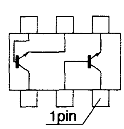
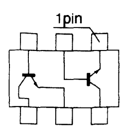
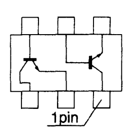
●UMT6 and SMT6 packages

Two circuits are housed in a 2125 type package (UMT6) and a 2916 type package (SMT6).

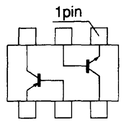
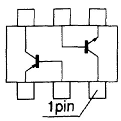
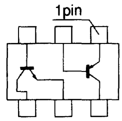
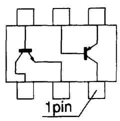
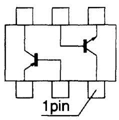
The two circuits are completely independent of each other, allowing the configuration of any desired circuit with the advantage of space-saving through reduction of mounted components.

UMT6

SMT6

Internal circuit(TOP VIEW)		Application	Package		Equivalent	V_{CEO} (V)	I_C (mA)	h_{FE}		
UMT6	SMT6		UMT6	SMT6					V_{CE}(V)	I_C(mA)
			Product name							
		Pre Amp	**UMT1N** (545)	**IMT1A** (545)	2SA1037AK×2	−50	−150	120~	−6	−1
				IMT17 (472)	2SA1036K×2	−50	−500	120~390	−3	−100
			**UMT2N** (584)	**IMT2A** (584)	2SA1037AK×2	−50	−150	120~	−6	−1
—			—	**IMT3A** (584)	2SA1037AK×2	−50	−150	120~	−6	−1
			—	**IMT4** (567)	2SA1514K×2	−120	−50	180~	−6	−2
			**UMX1N** (551)	**IMX1** (551)	2SC2412K×2	50	150	120~	6	1
			—	**IMX9** (475)	2SD2114K×2	20	500	560~ 2700	3	10
			—	**IMX17** (478)	2SD1484K×2	50	500	120~390	3	100
			**UMX2N** (584)	**IMX2** (584)	2SC2412K×2	50	150	120~	6	1
			**UMX3N** (584)	**IMX3** (584)	2SC2412K×2	50	150	120~	6	1
			—	**IMX8** (567)	2SC3906K×2	120	50	180~	6	2
		TV Tuner Mix. Osc.	**UMX4N** (585)	**IMX4** (585)	2SC3837K×2	18	50	56~180	10	10
			UMX5N (585)	**IMX5** (585)	2SC3838K×2	11	50	56~180	10	5

Note: The number in parentheses below the product name is the page on which detailed product data appears.

Internalcircuil(TOP VIEW)		Application	Package		Equivalent	V_{CEO} (V)	I_C (mA)	h_{FE}		
UMT6	SMT6		UMT6	SMT6					V_{CE}(V)	I_C(mA)
			Product name							
		Pre Amp	**UMZ1N** (559)	**IMZ1A** (559)	2SA1037AK	−50	−150	120~	−6	−1
					2SC2412K	50	150	120~	6	1
			**UMZ2N** (586)	**IMZ2A** (586)	2SA1037AK	−50	−150	120~	−6	−1
					2SC2412K	50	150	120~	6	1
—			—	**IMZ4** (481)	2SA1036K	−32	−500	120~560	−3	−10
					2SC2411K	32	500	120~560	3	10

Note: The number in parentheses below the product name is the page on which detailed product data appears.

ROHM

Dual digital transistor type

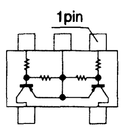
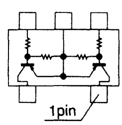
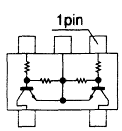
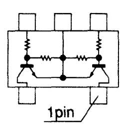
● UMT5 and SMT5 packages

Two transistor circuits with resistors are incorporated into a 2125 type package (UMT5) and 2916 type package (SMT5). Circuit configuration has been completed within the chip, eliminating the need for connections and saving space.

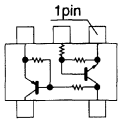
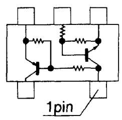
UMT5

SMT5

Two-resistor type

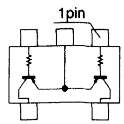
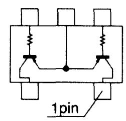
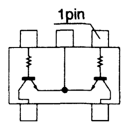
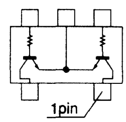
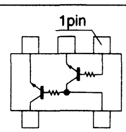
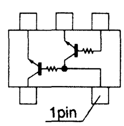
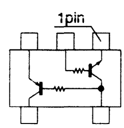
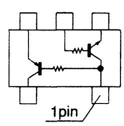
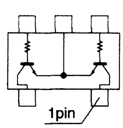
Internal circuit(TOP VIEW) UMT5	Internal circuit(TOP VIEW) SMT5	Application	Package UMT5 (Product name)	Package SMT5 (Product name)	Equivalent	Resistance R_1(kΩ)	Resistance R_2(kΩ)	V_{CC} (V)	I_O (mA)	G_I	V_O(V)	I_O(mA)
		Inverter Driver	**UMA1N** (573)	**FMA1A** (573)	DTA124E×2	22	22	−50	−30	56~	−5	−5
			UMA2N (485)	**FMA2A** (485)	DTA144E×2	47	47	−50	−30	68~	−5	−5
			UMA5N (575)	**FMA5A** (575)	DTA123J×2	2.2	47	−50	−100	80~	−5	−10
			UMA7N (577)	**FMA7A** (577)	DTA143×2	4.7	10	−50	−100	30~	−5	−10
			UMA8N (578)	**FMA8A** (578)	DTA114Y×2	10	47	−50	−100	68~	−5	−5
			UMA9N (489)	**FMA9A** (489)	DTA114E×2	10	10	−50	−50	30~	−5	−5
			UMA10N (579)	**FMA10A** (579)	DTA113Z×2	1	10	−50	−100	33~	−5	−5
			UMA11N (491)	**FMA11A** (491)	DTA143Z×2	4.7	47	−50	−100	80~	−5	−10
			**UMG1N** (573)	**FMG1A** (573)	DTC124EX 2	22	22	50	30	56~	5	5
			UMG2N (524)	**FMG2A** (524)	DTC144EX 2	47	47	50	30	68~	5	5
			UMG5N (578)	**FMG5A** (578)	DTC114Y×2	10	47	50	70	68~	5	5
			UMG8N (528)	**FMG8A** (528)	DTC143Z×2	4.7	47	50	100	80~	5	10
			UMG9N (530)	**FMG9A** (530)	DTC114EX 2	10	10	50	50	30~	5	5
			UMG10N (579)	—	DTC113Z×2	1	10	50	100	33~	5	5
			UMG11N (575)	**FMG11A** (575)	DTC123J×2	2.2	47	50	100	80~	5	10

Note: The number in parentheses below the product name is the page on which detailed product data appears.

Internal circuit(TOP VIEW)		Application	Package		Equivalent	Resistance		V_{CC} (V)	I_O (mA)	G_I		
UMT5	SMT5		UMT5	SMT5		R_1(kΩ)	R_2(kΩ)				V_O(V)	I_O(mA)
			Product name									
		Switching circuit Power Manage-ment	**UMC2N** (503)	**FMC2A** (503)	DTA124E	22	22	−50	−30	56~	−5	−5
					DTC124E	22	22	50	30	56~	5	5
			UMC3N (506)	**FMC3A** (506)	DTA114E	10	10	−50	−50	30~	−5	−5
					DTC114E	10	10	50	50	30~	5	5
			UMC4N (509)	**FMC4A** (509)	DTA114Y	10	47	−50	−70	68~	5	−5
					DTC144E	47	47	50	30	68~	5	5
			UMC5N (512)	**FMC5A** (512)	DTA143X	4.7	10	−50	−100	30~	−5	−5
					DTC144E	47	47	50	30	68~	5	5
			—	**FMC6A** (564)	DTA115E	100	100	−50	−20	82~	−5	−5
					DTC115E	100	100	50	20	82~	5	5
—			—	**FMC7A** (581)	DTA144E	47	47	−50	−30	68~	−5	−5
					DTC144E	47	47	50	30	68~	5	5

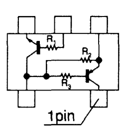
Note: The number in parentheses below the product name is the page on which detailed product data appears.

One-resistor type

Internal circuit (TOP VIEW) UMT5	Internal circuit (TOP VIEW) SMT5	Application	Package UMT5 Product name	Package SMT5 Product name	Equivalent	Resistance R_1(kΩ)	V_{CEO} (V)	I_C (mA)	h_{FE}	V_{CE}(V)	I_C(mA)
		Inverter Driver	**UMA3N** (487)	**FMA3A** (487)	DTA143T×2	4.7	−50	−100	100~600	−5	−1
			UMA4N (574)	**FMA4A** (574)	DTA114T×2	10	−50	−100	100~600	−5	−1
			UMA6N (576)	**FMA6A** (576)	DTA144T×2	47	−50	−100	100~600	−5	−1
			**UMG3N** (526)	**FMG3A** (526)	DTC143T×2	4.7	50	100	100~600	5	1
			UMG4N (574)	**FMG4A** (574)	DTC114T×2	10	50	100	100~600	5	1
			UMG6N (576)	**FMG6A** (576)	DTA144T×2	47	50	100	100~600	5	1
			**UMG7N** (574)	**FMG7A** (574)	DTA114T×2	10	50	100	100~600	5	1
		Switching Circuit Power Manage-ment	**UMC1N** (581)	**FMC1A** (581)	DTA143T	4.7	−50	−100	100~600	−5	−1
					DTC143T	4.7	50	100	100~600	5	1
—		Muting Power Switching	—	**FMG12** (565)	DTC323T×2	2.2	15	600	100~600	5	50
			—	**FMG13** (569)	DTC343T×2	4.7	15	600	100~600	5	50

Note: The number in parentheses below the product name is the page on which detailed product data appears.

One-resistor / two-resistor type

Internal circuit (TOP VIEW) UMT5	Internal circuit (TOP VIEW) SMT5	Application	Package UMT5 Product name	Package SMT5 Product name	Equivalent	Resistance R_1/R_2 (kΩ)	Resistance R_3(kΩ)	V_{CC} (V)	I_O (mA)	G_I	V_O(V)	I_O(mA)
—		Switching Circuit Power Manage-ment	—	**FMQ2** (566)	DTC115TK	100	200	30	30	270~	2	1
					—	—	—	−30	−500	120~	−2	−100

Note: The number in parentheses below the product name is the page on which detailed product data appears.

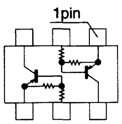
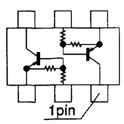
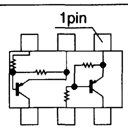
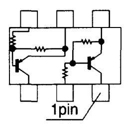
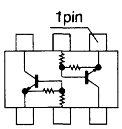
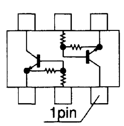
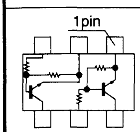
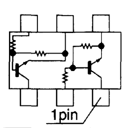
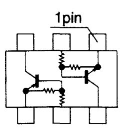
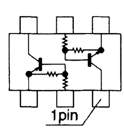
●UMT6 and SMT6 packages

Two circuits are housed in a 2125 type package (UMT6) and a 2916 type package (SMT6). The two circuits are completely independent of each other, allowing the configuration of any desired circuit with the advantage of space-saving through reduction of mounted components.

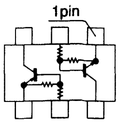
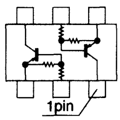
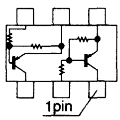
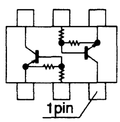

UMT6


SMT6

Two-resistor type

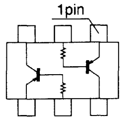
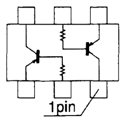
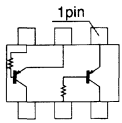
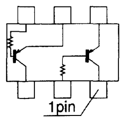
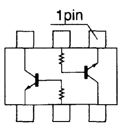
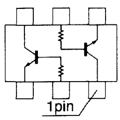
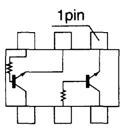
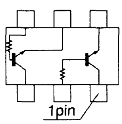
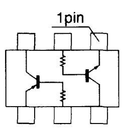
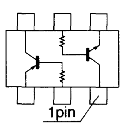
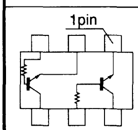
Internal circuit (TOP VIEW) UMT6	Internal circuit (TOP VIEW) SMT6	Application	Package UMT6 Product name	Package SMT6 Product name	Equinvalent	Resistance R_1(kΩ)	Resistance R_2(kΩ)	V_{CC} (V)	I_O (mA)	G_I	V_O(V)	I_O(mA)
		Inverter Driver	**UMB1N** (573)	**IMB1A** (573)	DTA124E×2	22	22	−50	−30	56~	−5	−5
			UMB2N (493)	**IMB2A** (493)	DTA144E×2	47	47	−50	−30	68~	−5	−5
			UMB9N (497)	**IMB9A** (497)	DTA114Y×2	10	47	−50	−70	68~	−5	−5
			UMB10N (499)	**IMB10A** (499)	DTA123J×2	2.2	47	−50	−100	80~	−5	−10
			UMB11N (501)	**IMB11A** (501)	DTA114E×2	10	10	−50	−50	30~	−5	−5
			**UMB5N** (573)	**IMB5A** (573)	DTA124E×2	22	22	−50	−30	56~	−5	−5
			UMB6N (580)	**IMB6A** (580)	DTA144E×2	47	47	−50	−30	68~	−5	−5
			**UMH1N** (573)	**IMH1A** (573)	DTC124E×2	22	22	50	30	56~	5	5
			UMH2N (532)	**IMH2A** (532)	DTC144E×2	47	47	50	30	69~	5	5
			UMH9N (536)	**IMH9A** (536)	DTC114Y×2	10	47	50	70	68~	5	5
			UMH10N (538)	**IMH10A** (538)	DTC123J×2	2.2	47	50	100	80~	5	10
			UMH11N (540)	**IMH11A** (540)	DTA114E×2	10	10	50	50	30~	5	5
			**UMH5N** (573)	**IMH5A** (573)	DTC124E×2	22	22	50	30	56~	5	5
			UMH6N (580)	**IMH6A** (580)	DTC144E×2	47	47	50	30	68~	5	5
			**UMD2N** (515)	**IMD2A** (515)	DTA124E	22	22	−50	−30	56~	−5	−5
					DTC124E	22	22	50	30	56~	5	5
			UMD3N (518)	**IMD3A** (518)	DTA114E	10	10	−50	−50	30~	−5	−5
					DTC114E	10	10	50	50	30~	5	5
			—	**IMD9A** (570)	DTA114Y	10	47	−50	−70	68~	−5	−5
					DTC114Y	10	47	50	70	68~	5	5

Note: The number in parentheses below the product name is the page on which detailed product data appears.

Internal circuit(TOP VIEW)		Application	Package		Equivalent	Resistance		V_{CC} (V)	I_O (mA)	G_I		
UMT6	SMT6		UMT6	SMT6		R_1(kΩ)	R_2(kΩ)				V_O(V)	I_O(mA)
			Product name									
	—	Inverter Driver	**UMD12N** (581)	—	DTA144E	47	47	−50	−30	68∼	−5	−5
					DTC144E	47	47	50	30	68∼	5	5
—			—	**IMB16** (577)	DTB143XX2	4.7	10	−50	−500	56∼	−5	−50
—			—	**IMB17A** (579)	DTA113ZX2	1	10	−50	−100	33∼	−5	−5
—			—	**IMD14** (565)	—	0.22	10	−50	−500	82∼	−5	−100
					—	0.22	10	50	500	82∼	5	100

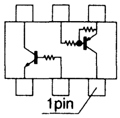
Note: The number in parentheses below the product name is the page on which detailed product data appears.

One-resistor type

<table>
<tr><th colspan="2">Internal circuit(TOP VIEW)</th><th rowspan="3">Application</th><th colspan="2">Pqckage</th><th rowspan="3">Equivalent</th><th>Resistance</th><th rowspan="3">V_{CEO} (V)</th><th rowspan="3">I_C (mA)</th><th rowspan="3">h_{FE}</th><th rowspan="3">V_O(V)</th><th rowspan="3">I_O(mA)</th></tr>
<tr><th rowspan="2">UMT6</th><th rowspan="2">SMT6</th><th>UMT6</th><th>SMT6</th><th rowspan="2">R_1(kΩ)</th></tr>
<tr><th colspan="2">Product name</th></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td rowspan="17">Inverter Driver</td><td>UMB3N (495)</td><td>IMB3A (495)</td><td>DTA143T×2</td><td>4.7</td><td>−50</td><td>−100</td><td>100~600</td><td>−5</td><td>−1</td></tr>
<tr><td>UMB4N (574)</td><td>IMB4A (574)</td><td>DTA114T×2</td><td>10</td><td>−50</td><td>−100</td><td>100~600</td><td>−5</td><td>−1</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>—</td><td>IMB7A (569)</td><td>DTA143T×2</td><td>4.7</td><td>−50</td><td>−100</td><td>100~600</td><td>−5</td><td>−1</td></tr>
<tr><td>UMB8N (574)</td><td>IMB8A (574)</td><td>DTA114T×2</td><td>10</td><td>−50</td><td>−100</td><td>100~600</td><td>−5</td><td>−1</td></tr>
<tr><td rowspan="3"></td><td rowspan="3"></td><td>UMH3N (534)</td><td>IMH3A (534)</td><td>DTC143T×2</td><td>4.7</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td>UMH4N (574)</td><td>IMH4A (574)</td><td>DTC114T×2</td><td>10</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td>—</td><td>IMH15A (576)</td><td>DTC144T×2</td><td>47</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td rowspan="3"></td><td rowspan="3"></td><td>UMH7N (569)</td><td>IMH7A (569)</td><td>DTC143T×2</td><td>4.7</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td>UMH8N (574)</td><td>IMH8A (574)</td><td>DTC114T×2</td><td>10</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td>—</td><td>IMH14A (576)</td><td>DTC144T×2</td><td>47</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td rowspan="6"></td><td rowspan="6"></td><td rowspan="2">—</td><td rowspan="2">IMD1A (564)</td><td>DTA124T</td><td>22</td><td>−50</td><td>−100</td><td>100~600</td><td>−5</td><td>−1</td></tr>
<tr><td>DTC124T</td><td>22</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td rowspan="2">UMD6N (521)</td><td rowspan="2">IMD6A (521)</td><td>DTA143T</td><td>4.7</td><td>−50</td><td>−100</td><td>100~600</td><td>−5</td><td>−1</td></tr>
<tr><td>DTC143T</td><td>4.7</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td rowspan="2">—</td><td rowspan="2">IMD8A (570)</td><td>DTA144T</td><td>47</td><td>−50</td><td>−100</td><td>100~600</td><td>−5</td><td>−1</td></tr>
<tr><td>DTC144T</td><td>47</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
<tr><td></td><td>—</td><td>UMH14N (576)</td><td>—</td><td>DTC144T×2</td><td>47</td><td>50</td><td>100</td><td>100~600</td><td>5</td><td>1</td></tr>
</table>

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbriviated.

One-resistor/two-resistor type

Internal circuit(TOP VIEW)		Application	Package		Equivalent	Resistance		Vcc (V)	Ic (mA)	hFE (GI)		
UMT6	SMT6		UMT6	SMT6		R_1(kΩ)	R_2(kΩ)				V_O(V)	I_O(mA)
			Product name									
—	 1pin	Inverter Driver	—	**IMD10A** (571)	—	0.1	10	−50	−500	68~	—	—
					DTC114T	10	—	50	100	100~600	5	1
			—	**IMD16A** (572)	DTB123E	2.2	2.2	−50	−500	82~	−5	−50
					DTC115T	100	—	50	100	100~600	5	1

Note: 1. The number in porentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbriviated.

Leaded types

■MOS FET

- 4V drive types : Direct drive from IC allows reduction of components (elimination of buffer transistor).
- High-speed switching characteristics : Based on new process technology, the input capacitance (Ciss) has been reduced to achieve high-speed switching characteristics.
  2SK2792 (ROHM : 600V, 4A) t_{on} : 29ns (Typ.) t_{off} : 82ns (Typ.)
  Previous product of same class (600V, 5A class) t_{on} : 36ns (Typ.) t_{off} : 130ns (Typ.)

●TO-220FN packages

TO-220FN

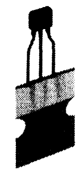
Application	Package	Product name	V_{DSS} (V)	I_D (A)	P_D (W)	$R_{DS(on)}$ Typ. (Ω)	
					T_c=25°C	V_{GS}=4V	V_{GS}=10V
Switching	TO-220FN	**2SK2095N** (95)	60	10	30	0.11	0.08
		2SK2459N (111)	200	5	30	—	0.45
		2SK2460N (115)	250	5	30	—	0.55
		2SK2711 (131)	250	16	30	—	0.2
		2SK2739 (151)	300	16	30	—	0.27
		2SK2713 (135)	450	5	30	—	1
		2SK2299N (107)	450	7	30	—	0.85
		2SK2793 (163)	500	5	30	—	1.1
		2SK2714 (139)	500	10	30	—	0.75
		2SK2792 (159)	600	4	30	—	1.8
		2SK2740 (155)	600	7	30	—	1
		2SK2294 (103)	800	3	30	—	3

Note: The number in parentheses below the product name is the page on which detailed product data appears.

■Transistors

●SPT package

This is the orthodox package for leaded transistors.
Supplied on tape for support of automatic mounting lines.



SPT

Application	PNP	NPN	V_{CEO} (V)	I_C (A)	P_C (W) Tc=25℃	h_{FE}	
	Product name					Width	Rank
Low Noise	**2SA933AS** (179)	**2SC1740S** (222)	50	0.15	0.3	120~560	Q, R, S
Driver	**2SA854S** (182)	**2SC1741S** (232)	32	0.5	0.3	120~390/ 120~560	Q, R/Q, R, S
	2SA1515S (182)	—	32	1	0.3	120~390	Q, R
	—	**2SC1741AS** (304)	50	0.5	0.3	120~390	Q, R
	—	**2SC3359S** (304)	80	0.3	0.3	120~390	Q, R
	—	**2SD1768S** (246)	80	1	0.3	120~390	Q, R
Low $V_{CE(sat)}$	**2SA1585S** (182)	**2SC4115S** (229)	20	2	0.4	120~390/ 120~560	Q, R/Q, R, S
	—	**2SD1468S** (297)	15	1	0.4	120~560	Q, R, S
High h_{FE}	—	**2SD2144S** (214)	20	0.5	0.3	560~2700	U. V. W
	—	**2SD2171S** (308)	25	1.2	0.3	820~1800	V
	—	**2SD2227S** (308)	50	0.15	0.3	1200~2700	W
Chroma	—	**2SC3415S** (295)	300	0.1	0.3	56~180	N, P
Storobo Flash	—	**2SD2470** (302)	10	5	0.4	270~820	—
High voltage sw	**2SA821S** (260)	**2SC1651S** (260)	210 (V_{CER})	0.03	0.25	82~270	P, Q
Darlington	—	**2SC2062S** (302)	32	0.3	0.3	10k~	C
	2SA830S (266)	**2SC1645S** (266)	32 (V_{CES})	0.3	0.3	5k~	B

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.

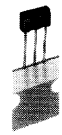
●SPT package (for high-frequency use)

Application	Product name	V_{CEO} (V)	I_C (A)	f_T (MHz)	Cob (pF)	h_{FE}	
						Width	Rank
TV Tuner Mix. Osc.	**2SC4043S** (289)	11	0.05	3200	1	82~180	P
FM IF/AM RF	**2SC2058S** (296)	25	0.05	300	1.6	82~180	P

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.

●ATV and ATR packages

Of approximately the same size as the SPT, the ATV yields 1W.
Supplied on tape for use in automatic mounting lines.



ATV

ATR

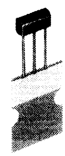
Application	Package ATV PNP	Package ATV NPN	Package ATR PNP	Package ATR NPN	V_{CEO} (V)	I_C (A)	P_C(mW) Ta=25°C	h_{FE} width	h_{FE} Rank
	Product name								
Driver	**2SB1237** (188)	**2SD1858** (235)	—	—	32	1	1	82~390	P, Q, R
	2SB1240 (196)	**2SD1862** (242)	**2SB911M** (162)	**2SD1227M** (206)	32	2	1	82~390/ 120~390	P, Q, R/ Q, R
	2SB1243 (205)	**2SD1864** (250)	—	—	50	3	1	82~390	P, Q, R
	2SB1238 (264)	**2SD1859** (264)	—	—	80	0.7	1	82~390/ 120~390	P, Q, R/ Q, R
	2SB1241 (201)	**2SD1863** (246)	—	—	80	1	1	120~390/ 180~390	Q, R/R
	2SB1236 (262)	**2SD1857** (262)	—	—	120	1.5/2	1	120~390/ 82~390	Q, R/ P, Q, R
	2SB1236A (263)	**2SD1857A** (263)	—	—	160	1.5	1	82~270	P, Q
Low $V_{CE(sat)}$	—	**2SD2264** (229)	—	—	20	3	1	180~390	R
	2SB1443 (277)	—	—	—	50	2	1	120~270	Q
	—	**2SD1865** (297)	—	—	15	1	0.6	120~390	Q, R
Chroma	—	**2SC4015** (295)	—	—	300	0.1	1	56~120	N
High Voltage	—	**2SC4620** (291)	—	—	400	0.1	1	82~270	P, Q
	2SA1776 (306)	—	—	—	400	0.5	1	82~270	P, Q
	2SA1920 (294)	—	—	—	600	0.1	1	82~180	P
Storobo	**2SB1326** (192)	**2SD2097** (238)	—	—	20	5	1	120~390	Q, R
Darlington	**2SB1239** (269)	**2SD1861** (269)	—	—	40 (V_{CER})	2	1	1k~	—
	—	**2SD1866** (307)	—	—	60±10	2	1	1k~10k	—
	—	**2SC5060** (309)	—	—	90±10	1	1	2k~2.5k	M
	—	**2SD1867** (273)	—	—	100	2	1	1k~10k	—

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. PC for ATV package when mounted on a 1.7 mm thick board with 1 cm2 collector copper plating.
3. The minus sign has been abbreviated on PNP values.

ROHM

●FTL and FTR packages

The height of the FTL and FTR are lower than the board plane when mounted on a set board, making them ideal for applications with mounting area and height limitations.
The FTL is available on tape for use in automatic mounting lines.


FTL


FTR

Application	FTL		FTR		V_{CEO} (V)	I_C (A)	P_C(mW) Ta=25℃	h_{FE}	
	PNP	NPN	PNP	NPN					
	Product name							Width	Rank
Driver	**2SB1277** (196)	**2SD1919** (242)	**2SB822** (196)	**2SD1055** (242)	32	2	0.75	82~390	P, Q, R

Note: The number in parentheses below the product name is the page on which detailed product data appears.

●TO-126FP package

The TO-126FP is a direct-mount type which eliminates the need for an isolation sheet, allowing efficient assembly.

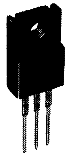

TO-126FP

Application	PNP	NPN	V_{CEO} (V)	I_C (A)	P_C (W) Tc=25℃	h_{FE}	
	Product name					Width	Rank
Driver	**2SB891F** (196)	**2SD1189F** (242)	32	2	5	82~390/ 120~390	P, Q, R/Q, R
	2SB889F (264)	**2SD1200F** (264)	80	0.7	5	120~270/ 120~390	Q/Q, R
	—	**2SD1381F** (246)	80	1	5	82~270	P, Q
	—	**2SD2343** (262)	120	1.5	5	82~270	P, Q
Low $V_{CE(sat)}$	**2SB1436** (192)	**2SD2166** (238)	20	5	5	180~390/ 120~390	R/Q, R
High h_{FE}	—	**2SC4137** (292)	20	0.1	4	820~2700	V, W
Chroma	—	**2SC3271F** (295)	300	0.1	5	56~120	N
Derlington	**2SB786F** (269)	**2SD947F** (269)	40 (V_{CER})	2	2	1k~	—

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.

●TO-220FN package

The TO-220FN package is designed for high density mounting. It is 2mm lower than the TO-220FP, and the support pins in the fin have been eliminated.



TO-220FN

Application	PNP	NPN	V_{CEO} (V)	I_C (A)	P_C (W) Tc=25℃	h_{FE}	
	Product name					Width	Rank
Driver	**2SB1566** (282)	**2SD2395** (282)	50	3	25	100~320	E, F
	2SB1655 (305)	**2SD2576** (300)	60	3	25	100~200/ 160~320	E/F
	2SB1565 (305)	**2SD2394** (300)	60	3	30	100~320	E, F
	2SB1569A (263)	**2SD2400A** (263)	160	1.5	20	100~200	E
High h_{FE}	**2SB1639** (281)	—	60	3	30	400~800	H
	—	**2SD2396** (309)	60	3	30	400~2k	H, J, K
Chroma	—	**2SC5147** (288)	300	0.1	10	60~200	D, E
High voltage SW	—	**2SC5113** (225)	450	5	35	10~30	—
Derlington	**2SB1568** (286)	**2SD2399** (286)	80	4	30	1k~10k	—
	2SB1567 (273)	**2SD2398** (273)	100	2	20	1k~10k	—

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on PNP values has been abbrebiated.

●TO-220FP package

The TO-220FP has the same fins as the TO-220, but molded for easy installation. P_C, at 2W, is high.

TO-220FP

Application	PNP	NPN	V_{CEO} (V)	I_C (A)	P_C (W) Tc=25℃	h_{FE}	
	Product name					Width	Rank
Driver	**2SB1185** (205)	**2SD1762** (250)	50	3	25	60~320	D, E, F
	2SB1370 (305)	**2SD2061** (301)	60	3	30	100~320	E, F
	2SA1635 (275)	—	80	4	30	100~200	E
	2SB1335 (265)	**2SD1855** (265)	60	4	30	100~320	E, F
	2SB1292 (272)	**2SD1832** (272)	60	5	30	100~320	E, F
	—	**2SC4008** (275)	80	4	30	100~500	E, F, G
	2SB1290 (271)	**2SD1833** (271)	80	7	30	100~320/ 60~320	E, F/D, E, F
	—	**2SD1897** (303)	100	5	30	100~200	E
	2SB1186 (262)	**2SD1763** (262)	120	1.5	20	100~320	E, F
	—	**2SD1957** (301)	120	7	30	160~500	F, G
	2SB1186A (263)	**2SD1763A** (263)	160	1.5	20	60~200	D, E
Velocity Modulation	**2SA1964** (268)	**2SC5248** (268)	160	1.6	20	60~200	D, E
Low $V_{CE(sat)}$	**2SA1757** (267)	**2SC4596** (267)	60	5	25	160~320/ 100~320	F/E, F
	—	**2SC4849** (288)	120	7	30	100~200	E
High h_{FE}	—	**2SD1944** (281)	60	3	30	400~2000	H, J, K
High voltage SW	—	**2SC3969** (218)	400	2	20	25~50	B
	—	**2SC4129** (295)	400	7	30	16~50	A, B

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.

2. The minus sign (−) on PNP values has been abbrebiated.

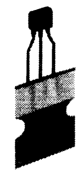
Application	PNP	NPN	V_{CEO} (V)	I_C (A)	P_C (W) Tc=25℃	h_{FE}	
	Praduct name					Width	Rank
Derlington	—	**2SC4574** (299)	60±10	4	30	2k~10k	—
	—	**2SD1764** (307)	60±10	2	20	1k~10k	—
	—	**2SD1856** (307)	60±10	5	25	2k~30k	—
	2SB1342 (284)	**2SD1933** (284)	80	4	30	1k~10k	—
	2SB1616 (287)	**2SD2478** (287)	80	4	30	1k~10k	—
	2SB1551 (298)	—	80	10	30	1k~20k	—
	2SB1287 (273)	**2SD1765** (273)	100	2	20	1k~10k	—
	2SB1344 (285)	**2SD2025** (285)	100	8	30	1k~20k	—
	2SB1340 (274)	**2SD1889** (274)	120	6	30	2k~20k	—

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on PNP values has been abbrebiated.

■Digital transistors

●SPT package

Transistors with built-in resistors in an SPT package. A variety of resistor values and application types are available to meet a wide range of needs.



SPT

$R_1 = R_2$ Voltage divider type

Application	PNP	NPN	Resistance		P_C (mW)	V_{CC} (V)	I_O (mA)	G_I
	Product name		R_1 (kΩ)	R_2 (kΩ)				
100mA	DTA123ESA (322)	DTC123ESA (388)	2.2	2.2	300	50	100	20~
	DTA143ESA (340)	DTC143ESA (418)	4.7	4.7	300	50	100	20~
	DTA114ESA (313)	DTC114ESA (379)	10	10	300	50	50	30~
	DTA124ESA (331)	DTC124ESA (397)	22	22	300	50	30	56~
	DTA144ESA (352)	DTC144ESA (418)	47	47	300	50	30	68~
	DTA115ESA (459)	DTC115ESA (459)	100	100	300	50	20	82~
500mA	DTB113ES (358)	DTD113ES (433)	1	1	300	50	500	33~
	DTC123ES (388)	DTD123ES (440)	2.2	2.2	300	50	500	39~
	DTB143ES (371)	DTD143ES (446)	4.7	4.7	300	50	500	47~
	DTB114ES (362)	DTD114ES (438)	10	10	300	50	500	56~
Muting	—	DTC363ES (427)	6.8	6.8	300	20	600	70~

NOte: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.

$R_1 \neq R_2$ Leak absorption type

Application	PNP	NPN	Resistance		P_C (mW)	V_{CC} (V)	I_O (mA)	G_I
	Product name		R_1 (kΩ)	R_2 (kΩ)				
100mA	**DTA113ZSA** (310)	**DTC113ZSA** (376)	1	10	300	50	100	33~
	DTA123YSA (328)	**DTC123YSA** (394)	2.2	10	300	50	100	33~
	DTA123JSA (325)	**DTC123JSA** (391)	2.2	47	300	50	100	80~
	DTA143XSA (346)	**DTC143XSA** (412)	4.7	10	300	50	100	30~
	DTA143ZSA (349)	**DC143ZSA** (415)	4.7	47	300	50	100	80~
	DTA114WSA (458)	**DTC114WSA** (458)	10	4.7	300	50	100	24~
	DTA114YSA (319)	**DTC114YSA** (385)	10	47	300	50	70	68~
	DTA124XSA (337)	**DTC124XSA** (403)	22	47	300	50	50	68~
	DTA144VSA (465)	**DTC144VSA** (465)	47	10	300	50	70	33~
	DTA144WSA (466)	**DTC144WSA** (466)	47	22	300	50	30	56~
500mA	**DTB113ZS** (360)	**DTD113ZS** (435)	1	10	300	50	500	56~
	DTB123YS (368)	**DTD123YS** (444)	2.2	10	300	50	500	56~
	DTB133HS (470)	**DTD133HS** (470)	3.3	10	300	50	500	56~

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP type has been abbreviated.

R_1 only Input resistor type

Application	PNP	NPN	Resistance R_1 (kΩ)	Resistance R_2 (kΩ)	P_C (mW)	V_{CEO} (V)	I_C (mA)	h_{FE}
100mA	**DTA143TSA** (343)	**DTC143TSA** (409)	4.7	None	300	500	100	100~600
	DTA114TSA (316)	**DTC114TSA** (382)	10	None	300	50	100	100~600
	DTA124TSA (334)	**DTC124TSA** (463)	22	None	300	50	100	100~600
	DTA144TSA (355)	**DTC144TSA** (421)	47	None	300	50	100	100~600
	DTA115TSA (461)	**DTC115TSA** (461)	100	None	300	50	100	100~600
	DTA125TSA (463)	**DTC125TSA** (463)	200	None	300	50	100	100~600
500mA	—	**DTD123TS** (442)	2.2	None	300	40	500	100~600
	DTB143TS (374)	—	4.7	None	300	40	500	100~600
Muting	—	**DTC323TS** (467)	2.2	None	300	15	600	100~600
	—	**DTC343TS** (467)	4.7	None	300	15	600	100~600
	—	**DTC363TS** (430)	6.8	None	300	15	600	100~600
	—	**DTC314TS** (424)	10	None	300	15	600	100~600

Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.

R_2 only Bleeder resistor type

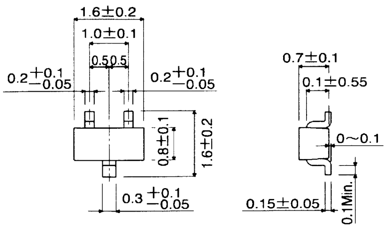
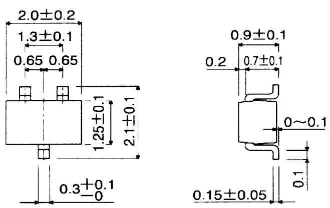
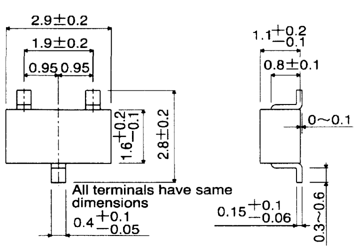
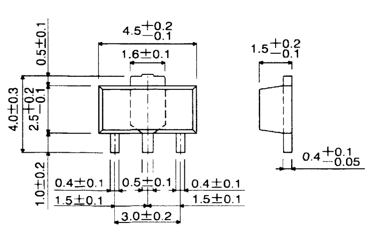
Application	PNP	NPN	Resistance R_1 (kΩ)	Resistance R_2 (kΩ)	P_C (mW)	V_{CEO} (V)	I_C (mA)	h_{FE}
100mA	**DTA114GSA** (457)	**DTC114GSA** (457)	None	10	300	50	100	30~
	DTA124GSA (462)	**DTC124GSA** (462)	None	22	300	50	100	56~
	—	**DTC144GSA** (464)	None	47	300	50	100	68~

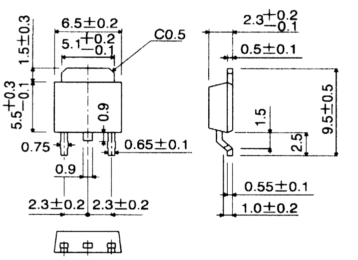
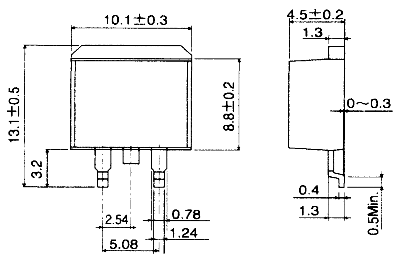
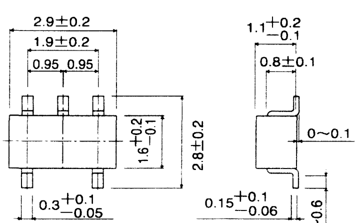
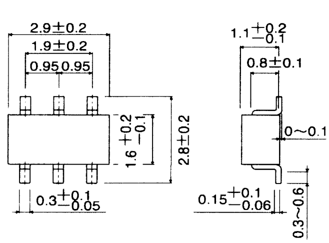
Note: 1. The number in parentheses below the product name is the page on which detailed product data appears.
2. The minus sign (−) on values of PNP types has been abbreviated.

Packages

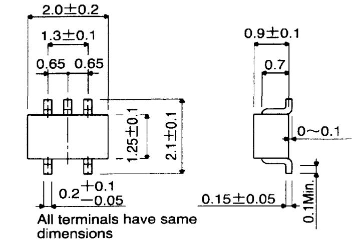
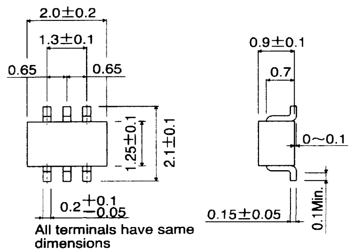
ROHM has been manufacturing transistors since 1975. In the development of products, we constantly strive to anticipate the needs of our customers. Regarding packages, the demands of the market for compactness, low power consumption, low power dissipation and automatic mounting support are becoming ever greater, and we are strengthening our product development system to meet these needs.

●Types and features of surface-mount packages

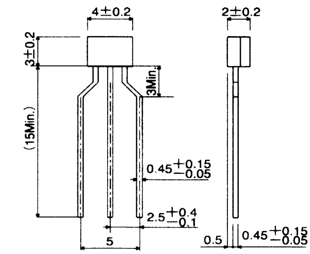
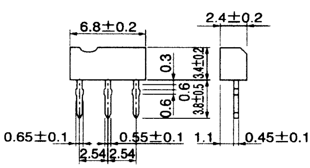
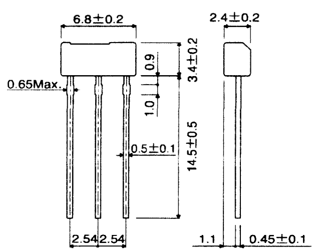
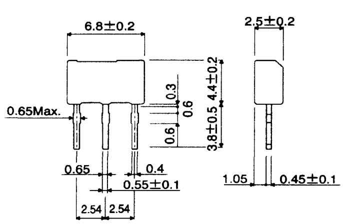
Type	External dimensions (Units : mm)	Features
EMT3 SC-75A type		A more compact version of the UMT3 (SC-70), the EMT3 is the world's smallest transistor with a mold size of 1.6 × 0.8 mm. The mounting area is approximately 60% of the UMT3 and 30% of the SMT3, making it ideal for ultra-high density mounting. Mounting is possible with the same type of automatic mounting machine as the UMT3.
UMT3 SC-70 type	 All terminals have same dimensions	The UMT3 is a smaller version of the SMT3 (SC-59). The mounting area is approximately 60% of the SMT3, making it optimum for high density mounting. The taping size is the same as the SMT3, allowing use of conventional automatic mounting machines. Electrical characteristics and reliability are the same as the SMT3.
SMT3 SC-59 type		The SMT3 is a compact package suitable for small electronic devices and hybrid IC applications. With proven performance, this is one of the most basic small packages. With the exception of Pc (collector power dissipation), electrical characteristics are similar to leaded packages. Reliability is on the same level as the TO-92.
MPT3 SC-62 type		By itself the MPT3 has a Pc of 0.5 W (Ta = 25℃), but when used on a 40 × 40 × 0.7 mm ceramic board, Pc = 2 W (Tc = 25℃), allowing high power to be obtained with a small package. The flat package makes it suitable for applications requiring compactness such as hybrid ICs. Available on tape for automatic mounting.

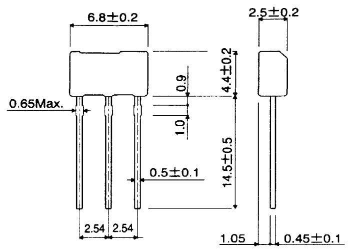
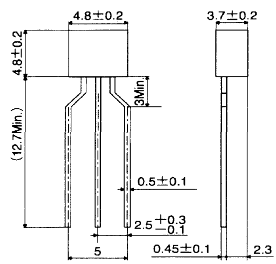
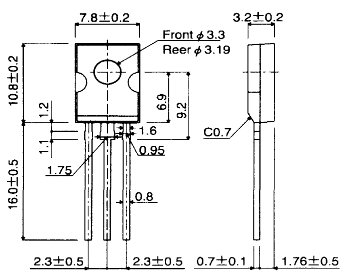
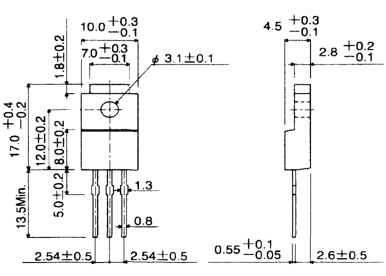
Type	External dimensions (Units : mm)	Features
CPT 3 SC-63 type		By itself the CPT3 has a Pc of 1 W (Ta = 25℃), but a large Pc of several watts can be obtained with an appropriate mounting surface. At the same time the CPT3 is compact, making it suitable for high density mounting and hybrid ICs. Available on tape for automatic mounting. For vertical high density mounting, the leaded CPT (SC-64) type with the same mold size is also available.
PSD3		The PSD3 is a TO-220 class surface-mount package. A high Pc can be obtained with an appropriate mounting surface. Surface mounting allows a high vertical density, enabling the design of slim and compact devices. The PSD3 is available on tape for automatic mounting, and it helps improve mounting efficiency and reduce mounting cost.
SMT5 SC-74A type	All terminals have same dimensions	The SMT5 consists of two connected transistors or digital transistors in an SMT3 (SC-59) package. The mounting area can be reduced by 50% compared to the SMT3 and the internal circuitry is complete, making this package ideal for high density mounting at half the assembly cost.
SMT6 SC-74 type		The SMT6 consists of two independent transistors or two independent digital transistors in an SMT3 (SC-59) package. The mounting area and mounting cost can be reduced by 50% compared to the SMT3, and the two transistors are independent to allow free configuration of a high density circuit.

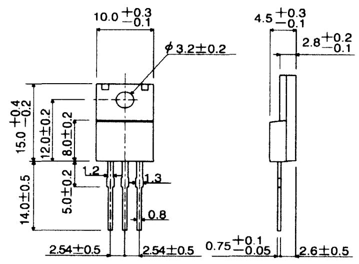
EXPLANATION

<table>
<tr><th>Type</th><th>External dimensions (Units : mm)</th><th>Features</th></tr>
<tr><td>UMT5
SC-88A type</td><td>
</td><td>The UMT5 consists of two connected transistors or digital transistors in a UMT3 (SC-70) package. The mounting area can be reduced by 50% compared to the UMT3 and the internal circuitry is completed, making this package ideal for high density mounting at half the assembly cost.</td></tr>
<tr><td>UMT6
SC-88 type</td><td>
</td><td>The UMT6 consists of two independent transistors or two independent digital transistors in a UMT (SC-70) package. The mounting area and mounting cost can be reduced by 50% compared to the UMT3, and the two transistors are independent to allow free configuration of a high density circuit.</td></tr>
</table>

●Types and features of leaded packages

Type	External dimensions (Units : mm)	Features
SPT (SC-72 type)	 	The SPT is a smaller version of the conventional TO-92 type. The body size (3×4×2 mm³) has been reduced to 1/4 that of the TO-92 (5×5×4 mm³). The SPT is available on tape for automatic insertion, and less space is occupied on the printed circuit board than the TO-92. Reliability is the same as the TO-92.
FTR	 	SIL type with a height of 3.4 mm and a lead pitch of 2.54 mm.
FTL	 	The FTL is a radial taping version of the highly popular FTR. This enables automatic high-density mounting with a radial insertion machine.
ATR (SC-71 type)	 	SC-71type with a height of 4.4 mm and a Pc=1W type.

Type	External dimensions (Units : mm)	Features
ATV		The ATV is a radial taping version of the highly popular ATR. This enables automatic high-density mounting with a radial insertion machine.
TO-92 (SC-43 type)		The SC-43 is for general purpose small signals.
TO-126FP		The TO-126FP is an isolation type package based on a TO-126 full mold. In addition to the features of the TO-126, molded heat sink fins allow easy isolation of the heat sink.
TO-220FP (SC-67 type)		The TO-220FP is an isolation type package based on a TO-220 full mold. In addition to the features of the TO-126 and TO-220, molded heat sink fins allow easy isolation of the heat sink.

Type	External dimensions (Units : mm)	Features
TO-220FN		The TO-220FN features the same performance as the TO-220FP with approximately 2 mm less height, allowing the design of slimmer devices. Furthermore, the elimination of support pins in the fin (collector electrode) solves short-circuiting problems with neighboring components and the chassis. To make the heigth to the installation hole the same as the TO-220FP, it can be replaced as is from the TO-220FP.

Quality assurance and reliability

●Quality Assurance Measures

JIS (Japan Industrial Standards) defines reliability to be "the ability for an item to perform a required function under given conditions for a specified time". This can be expressed quantitatively as a failure rate or reliability level.

The failure rate of electronic components generally takes the form of a bathtub curve (curve A below). However, by nature semiconductor devices such as transistors do not experience wear, and therefore the failure rate takes the form of curve B below, with reliability determined by the rate of initial failures and random failures. Initial failures are a manifestation of hidden defects in the manufacturing line. ROHM endeavors to hold down the rate of initial failures by means of quality control and line control, as well as 100% screening.

Random failures can be regarded as indicative of the characteristic reliability of a product, and are largely affected by the derating level, usage environment, circuit conditions and other usage conditions.

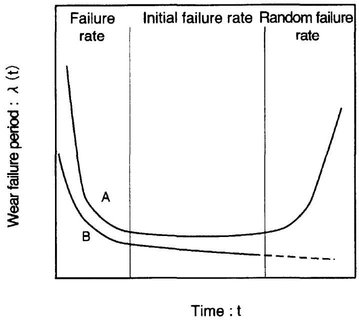


Fig. 1

●Overview of quality assurance measures

(1) ROHM's quality assurance measures are implemented primarily by our Quality Control Department and the quality control groups in each manufacturing department. All members take part in controlling, maintaining, and improving manufacturing lines centering on long and short term themes. In addition, quality assurance is carried out on each line by the members of that line, with the successive line being regarded as their "customer".

(2) Internal standardization is pursued on a company-wide basis, and work is performed strictly according to written standards.

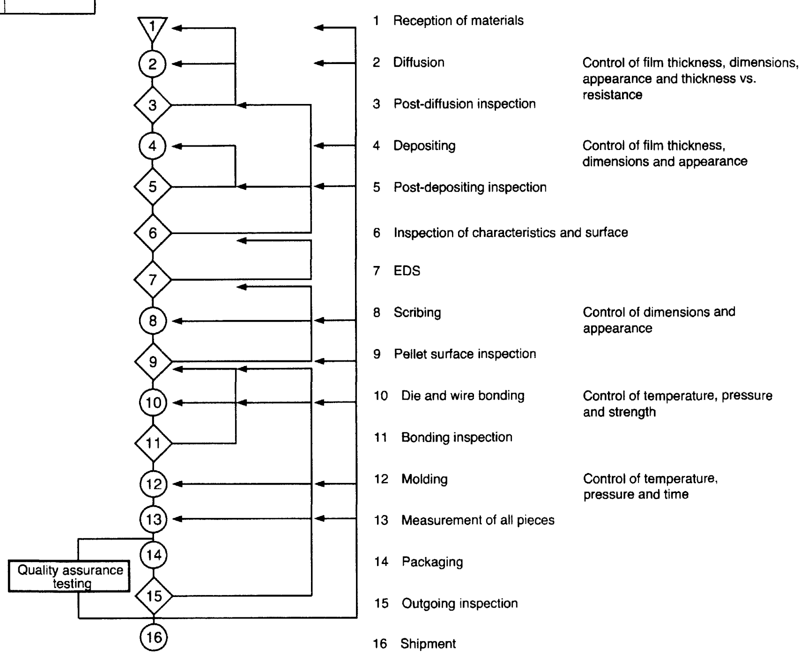


Fig.2

(3) Line performance is determined by statistical methods and the line managed accordingly.
(4) It is important to eliminate initial failures so that reliability is determined only by the random failure rate. ROHM carries out 100% screening of its products.
(5) Control testing is performed for long term reliability assurance, and measures are carried out to improve understanding of reliability levels.
(6) We require our suppliers to ensure the quality of the materials they deliver. We have each supplier sign a quality assurance contract stating that all materials we purchase must have passed our authorized inspection, with the supplier testing materials based on our standards.

●Overview of manufacturing process

Reliability is one of our primary concerns in manufacturing semiconductor devices. We perform multiple quality authorization tests from the beginning of development through the beginning of mass production, and only bring those products which have passed the tests into mass production. After mass production begins, we continue to carry out the aforementioned quality assurance measures.

●Reliability design and process technology

ROHM has made significant advances toward higher reliability in the areas of transistor design, process technology and assembly technology. These advances have been made through control technology, improvement of equipment precision, and introduction of new technology.

(1) Stabilization of element surfaces

One type of transistor failure is the deterioration of the surface of the element leading to lowered isolation voltage and h_{FE}. ROHM carries out the following measures to prevent this problem.

1) Over-passivation to protect aluminum wires and prevent external contamination. This over-passivation uses a nitrogen layer which achieves a reliability far surpassing that of previous phosphorus gas processes.
2) Clean processes
   We carry out measures to increase material purity, enhance cleaning techniques, improve wafer handling, and prevent dust at all stages including the assembly process.
3) Process control
   We use automated measurement for protective layer control, including such factors as film thickness, refractive indices, and control of mobile ions based on the BT method.

(2) Improved reliability in the assembly process

1) Our die and wire bonding processes are fully automated, and use pattern recognition for positioning. We develop our own high-performance equipment which has superb precision and stability.
2) Our molds are based on a reliability analysis of resin materials and mold manufacturing, and are designed to attain ideal conditions to match the material.
3) In addition to measurement at normal temperatures, we have also introduced special measurements to screen out line-break defects and surface defects, thereby attaining a higher reliability.

●Reliability assurance testing

Reliability testing is conducted to examine the quality of manufactured products, their durability over time, and their physical and chemical durability. Reliability testing is also conducted to ascertain design levels and failure limit levels. A variety of external stresses affect reliability, including functional stresses such as electrical and mechanical stresses, environmental stresses such as temperature, humidity and vibration, the skill of the user, and service systems. We conduct life and environmental tests involving simulations to determine stress resulting from practical use. Furthermore, it is not sufficient in reliability testing to simply determine a standard for acceptance and rejection, we also must examine and evaluate changes in characteristics over time and characteristic distributions.

In order to improve and assure the reliability of all our products, ROHM conducts reliability forecasts and performs the following quality assurance tests based on the Japanese Industrial Standards.

Table1 Quality assurance tests

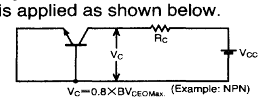
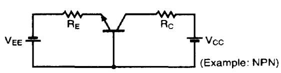
Test	Description	Specified values	Related standards
A-1 ES Soldering heat resistance	1. Pb : Sn = 4 : 6 (H63A) eutectic solder is used. 2. Immersed once in 260 ± 5°C solder bath to point 1.5 mm from base of terminal for 10 ± 1 seconds (for mini-mold types entire product is immersed). 3. Left at normal temperature at for at least two hours after immersion.	1) No mechanical damage. 2) I_{CBO} 2Su I_{EBO} 2Su 3) $\mid \Delta h_{FE}/h_{FE} \mid \leqq 20\%$ For Darlington devices, $\leqq 40\%$	JIS C7021 A-1
A-2 SOLDA Solderability	1. Pb : Sn = 4 : 6 (H63A) eutectic solder is used. 2. Rosin dissolved in isopropyl alcohol (25%) is used for flux. 3. Immersed in flux to point 1.0 mm from base of terminal for 10 seconds, then immersed in 230 ± 5°C solder bath to point 1.0 mm from body for 3 ± 0.5 seconds (for mini-mold types entire product is immersed). 4. Left to sit naturally after immersion, and then cleaned in isopropyl alcohol to remove flux.	Enlarge 10 to 20 times and verify that solder smoothly coats at least 95% of the immersed surface.	JIS C7021 A-2
A-3 HS Thermal shock	1. Immersed in 100^{+0}_{-5}℃ bath for five minutes, then within 10 seconds immersed in 0^{+5}_{-0}℃ bath for five minutes. 2. This is repeated 100 times. 3. After final cycle, product is left for at least 2 hours at room temperature.	1) No mechanical damage. 2) I_{CBO} 2Su I_{EBO} 2Su 3) $\mid \Delta h_{FE}/h_{FE} \mid \leqq 20\%$ For Darlington devices, $\leqq 40\%$	JIS C7021 A-3
A-4 TCY Temperature cycle	1. After leaving in $Tstg_{Min.}$ air for 30 minutes, product is kept at room temperature for 10 minutes, then left in $Tstg_{Max.}$ air for 30 minutes. 2. This is repeated 200 times. 3. After final cycle, product is left at room temperature for at least two hours.		JIS C7021 A-4
B-2 THB High-temperature, high-humidity reverse bias	1. Ta=85±30℃ 2. RH=85^{+5}_{-0}% 3. Voltage is applied as shown below.  4. Test time is 100 hours. 5. After test, product is left at room temperature for at least two hours.		JIS C7021 B-11
B-3 PCT Pressure cooker	1. Ta=121℃, 100%RH 2. P=203kPa {2atm} Test time is 150 hours (100 hours for mini-mold types). 3. After test, product is left at normal temperature for at least two hours.		
B-4 LL Load life	1. Apply $P_{CMax.}$ with Ta = 25 ± 5℃. 2. Do above using following circuit.  3. Test time is 1000 hours. 4. After test, product is left at normal temperature for at least two hours.		JIS C7021 B-4
B-5 HTRB High-temperature reverse bias	1. Ta=125±2℃ 2. Test circuit is same as B-2 THB. 3. Test time is 1000 hours. 4. After test, product is left at normal temperature for at least two hours.		JIS C7021 B-8
B-6 ST High temperature	1. Ta=$Tstg_{Max.}$ 2. Test time is 1000 hours. 3. After test, product is left at normal temperature for at least two hours.		JIS C7021 B-10
C-1TENS Terminal strength (tensile)	1. Body of product being tested is secured, and 9.8 N (1 kgf) load is applied in the axial direction for 5 ± 1 seconds (2.94 N (300 g) load for mini-mold types).	No displacement of terminal relative to body, damage, or looseness.	JIS C7021 A-11

Table2 Results of transistor reliability tests

Reliability level: 60%

Test	Soldering heat resistance			Thermal shock				Temperature cycle				High-temperature, high-humidity reverse bias				Pressure cooker				Load life				High-temperature reverse bias				High temperature			
Test conditions	10 sec. immersion in 260±5℃ eutectic solder bath.			100℃ for 5min./0℃ for 5min. Transfer within 10 sec. T=100Cycle				Ta=55/25/150/25℃ t=30/10/30/10min. T=200Cycle				Ta=85±2℃ , RH=85±5% Apply $V_{CES}=V_{CEO}\times0.8$ T=1000h				Ta=121℃ , RH=100% P=203kPa (2atm) T=150h [100h]				Ta=25±5℃ Apply P_{CMax} T=1000h				Ta=150±2℃ Apply $V_{CEO}=V_{CEO}\times0.8$ T=1000h				Ta=150±2℃ T=1000h			
TYPE	n (pcs)	r (pcs)	P (%)	n (pcs)	r (pcs)	T (C. C)	λ (1/Cy)	n (pcs)	r (pcs)	T (C. C)	λ (1/Cy)	n (pcs)	r (pcs)	T (C. h)	λn (1/h)	n (pcs)	r (pcs)	T (C. h)	λ (1/h)	n (pcs)	r (pcs)	T (C. h)	λ (1/h)	n (pcs)	r (pcs)	T (C. h)	λ (1/h)	n (pcs)	r (pcs)	T (C. h)	λ (1/h)
2SC4617 General purpose EMT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SA1774 General purpose EMT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SC4081 General purpose UMT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SA1576A General purpose UMT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SC2412K General purpose SMT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SA1037AK General purpose SMT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
DTC124EKA Built-in resistors SMT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
DTA124EKA Built-in resistors SMT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SD1664 Mini-power MPT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SB1132 Mini-power MPT3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SB1184 Power CPT 3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SD1760 Power CPT 3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SA1870 Power PSD 3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}
2SC4939 Power PSD 3	264	0	0	264	0	2.64×10^{4}	3.47×10^{-5}	540	0	108×10^{3}	8.49×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	264	0	264×10^{2}	3.47×10^{-5}	132	0	132×10^{3}	6.94×10^{-6}	264	0	264×10^{3}	3.47×10^{-6}	44	0	44×10^{3}	2.08×10^{-5}

Explanation of symbols

●General symbols

The following symbols are used to indicate electrical characteristics and other parameters.

V : Voltage	f : Frequency
I : Current	C : Capacitance
P : Power	N : Noise
T : Temperature	t : Time

These letters will be upper case in the case of direct current, and lower case in the case of alternating current.

The following suffixes may be added to the letters.

Suffix type 1

①Additional qualifier. Example : Tstg

②Indication of terminal or lead. Example : I_C

③Indication of direction.

i : Input

r : Reverse

f : Forward

o : Output

Suffix type 2

Indicates ground lead. Example : V_{CBO}

Suffix type 3

①Condition of leads other those with suffix type 1 or 2.

S : Third lead is shorted to ground lead.

R : Specified resistor is connected between third lead and ground lead.

O : Third lead is open.

②Electrical condition of device.

(sat) : Indicates that the device is saturated.

(off) : Indicates that the device is cut off.

●Explanation of symbols

V_{CBO} : (Collector-base voltage) The maximum voltage between the collector and base when the emitter is open-circuited. This is the electron avalanche breakdown voltage at the emitter-base junction, and occurs when 10^5V/cm is applied to a PN junction.

V_{EBO} : (Emitter-base voltage) The maximum voltage between the emitter and base when the collector is open-circuited. This is the electron avalanche breakdown voltage or Zener breakdown at the emitter-base junction.

V_{CEO} : (Collector-emitter voltage) The maximum voltage between the collector and emitter when the base is open-circuited. It is determined by V_{CBO} and h_{FE}.

$$V_{CEO} = \frac{V_{CBO}}{\sqrt[m]{1+h_{FE}}} \quad m : 3\sim4\text{NPN},\ 6\sim8\text{PNP}$$

V_{CER} : (Collector-emitter voltage). The maximum voltage between the collector and emitter when a resistor is connected between the base and emitter. It is determined by V_{CBO} and R_{BE} :

$$V_{CER} = V_{CBO} \sqrt[m]{1-\frac{I_{CBO}(r_b+R_{BE})}{V_{TF}}}$$

r_b : Base resistance

V_{TF} : Forward rise voltage between base and emitter.

V_{CES} : (Collector-emitter voltage). The maximum voltage between the collector and emitter when the base and emitter are short-circuited.

$$V_{CES} = V_{CBO} \sqrt[m]{1-\frac{I_{CBO}-r_b}{V_{TF}}} \fallingdotseq V_{CEO}$$

I_C : (Collector current) The forward current which flows through the collector junction when a forward voltage is applied between the base and emitter. It consists of minority carriers injected from the emitter into the base and majority carriers generated in the collector depletion layer. ROHM normally takes this to be the current at which h_{FE} is reduced to 1 / 3 to 1 / 2 of its maximum value at $Tj_{Max.}$ or less.

I_B : (Base current) The current which flows through the base when a forward voltage is applied between the base and emitter, and the emitter and collector are short-circuited. Normally 1 / 3 of the collector current in a single transistor.

P_C : (Collector dissipation) The power dissipated in the collector is equal to the power Pin entering the transistor minus the output power, and is called collector dissipation. It is normally equal to $V_{CE} \times I_C$ when the junction temperature is at a maximum. The standard temperature is 25℃.

Tj : (Junction temperature) This is a combination of heat due to power dissipation in the device and the ambient temperature. The maximum allowable junction temperature ($Tj_{Max.}$) depends on device and package materials, and is determined by temperature and operating life tests.

Tstg : (Storage temperature range) This is the temperature range at which a device can be stored without electrical load. The upper limit is determined by the maximum allowable junction temperature and the lower limit is determined by the package material.

Cib : (Emitter input capacitance) The input capacitance with the base grounded. More precisely, it is the capacitance measured between the emitter and base at a specified emitter-base voltage and frequency with the collector open-circuited. It includes the stray capacitance of the case.

Cob : (Output capacitance) The output capacitance with the base grounded. More precisely, it is the capacitance measured between the collector and base at a specified collector-base voltage and frequency with the emitter open-circuited. It includes the stray capacitance of the case.

Cre : (Small signal reverse transfer capacitance) This is the imaginary part of the reverse transfer admittance Y_{re}.

f_T : (Transition frequency) The frequency at which the grounded-emitter small signal current gain h_{FE} becomes 1 at a specified V_{CE} and I_C.

Cc $r_{bb'}$: (Collector-base time constant) The product of the collector capacitance C_C and the base resistance $r_{bb'}$. The following relationship holds between the maximum oscillating frequency $f_{Max.}$ and the cutoff frequency α :

$$f^2_{Max.} \doteqdot \frac{f\alpha}{8\pi Cc \cdot r_{bb'}}$$

h_{FE} : (DC current transfer ration) This is the ratio I_C/I_B at a specified V_{CE} and I_C.

h_{ie} : (Closed circuit small signal short circuit input impedance) This is the ratio between the AC input voltage and the AC input current with the output short-circuited (grounded emitter). Normally f = 270Hz.

h_{re} : (Reverse voltage transfer ratio) This is the ratio between the AC output current and the AC input current with the output short-circuited (grounded emitter). Normally f = 270Hz.

h_{oe} : (Small signal short circuit output admittance) This is the ratio between the AC output current and the AC voltage applied to the output terminal with the input open-circuited (grounded emitter). Normally f = 270Hz.

I_{CBO} : (Collector cutoff current) This is the collector current when a specified voltage is applied between the collector and base with the emitter open-circuited.

I_{CEO} : (Collector cutoff current) This is the collector current when a specified voltage is applied between the collector and emitter with the base open-circuited. I_{CER} is the collector current when a specified resistor is connected between the base and emitter, and I_{CES} is the collector current when the base and emitter are short-circuited.

I_{EBO} : (Emitter cutoff current) This is the emitter current when a specified voltage is applied between the emitter and base with the collector open-circuited.

NF : (Noise figure) This is the measured ratio of the effective noise output power per unit bandwidth of the device and the noise output resulting from the signal source resistance connected to the input terminal. The noise figure is measured at a standard temperature of 290° K.

$$NF = 10\log\frac{\text{Effective noise output power}}{\text{Output noise power due to thermal noise of signal source resistance}}$$

$$= 10\log\frac{\text{Ratio of input signal to noise}}{\text{Ratio of output signal to noise}} = \frac{Si\ Ni}{So\ No}$$

$$= 10\log\frac{E_{ni}^2}{E_t^2}$$

EXPLANATION

E_{ni} is the equivalent input noise and Et is the thermal noise of the input resistance. The noise of the amplifier can be expressed by the voltage source e_n connected in series to the input terminal (zero impedance), the current source in (infinite impedance) connected in parallel to the input terminal, and the correlation coefficient C of the two (not shown in the diagram).

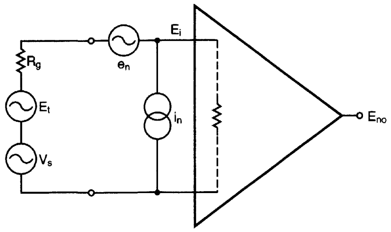


Fig.1

$$E_{ni}^2 = E_t^2 + e_n^2 + i_n^2 R_g^2$$

$$E_t^2 = 4KTR_g \Delta f$$

Thus,

$$NF = 10 \log \frac{4KTR_g + e_n^2 + i_n^2 R_g^2}{4KTR_g}$$

Also, the intermediate frequency noise without the transistor's 1 /f noise is given by

$e_n^2 = 4KTr_{bb'} + 2qI_{cre}^2$

$i_n^2 = 2_{qIB}$

therefore a reduction of $r_{bb'}$ and an increase of h_{FE} are necessary for reducing noise.

NV_1 : (Noise voltage (RMS)) In a specified transistor (normally G_V = 80dB, f = 20 to 20kHz $^{+0}_{-3}$ dB, FLAT AMP.), this is the effective value of the output noise voltage when a specified DC voltage and current with a specified signal source resistance are applied to the terminals of the transistor.

NV_2 : Noise voltage peak
The peak value of the output noise voltage of the same amplifier as NV1.

PG : Power gain
This is the ratio of the power obtained from the output of the transistor to the power supplied to the input.

$$G = \left(\frac{i_o}{i_i}\right)^2 \cdot \frac{R_o}{R_i} = \frac{V_o i_o}{V_i i_i}$$

R_{BE} : (Base-emitter resistance) This is the value of the resistor connected between the base and emitter.

$r_{bb'}$: (Base resistance) This is the series base resistance which consists of the resistance of the non-active base region and the resistance of the active region which causes a transverse ohmic voltage drop.

t_d : (Delay time) The delay between the application of the input pulse and the point at which the output pulse reaches 10% of its maximum amplitude. (Fig.2)

t_r : (Rise time) The time needed for the output pulse to rise from 10% to 90% of its maximum amplitude. (Fig.2)

t_{stg} : (Storage time) The time needed for the output pulse to fall to 90% of its maximum amplitude after the input pulse ends. (Fig.2)

t_f : (Fall time) The time needed for the output pulse to fall from 90% to 10% of its maximum amplitude. (Fig.2)

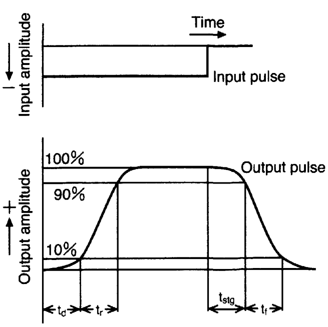


Fig.2 Pulse response
(example of PNP common emitter)

$V_{CE(sat)}$: (Collector saturation voltage) When a sufficient base current flows into a common emitter amplifier circuit, this is the condition in which the collector-emitter voltage decreases and the base-collector junction is forward biased. Measured with the assumption that IB is I_C / n, where n is an integer (usually 10), with a specified V_{CE} and I_C.

V_{BE} : (Base-emitter voltage) This is measured at a specified V_{CE} and I_C.

V_F : (Forward voltage) The forward voltage when a specified forward current flows.

y_{ie} : (Small signal, short-circuit input admittance) The ratio of the AC input current and the AC input voltage with the output short-circuited (grounded emitter).

$$y_{ie} = \frac{1}{r_{ie}} + j\omega C_{ie}$$

Y_{re} : Small signal, short-circuit, reverse transfer admittance
The ratio of the AC current appearing at the input when the input is short-circuited and the AC voltage applied to the output (grounded emitter).
$Y_{re} = | y_{re} | \exp(j \phi_{re})$

Y_{fe} : (Small signal, short-circuit forward transfer admittance) The ratio of the AC output current and the AC input voltage with the output short-circuited (grounded emitter).
$Y_{fe} = | y_{re} | \exp(j \phi_{fe})$

Y_{oe} : (Small signal, short-circuit output admittance) The ratio of the AC output current and the AC voltage applied to the output with the input short-circuited (grounded emitter).

$$y_{oe} = \frac{1}{r_{oe}} + j\omega C_{oe}$$

SOA : (Safe operating area) This is the area in which a transistor can be used without damage or deterioration.
Range 1 : Current limiting range : This range is limited by the maximum collector current $I_{C Max.}$
Range 2 : Thermal resistance limiting range (P_C area). This range is limited by the thermal resistance. If the collector-emitter voltage is V_{CE} and the collector current is I_C, the transistor power dissipation is limited as follows : $P_C = V_{CE} \times I_C \leqq P_{CMax.}$
Range 3 : Secondary breakdown range. This range is limited by the secondary breakdown of the transistor. As the voltage grows higher, current hot spots appear in non-uniform parts of chip junctions and in defects within the chip, and the transistor becomes susceptible to secondary breakdown. Differences in transistor resistance to damage become apparent in this region, thus it is used for control of normal resistance to damage.
Range 4 : Voltage limiting region. This range is limited by the maximum collector-emitter voltage $V_{CEOMax.}$

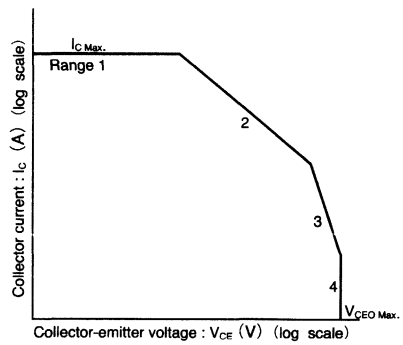


Fig.3 Safe operating area (SOA)

S parameters

The scattering matrix method can be used to express the equivalent circuit of an ultra-short wave band transistor as follows :
$b_1 = S_{11}a_1 + S_{12}a_2$
$b_2 = S_{21}a_1 + S_{22}a_2$
The four parameters S_{11}, S_{12}, S_{21}, and S_{22} appearing in this equation are called the S parameters.

EXPLANATION

S_{11e} : Input reflection coefficient (grounded emitter).
S_{12e} : Reverse transmission coefficient (grounded emitter).
S_{22e} : Forward transmission coefficient (grounded emitter)
S_{22e} : Output reflection coefficient (grounded emitter)

The above S parameters express the characteristics of a three dimensional microwave circuit, and are defined as reflected and transmitted waves as shown in Figure 4.

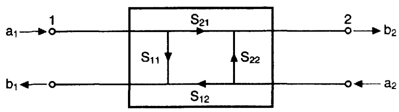


Fig.4

$S_{11}=\left.\frac{b_1}{a_1}\right|_{a_2=0}$ Output 2 is terminated and expressed as the ratio of incident wave a_1 and reflected wave b_1.

$S_{12}=\left.\frac{b_1}{a_2}\right|_{a_1=0}$ Input 1 is terminated and expressed as the ratio of incident wave a_1 and transmitted wave b_1.

$S_{21}=\left.\frac{b_2}{a_1}\right|_{a_2=0}$ Output 2 is terminated and expressed as the ratio of incident wave a_1 and transmitted wave b_2.

$S_{22}=\left.\frac{b_2}{a_2}\right|_{a_1=0}$ Input 1 is terminated and expressed as the ratio of incident wave a_2 and reflected wave b_2.

Conversions for S and Y parameters are shown in Table 1.

●Digital transistor symbols

V_{CC} : (Power supply voltage) This is the maximum voltage at which characteristics and operating levels can be guaranteed. This value includes both DC changes (primary power supply, load changes, temperature changes over time) and AC changes (ripple, noise, spike currents).

V_{IN} : (Input voltage) The maximum input voltage at which device operation can be guaranteed.

I_O : (Output current) The maximum allowed continual current which can flow through the OUT pin when a forward voltage V_1 is applied between the IN pin and GND pin.

$I_{C(Max.)}$: (Collector current) The maximum current that can flow in a component transistor by itself.

$I_{O(OFF)}$: (Output cutoff current) The current which flows in the Outpin when a specified voltage (V_O) is applied between the OUT pin and GND pin with the IN pin open-circuited.

Pd : (Power dissipation) The maximum power which can be continually dissipated while the device is in operation.

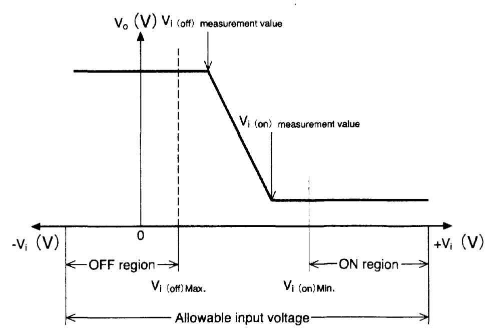


Fig.5 OFF region ON region

Table1

S_{11}	$\frac{(1-y_{11})(1+y_{22})-y_{12}y_{21}}{(1-y_{11})(1+y_{22})-y_{12}y_{21}}$	y_{11}	$\frac{(1+S_{22})(1-S_{11})+S_{12}S_{21}}{(1+S_{11})(1+S_{22})-S_{12}S_{21}}$
S_{12}	$\frac{-2y_{12}}{(1+y_{11})(1+y_{22})-y_{12}y_{21}}$	y_{12}	$\frac{-2S_{12}}{(1+S_{11})(1+S_{22})-S_{12}S_{21}}$
S_{21}	$\frac{-2y_{21}}{(1+y_{11})(1+y_{22})-y_{12}y_{21}}$	y_{21}	$\frac{-2S_{21}}{(1+S_{11})(1+S_{22})-S_{12}S_{21}}$
S_{22}	$\frac{(1+y_{11})(1-y_{22})+y_{12}y_{21}}{(1+y_{11})(1+y_{22})-y_{12}y_{21}}$	y_{22}	$\frac{(1+S_{11})(1-S_{22})+S_{12}S_{21}}{(1+S_{11})(1+S_{22})-S_{12}S_{21}}$

$|s_{21}e|^2$:(Insertion gain) The square of the absolute value of the forward transmission coefficient (a complex number) expressed as a decibel.

$V_{I(ON)Min.}$: (Input on-voltage) With a forward voltage (V_O) applied between the OUT pin and the GND pin, this is the minimum input voltage needed to make the specified output current flow. In other words, it is the minimum input voltage needed to keep the digital transistor turned ON. To turn OFF the transistor it is necessary to lower the input voltage below this value, and thus the value of a good transistor will go below this. (See Figure 5)

$V_{I(OFF)Max.}$: (Input off-voltage) This is the maximum input voltage obtained between the IN pin and GND pin when the specified output current (I_O) is applied and the specified supply voltage (V_{CC}) is applied between the OUT pin and GND pin. In other words, it is the maximum input voltage which can be applied and still keep the transistor turned OFF. To turn on the transistor, it is necessary to increase the input voltage above this maximum input voltage, and thus the value of a good transistor go above this. (See Figure 5)

$V_{O(ON)}$: (Output voltage) The output pin voltage under any input conditions which do not exceed the absolute maximum ratings. When sufficient input current is made to flow in GND amplifier circuit, the output voltage will decrease and the IN and OUT junctions will be forward biased. II is measured as a fraction (usually 1/10 to 1/20) at a specified V_O and I_O.

$I_{IMax.}$: (Input current) The maximum allowed input current which can continually flow through the IN pin when a forward voltage (V_I) is applied between the IN pin and GND pin.

G_I : (DC current gain) The ratio I_O / I_I at a specified V_O and I_O.

R_1 : (Input resistance) The built-in resistor between the IN pin and transistor base. The allowed range of R1 is $\pm$30%.

R_2 / R_1 : (Resistance ratio) The ratio of the transistor base-emitter resistance to the built-in input resistor.

h_{FE} rankings code

●The h_{FE} values of ROHM transistors are classified as shown below, and the h_{FE} code labeled on each product.

Code	h_{FE}rank
L	27~56
M	39~82
N	56~120
P	82~180
Q	120~270
R	180~390
S	270~560
E	390~820
U	560~1200
V	820~1800
W	1200~2700
X	1800~3900
Y	2700~5600

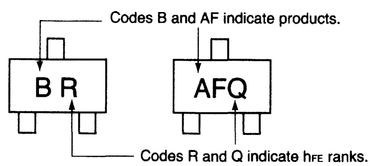
The h_{FE} of the TO-220FP and FO-220FE are classified as shown below, and the h_{FE} code labeled on each product.

Code	h_{FE}rank
A	16~32
B	25~50
C	40~80
D	60~120
E	100~200
F	160~320
G	250~500
H	400~800
J	600~1200
K	1000~2000

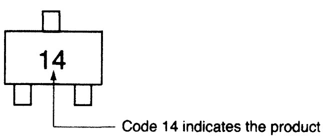
Abbreviated label symbols on mini molded type

●EMT3 and UMT3 labels

On general transistors, the product and h_{FE} rank are indicated by 2 or 3 letters. On digital transistors, the product type is indicated by a 2-digit number.



General transistors



Digital transistor

●SMT3 labels

With the SMT3 package as well, the product and h_{FE} rank are indicated by 2 or 3 letters on general transistors, and the product is indicated by a 2-digit number on digital transistors.

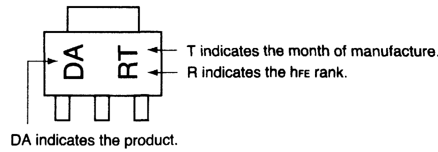
Furthermore, on SMT products with direct laser labels there is also a number indicating the week of manufacture. The direction of the number indicates whether the year of manufacture was an odd year or an even year.

(a) Manufactured during the 35th week of an odd year. (b) Manufactured during the 35th week of an even year.

SMT3 labels

●MPT3 labels

The label on MPT3 packages indicates the product, h_{FE} rank, and month of manufacture using 4 letters.



MPT3 labels

The month of manufacture is indicated as shown below by a letter, excluding I and O. (This method is also used on other packages.)

Month of manufacture	1	2	3	4	5	6	7	8	9	10	11	12
Even year	A	B	C	D	E	F	G	H	J	K	L	M
Odd year	N	P	Q	R	S	T	U	V	W	X	Y	Z

●UMT5, UMT6, SMT5, and SMT6 labels

The labels on UMT5, UMT6, SMT5, and SMT6 packages show the product name excluding the initial two letters (UM or FM), and consist of 2 or 3 letters. On SMT6 packages with direct laser labels, the week of manufacture is also shown as explained for the SMT3.

EXPLANATION

Package	Label	Product name
EMT3 An h_{FE} rank code will appear in each place marked by a □.	A□	2SC4618
	AC□	2SC4725
	AD□	2SC4726
	B□	2SC4617
	BV□	2SC5274
	CA	2SA1885
	CB	2SC4997
	F□	2SC1774
	12	DTA123EE
	13	DTA143EE
	14	DTA114EE
	15	DTA124EE
	16	DTA144EE
	19	DTA115EE
	22	DTC123EE
	23	DTC143EE
	24	DTC114EE
	25	DTC124EE
	26	DTC144EE
	29	DTC115EE
	33	DTA143XE
	35	DTA124XE
	43	DTC143XE
	45	DTC124XE
	52	DTA123YE
	54	DTA114YE
	62	DTC123YE
	64	DTC114YE
	69	DTC115EE
	74	DTA114WE
	76	DTA144WE
	84	DTC114WE
	86	DTC144WE
	93	DTA143TE
	94	DTA114TE
	95	DTA124TE
	96	DTA144TE
	99	DTA115TE
	03	DTC143TE
	04	DTC114TE
	05	DTC124TE
	06	DTC144TE
	E11	DTA113ZE

Package	Label	Product name
EMT3	E13	DTA143ZE
	E23	DTC143ZE
	E32	DTA123JE
	E42	DTC123JE
	K14	DTA114GE
	K26	DTC144GE
	Z21	DTC113ZE

Package	Label	Product name
UMT3 An h_{FE} rank code will appear in each place marked by a □.	1C□	2SC4082
	1D□	2SC4083
	A□	2SC4098
	B□	2SC4081
	BJ□	2SD2351
	BM□	2SC4774
	C□	2SC4097
	CB	2SC4998
	F□	2SA1576A
	H□	2SA1577
	R□	2SA1579
	T□	2SC4102
	Y□	2SD1949
	95	DTA124TUA
	96	DTA144TUA
	03	DTC143TUA
	04	DTC114TUA
	04	DTC114TUA
	05	DTC124TUA
	06	DTC144TUA
	09	DTC115TUA
	0A	DTC125TUA
	12	DTA123EUA
	13	DTA143EUA
	14	DTA114EUA
	15	DTA124EUA
	16	DTA144EUA
	19	DTA115EUA
	22	DTC123EUA
	23	DTC143EUA
	24	DTC114EUA
	25	DTC124EUA
	26	DTC144EUA
	29	DTC115EUA

Package	Label	Product name
UMT3	33	DTA143XUA
	35	DTA124XUA
	43	DTC143XUA
	45	DTC124XUA
	52	DTA123YUA
	54	DTA114YUA
	62	DTC123YUA
	64	DTC114YUA
	69	DTC115EUA
	74	DTA114WUA
	76	DTA144WUA
	84	DTC114WUA
	86	DTC144WUA
	93	DTA143TUA
	95	DTA124TUA
	96	DTA144TUA
	99	DTA115TUA
	9A	DTA125TUA
	111	DTA113ZUA
	113	DTA143ZUA
	123	DTC143ZUA
	132	DTA123JUA
	142	DTC123JUA
	156	DTA144VUA
	166	DTC144VUA
	121	DTC113ZU
	H02	DTC323TU
	H04	DTC314TU
	H27	DTC363EU
	K14	DTA114GUA
	K16	DTA144GUA
	K19	DTA115GUA
	K24	DTC114GUA
	K25	DTC124GUA
	K26	DTC144GUA
	K29	DTC115GUA
	Z21	DTC113ZUA
	G1K	BC848BW
	G3K	BC858BW
	R1A	UMT3904
	R1P	UMT2222A
	R2A	UMT3906
	R2F	UMT2907A

Package	Label	Product name
UMT3	R2T	UMT4403
	R2X	UMT4401

Package	Label	Product name
SMT3 An hFE rank code will appear in each place marked by a □.	A□	2SC2413K
	AA□	2SD1757K
	AC□	2SC3837K
	AD□	2SC3838K
	AF□	2SD1781K
	AH□	2SB1197K
	AJ□	2SD1782K
	AK□	2SB1198K
	AN□	2SC4061K
	B□	2SC2412K
	BB□	2SD2114K
	BJ□	2SD2226K
	BK□	2SB1590K
	BM□	2SC4713K
	BS□	2SD2444K
	C□	2SC2411K
	F□	2SA1037AK
	H□	2SA1036K
	R□	2SA1514K
	KL	2SK2731
	R1M	2SD2142K
	T□	2SC3906K
	U□	2SB852K
	W□	2SD1383K
	Y□	2SD1484K
	02	DTC123TKA
	03	DTC143TKA
	04	DTC114TKA
	04	DTC114TKA
	05	DTC124TKA
	06	DTC144TKA
	09	DTC115TKA
	0A	DTC125TKA
	12	DTA123EKA
	13	DTA143EKA
	14	DTA114EKA
	15	DTA124EKA

Package	Label	Product name
SMT3	16	DTA144EKA
	19	DTA115EKA
	22	DTC123EKA
	23	DTC143EKA
	24	DTC114EKA
	25	DTC124EKA
	26	DTC144EKA
	29	DTC115EKA
	33	DTA143XKA
	35	DTA124XKA
	43	DTC143XKA
	45	DTC124XKA
	52	DTA123YKA
	54	DTA114YKA
	62	DTC123YKA
	64	DTC114YKA
	69	DTC115EKA
	74	DTA114WKA
	76	DTA144WKA
	84	DTC114WKA
	86	DTC144WKA
	91	DTA113TKA
	93	DTA143TKA
	94	DTA114TKA
	95	DTA124TKA
	96	DTA144TKA
	99	DTA115TKA
	9A	DTA125TKA
	E11	DTA113ZKA
	E13	DTA143ZKA
	E23	DTC143ZKA
	E32	DTA123JKA
	E42	DTC123JKA
	E56	DTA144VKA
	E66	DTC144VKA
	F02	DTD123TK
	F03	DTD143TK
	F11	DTB113EK
	F12	DTB123EK
	F13	DTB143EK
	F14	DTB114EK
	F21	DTD113EK
	F22	DTD123EK

Package	Label	Product name
SMT3	F23	DTD143EK
	F24	DTD114EK
	F52	DTB123YK
	F62	DTD123YK
	F92	DTB123TK
	F93	DTB143TK
	F94	DTB114TK
	G08	DTD133HKA
	G11	DTB113ZK
	G21	DTD113ZK
	G3C	DTB122JK
	G4C	DTD122JK
	G98	DTB133HKA
	H02	DTC323TK
	H03	DTC343TK
	H04	DTC314TK
	H07	DTC363TK
	H27	DTC363EK
	K14	DTA114GKA
	K15	DTA124GKA
	K16	DTA144GKA
	K19	DTA115GKA
	K24	DTC114GKA
	K25	DTC124GKA
	K26	DTC144GKA
	K29	DTC115GKA
	L14	DTB114GK
	L24	DTD114GK
	Z21	DTC113ZKA
	R1A	MMST3904
	R1G	MMSTA06
	R1K	MMST6428
	R1M	MMSTA13
	R1N	MMSTA14
	R1O	MMST5088
	R1P	MMST2222A
	R2A	MMST3906
	R2B	MMST2907
	R2F	MMST2907A
	R2G	MMSTA56
	R2K	MMST8598
	R2O	MMST5087
	R2P	MMST5086

Package	Label	Product name
SMT3	R2T	MMST4403
	R2V	MMSTA64
	R2X	MMST4401
	R3B	MMST918
	RAT	MMSTA28
	RAV	MMST8098
	RVZ	MMST4126
	RZC	MMST4124

Package	Label	Product name
SST3	13	DTA143ECA
	14	DTA114ECA
	15	DTA124ECA
	24	DTC114ECA
	25	DTC124ECA
	96	DTA144TCA
	04	DTC114TCA
	E23	DTC143ZCA
	F13	DTB143EC
	F23	DTD143EL
	F52	DTB123YC
	G1E	BC847A
	G1F	BC847B
	G1G	BC847C
	G1J	BC848A
	G1K	BC848B
	G1L	BC848C
	G1L	BC848C
	G3E	BC857A
	G3F	BC857B
	G3K	BC858B
	G5B	BC807-25
	G6B	BC817-25
	GAB	BCW60B
	GAC	BCW60C
	GAD	BCW60D
	GAH	BCX70H
	GAJ	BCX70J
	GAK	BCX70K
	GBB	BCW61B
	GBC	BCW61C
	GBG	BCX71G
	GBH	BCX71H

Package	Label	Product name
SST3	GBJ	BCX71J
	GC2	BCW30
	GD1	BCW31
	GD2	BCW32
	GD3	BCW33
	GEC	BCW65C
	GH1	BCW69
	GH2	BCW70
	GK1	BCW71
	GK2	BCW72
	GMA	BFS17
	GT1	BCX17
	GU1	BCX19
	R1A	SST3904
	R1G	SSTA06
	R1H	SSTA05
	R1J	SST6427
	R1M	SSTA13
	R1N	SSTA14
	R1P	SST2222A
	R2A	SST3906
	R2F	SST2907A
	R2G	SSTA56
	R2T	SST4403
	R2X	SST4401
	R3B	SST8245
	R97	SSTTIS97
	RAT	SSTA28
	RBR	SST6838
	RFQ	SST6839
	RKM	RK7002
	RZC	SST4124

Package	Label	Product name
MPT3 hFE rank code will be shown in □ and Lot No. will be shown in ■.	AC■	RXT2907A
	AD■	RXT3906
	AE□	2SB1424
	AG□	2SA1797
	AH□	2SA1759
	AJ□	2SA1812
	AL□	2SA1900
	BA□	2SB1132
	BC□	2SB1188

Package	Label	Product name
MPT3 hFE rank code will be shown in □ and Lot No. will be shown in ■.	BD□	2SB1189
	BE□	2SB1260
	BE■	BCX53
	BF□	2SB1308
	BF■	RXTA76
	BH□	2SB1386
	BJ□	2SB1427
	BL□	2SB1561
	BN□	2SB1580
	CB□	2SC4132
	CB■	RXT2222A
	CD■	RXT3904
	CE□	2SC4505
	CF□	2SD2150
	CG□	2SC5053
	DA□	2SD1664
	DB□	2SD1766
	DC□	2SD1767
	DC■	RXTA14
	DE□	2SD1834
	DF□	2SD1898
	DF■	BCX56
	DG□	2SD1963
	DH■	RXTA28
	DJ□	2SD2098
	DL□	2SD2167
	DM□	2SD2170
	DN□	2SD2153
	DP□	2SD2195
	DQ□	2SD2211
	DR□	2SD2212
	DT□	2SD2391
	DV□	2SD2537
	DX□	2SC4672
	KA	2SK2103
	KC	2SK2463
	E01	DTDG14GP
	E02	DTDG23YP
	S01	DTDS14GP

Package	Label	Product name
UMT5	A1	UMA1N
	A10	UMA10N
	A11	UMA11N
	A2	UMA2N
	A3	UMA3N
	A4	UMA4N
	A5	UMA5N
	A6	UMA6N
	A7	UMA7N
	A8	UMA8N
	A9	UMA9N
	C1	UMC1N
	C2	UMC2N
	C3	UMC3N
	C4	UMC4N
	C5	UMC5N
	G1	UMG1N
	G10	UMG10N
	G11	UMG11N
	G2	UMG2N
	G3	UMG3N
	G4	UMG4N
	G5	UMG5N
	G6	UMG6N
	G7	UMG7N
	G8	UMG8N
	G9	UMG9N
	L1	UML1N
	L2	UML2N
	S1	UMS1N
	S2	UMS2N
	W10	UMW10N
	W10	UMW1N
	W2	UMW2N
	W6	UMW6N
	W7	UMW7N
	W8	UMW8N
	Y1	UMY1N
	Y3	UMY3N

Package	Label	Product name
UMT6	B1	UMB1N
	B10	UMB10N
	B11	UMB11N
	B2	UMB2N
	B3	UMB3N
	B4	UMB4N
	B5	UMB5N
	B6	UMB6N
	B8	UMB8N
	B9	UMB9N
	D12	UMD12N
	D2	UMD2N
	D3	UMD3N
	D6	UMD6N
	H1	UMH1N
	H10	UMH10N
	H11	UMH11N
	H14	UMH14N
	H2	UMH2N
	H3	UMH3N
	H4	UMH4N
	H5	UMH5N
	H6	UMH6N
	H7	UMH7N
	H8	UMH8N
	H9	UMH9N
	T1	UMT1N
	T2	UMT2N
	X1	UMX1N
	X2	UMX2N
	X3	UMX3N
	X4	UMX4N
	X5	UMX5N
	Z1	UMZ1N
	Z2	UMZ2N

Package	Label	Product name
SMT5	A1	FMA1A
	A10	FMA10A
	A11	FMA11A
	A2	FMA2A
	A3	FMA3A
	A4	FMA4A

Package	Label	Product name
SMT5	A5	FMA5A
	A6	FMA6A
	A7	FMA7A
	A8	FMA8A
	A9	FMA9A
	C1	FMC1A
	C2	FMC2A
	C3	FMC3A
	C4	FMC4A
	C5	FMC5A
	C6	FMC6A
	C7	FMC7A
	G1	FMG1A
	G11	FMG11A
	G12	FMG12
	G13	FMG13
	G2	FMG2A
	G3	FMG3A
	G4	FMG4A
	G5	FMG5A
	G6	FMG6A
	G7	FMG7A
	G8	FMG8A
	G9	FMG9A
	Q2	FMQ2
	S1	FMS1A
	S2	FMS2N
	S3	FMS3
	S4	FMS4
	W1	FMW1
	W10	FMW10
	W2	FMW2
	W3	FMW3
	W4	FMW4
	W6	FMW6
	W7	FMW7
	W8	FMW8
	Y1	FMY1A
	Y3	FMY3A
	Y4	FMY4A
	Y5	FMY5
	Y6	FMY6

Package	Label	Product name
SMT6	B1	IMB1A
	B10	IMB10A
	B11	IMB11A
	B16	IMB16
	B17	IMB17A
	B2	IMB2A
	B3	IMB3A
	B4	IMB4A
	B5	IMB5A
	B6	IMB6A
	B7	IMB7A
	B8	IMB8A
	B9	IMB9A
	D1	IMD1A
	D10	IMD10A
	D14	IMD14
	D16	IMD16A
	D2	IMD2A
	D3	IMD3A
	D4	IMD6A
	D8	IMD8A
	D9	IMD9A
	H1	IMH1A
	H10	IMH10A
	H11	IMH11A
	H14	IMH14A
	H15	IMH15A
	H2	IMH2A
	H3	IMH3A
	H4	IMH4A
	H5	IMH5A
	H6	IMH6A
	H7	IMH7A
	H8	IMH8A
	H9	IMH9A
	T1	IMT1A
	T17	IMT17
	T2	IMT2A
	T3	IMT3A
	T4	IMT4
	X1	IMX1
	X17	IMX17
	X2	IMX2

Package	Label	Product name
SMT6	X3	IMX3
	X4	IMX4
	X5	IMX5
	X8	IMX8
	X9	IMX9
	Z1	IMZ1A
	Z2	IMZ2A
	Z4	IMZ4

Product designation

2 S C 2 4 1 2 K □ □ □ □ T 1 4 6 R

Product name (base name)

Code for special specification (blank for standard products)

Packaging specifications

hFE ranks

See page 53

• Surface-mount type

Package	Code	
EMT3	TL	See Page 70
	TBL	
UMT3	T106	
	T206	
UMT5	TR	
UMT6	TR	
	TN	
SST3	T116	
	T216	
SMT3	T146	
	T246	
SMT5	T148	
SMT6	T108	
	T110	
MPT3	T100	
	T200	
CPT3	TL	
PSD3	TL	

• Leaded types

Package	包装記号	
SPT	TP	See Page 73
FTL	TL2	
ATV	TV2	
TO-92	T93	
ATR	—	
FTR	—	
TO-126FP	—	
TO-220FP	—	
TO-220FN	—	

• When ordering, please specify the product name.
• Make sure the combination of codes is correct.
• Fill in the spaces from the left.

EXPLANATION

●Product names of digital transistors (base name)

DT A 1 2 4 E K A
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① DT : Indicates that transistor is digital.

② A : Indicates polarity.
A, B ··· PNP
C, D ··· NPN

③ 1 : indicates device specification.

④ 2 : indicates the basis of the R_1 resistance value.
1···1.0
2···2.2
3···3.3
4···4.7
6···6.8

⑤ 4 : indicates power-of-ten of R_1 value.
3···10^3
4···10^4

The value of R1 is indicated by combining ④ and ⑤.
24···$2.2\times10^4\Omega=22k\Omega$
43···$4.7\times10^3\Omega=4.7k\Omega$

⑥ E : indicates resistance ratio R_1/R_2.

E···$R_2/R_1=1/1$
X···$R_2/R_1=2/1$
Y···$R_2/R_1=5/1$
Z···$R_2/R_1=10/1$
J···$R_2/R_1=20/1$
W···$R_2/R_1=1/2$
V···$R_2/R_1=1/5$
U···$R_2/R_1=1/10$
T···R_1 only
G···R_2 only

⑦ K : indicates package shape.

E···EMT3
U···UMT3
K···SMT3
P···MPT3
S···SPT

⑧ A : is a suffix. Except for EMT3, this suffix is appended to almost all models in the 100mA series.

Operation notes

●Selecting semiconductor devices

The reliability of semiconductor devices is determined primarily by conditions of use. When using semiconductors, pay careful attention to any changes in conditions and be aware of the specifications of each device. Absolute maximum ratings and related precautions are explained in the following. A good understanding of the absolute maximum ratings is necessary for selection of appropriate devices.

(1) Maximum ratings

Absolute maximum ratings are used to specify the maximum temperature, voltage, and other limiting conditions under which a device can be used. The absolute maximum ratings are maximum values for operating and environmental conditions which apply to all products, and they must never be exceeded, regardless of the circumstance. We have determined the absolute maximum ratings for our products, and as long as a semiconductor device is used within the ratings, we guarantee its performance and characteristics. When designing a device, it is necessary for the user of the semiconductor to take into consideration fluctuations in supply voltage, deviations in components, load fluctuations and environmental changes, and design the device so that the absolute maximum ratings are not exceeded even under the worst conditions. If the absolute maximum ratings are exceeded, it is possible that immediate deterioration and / or damage to the semiconductor device may occur, and even if it still operates, a considerable shortening of its life is likely. Furthermore, semiconductor ratings are not independent entities. Temperature, voltage, current, and power all are closely interrelated, and none may be exceeded.

(2) Maximum allowed voltages

Maximum allowed voltages are the maximum voltages that can be applied between the emitter and base, collector and base, and collector and emitter without damaging the transistor. If a maximum allowed voltage is exceeded, transistor damage may result. ROHM regards the breakdown voltage to be the maximum allowed voltage of a device, and we guarantee that the breakdown voltage is higher than the rated voltage. For this reason, applying a voltage higher than the rated voltage may not cause transistor damage. However, taking into consideration device deviations, it is essential that the rated voltage not be exceeded.

The emitter-base and collector-base junctions are both PN junctions. However, the collector-emitter junction interacts with both, and thus its maximum allowed voltage will differ depending on whether it is forward biased or reverse biased. In general the following relation holds, and there is not a large difference between BV_{CBO}, BV_{CEX}, and BV_{CES}. The actual breakdown voltage is in a region in which the current increases very rapidly, and the voltage measured is that at which the current reaches a certain value. The absolute maximum rating has been fixed so that the entire transistor has margin with respect to the breakdown voltage. This margin varies by product such that the absolute maximum voltage falls within 50% to 80% of the breakdown voltage.

$$BV_{CBO} > BV_{CEX} > BV_{CES} > BV_{CER} > BV_{CEO}$$

The absolute maximum voltage is rated at an ambient temperature of 25℃. Therefore, when the junction temperature approaches the absolute maximum temperature, the absolute maximum voltage for 25℃ cannot be applied. If it is, poor stability will result and there will be a danger of thermal runaway. Thermal runaway is a condition in which the current gain and cutoff current (I_{CBO}) rise together with the temperature and the base voltage (V_{BE}) decreases. If for any reason the temperature of the collector junction rises, the collector current increases, and this results in a further increase in the collector junction temperature. This cycle continues with the final result being damage to the transistor.

In actual use considerable margin must be established with respect to the rated values. A device should normally be used at a maximum of 80% of the rated values for 25℃.

(3) Maximum allowed current
As a transistor is a 3-terminal device, an absolute maximum current should be fixed for each of the terminals. However, normally only the emitter or collector current is rated. The maximum collector current is normally rated to be the current at which the DC current gain (h_{FE}) falls to 50% of its maximum value. The maximum peak current is rated at a value which ensures reliability within the maximum allowed junction temperature.
In the case of a transistor by itself, the maximum base current is normally rated to be 1 / 3 the collector current.
(4) Maximum allowed junction temperature
The junction temperature is limited by the relationship between temperature and life, and the characteristics of the materials composing the transistor. Furthermore, transistors use minority carriers and thus are easily affected by temperature. In particular, if the temperature rises in a reverse-biased collector-base junction, carriers are generated without relation to the signal, the operating point shifts, and in the worst case thermal runaway occurs and the transistor becomes damaged. For this reason, the circuit must be designed so as to prevent the junction temperature from rising. Transistor deterioration occurs quickly when the junction temperature rises. The following relationship exists between average life (h) and junction temperature Tj (°K).

$$\log L = A + \frac{B}{Tj}$$

To obtain high reliability, it is necessary to keep the junction temperature as low as possible. The maximum temperature of ROHM transistors is normally 150℃, however, we recommend usage at less than 100℃.

(5) Maximum allowed power dissipation
The junction temperature rises due to consumption of electrical power within the transistor and increases in ambient temperature. The maximum allowed power dissipation is the amount of power consumption needed to raise the junction temperature to the maximum allowed rating.

$$P_{C\ Max.} = \frac{Tj_{Max.} - T_a}{R_{th}(j-a)}$$

$Tj_{Max.}$ is the maximum allowed junction temperature, Ta is the ambient temperature, and Rth(j − a) is a thermal resistance where (j − a) includes all thermal resistance from the junction to the external air. By using a heat sink for improved heat dissipation, the thermal resistance can be reduced and allowed power dissipation improved. Also, only DC allowed power dissipation is normally indicated. When a transistor is used for switching, the rating can sometimes be exceeded.
In the case of saturated switching, the transistor moves between the saturated region and the cutoff region. In both regions power dissipation is low, and if the power dissipation of the transient state which moves along the load curve can be ignored, it can sometimes be acceptable for the operating point to move into the

$$V_{CE} \times I_C > P_{CMax.}$$

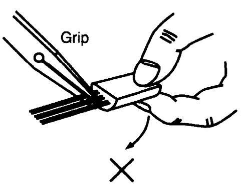
region provided the voltage and current ratings are not exceeded. The maximum allowed power dissipation has been determined based on repeated reliability and damage tests, however, we recommend use at 75% of the rated value.
(6) Maximum allowed storage temperature range
As an environmental condition for storage of a semiconductor product, temperature in particular is rated. The maximum temperature is determined by the maximum junction temperature and the package material. The minimum temperature is based on the package. ROHM normally rates the temperature range at −55° to 150℃.

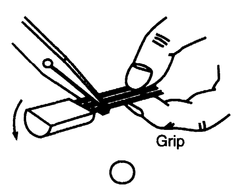
(7) Secondary breakdown (S/B) and safe operation area (SOA)
The explanations to this point have been of ratings under normal conditions, however, if the operation involves inductive loads or sudden voltage and current increases, damage may occur which cannot be explained simply based on the average maximum allowed junction temperature. This is principally secondary breakdown, and is caused by fly-back pulses, load shorts, or large load fluctuations. Secondary breakdown further increases the current after primary breakdown, and once a certain voltage or current level is reached, operation suddenly moves to a low impedance region, a high current flows, and transistor damage occurs.
The area in which the transistor can be used without damage or deterioration and with high reliability is called the safe operation area, (SOA) and it is determined by the maximum voltage, the maximum current, the maximum collector power dissipation, and secondary breakdown.
(8) Deviation of characteristics
Strict quality standards and control points are established for each stage of the transistor manufacturing process and transistors are produced in very large numbers. However, characteristics can change due to deviations in raw materials and slight changes in processing conditions, and deviations may appear not only among lots, but within one lot and even within the same wafer. It is not possible to correct these deviations by later adjustments. Principal factors affecting deviations include the thickness, diffusion density, depth, and resistivity of the wafer, and deviations appear in almost all of the characteristics, including h_{FE}, BV_{CBO}, Cob, and f_T.
Deviations in the characteristics appearing in the data sheets are held within a certain range through lot inspections and 100% inspection.

●Testing and inspection
Take special care with regard to noise produced by testing and inspection instruments. Voltage surges in commercial power supplies can cause deterioration or damage to semiconductor devices. Make sure that measuring instruments are sufficiently grounded.
Breakdown voltages are frequently measured using a curve tracer or similar method. As the voltage is gradually applied make sure that the limit resistance setting is appropriate, and ensure that the rated voltage is not exceeded. Also, avoid bad contacts with measuring instrument terminals as a bad contact can cause surges.

●Moving and storage
Observe the following precautions when moving or storing transistors.
(1) Avoid high humidity and high temperature.
(2) Avoid static electricity (do not store in Styrofoam boxes). Store in containers in which there is little generation of static electricity.
(3) Do not store in a location where harmful gases are produced. Store in a location where there is little dust.
(4) Make sure that no heavy loads are placed on devices in storage.
(5) Do not store for a prolonged time after forming leads (rust may form due to slight damages caused by forming).
(6) Avoid sudden temperature changes during storage and when removing from storage.

●Handling transistors during the manufacturing process
When handling transistors during manufacturing, take care not to subject them to mechanical, thermal, electrical, or chemical stresses.
(1) Forming leads
When forming leads, make sure that the force applied to the lead is not transmitted to the package. Also, when applying force only to the lead, make sure the stress is released.
1) Do not hold the package when bending a lead (maximum load of 250g).



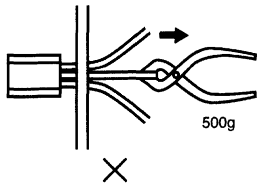


2) Do not pull a lead (maximum load of 500g).
3) Bend the lead at a point at least 1.0mm from its base. Do not bend the lead at the base.
4) Do not repeatedly bend a lead.
5) Do not damage a lead. The surface of the lead is solder, and if the metal underneath becomes exposed it will oxidize and impair soldering.

(2) Mounting on the board

Observe the same precautions as for forming leads.

1) Make sure that the distance between the leads is the same as the distance between the insertion holes in the board. If not, form the leads before insertion.
2) Do not pull hard on the leads when inserting them in the board (maximum load of 500g).



(3) Soldering

① Flux

Use a rosin based flux. Do not use a highly acidic or alkaline flux.

② Soldering

Semiconductor devices do not tolerate heat well, thus soldering must be completed as quickly as possible. Ground the solder bath and iron and eliminate leaks.

③ Cleaning

Some detergents may dissolve the package, weaken the seal, or efface the inscription. If the transistors are cleaned by ultrasonic cleaning, make sure the output is at a level which will not subject the transistors to stress.

Solvents which can be used : Methyl alcohol
(Recommended conditions for ultrasonic cleaning)
Ultrasonic output : 15W/liter, 25 to 28kHz
Time : 60 seconds maximum

Do not allow the board or device to come in contact with the vibration source.

●Layout of components

Heating of semiconductor devices must be avoided as much as possible, and they must be protected from surge damage. For this purpose,

1) Do not place a heat source near a device.
2) Dust collects on high-voltage circuits. Make sure dust does not collect on devices.
3) Exercise caution with high-voltage wiring, high frequency wiring, and winding. These kinds of wiring can cause device damage through surges.

●Handling digital transistors

Surge voltages, electrostatic discharge and noise are problems which affect all semiconductor devices. As shown in the pellet cross-section of Figure 1, the inputs (bases) of ROHM digital transistors are a type of MOSFET structure, and therefore require particular care to prevent electrostatic discharge.

To prevent damage due to electrostatic discharge, understand and observe the following precautions.

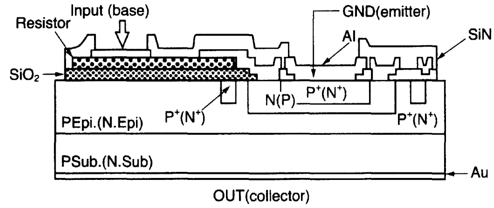


Fig.1 Cross-section of digital transistor pellet

(1) Storage precautions

Use conductive containers to store digital transistors.

(2) Moving precautions

1) Use moving containers which not allow a buildup of charge due to vibration or other causes during moving. Conductive containers and aluminum foil are effective means of preventing electrostatic discharge.
2) To prevent damage due to discharge of charge built up on the human body or clothing, people handling transistors should be grounded through a high resistance, such as a wrist band.
3) Similar precautions should be observed when moving digital transistors mounted on boards. Terminals should be shorted to keep them at the same electric potential.

(3) Precautions when measuring and handling digital transistors
When measuring and mounting digital transistors, the likelihood increases that open-circuited terminals will individually come in contact with the human body, measuring instruments, the work stand, soldering iron, or other equipment. In addition to electrostatic discharge, leakage from electrical equipment will damage the transistors, therefore, care must be taken that no current leakage from an AC power source occurs through the terminals of the measuring instrument.

●Mounting mini-mold transistors
(1) Using a soldering iron
Soldering with a soldering iron can easily create thermal and mechanical stresses which will damage the package, and it can also cause misalignment. For these reasons, we recommend that you only use a soldering iron for testing and repair work.
Soldering conditions are as follows :
  Soldering iron temperature : 350℃ maximum
  Soldering time3 : 3 seconds maximum
(2) Using soldering tape
This method involves fixing the product to the board with an adhesive agent and then immersing it in the soldering bath. We recommend a maximum soldering temperature of 230 to 260℃ for a maximum of 10 seconds.
(3) Reflow soldering
This method involves printing soldering paste on the board by screen printing or other technique, mounting the product, and then conveying it into an oven where it is soldered by heating. We recommend preheating to prevent package damage, board warping, deformation, and solder paste fly-off.
The conditions we recommend for reflow are as follows :

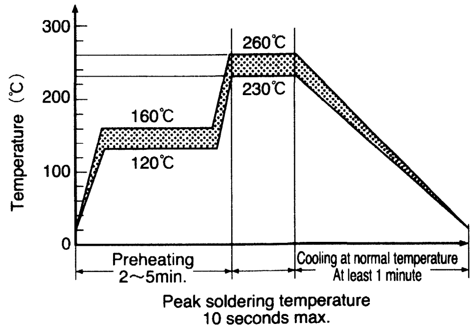
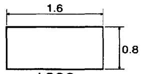
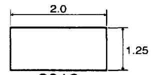
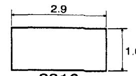
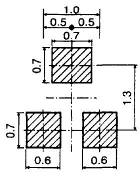
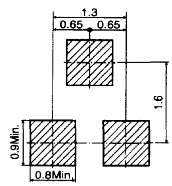
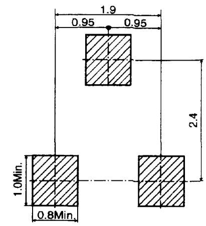
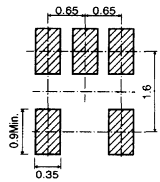
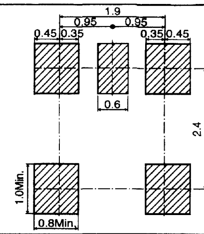
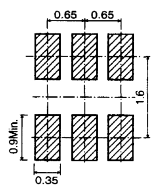
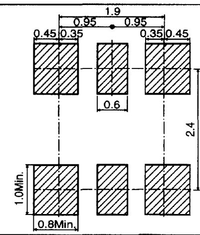


Fig. 2

(4) Land pattern
We recommend the following land pattern for hybrid ICs and high density mounting. In particular, to allow sufficient heat dissipation from the collector fins of power MPT3, CPT3, PSD3 type transistors, make the pad dimensions as large as possible.

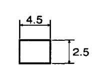
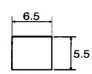
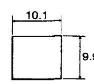
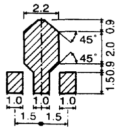
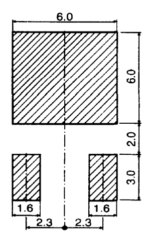
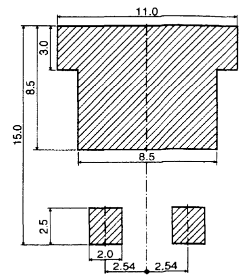
●Mini-mold type

(Units : mm)

Mold dimensions		 1608 (0603)	 2012 (0805)	 2916 (1106)
Land pattern		EMT3	UMT3	SMT3
	3 pins			
			UMT5	SMT5
	5 pins			
			UMT6	SMT6
	6 pins			

●Power type

(Units : mm)

	MPT3	CPT3	PSD3
Mold dimensions			
Land pattern			

●Using power transistors

(1) Temperature ratings

To ensure normal operation, allowed temperature ranges for operation and storage have been established.

(2) Power rating

Maximum collector power dissipation ratings (P_C) have been respectively established both for a fixed ambient temperature (Ta) and a fixed case temperature (T_C), and for use with and without heat sinks. Based on these values, the thermal resistances from the junction to the free area ($R_{th}(j-a)$) and the junction to the case ($R_{th}(j-c)$) can be calculated as follows :

$$R_{th}(j-a)=\frac{Tj-Ta}{P_{C1}}$$

$$R_{th}(j-c)=\frac{Tj-T_C}{P_{C2}}$$

Ta : Ambient temperature

T_C : Case temperature

P_{C1} : Collector dissipation at ambient temperature = 25℃

P_{C2} : Collector dissipation at case temperature = 25℃

(3) Safe operating area

In addition to allowed ranges for V_{CE}, I_C, and P_C, power transistors also have voltage, current and pulse width restrictions. This is due to the fact that excessive voltage, current and pulse width can cause secondary breakdown, leading to a weakening of the breakdown voltage and a damaged transistor.

1) Testing method

ROHM conducts a 100% inspection based on the transient thermal resistance method and guarantees the safe operating area (SOA). A bias with a specified pulse is applied and the forward voltage ($V_{BE(ON)}$) is used to detect indications of increased temperature due to current hot spots which cause secondary breakdown.

The test circuit and applied pulse are shown in Figures 3 and 4. The base-emitter voltage ($V_{BE(ON)}$) used for temperature detection (Figure 5) has a negative temperature coefficient, and the temperature rise at the time of the pulse is measured based on the following equation.

$$\Delta Tj=\frac{V_{BE1}-V_{BE2}}{\alpha}\ (℃)$$

V_{BE1} : V_{BE} before pulse

V_{BE2} : V_{BE} immediately after pulse

α : Temperature coefficient (≒ 2mv/℃)

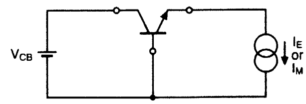


Fig.3

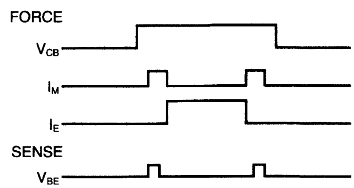


Fig.4

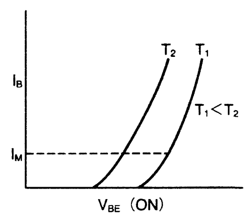


Fig.5

2) Rating the safe operating area

Ranges I through IV of the safe operating area shown in Figure 6 are determined based on the following factors.

① Range I

This is limited by the maximum collector current. The maximum collector current is determined as an actual allowed range of use of h_{FE}.

② Range II

This is limited by the thermal resistance, with the limit being the line = $P_{CMax.} = I_C \times V_{CE}$.

③ Range III

This is limited by secondary breakdown.

④ Range IV
This is limited by the collector-emitter breakdown voltage.

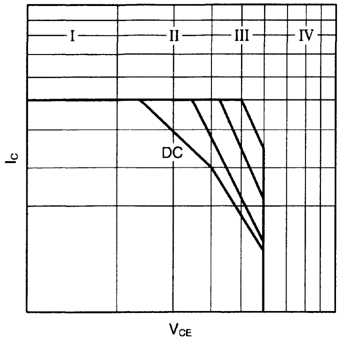


Fig.6

(4) Attachment to heat sink fins

The use of heat sink fins with power transistors will dissipate the heat generated by the transistor and lower the temperature of the junction. However, an inappropriate method of attachment will result not only in a failure to dissipate heat, but may damage the transistor as well. Observe the following precautions when attaching transistors to heat sink fins.

1) If the fin is warped or there are burrs in the insertion holes, not only will insufficient heat dissipation result, but the transistor may be damaged as well. For this reason, observe the following :

① The heat sink should not be more than 0.05mm out of true.
② The insertion holes should be beveled.
③ The holes should be an appropriate size.
④ Ensure that no foreign matter is trapped between the transistor and the heat sink.

2) If the transistor is not attached with sufficient torque, full heat dissipation will not be obtained. At the same time, excessive torque may damage the transistor or break leads. Table 1 shows recommended torque ranges.

Table1 Recommended torque

Package	Torque (N・cm)
TO-126FP	0.408~0.510
TO-220FP	0.510~0.714
TO-220FN	0.510~0.714

3) Use self-tapping screws to attach the transistor to the heat sink. Do not use flat or round head screws as they may apply abnormal stress to the transistor.

4) Silicon grease applied between the transistor and the heat sink to reduce thermal resistance should be thin and even. Also, some types of silicon grease can damage the transistor or impair its performance, therefore, select the type of grease carefully. We recommend G746 (Shin-etsu Chemical Co., Ltd.), SC101 (Toray Industries, Inc.) or an equivalent product.

5) Attach the transistor to the heat sink before soldering it. If the transistor is attached after being soldered, the leads and package may be damaged due to excessive stress.

Packaging

●Surface-mount type

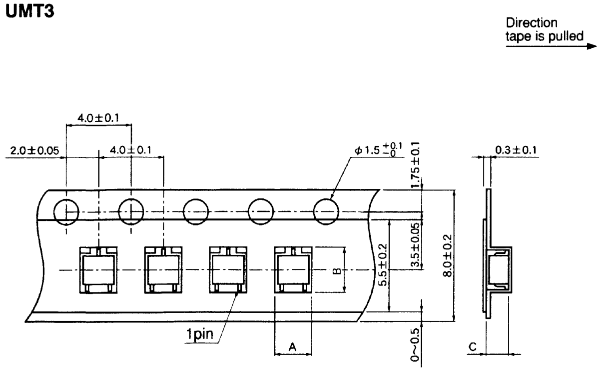
Package	Code	packaging specification	direction	Basic ordering unit (pcs)
EMT3	TL	Embossed tape	The electrode is next to the sprocket holes.	3000
	TBL	Embossed tape	The electrode is next to the sprocket holes.	15000
UMT3	T106	Embossed tape	The electrode is next to the sprocket holes.	3000
	T206	Embossed tape	The electrode is next to the sprocket holes.	10000
UMT5	TR	Embossed tape	The three electrodes are next to the sprocket holes.	3000
UMT6	TR	Embossed tape	The electrode pin 1 is next to the sprocket holes.	3000
	TN	Embossed tape	No direction	3000
SST3	T116	Embossed tape	The electrode is next to the sprocket holes.	3000
	T216	Embossed tape	The electrode is next to the sprocket holes.	10000
SMT3	T146	Embossed tape	The electrode is next to the sprocket holes.	3000
	T246	Embossed tape	The electrode is next to the sprocket holes.	10000
SMT5	T148	Embossed tape	The three electrodes are next to the sprocket holes.	3000
SMT6	T108	Embossed tape	The electrode pin 1 is opposite the sprocket holes.	3000
	T110	Embossed tape	No direction	3000
MPT3	T100	Embossed tape	The three electrodes are next to the sprocket holes.	1000
	T200	Embossed tape	The three electrodes are next to the sprocket holes.	4000
CPT3	TL	Embossed tape	The fin is next to the sprocket holes.	2500
PSD3	TL	Embossed tape	The fin is next to the sprocket holes.	1000

Tape dimensions

(Units : mm)

Tape

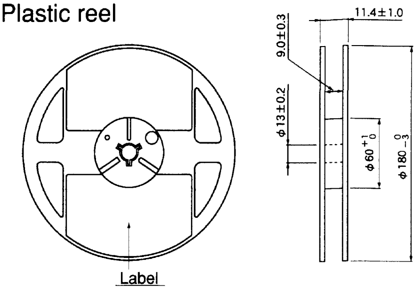
EMT3 · UMT3



Package	Size		
	A	B	C
EMT3	1.8±0.1	1.8±0.1	0.9±0.2
UMT3	2.2±0.1	2.4±0.1	1.15±0.1

Reel

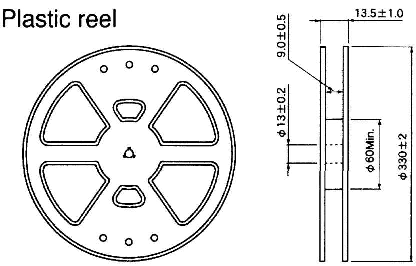
Plastic reel



(φ180 Reel)

Conforms with EIAJ TX-7001

Plastic reel



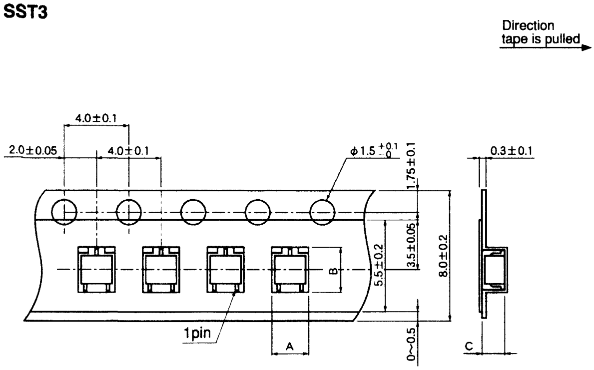
(φ330 Reel)

Conforms with EIAJ TX-7001

(Units : mm)

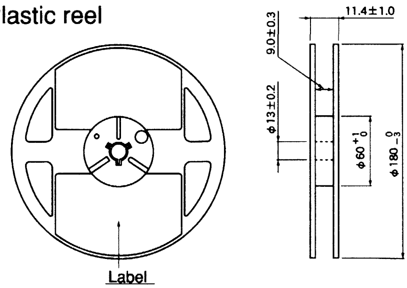
Tape	Reel

SMT3 · SST3



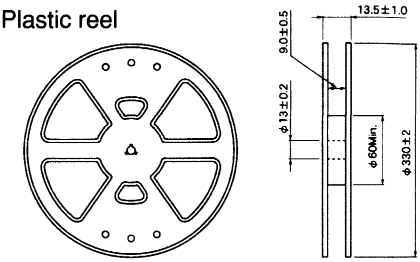
Package	Size		
	A	B	C
SMT3	3.1±0.1	3.2±0.1	1.35±0.2
SST3	3.1±0.1	2.7±0.1	1.2±0.1

Plastic reel



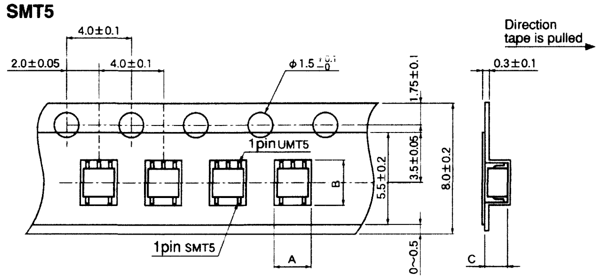
(φ180 Reel) Conforms with EIAJ TX-7001

Plastic reel



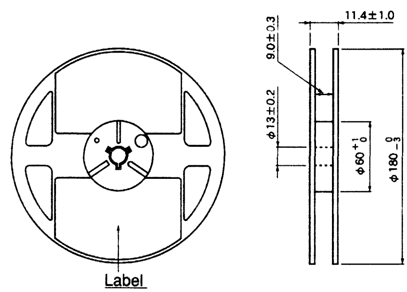
(φ330 Reel) Conforms with EIAJ TX-7001

UMT5 · SMT5



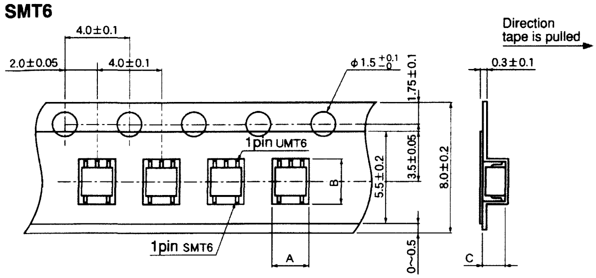
Package	Size		
	A	B	C
UMT5	2.2±0.1	2.4±0.1	1.15±0.1
SMT5	3.1±0.1	3.2±0.1	1.35±0.1

Plastic reel



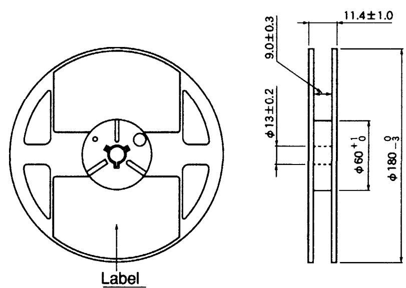
Conforms with EIAJ TX-7001

UMT6 · SMT6



Package	Size		
	A	B	C
UMT6	2.2±0.1	2.4±0.1	1.15±0.1
SMT6	3.1±0.1	3.2±0.1	1.35±0.1

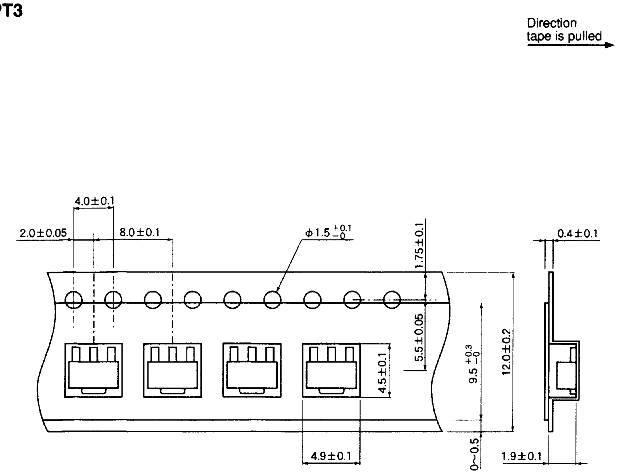
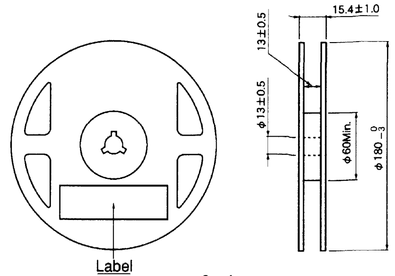
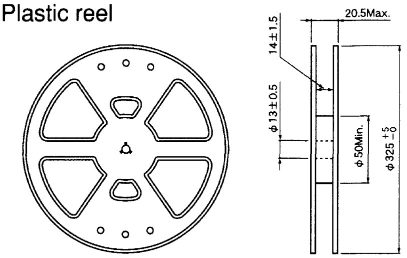
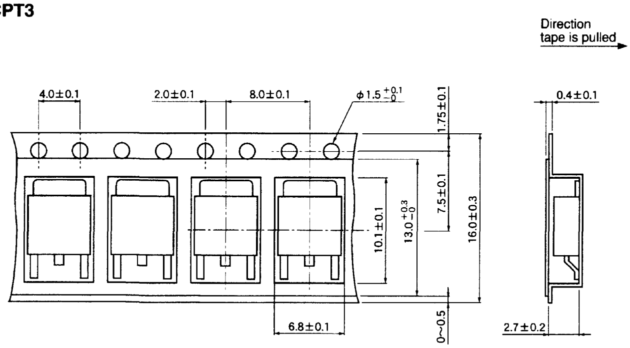
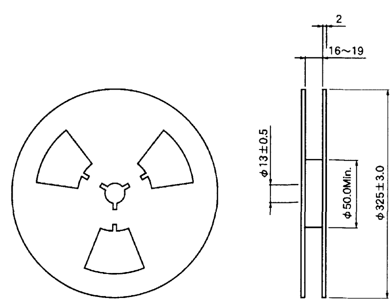
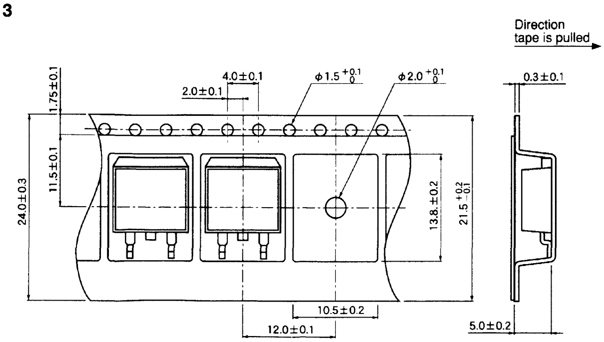
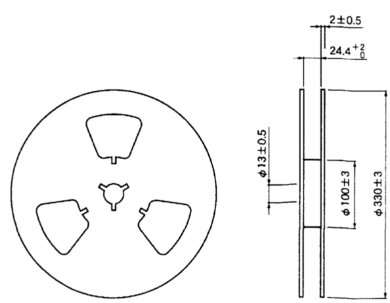
Plastic reel



Conforms with EIAJ TX-7001

EXPLANATION

(Units : mm)

Tape	Reel
MPT3 	Plastic reel  (ϕ180 Reel) Conforms with EIAJ ETX-7001 Plastic reel  (ϕ330 Reel) Conforms with EIAJ ETX-7001
CPT3 	
PSD3 	

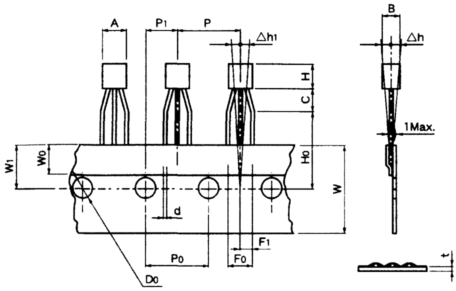
●Leaded-type packaging

Package	Package name	Package code	Package type	Quantity
SPT	Radial taping	TP	Zigzag fold	5000pcs / box
FTL	Radial taping	TL2	Zigzag fold	2500pcs / box
ATV	Radial taping	TV2	Zigzag fold	2500pcs / box
TO-92	Radial taping	T93	Zigzag fold	3000pcs / box

Tape dimensions

Tape

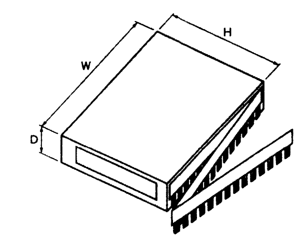
TO-92 · SPT



Symbol	TO-92	SPT
A	4.8±0.2	4.0±0.2
B	3.7±0.2	2.0±0.2
C	2.5Min.	3.0Min.
H	4.8±0.2	3.0±0.2
d	0.5±0.1	$0.45^{+0.15}_{-0.05}$
P	12.7±0.3	12.7±1.0
P_0	12.7±0.3	12.7±0.2
D_0	ϕ4.0±0.2	ϕ4.0±0.2
P_1	6.35±0.5	6.35±0.5
F_0	$5.0^{+0.6}_{-0.2}$	$5.0^{+0.6}_{-0.2}$
F_1	$2.5^{+0.3}_{-0.1}$	$2.5^{+0.4}_{-0.1}$
W	$18.0^{+1.0}_{-0.5}$	$18.0^{+1.0}_{-0.5}$
H_0	16.0±0.5	16.0±0.5
W_0	6.0±0.5	6.0±0.5
W_1	9.0±0.5	9.0±0.5
Δh	0±1.0	0±1.0
Δh_1	0±0.5	0±1.0
t	0.7±0.2	0.7±0.2

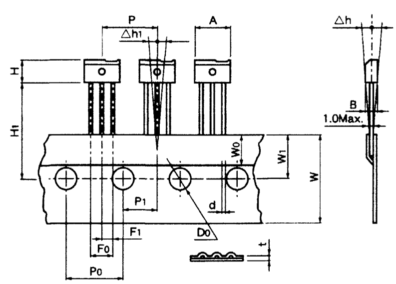
Box

Zig-zag taping



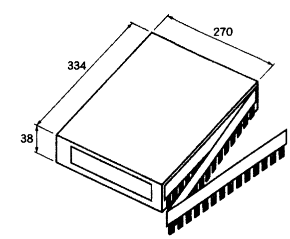
	W	H	D
TO-92	330	243	39
SPT	330	232	40

ATV, FTL



Symbol	ATV	FTL
A	6.8±0.2	6.8±0.2
B	2.5±0.2	2.4±0.2
H	4.4±0.2	3.4±0.2
d	0.5±0.1	0.5±0.1
P	12.7±1.0	12.7±1.0
P_0	12.7±0.2	12.7±0.2
D_0	ϕ4.0±0.2	ϕ4.0±0.2
P_1	6.35±0.4	6.35±0.4
F_0	$5.08^{+0.8}_{-0.2}$	$5.08^{+0.8}_{-0.2}$
F_1	$2.54^{+0.4}_{-0.1}$	$2.54^{+0.4}_{-0.1}$
W	$18.0^{+1.0}_{-0.5}$	$18.0^{+1.0}_{-0.5}$
H_1	19.0±0.5	19.0±0.5
W_0	6.0±0.5	6.0±0.5
W_1	9.0±0.5	9.0±0.5
Δh	0±1.0	0±1.0
Δh_1	0±1.0	0±1.0
t	0.7±0.2	0.7±0.2

Zig-zag taping



●Bulk packaging

Package	Package name	Package code	Package type	Quantity
ATR	Bulk	—	Plastic bag	2000 pcs
FTR	Bulk	—	Plastic bag	2000 pcs
TO-126FP	Bulk	—	Plastic bag	1000 pcs
TO-220FP	Bulk	—	Plastic bag	500 pcs
TO-220FN	Bulk	—	Plastic bag	500 pcs

USA / European specification models types [Surface mounting type]

●UMT3/NPN type

General purpose small signal amplifiers

UMT3 package

Product name	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_C Max. (mA)	I_{CBO} Max. (μA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE}(sat) Max. (V)	& V_{BE}(sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Typ. (MHz)	@I_C (mA)	toff Max. (ns)	MARKING	DIE NO.
BC848BW	30	30	5	100	0.1	30	200	450	2	5	0.6	—	100	3	200	—	—	G1K	C22

●UMT3/PNP type

General purpose small signal amplifiers

UMT3 package

Product name	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_C Max. (mA)	I_{CBO} Max. (μA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE}(sat) Max. (V)	& V_{BE}(sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Typ. (MHz)	@I_C (mA)	toff Max. (ns)	MARKING	DIE NO.
BC858BW	30	30	5	100	0.1	30	210	480	2	5	0.65	—	100	4.5	250	—	—	G3K	A32

・The minus sign (—) on PNP values has been abbreviated.

General purpose amplification and switching

Product name	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_C Max. (mA)	I_{CBO} Max. (μA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE}(sat) Max. (V)	& V_{BE}(sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Typ. (MHz)	@I_C (mA)	toff Max. (ns)	MARKING	DIE NO.
							75		0.1	10									
							100		1	10									
UMT2907A	60	60	5	600	100	50	100		10	10	0.4	1.3	150	8	200	50	180	R2F	A31
							100	300	150	10	1.6	2.6	500						
							50		500	10									
							60		0.1	1									
							80		1	1									
UMT3906	40	40	5	200	50	30	100	300	10	1	0.25	0.85	10	4.5	250	10	300	R2A	A38
					(I_{CES})		60		50	1	0.4	0.95	50						
							30		100	1									
							30		0.1	1									
							60		1	1									
UMT4403	40	40	5	600	100	35	100		10	1	0.4	0.95	150	8.5	200	20	225	R2T	A31
							100	300	150	2	0.75	1.3	500						
							20		500	2									

・The minus sign (—) on PNP values has been abbreviated.

General purpose amplification and switching

Product name	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_C Max. (mA)	I_{CBO} Max. (μA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE}(sat) Max. (V)	& V_{BE}(sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Typ. (MHz)	@I_C (mA)	toff Max. (ns)	MARKING	DIE NO.
							35		0.1	10									
							50		1	10									
UMT2222A	75	40	6	600	100	60	75		10	10	0.3	1.2	150	8	250	20	285	R1P	C31
							100	300	150	10	1.0	2	500						
							50		150	1									
							30		500	10									
							40		0.1	1									
							70		1	1									
UMT3904	60	40	6	200	50	30	100	300	10	1	0.2	0.85	10	4	300	10	250	R1A	C37
					(I_{CEX})		60		50	1	0.3	0.95	50						
							30		100	1									
							20		0.1	1									
							40		1	1									
UMT4401	60	40	6	600	100	35	80		10	1	0.4	0.95	150	6.5	250	20	225	R2X	C31
							100	300	150	1	0.75	1.2	500						
							40		500	2									

●SST3 / NPN type

SST3 package

Application	Product name	BV_{CEO} (V)	I_C (mA)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	f_T (MHz)	Cob (pF)	MARKING	DIE NO.
Pre Amp	BC817-25	45	800	160	400	100	1	150	6	G6B	D15
	BSR14	40	800	100	300	150	10	300	8	GU8	D15
	BC847A	45	100	110	230	2	5	200	3	G1E	C22
	BC847B	45	100	200	450	2	5	200	3	G1F	C22
	BC847C	45	100	450	800	2	5	200	3	G1G	C22
	BC848A	30	100	110	230	2	5	200	3	G1J	C22
	BC848B	30	100	200	450	2	5	200	3	G1K	C22
	BC848C	30	100	420	800	2	5	200	3	G1L	C22
	BCW31	32	100	110	230	2	5		4	GD1	C22
	BCW32	32	100	200	450	2	5		4	GD2	C22
	BCW33	32	100	420	800	2	5		4	GD3	C22
Low Noise Amp	BCW60A	32	200	110	230	2	5	125	4.5	GAA	C22
	BCW60B	32	200	180	310	2	5	125	4.5	GAB	C22
	BCW60C	32	200	260	460	2	5	125	4.5	GAC	C22
	BCW60D	32	200	380	630	2	5	125	4.5	GAD	C22
Driver	BCW65B	32	800	160	400	100	1	100	12	GEB	D15
	BCW65C	45	800	250	630	100	1	100	12	GEC	D15
Low Noise Amp	BCW71	45	100	110	230	2	5		4	GK1	C22
	BCW72	45	100	200	450	2	5		4	GK2	C22
Driver	BCX19	45	500	100	600	100	1			GU1	D15
	BCX20	25	500	100	600	100	1			GU2	D15
Low Noise Amp	BCX70H	45	200	180	310	2	5	125	4.5	GAH	C22
	BCX70J	45	200	250	460	2	5	125	4.5	GAJ	C22
	BCX70K	45	200	380	630	2	5	125	4.5	GAK	C22
Mix Osc.	BFS17	15	50	20	150	2	5	1000	1.5	GMA	C33

EXPLANATION

●SST3・SMT3 / NPN type

General purpose small signal amplifiers

SST3 package

SMT3 package

Product name / Package SST3	SMT3	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	NF (dB)	I_C Max. (mA)	MARKING	DIE NO.
—	MMST5088	35	30	4.5	100	30	300 350 300	900	0.1 1 10	5 5 5	0.3	0.8 ($V_{BE(ON)}$)	10	4	50	0.5	3	200	R10	C22
—	MMST6428	60	50	6	100	30	250 250 250 250	650	0.01 0.1 1 10	5 5 5 5	0.2 0.6		10 100	3	100	1	—	200	RtK	C22
SST6838	—	50	40	5	500	30	200 150		1 10	5 5	0.4		50	3.5	50	2	—	200	RBR	C22
SSTTIS97	—	60	40	6	50	40	250	700	0.1	5		0.65 ($V_{BE(ON)}$)	0.1	4			2	200	R97	C22
—	MMST8098	60	60	6	100m	60	100	300	1	5	0.4	0.7	100	6	150	10	—	200	RAV	C22

●SST3・SMT3 / PNP type (cont.)


SST3 package


SMT3 package

General purpose amplification and switching

SST3	SMT3	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	t_{off} Max. (ns)	I_C Max. (mA)	MARKING	DIE NO.
SST2222A	MMST2222A	75	40	6	100	60	35		0.1	10	0.3	1.2	150	8	250	20	285	600	R1P	C31
							50		1	10	1	2	500							
							75		10	10										
							100	300	150	10										
							50		150	1										
							30		500	10										
SST3904	MMST3904	60	40	6	50 (I_{CEX})	30	40		0.1	1	0.2	0.85	10	4	300	10	250	200	R1A	C37
							70		1	1	0.3	0.95	50							
							100	300	10	1										
							60		50	1										
							30		100	1										
SST4124	MMST4124	30	25	5	50	20	120	360	2.0	1	0.3	0.95	50	4	300	10	—	200	RZC	C37
							60		50	1										
SST4401	MMST4401	60	40	6	100	35	20		0.1	1	0.4	0.95	150	6.5	250	20	225	600	R2X	C31
							40		1	1	0.75	1.2	500							
							80		10	1										
							100	300	150	1										
							40		500	2										

Medium power amplification

SST3	SMT3	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	t_{off} Max. (ns)	I_C Max. (mA)	MARKING	DIE NO.
SSTA05	—	60	60	4	100	60	100		10	1	0.25	1.2 ($V_{BE(ON)}$)	100		100	10		500	R1H	D16
							100		100	1										
SSTA06	MMSTA06	80	80	4	100	80	100		10	1	0.25	1.2 ($V_{BE(ON)}$)	100		100	10		500	R1G	D16
							100		100	1										

Darlington pair type

SST3	SMT3	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	NF (dB)	I_C Max. (mA)	MARKING	DIE NO.
SST6427	—	40	40	12	50	30	10	100	10	5	1.2	2	50	7			10	500	R1J	D25
							20	200	100	5	1.5		500							
							14	140	500	5										
SSTA13	MMSTA13	(V_{CES}) 30		10	100	30	5		10	5	1.5		100	10	125	10		500	R1M	D25
							10		100	5										
SSTA14	MMSTA14	(V_{CES}) 30		10	100	30	10		10	5	1.5		100	10	125	10		500	R1N	D25
							20		100	5										
SSTA28	MMSTA28	(V_{CES}) 80		12	100	60	10		10	5	1.5		100	8	125	10		500	RAT	D69
							10		100	5										

High frequency applications

SST3	SMT3	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	NF. (dB)	I_C Max. (mA)	MARKING	DIE NO.
SST8245	—	30	20	3	100 (I_{CES})	18	60	150	2.5	4	0.4	1	10	1.2	600	2.5		50	R3B	C33
—	MMST918	30	15	3	100	15	20		3	1	0.4	1	10	1.7	600	4	6	50	RVX	C33

●SST3 / PNP type


SST3 package

Application	Product name	BV$_{CEO}$ (V)	I$_C$ (mA)	h$_{FE}$ Min.	h$_{FE}$ Max.	@I$_C$ (mA)	@V$_{CE}$ (V)	f$_T$ (MHz)	Cob (pF)	MARKING	DIE NO.
Pre Amp	BC807-25	45	500	160	400	100	1	150	6	G5B	B11
	BC857A	45	100	110	230	2	5	250	4.5	G3E	A32
	BC857B	45	100	210	480	2	5	250	4.5	G3F	A32
	BC858B	30	100	210	480	2	5	250	4.5	G3K	A32
	BCW29	32	100	110	260	2	5		7	GC1	A32
	BCW30	32	100	210	500	2	5		7	GC2	A32
Low Noise Amp	BCW61B	32	200	180	310	2	5	180	5	GBB	A32
	BCW61C	32	200	250	460	2	5	180	5	GBC	A32
Driver	BCW68F	45	800	100	250	100	1	100	18	GDF	B11
	BCW68G	45	800	160	400	100	1	100	18	GDG	B11
Low Noise Amp	BCW69	45	100	110	260	2	5		7	GH1	A32
	BCW70	45	100	210	500	2	5		7	GH2	A32
Driver	BCX17	45	500	100	600	100	1			GT1	B11
Low Noise Amp	BCX71G	45	200	110	220	2	5	180	6	GBG	A32
	BCX71H	45	200	140	310	2	5	180	6	GBH	A32
	BCX71J	45	200	250	460	2	5	180	6	GBJ	A32

●SST3・SMT3 / PNP type


General purpose small signal amplifiers

SST3 package　　SMT3 package

Product name / Package SST3	SMT3	BV$_{CBO}$ Min. (V)	BV$_{CEO}$ Min. (V)	BV$_{EBO}$ Min. (V)	I$_{CBO}$ Max. (nA)	@V$_{CB}$ (V)	h$_{FE}$ Min.	h$_{FE}$ Max.	@I$_C$ (mA)	@V$_{CE}$ (V)	V$_{CE}$ (sat) Max. (V)	V$_{BE}$ (sat) Max. (V)	@I$_C$ (mA)	Cob Max. (pF)	f$_T$ Min. (MHz)	@I$_C$ (mA)	NF Max. (dB)	I$_C$ Max. (mA)	MARKING	DIE NO.
—	MMST5086	50	50	3	100	40	150 150 150	500	0.1 1 10	5 5 5	0.3		10	6	40	0.5	3	200	R2P	A32
—	MMST5087	50	50	3	100	40	250 250 250	800	0.1 1 10	5 5 5	0.3		10	6	40	0.5	2	200	R2O	A32
SST6839	—	50	40	5			100 100		1 100	5 5	0.5		100	3.5	50	2		200	RFO	A32
—	MMST8598	60	60	5	100	60	100	300	1	5	0.5		100	8	150	10		200	R2K	A32
—	MMSTA70	60	60	5	100	30	160	400	5	10	0.2		100	5	125	5		200	R2C	A32

・The minus sign (—) on PNP values has been abbreviated.

General purpose amplification and switching

Product name / Package SST3	SMT3	BV$_{CBO}$ Min. (V)	BV$_{CEO}$ Min. (V)	BV$_{EBO}$ Min. (V)	I$_{CBO}$ Max. (nA)	@V$_{CB}$ (V)	h$_{FE}$ Min.	h$_{FE}$ Max.	@I$_C$ (mA)	@V$_{CE}$ (V)	V$_{CE}$ (sat) Max. (V)	V$_{BE}$ (sat) Max. (V)	@I$_C$ (mA)	Cob Max. (pF)	f$_T$ Min. (MHz)	@I$_C$ (mA)	t$_{off}$ Max. (ns)	I$_C$ Max. (mA)	MARKING	DIE NO.
—	MMST2907	60	40	5	100	50	35 50 75 100 30	 300 	0.1 1 10 150 500	10 10 10 10 10	0.4 1.6	1.3 2.6	150 500	8	200	50	180	600	R2B	A31
SST2907A	MMST2907A	60	60	5	100	50	75 100 100 100 50	 300 	0.1 1 10 150 500	10 10 10 10 10	0.4 1.6	1.3 2.6	150 500	8	200	50	180	600	R2F	A31

・The minus sign (—) on PNP values has been abbreviated.

EXPLANATION

●SST3・SMT3 / PNP type


General purpose amplification and switching (cont.)

SST3 package SMT3 package

Product name / Package SST3	SMT3	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	t_{off} Max. (ns)	I_C Max. (mA)	MARKING	DIE NO.
SST3906	MMST3906	40	40	5	50 (I_{CES})	30	60 80 100 60 30	 300 	0.1 1 10 50 100	1 1 1 1 1	0.25 0.4	0.85 0.95	10 50	4.5	250	10	300	200	R2A	A38
—	MMST4126	25	25	4	50	20	120 60	360 	2 50	1 1	0.4	0.95	50	4.5	250	10		200	RVZ	A38
SST4403	MMST4403	40	40	5	100	35	30 60 100 100 20	 300 	0.1 1 10 150 500	1 1 1 2 2	0.4 0.75	0.95 1.3	150 500	8.5	200	20	255	600	R2T	A31

・The minus sign (—) on PNP values has been abbreviated.

Medium power amplification

Product name / Package SST3	SMT3	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	t_{off} Max. (ns)	I_C Max. (mA)	MARKING	DIE NO.
SSTA56	MMSTA56	80	80	4	100	80	100 100		10 100	1 1	0.25	1.2	100		50	100		500	R2G	B93

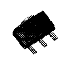
・The minus sign (—) on PNP values has been abbreviated.

Darlington pair type

Product name / Package SST3	SMT3	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	NF (dB)	I_C Max. (mA)	MARKING	DIE NO.
—	MMSTA64	30	30 (V_{CES})	10	100	30	10k 20k		10 100	5 5	1.5		100	7	125	10	3	300	R2V	B25

・The minus sign (—) on PNP values has been abbreviated.

●MPT3 / NPN type

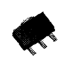


MPT3 package

Application	Product name	V_{CEO} (V)	I_C (A)	P_C (W)★	f_T (MHz)	Cob (pF)	h_{FE}	MARKING	DIE NO.
Driver	RXT2222A	40	0.6	1	300	8	100~300	CB	C31
	RXT3904	40	0.2	1	300	4	100~300	CD	C37
	BCX56	80	1	1	100	20	40~250	DF	D54
Darlington Driver	RXTA14	40	0.5	1	—	5.4	20k~	DG	D25
	RXTA28	80	0.5	1	125	5	10k~	DH	D69

★ On 14×18×0.7mm ceramic board.

●MPT3 / PNP type



MPT3 package

Application	Product name	V_{CEO} (V)	I_C (A)	P_C (W)★	f_T (MHz)	Cob (pF)	h_{FE}	MARKING	DIE NO.
Driver	RXT2907A	60	0.6	1	200	8	100~300	AC	A31
	RXT3906	40	0.2	1	250	4.5	100~400	AD	A38
	BCX53	80	1	1	100	20	40~250	BE	B54
Darlington Driver	RXTA76	50	0.5	1	125	5.4	20k~	BF2	B25

・The minus sign (—) on PNP values has been abbreviated.
★ On 14×18×0.7mm ceramic board.

[Leaded type]

TO-92 package

●TO-92 / NPN type

General purpose small signal amplifiers

Product name	Pin arrangement	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	NF (dB)	I_C Max. (mA)	DIE NO.
2N2925	ECB	25	25	5	100	25	235	470	2	10				10	160 (Typ.)			200	C22
2N5232A	ECB	70	50	5	100	50	250	500	2	5	0.125		10	4			5	100	C22
MPS8097	EBC	60	40	6	30 10 μ	40 60	250	700	0.1	5	0.65 ($V_{BE(ON)}$)		100	4	200	10	2	100	C22
MPSA20	EBC	40	40	4	100	30	40	400	5	10	0.25		10	4	125	5		100	C22
MPS8098	ECB	60	60	6	100	60	100	300	1	5	0.4	0.3	100	6	150	10		200	C22
PN918	ECB	30	15	3	100	15	20		3	1	0.4	1	1	3	600	4	6	50	C33
RJE9014C	ECB	—	40	—	—	—	60	1000	—	—	—	—	—	—	—	—	—	150	C22
RJE9018G	ECB	—	19	—	—	—	72	146	—	—	—	—	—	—	—	—	—	50	C33

General purpose amplification and switching

Product name	Pin arrangement	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	t_{off} Max. (ns)	I_C Max. (mA)	DIE NO.
PN2222A	EBC	75	40	6	100	60	35 50 75 100 50 30	 300 	0.1 1.0 10 150 150 500	10 10 10 10 1 10	0.3 1	1.2 2	150 500	8	250	20	285	600	C31
2N3904	EBC	60	40	6	50 (I_{CEX})	30	40 70 150 60 30	 300 	0.1 1 10 50 100	1 1 1 1 1	0.2 0.3	0.85 0.95	10 50	4	300	10	250	200	C37
2N4401	EBC	60	40	6	50	30	20 40 80 100 40	 300 	0.1 1 10 150 500	1 1 1 1 2	0.4 0.75	0.95 1.2	150 50	6.5	250	20	225	600	C31
MPS6515	EBC	40	25	4	50	30	250 150	500 	2 100	10 10	0.5		50	3.5	250	10	NF 2dB	100	C22
MPS6531	EBC	60	40	5	50	40	60 90 50	 270 	10 100 500	1 1 10	0.3	1.0	100	5	390 Typ.			600	C31

Medium power amplification

Product name	Pin arrangement	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	t_{off} Max. (ns)	I_C Max. (mA)	DIE NO.
MPSA06	EBC	80	80	4	100	80	100 100		10 100	1 1	0.25		100		50	10		500	D16
2N5551	EBC	180	160	6	50		56	270	10	5	0.2	1	1	6	50			600	C329

Darlington pair type

Product name	Pin arrangement	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	NF Max. (dB)	I_C Max. (mA)	DIE NO.
2N6426	EBC	40	40	12	50	30	20k 30k 20k	200k 300k 200k	10 100 500	5 5 5	1.2 1.5	 2	5 500	7			10	500	D25
MPSA13	EBC	(V_{CES}) 30		10	100	30	5k 10k		10 100	5 5	1.5		100	10	125	10		500	D25
MPSA28	EBC	(V_{CES}) 80		12	100	60	10k 10k		10 100	5 5	1.5		100	8	125	10		500	D69
MPSA29	EBC	(V_{CES}) 100		12	100	80	10k 10k		10 100	5 5	1.2		10	8	125	10		500	D69

EXPLANATION

●TO-92/PNP type

TO-92 package

General purpose small signal amplifier

Product name	Pin arrangement	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	NF Max. (dB)	I_C Max. (mA)	DIE NO.
2N3703	ECB	50	30	5	100	20	30	150	50	5	0.25	1 ($V_{BE(ON)}$)	50	12	100	50		200	A32
2N5087	EBC	50	50	3	100	40	250 250 250	800	0.1 1.0 10	5 5 5	0.3		10	6	40	0.5		200	A32
MPSA70	EBC	40	40	4	100	30	40	400	5	10	0.25		10	6	125	5		100	A32
RJE9015C	ECB	—	50	—	—	—	100	600				—		—	—	—	—	150	A32

・The minus sign (—) on PNP values has been abbreviated.

General purpose amplification and switching

Product name	Pin arrangement	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	t_{off} Max. (ns)	I_C Max. (mA)	DIE NO.
PN2907A	EBC	60	60	5	100	50	75 100 100 100 50	 300 	0.1 1 10 150 500	10 10 10 10 10	0.4 1.6	1.3 2.6	150 500	8	200	50	180	600	A31
2N3906	EBC	40	40	5	50 (I_{CES})	30	60 80 150 60 30	 300 	0.1 1 10 50 500	1 1 1 1 1	0.25 0.4	0.85 0.95	10 50	4.5	250	10	300	200	A38
2N4403	EBC	40	40	5	100	35	30 60 100 100 20	 300 	0.1 1 10 150 500	1 1 1 2 2	0.4 0.75	0.95 1.3	150 500	8.5	200	20	255	600	A31
MPS6534	EBC	40	40	4	100	30	60 90 50	 270 	10 100 500	1 1 10	0.5	1	100	8	260 Typ.			600	A31

・The minus sign (—) on PNP values has been abbreviated.

Medium power amplification

Product name	Pin arrangement	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	t_{off} Max. (ns)	I_C Max. (mA)	DIE NO.
MPSA56	EBC	80	80	4	100	80	50 50		10 100	1 1	0.25	1.2 ($V_{BE(ON)}$)	100		50	100		500	B13
2N5401	EBC	160	150	5	50		56	270	10	5	0.2	1.0	1	6	50			600	A329

・The minus sign (—) on PNP values has been abbreviated.

Darlington pair type

Product name	Pin arrangement	BV_{CBO} Min. (V)	BV_{CEO} Min. (V)	BV_{EBO} Min. (V)	I_{CBO} Max. (nA)	@V_{CB} (V)	h_{FE} Min.	h_{FE} Max.	@I_C (mA)	@V_{CE} (V)	V_{CE} (sat) Max. (V)	V_{BE} (sat) Max. (V)	@I_C (mA)	Cob Max. (pF)	f_T Min. (MHz)	@I_C (mA)	NF Max. (dB)	I_C Max. (mA)	DIE NO.
MPSA63	EBC	30	30 (V_{CES})	10	100	30	5k 10k		10 100	5 5	1.5		100	7	125	10		500	B25
MPSA64	EBC	30	30 (V_{CES})	10	100	30	10k 20k		10 100	5 5	1.5		100	7	125	10		500	B25

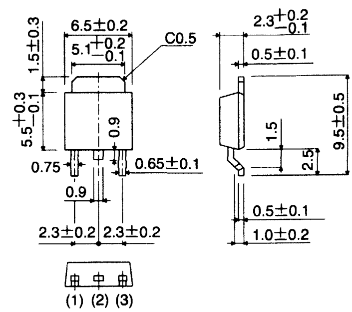
・The minus sign (—) on PNP values has been abbreviated.

Small switching (60V, 2A)
2SK2094

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Low-voltage drive (4V).
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Unit: mm)



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	60	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	2	A
	Pulsed	I_{DP}*	8	A
Drain reverse current	Continuous	I_{DR}	2	A
	Pulsed	I_{DRP}*	8	A
Total power dissipation(Tc=25℃)		P_D	20	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦300 μs, Duty cycle≦2%

●Packaging specifications

Type		
	Package name	Bulk
	Code	TL
	Basic ordering unit (pieces)	2500
2SK2094		○

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{DS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=60V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	—	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.3	0.35	Ω	I_D=1A, V_{GS}=10V
		—	0.4	0.5		I_D=1A, V_{GS}=4V
Forward transfer admittance	$\|Y_{fs}\|$	1	—	—	S	V_{DS}=10V, I_D=1A
Input capacitance	C_{iss}	—	400	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	150	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	50	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	I_D=1A, V_{DD}≒30V
Rise time	t_r	—	20	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	100	—	ns	R_L=30Ω
Fall time	t_r	—	40	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	100	—	ns	I_{DR}=2A, V_{GS}=0V, di/dt=50A/μs

● Electrical characteristic curves

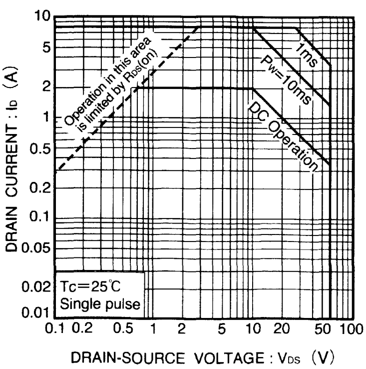


Fig.1 Maximum Safe Operating Area

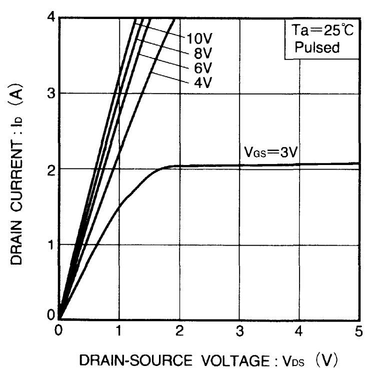


Fig.2 Typical Output Characteristics

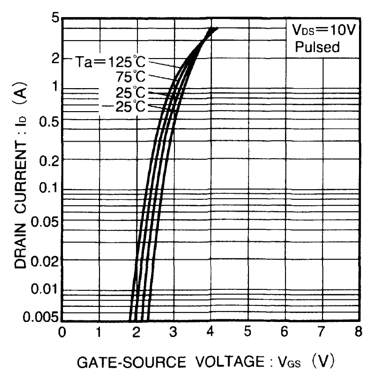


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

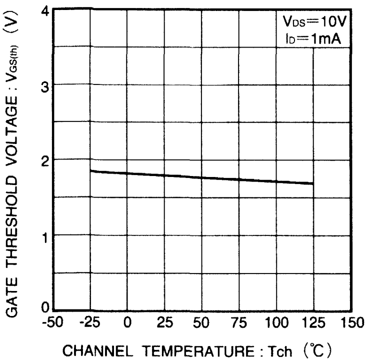


Fig.4 Gate Threshold Voltage vs. Channel Temperature

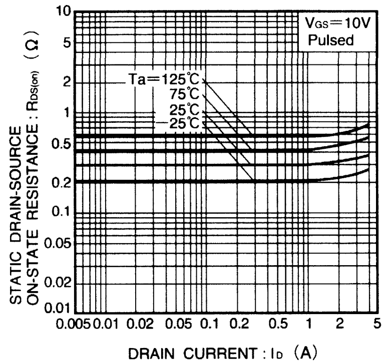


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (I)

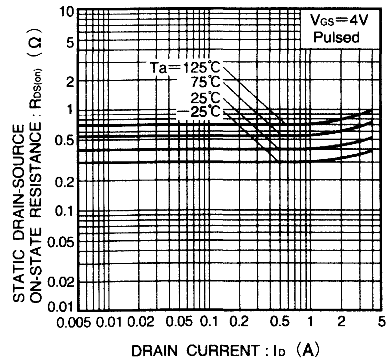


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (II)

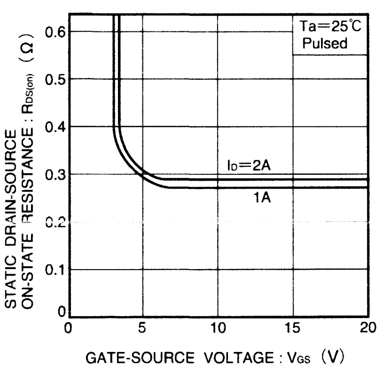


Fig.7 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

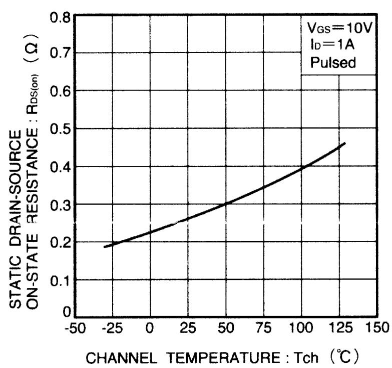


Fig.8 Static Drain-Source On-State Resistance vs. Channel Temperature

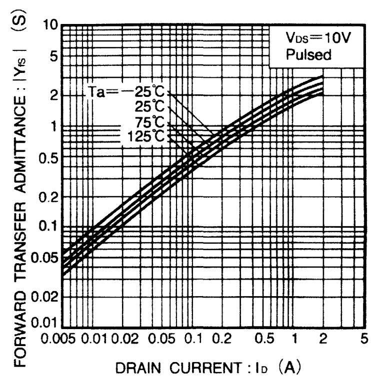


Fig.9 Forward Transfer Admittance vs. Drain Current

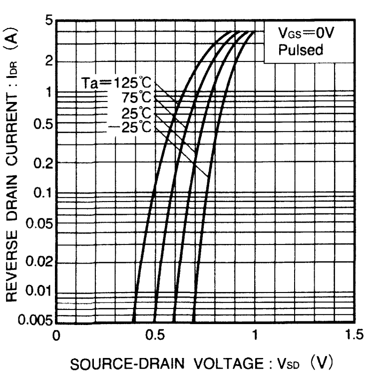


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (I)

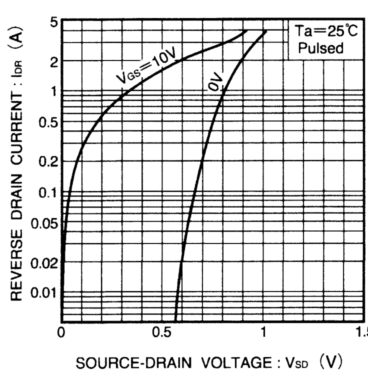


Fig.11 Reverse Drain Current vs. Source-Drain Voltage (II)

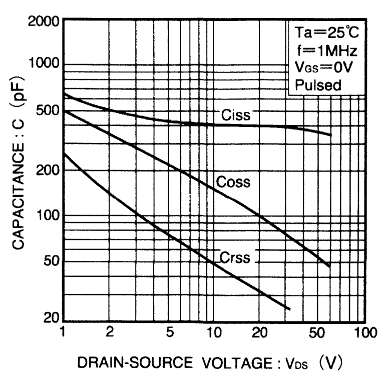


Fig.12 Typical Capacitance vs. Drain-Source Voltage

MOS FET

●Electrical characteristic curves

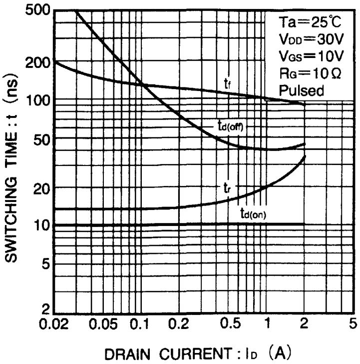


Fig.13 Switching Characteristics (See Figure. 15 and 16 for measurement circuits)

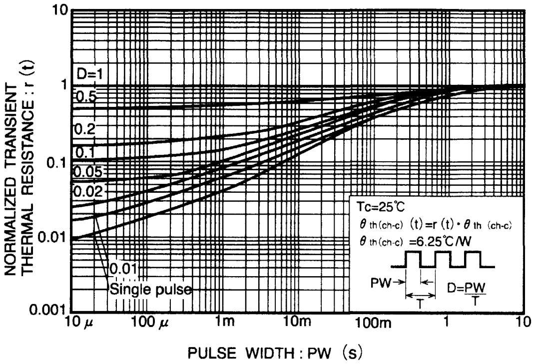
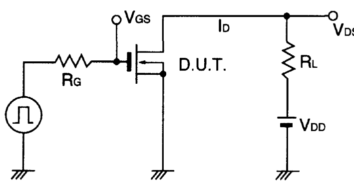


Fig.14 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit



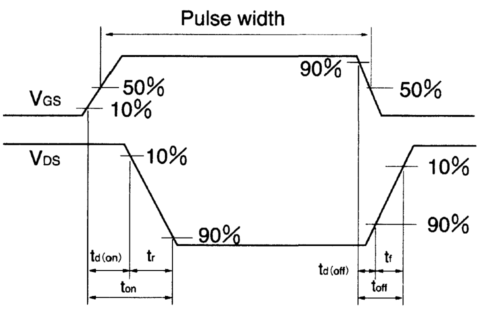


Fig.15 Switching Time Measurement Circuit

Fig.16 Switching Time Waveforms

Switching (60V, 10A)

2SK2095N

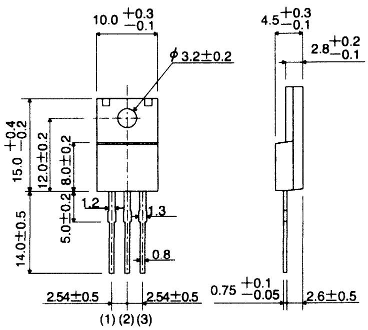
●Features

1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Easily designed drive circuits.
5) Low $V_{GS(th)}$.
6) Easy to use in parallel.

●Structure

Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	60	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	10	A
	Pulsed	I_{DP}*	40	A
Drain reverse current	Continuous	I_{DR}	10	A
	Pulsed	I_{DRP}*	40	A
Total power dissipation (Tc=25℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2095N		○

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=60V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	—	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.080	0.095	Ω	I_D=5A, V_{GS}=10V
		—	0.11	0.14		I_D=5A, V_{GS}=4V
Forward propagation admittance	$\lvert Y_{fs} \rvert$*	5	—	—	S	V_{DS}=10V, I_D=5A
Input capacitance	C_{iss}	—	1600	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	600	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	150	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	30	—	ns	I_D=5A, V_{DD}≒30V
Rise time	t_r	—	80	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	300	—	ns	R_L=6Ω
Fall time	t_f	—	100	—	ns	R_G=10Ω

* Pw≦300μs, Duty cycle≦1%

● Electrical characteristic curves

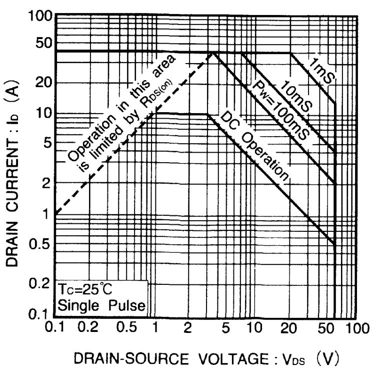


Fig.1 Maximum Safe Operating Area

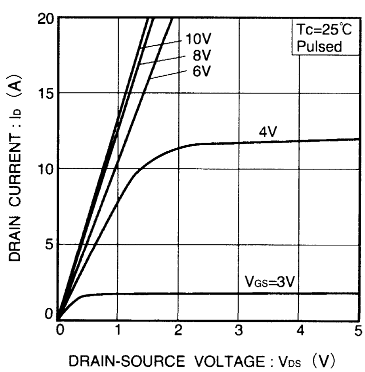


Fig.2 Typical Output Characteristics

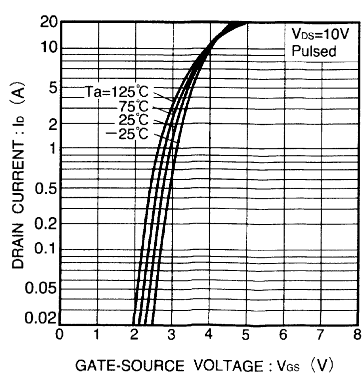


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

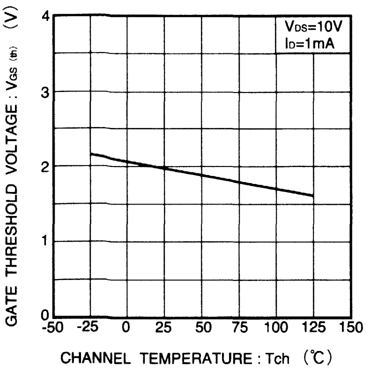


Fig.4 Gate Threshold Voltage vs. Channel Temperature

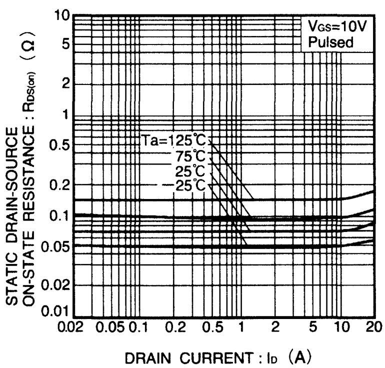


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (I)

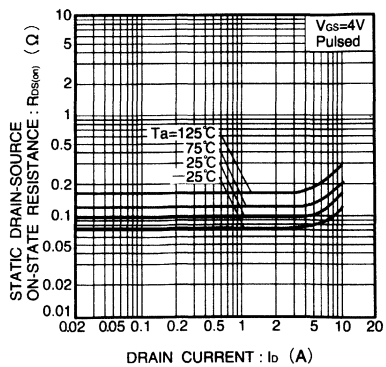


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (II)

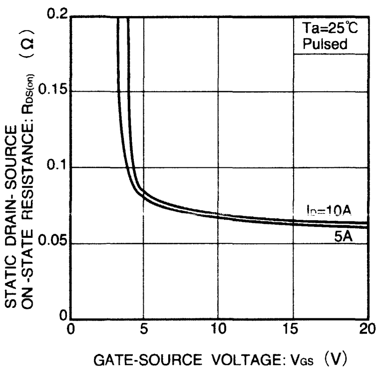


Fig.7 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

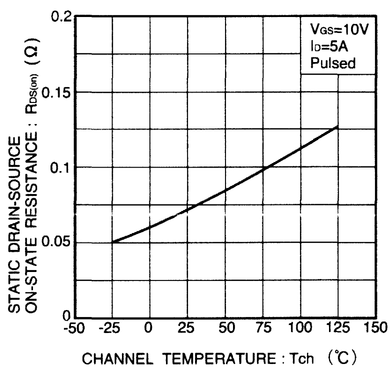


Fig.8 Static Drain-Source On-State Resistance vs. Channel Temperature

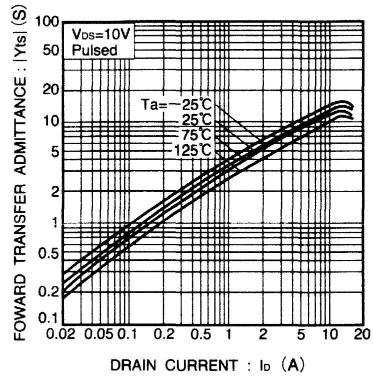


Fig.9 Forward Transfer Admittance vs. Drain Current

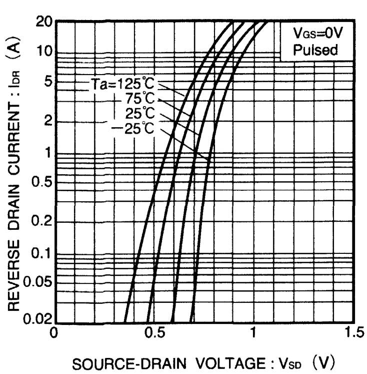


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (I)

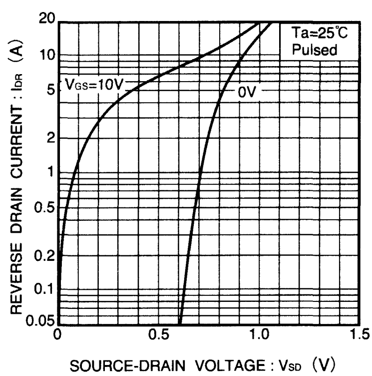


Fig.11 Reverse Drain Current vs. Source-Drain Voltage (II)

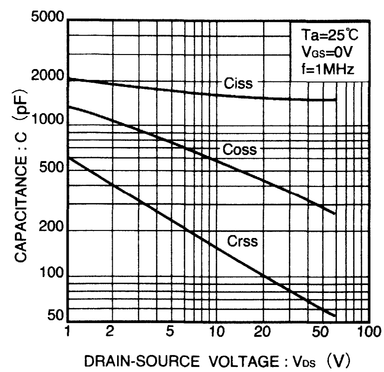


Fig.12 Typical Capacitance vs. Drain-Source Voltage

● Electrical characteristic curves

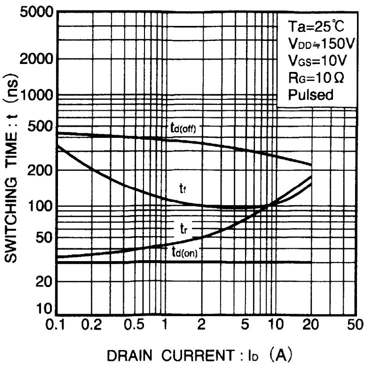


Fig.13 Switching Characteristics (See Figure. 15 and 16 for measurement circuits)

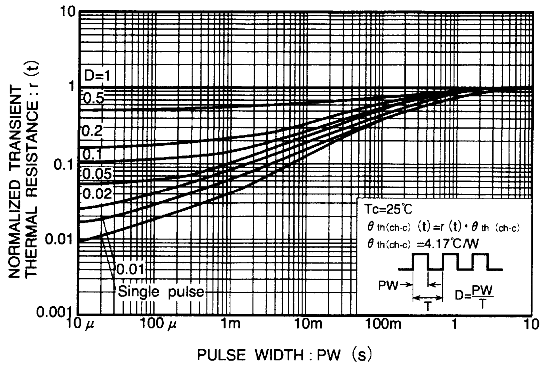


Fig.14 Normalized Transient Thermal Resistance vs.Pulse Width

● Switching characteristics measurement circuit

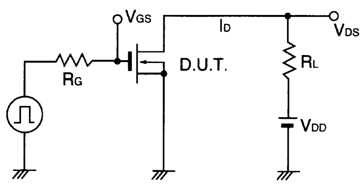


Fig.15 Switching Time Measurement Circuit

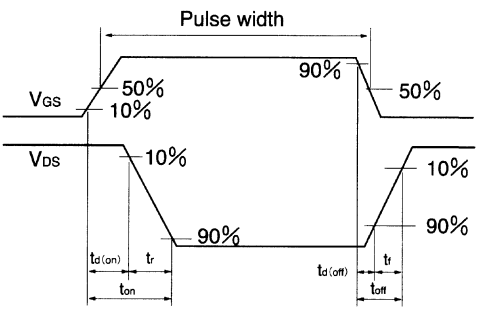


Fig.16 Switching Time Waveforms

Small switching (30V, 2A)

2SK2103

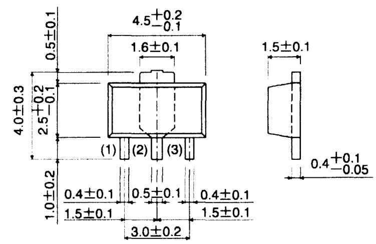
●Features

1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Low-voltage drive (4V).
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure

Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : MPT3
E I A J : SC-62

Abbreviated symbol: KA

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	30	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	2	A
	Pulsed	I_{DP} *1	8	A
Drain reverse current	Continuous	I_{DR}	2	A
	Pulsed	I_{DRP} *1	8	A
Total power dissipation		P_D *2	2	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* 1 Pw≦10 μs, Duty cycle≦1% * 2 On 40 x 40 x 0.7 mm aluminum-ceramic board.

●Packaging specifications

Type	Package	Taping
	Code	T100
	Basic ordering (pieces)	1000
2SK2103		○

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	10	μA	V_{DS}=30V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	—	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.25	0.4	Ω	I_D=1A, V_{GS}=10V
		—	0.38	0.6		I_D=1A, V_{GS}=4V
Forward transfer admittance	$\lvert Y_{fs} \rvert$*	1	—	—	S	V_{DS}=10V, I_D=1A
Input capacitance	C_{iss}	—	230	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	120	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	60	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	I_D=1A, V_{DD}≒15V
Rise time	t_r	—	25	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	60	—	ns	R_L=15Ω
Fall time	t_f	—	60	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	70	—	ns	I_{DR}=2A, V_{GS}=0V, di/dt=50A/μs

* Pw≦300μs, Duty cycle≦1%

●Electrical characteristic curves

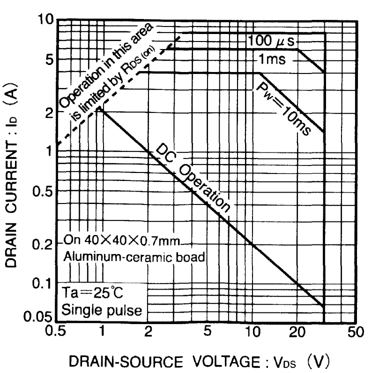


Fig.1 Maximum Safe Operating Area

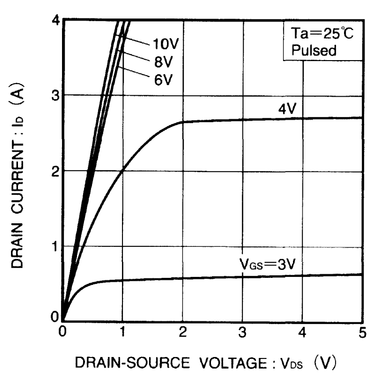


Fig.2 Typical Output Characteristics

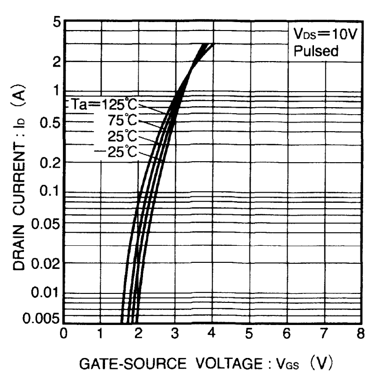


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

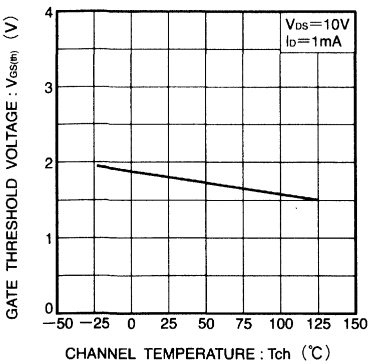


Fig.4 Gate Threshold Voltage vs. Channel Temperature

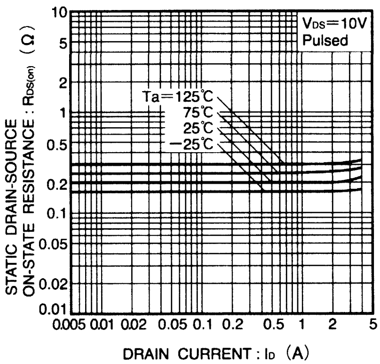


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (I)

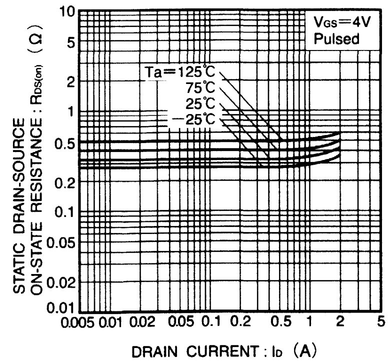


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (II)

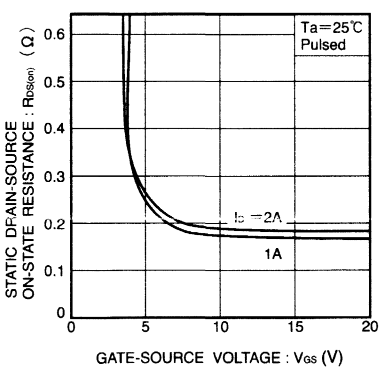


Fig.7 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

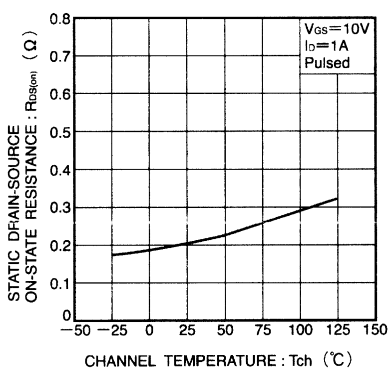


Fig.8 Static Drain-Source On-State Resistance vs. Channel Temperature

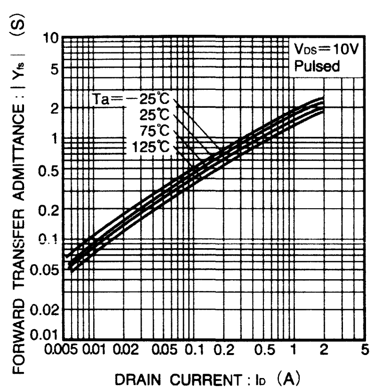


Fig.9 Forward Transfer Admittance vs. Drain Current

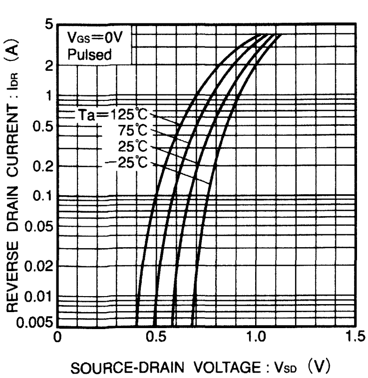


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (I)

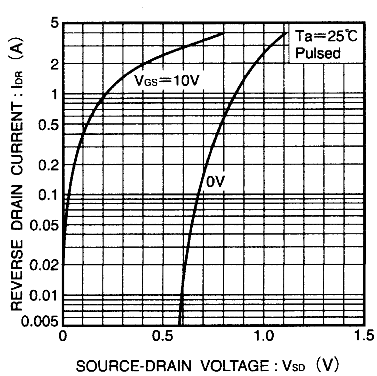


Fig.11 Reverse Drain Current vs. Source-Drain Voltage (II)

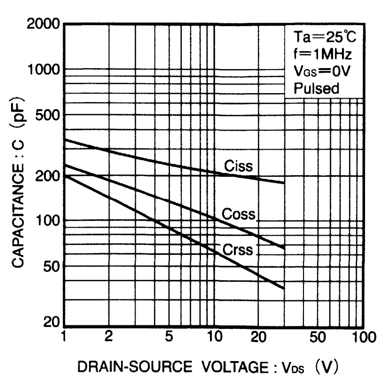


Fig.12 Typical Capacitance vs. Drain-Source Voltage

● Electrical characteristic curves

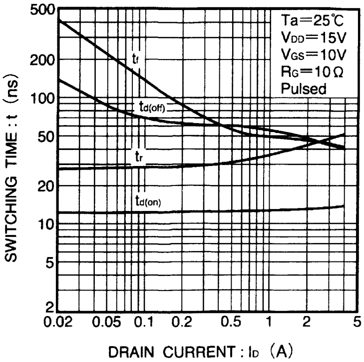


Fig. 13 Switching Characteristics

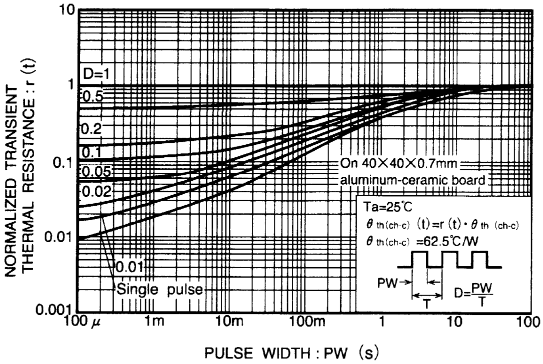


Fig.14 Normalized Transient Thermal Resistance vs. Pulse Width

● Switching characteristics measurement circuit

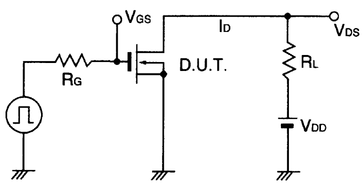


Fig.15 Switching Time Measurement Circuit

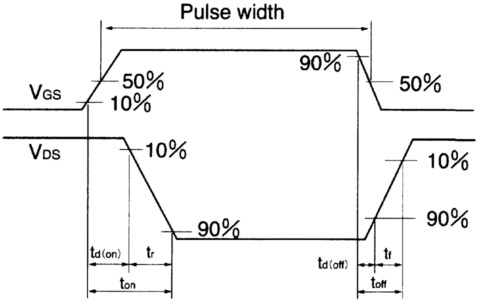


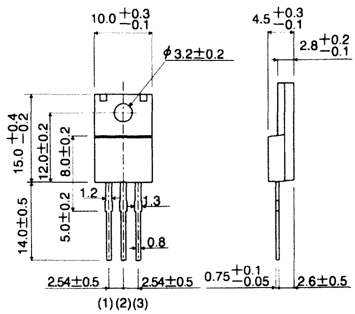
Fig.16 Switching Time Waveforms

Switching (800V, 3A)
2SK2294

● Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

● Structure
Silicon N-channel
MOSFET transistor

● External dimensions (Units: mm)



ROHM : TO-220FN

(1) Gate
(2) Drain
(3) Source

● Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	800	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	3	A
	Pulsed	I_{DP}*	6	A
Drain reverse current	Continuous	I_{DR}	3	A
	Pulsed	I_{DRP}*	6	A
Total power dissipation (Tc=25℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

● Packaging specifications

Type		
	Package	Bulk
	Code	−
	Basic ordering unit (pieces)	500
2SK2294		○

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	800	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=800V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	3	4	Ω	I_D=1.5A, V_{GS}=10V
Forward propagation admittance	$\mid Y_{fs} \mid$	1	2.5	—	S	V_{DS}=10V, I_D=1.5A
Input capacitance	C_{iss}	—	740	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	120	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	35	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	I_D=1.5A, V_{DD}≒150V
Rise time	t_r	—	14	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	53	—	ns	R_L=100Ω
Fall time	t_f	—	49	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	800	—	ns	I_{DR}=3A, V_{GS}=0V,
Reverse recovery load	Q_{rr}	—	4.4	—	μC	di/dt=100A/μs

● Electrical characteristic curves

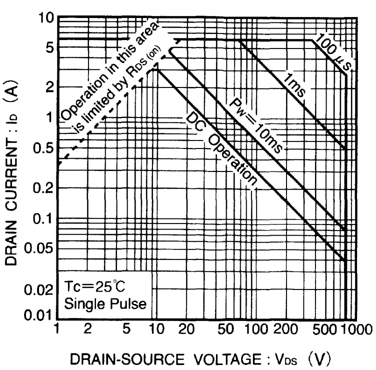


Fig.1 Maximum Safe Operating Area

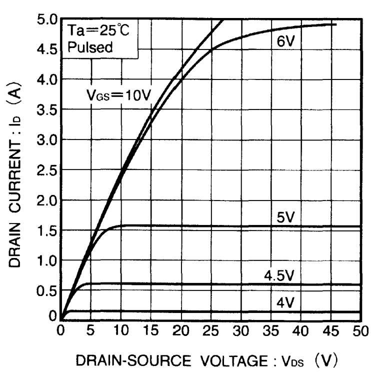


Fig.2 Typical Output Characteristics

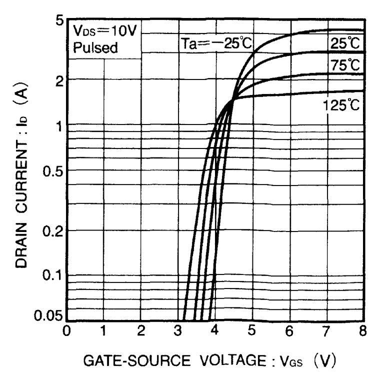


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

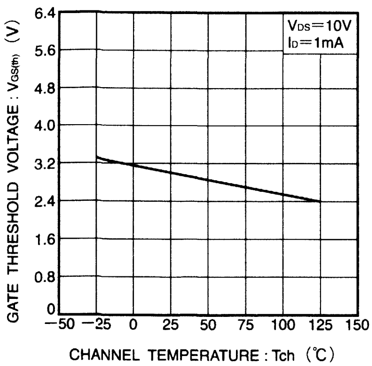


Fig.4 Gate Threshold Voltage vs. Channel Temperaturea

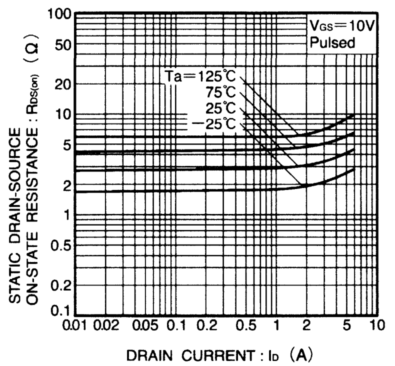


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

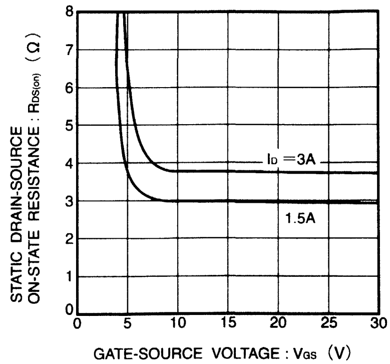


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

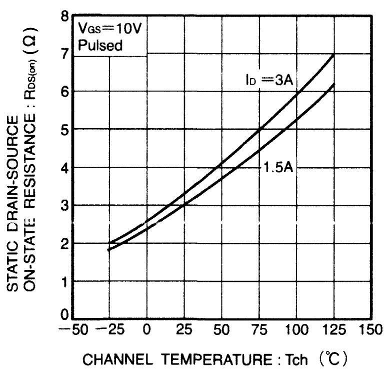


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

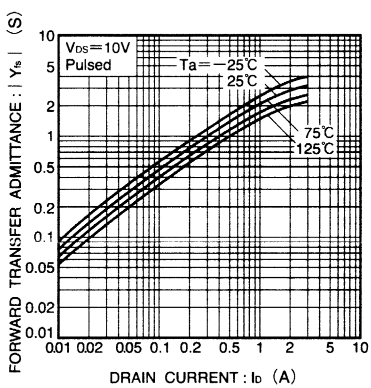


Fig.8 Forward Transfer Admittance vs. Drain Current

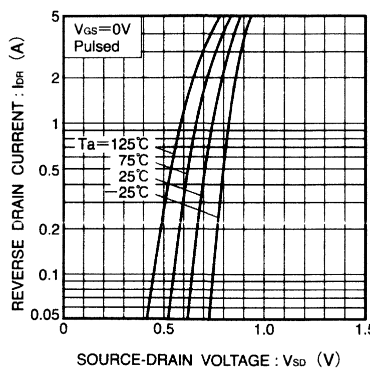


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

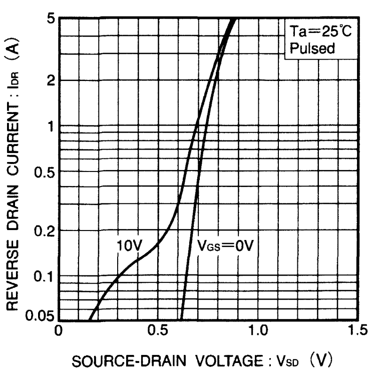


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

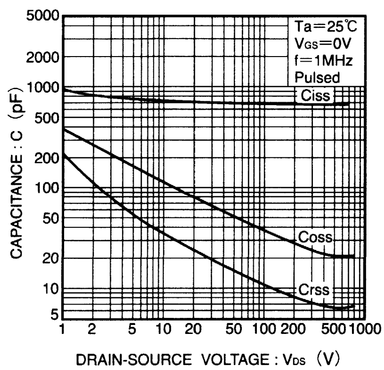


Fig.11 Typical Capacitance vs. Drain-Source Voltage

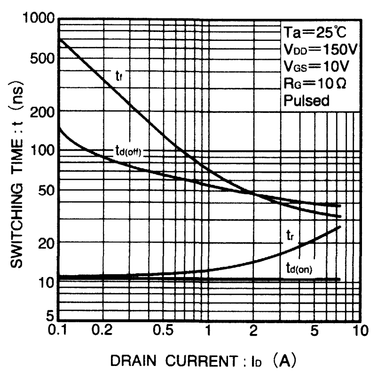


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

MOS FET

● Electrical characteristic curves

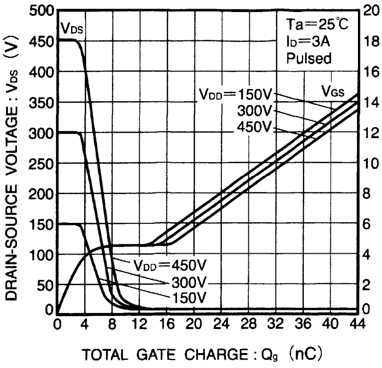


Fig.13 Dynamic Input Characteristics (See Figure. 18 for measurement circuit)

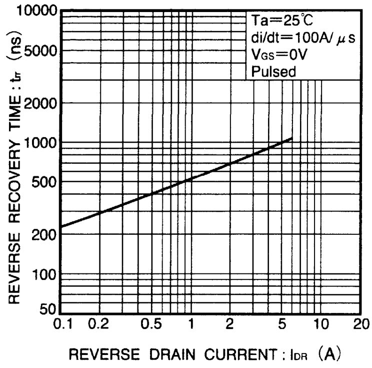


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

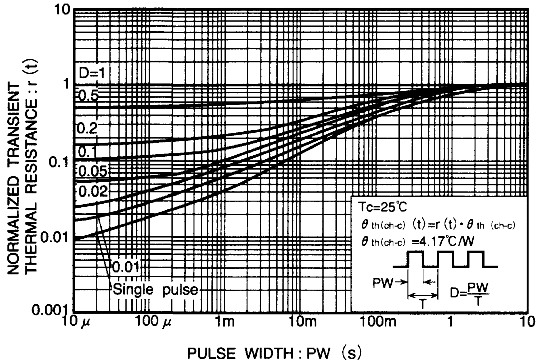


Fig.15 Normalized Transient Thermal Resistance vs.Pulse Width

● Switching characteristics measurement circuit

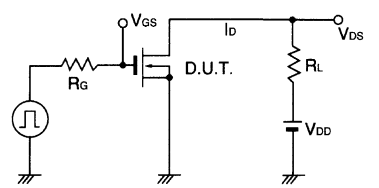


Fig.16 Switching Time Measurement Circuit

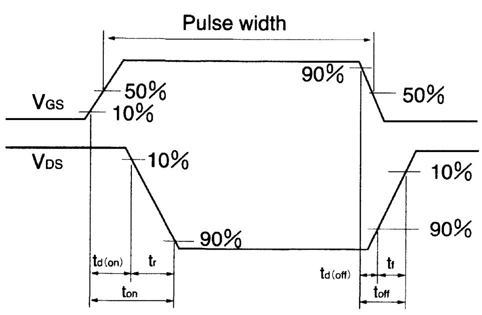


Fig.17 Switching Time Waveforms

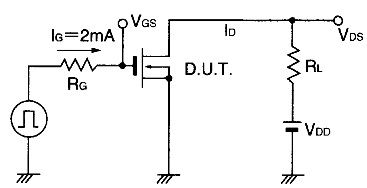


Fig.18 Gate Charge Measurement Circuit

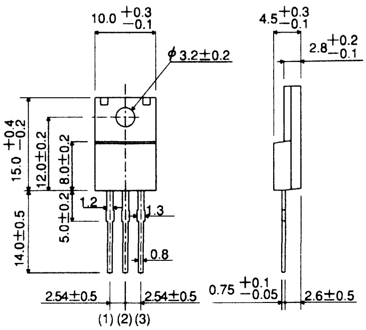
Switching (450V, 7A)

2SK2299N

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS}= ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : TO-220FN

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	450	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	7	A
	Pulsed	I_{DP}*	28	A
Drain reverse current	Continuous	I_{DR}	7	A
	Pulsed	I_{DRP}*	28	A
Total power dissipation (Tc=25℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2299N		○

MOS FET

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	450	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=450V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-resistance	$R_{DS(on)}$	—	0.85	1.1	Ω	I_D=4.0A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$*	3	5.5	—	S	V_{DS}=10V, I_D=4.0A
Input capacitance	C_{iss}	—	870	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	180	—	pF	V_{GS}=0
Return capacitance	C_{rss}	—	40	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	15	—	ns	I_D=4A, V_{DD}≒150V
Rise time	t_r	—	18	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	60	—	ns	R_L=37.5Ω
Fall time	t_f	—	35	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	400	—	ns	I_{DR}=7A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	2.5	—	μC	di/dt=100A/μs

* Pw≦300μs, Duty cycle≦1%

● Electrical characteristic curves

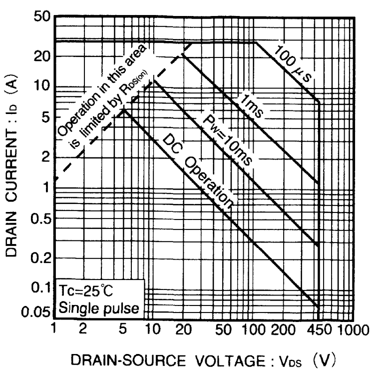


Fig.1 Maximum Safe Operating Area

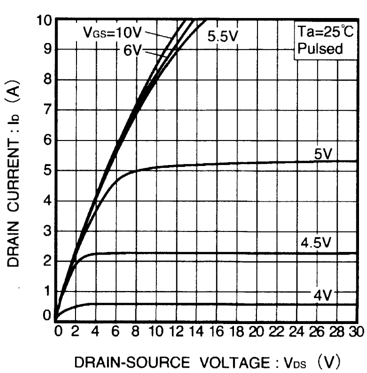


Fig.2 Typical Output Characteristics

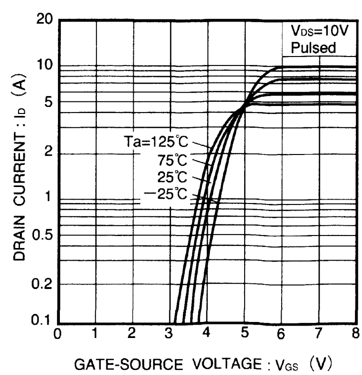


Fig.3 Typical Transfer Characteristics

● Electrical characteristic curves

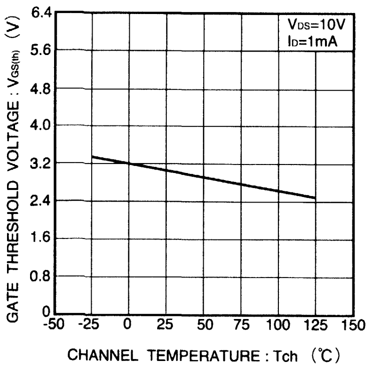


Fig.4 Gate Threshold Voltage vs. Channel Temperature

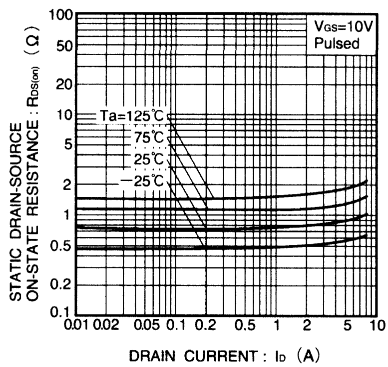


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

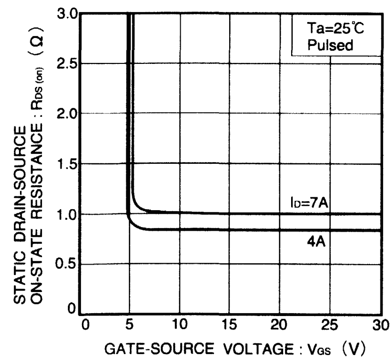


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

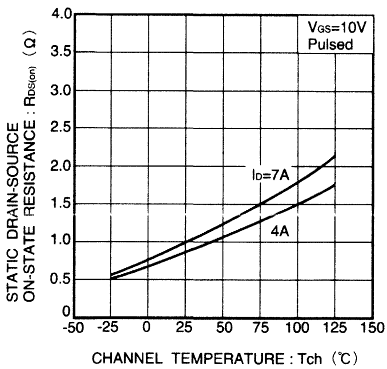


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

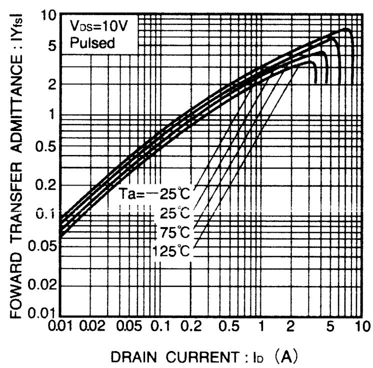


Fig.8 Forward Transfer Admittance vs. Drain Current

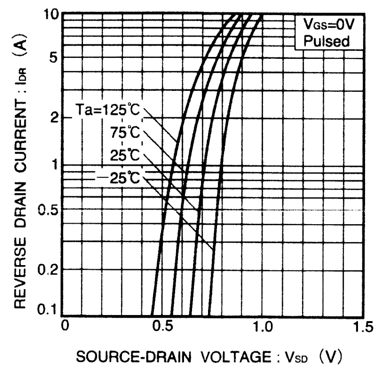


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

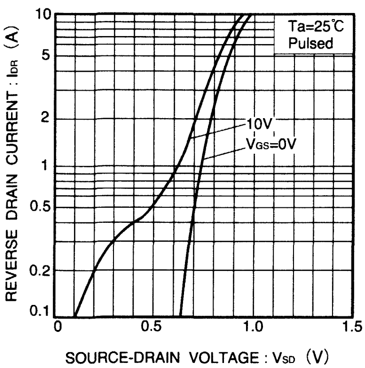


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

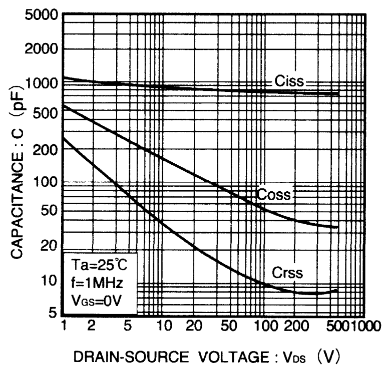


Fig.11 Typical Capacitance vs. Drain-Souce Voltage

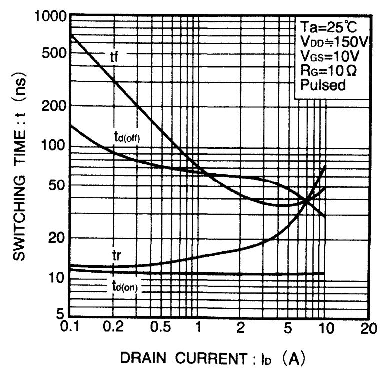


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

MOS FET

● Electrical characteristic curves

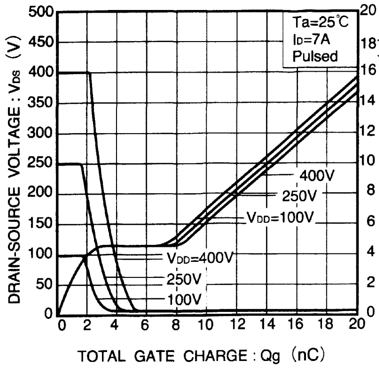


Fig.13 Dynamic Input Characteristics (See Fig. 18 for measurement circuit)

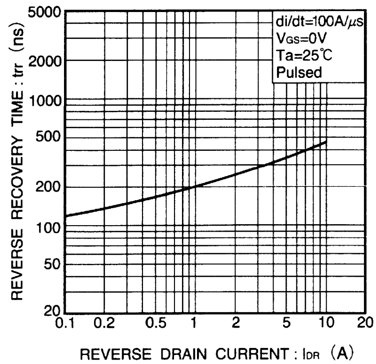


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

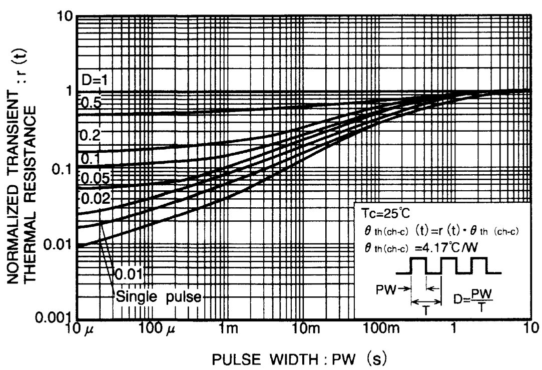


Fig.15 Normalized Transient Thermal Resistance Vs. Pulse Width

● Switching characteristics measurement circuit

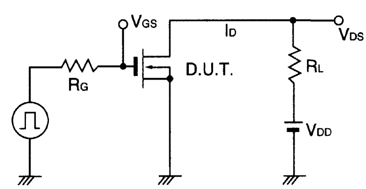


Fig.16 Switching Time Measurement Circuit

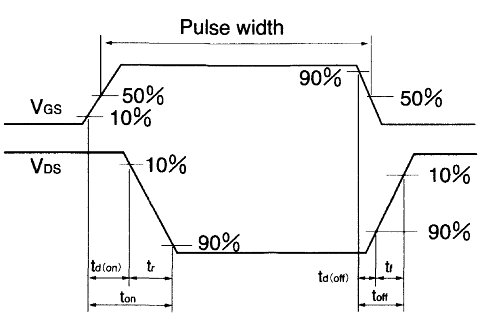


Fig.17 Switching Time Waveforms

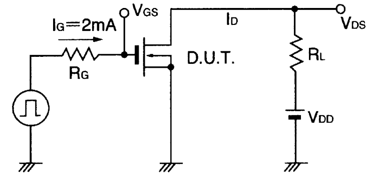


Fig.18 Gate Charge Measurement Circuit

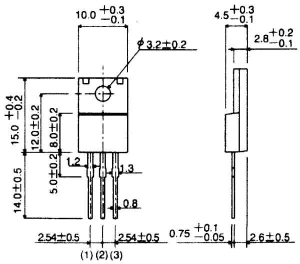
Switching (200V, 5A)

2SK2459N

● Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

● Structure
Silicon N-channel
MOSFET transistor

● External dimensions (Units: mm)



(1) Gate
(2) Drain
(3) Source

ROHM : TO-220FN

● Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	200	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	5	A
	Pulsed	I_{DP}*	20	A
Drain reverse current	Continuous	I_{DR}	5	A
	Pulsed	I_{DRP}*	20	A
Total power dissipation (Tc=25℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

● Packaging specifications

Type		
Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2459N		○

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	200	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=200V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.45	0.65	Ω	I_D=2.5A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$	2	3.5	—	S	V_{DS}=10V, I_D=2.5A
Input capacitance	C_{iss}	—	500	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	150	—	pF	V_{GS}=0
Reverse transfer capacitance	C_{rss}	—	35	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	7	—	ns	I_D=2.5A, V_{DD}≒100V
Rise time	t_r	—	15	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	30	—	ns	R_L=40Ω
Fall time	t_f	—	25	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	150	—	ns	I_{DR}=5A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	0.7	—	μC	di/dt=100A/μs

●Electrical characteristic curves

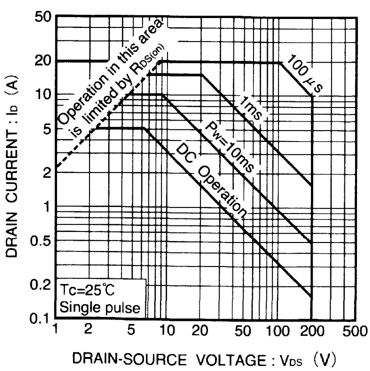


Fig.1 Maximum Safe Operating Area

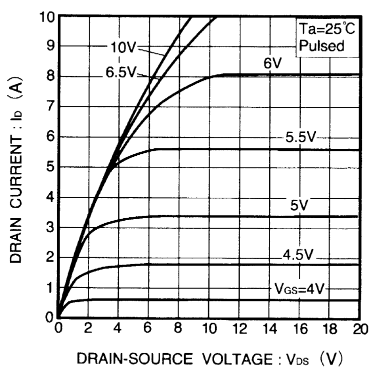


Fig.2 Typical Output Characteristics

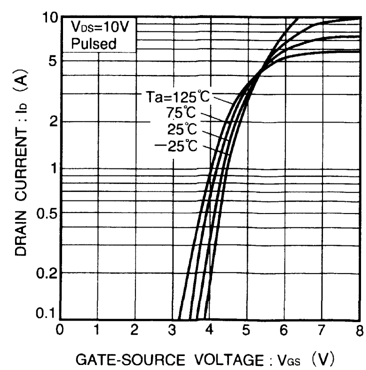


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

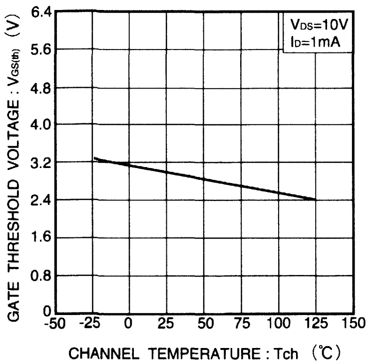


Fig.4 Gate Threshold Voltage vs. Channel Temperature

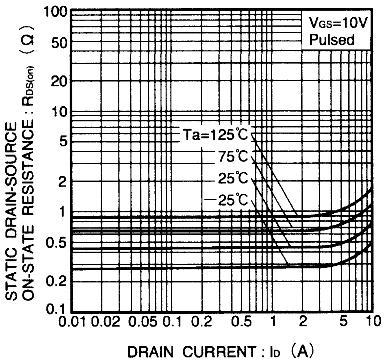


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

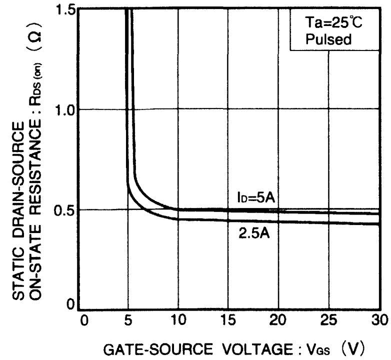


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

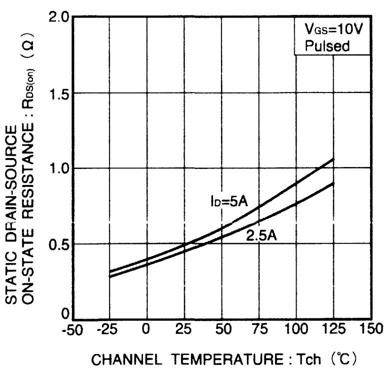


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

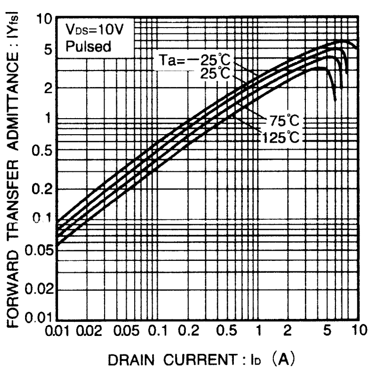


Fig.8 Forward Transfer Admittance vs. Drain Current

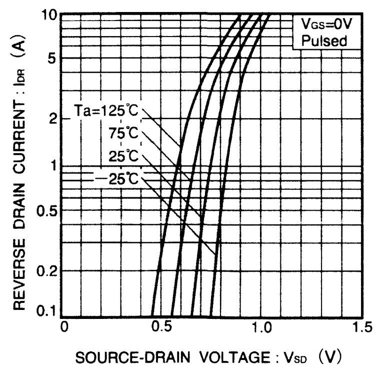


Fig.9 Reverse Drain Current vs. Source-Drain Voltage

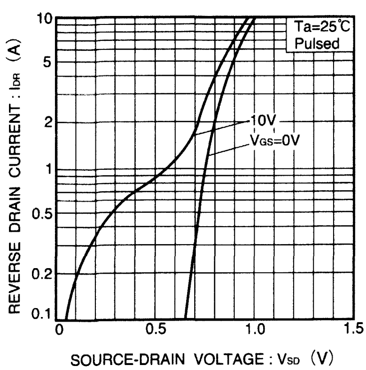


Fig.10 Reverse Drain Current vs. Source-Drain Voltage

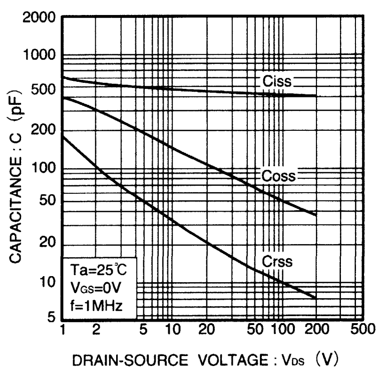


Fig.11 Typical Capacitance vs. Drain-Souce Voltage

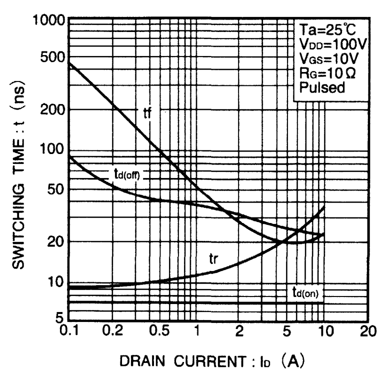


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

MOS FET

● Electrical characteristic curves

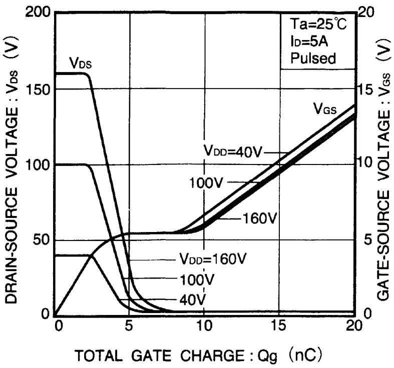


Fig.13 Dynamic Input Characteristics (See Fig. 18 for measurement circuit)

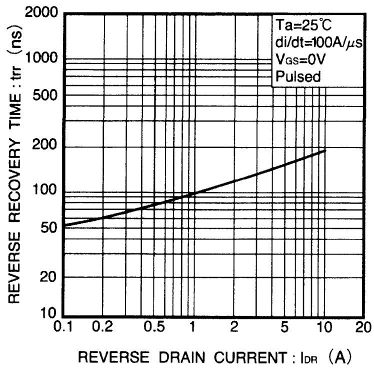


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

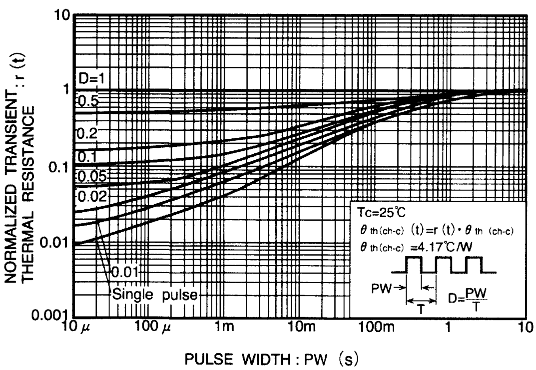


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

● Switching characteristics measurement circuit

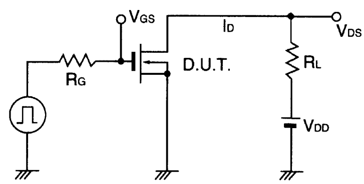


Fig.16 Switching Time Measurement Circuit

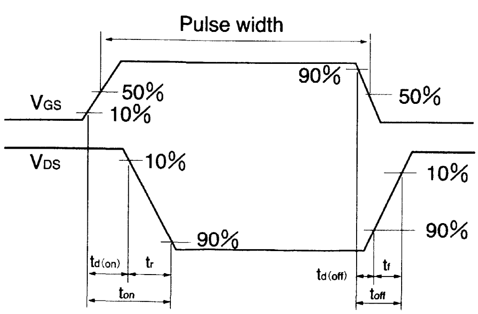


Fig.17 Switching Time Waveforms

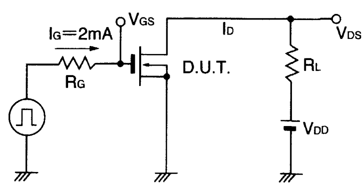


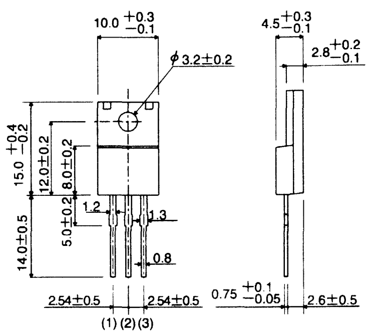
Fig.18 Gate Charge Measurement Circuit

Switching (250V, 5A)
2SK2460N

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



(1) Gate
(2) Drain
(3) Source

ROHM : TO-220FN

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	250	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	5	A
	Pulsed	I_{DP}*	20	A
Drain reverse current	Continuous	I_{DR}	5	A
	Pulsed	I_{DRP}*	20	A
Total power dissipation (Tc=25℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55～150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2460N		○

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	250	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=250V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.55	0.75	Ω	I_D=2.5A, V_{GS}=10V
Forward propagation admittance	$\lvert Y_{fs} \rvert$	2	3.5	—	S	V_{DS}=10V, I_D=2.5A
Input capacitance	C_{iss}	—	500	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	150	—	pF	V_{GS}=0
Reverse transfer capacitance	C_{rss}	—	35	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	7	—	ns	I_D=2.5A, V_{DD}≒100V
Rise time	t_r	—	15	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	30	—	ns	R_L=40Ω
Fall time	t_f	—	25	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	150	—	ns	I_{DR}=5A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	0.7	—	μC	di/dt=100A/μs

●Electrical characteristic curves

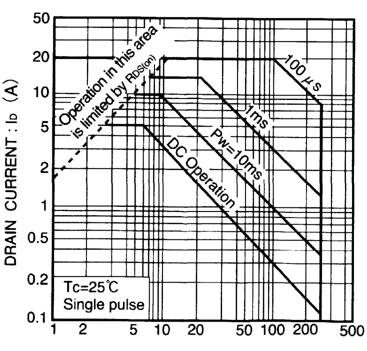


Fig.1 Maximum Safe Operating Area

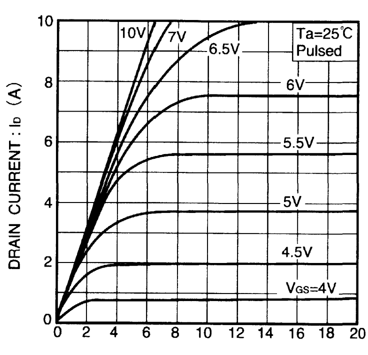


Fig.2 Typical Output Characteristics

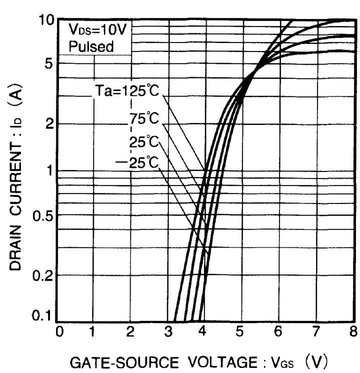


Fig.3 Typical Transfer Characteristics

● Electrical characteristic curves

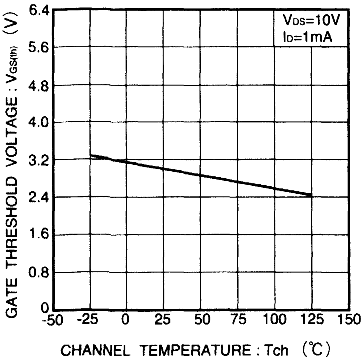


Fig.4 Gate Threshold Voltage vs. Channel Temperature

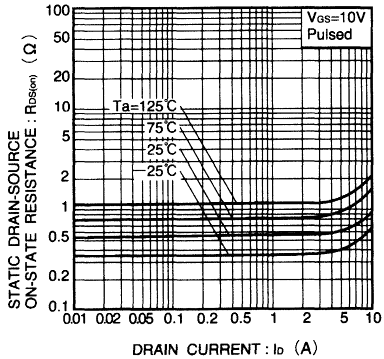


Fig.5 Static Drain-Source On-Resistance vs. Drain Current

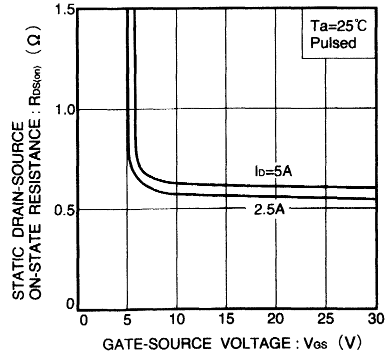


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

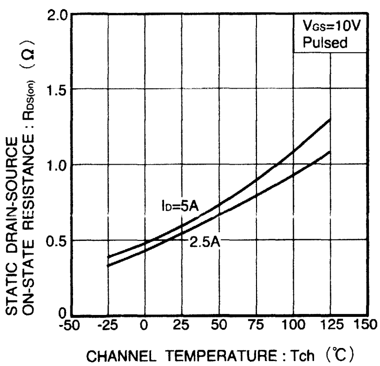


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

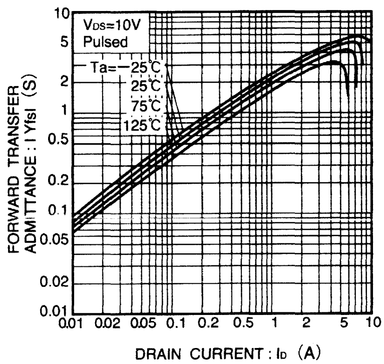


Fig.8 Forward Transfer Admittance vs. Drain Current

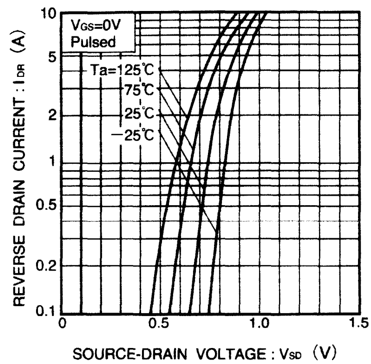


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

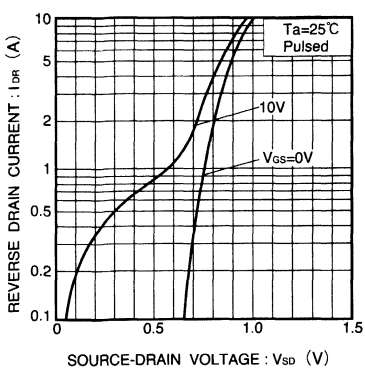


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

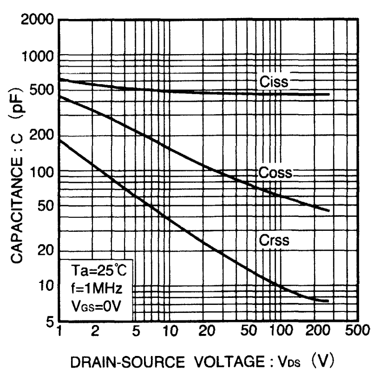


Fig.11 Typical Capacitance vs. Drain-Source Voltage

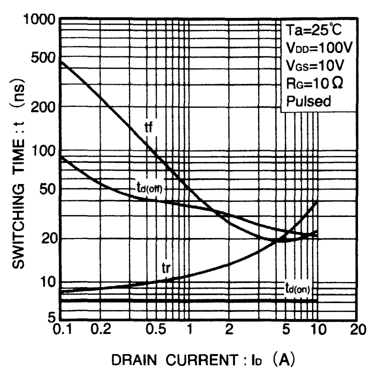


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

●Electrical characteristic curves

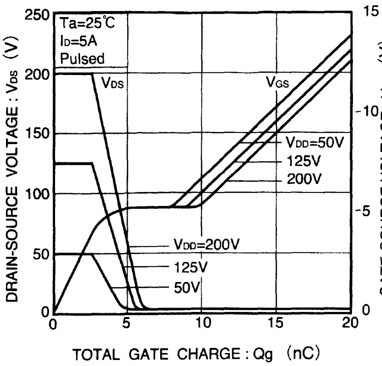


Fig.13 Dynamic Input Characteristics (See Figure. 18 for measurement circuit)

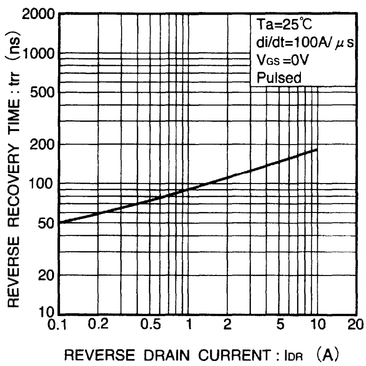


Fig.14 Rverse Recovery Time vs. Reverse Drain Current

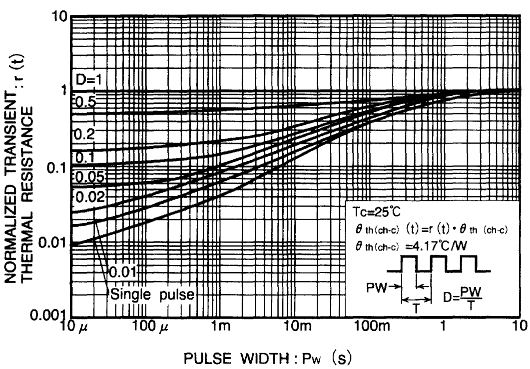


Fig.15 Normalized Transient Thermal Resistance Vs. Pulse Width

●Switching characteristics measurement circuit

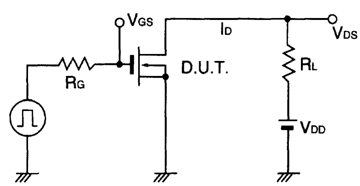


Fig.16 Switching Time Measurement Circuit

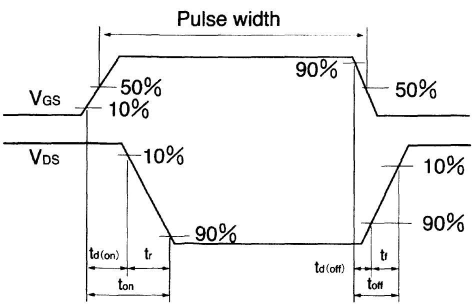


Fig.17 Switching Time Waveforms

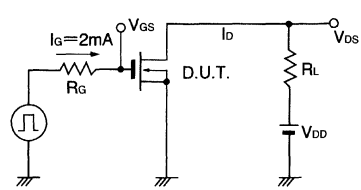


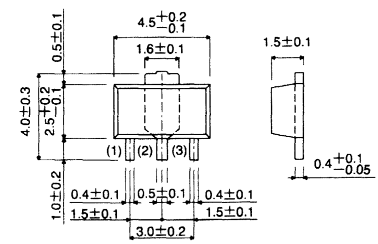
Fig.18 Gate Charge Measurement Circuit

Small switching (60V, 2A)
2SK2463

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Low-voltage drive (4V).
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : MPT3
EIAJ : SC-62

Abbreviated symbol: KC

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	60	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	2	A
	Pulsed	I_{DP} *1	8	A
Drain reverse current	Continuous	I_{DR}	2	A
	Pulsed	I_{DRP} *1	8	A
Total power dissipation		P_D *2	2	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* 1 Pw≦10 μs, Duty cycle≦1% * 2 When mounted on a 40 x 40 x 0.7 mm aluminum-ceramic board.

●Packaging specifications

Type	Package	Bulk
	Code	T100
	Basic ordering unit (pieces)	3000
2SK2463		○

MOS FET

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	10	μA	V_{DS}=60V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	—	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.30	0.38	Ω	I_D=1A, V_{GS}=10V
		—	0.45	0.58		I_D=1A, V_{GS}=4V
Forward propagation admittance	$\mid Y_{fs} \mid$*	1.2	—	—	S	V_{DS}=10V, I_D=1A
Input capacitance	C_{iss}	—	200	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	80	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	50	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	I_D=1A, V_{DD}≒30V
Rise time	t_r	—	25	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	50	—	ns	R_L=30Ω
Fall time	t_f	—	50	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	70	—	ns	I_{DR}=2A, V_{GS}=0V, di/dt=50A/μs

* Pw≦300μs, Duty cycle≦1%

●Electrical characteristic curves

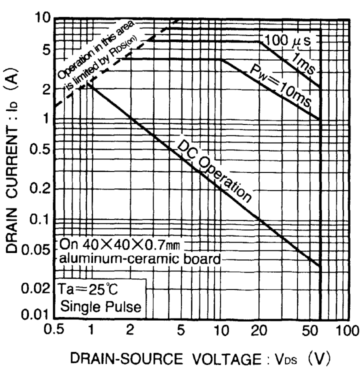


Fig.1 Maximum Safe Operating Area

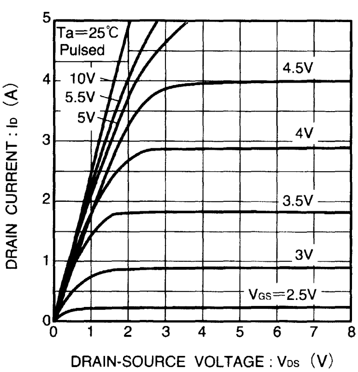


Fig.2 Typical Output Characteristics

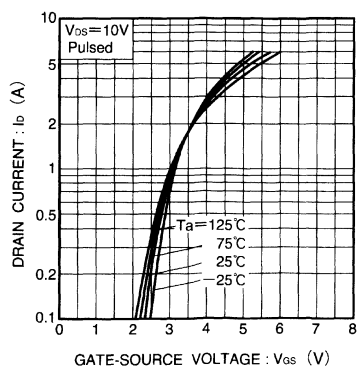


Fig.3 Typical Transfer Characteristics

● Electrical characteristic curves

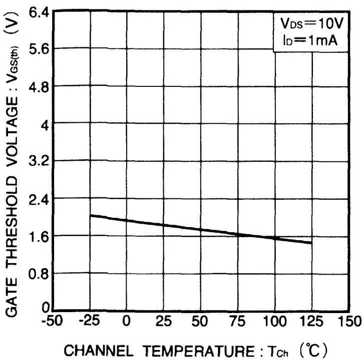


Fig.4 Gate Threshold Voltage vs. Channel Temperature

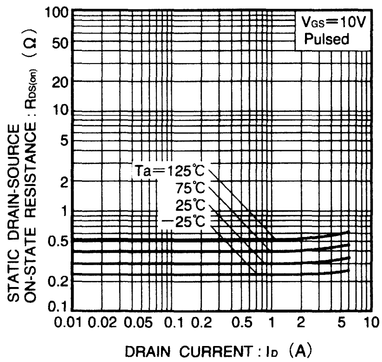


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (I)

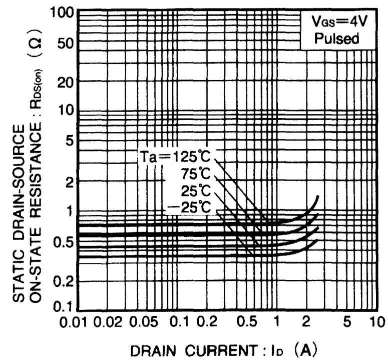


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (II)

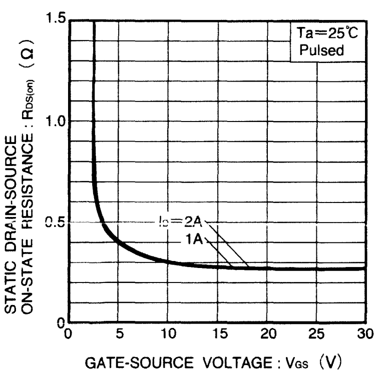


Fig.7 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

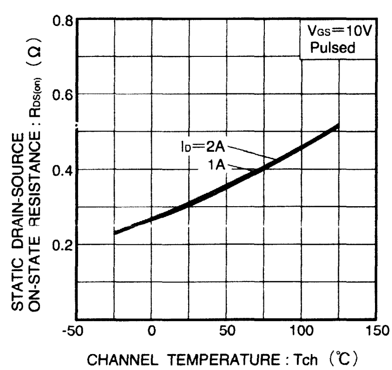


Fig.8 Static Drain-Source On-State Resistance vs. Channel Temperature

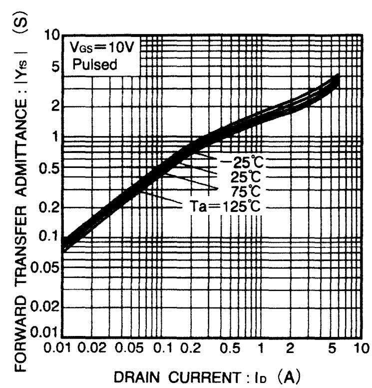


Fig.9 Forward Transfer Admittance vs. Drain Current

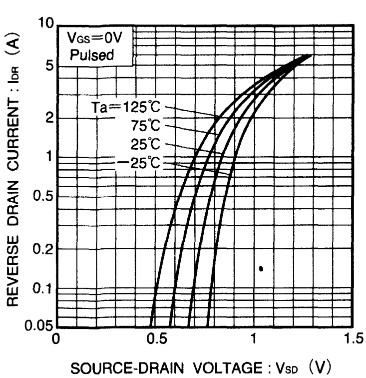


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (I)

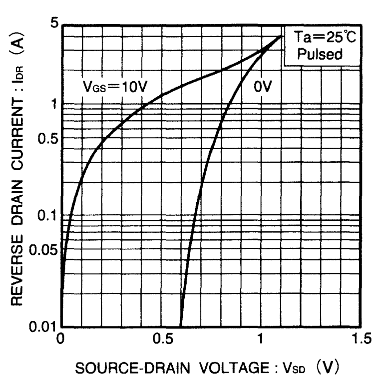


Fig.11 Reverse Drain Current vs. Source-Drain Voltage (II)

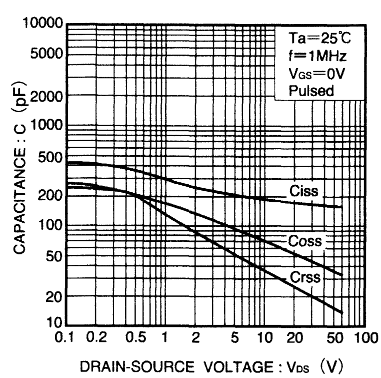


Fig.12 Typical Capacitance vs. Drain-Source Voltage

●Electrical characteristic curves

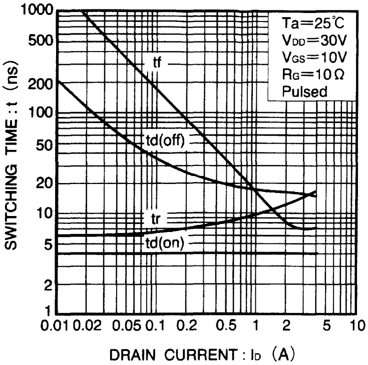


Fig.13 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

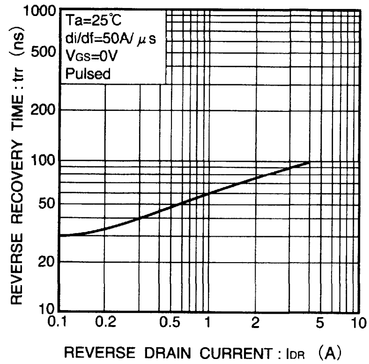


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

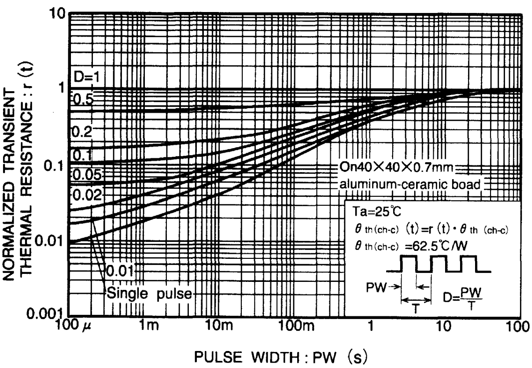


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

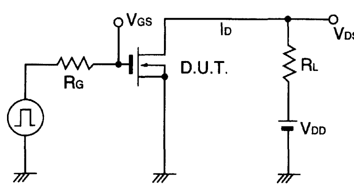


Fig.16 Switching Time Measurement Circuit

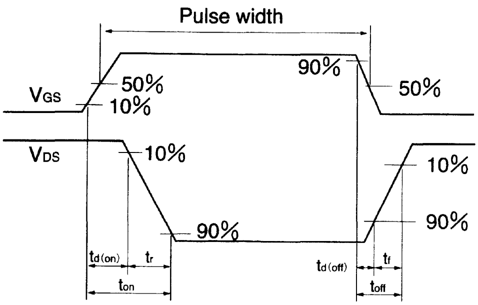


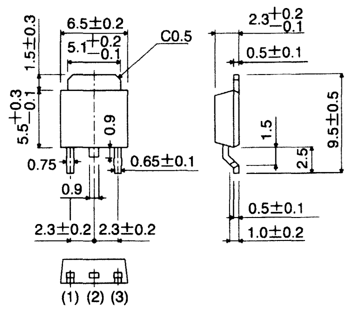
Fig.17 Switching Time Waveforms

Small switching (60V, 5A)
2SK2503

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Low-voltage drive (4V).
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : CPT3
EIAJ : SC-63

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	60	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	5	A
	Pulsed	I_{DP}*	20	A
Drain reverse current	Continuous	I_{DR}	5	A
	Pulsed	I_{DRP}*	20	A
Total power dissipation (Tc=25℃)		P_D	20	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Taping
	Code	TL
	Basic ordering unit (pieces)	2500
2SK2503		○

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	10	μA	V_{DS}=60V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	—	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.11	0.135	Ω	I_D=2.5A, V_{GS}=10V
		—	0.17	0.20		I_D=2.5A, V_{GS}=4V
Forward propagation admittance	$\lvert Y_{fs} \rvert$*	4	—	—	S	V_{DS}=10V, I_D=2.5A
Input capacitance	C_{iss}	—	520	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	240	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	100	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	5	—	ns	I_D=2.5A, V_{DD}≒30V
Rise time	t_r	—	20	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	50	—	ns	R_L=12Ω
Fall time	t_f	—	20	—	ns	R_G=10Ω

* Pw≦300μs, Duty cycle≦1%

●Electrical characteristic curves

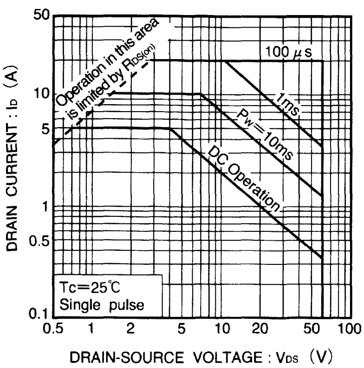


Fig.1 Maximum Safe Operating Area

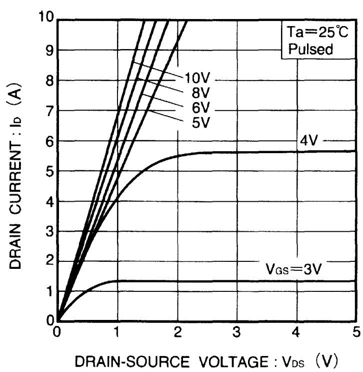


Fig.2 Typical Output Characteristics

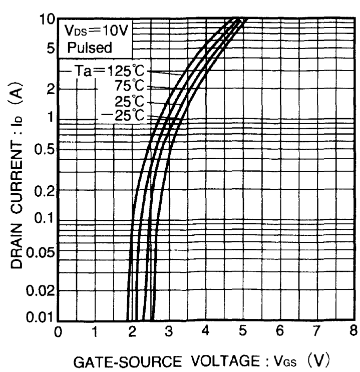


Fig.3 Typical Transfer Characteristics

● Electrical characteristic curves

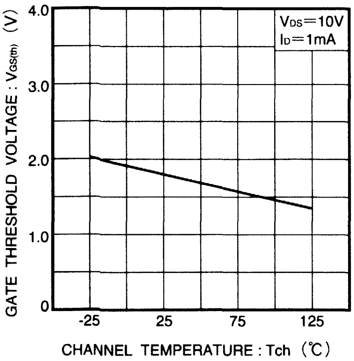


Fig.4 Gate Threshold Voltage vs. Channel Temperature

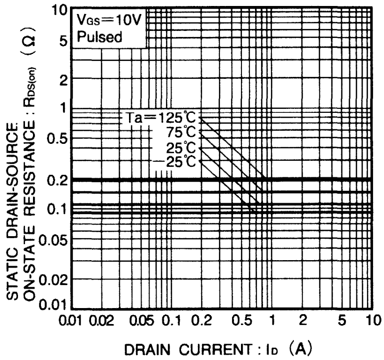


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (I)

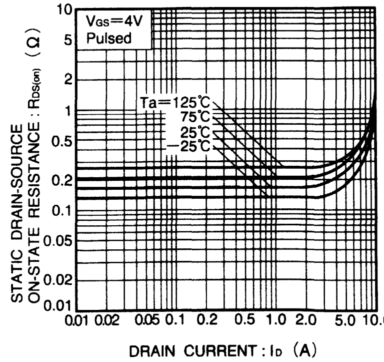


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (II)

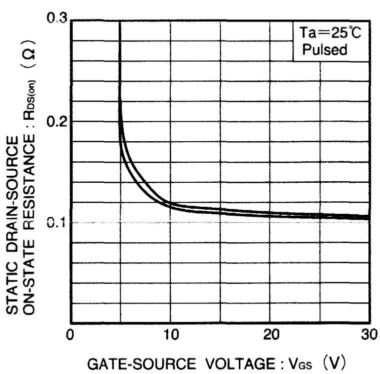


Fig.7 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

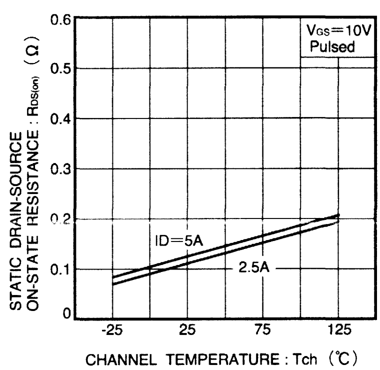


Fig.8 Static Drain-Source On-State Resistance vs. Channel Temperature

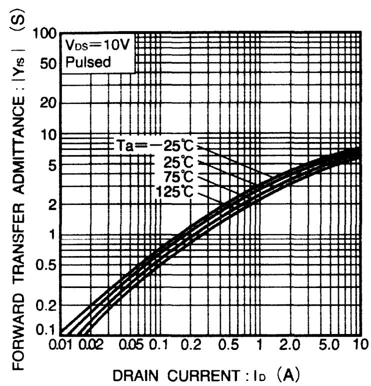


Fig.9 Forward Transfer Admittance vs. Drain Current

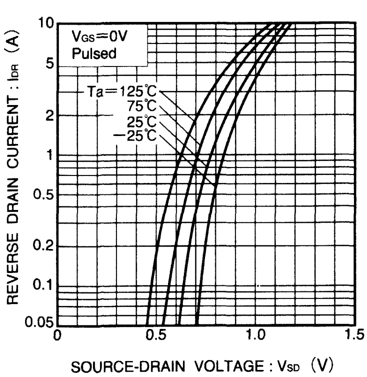


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (I)

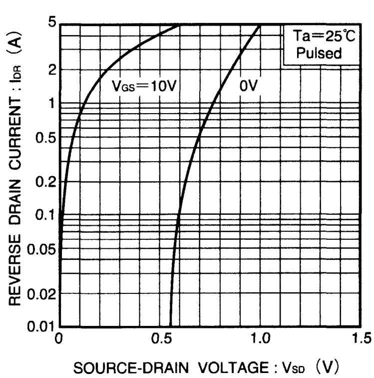


Fig.11 Reverse Drain Current vs. Source-Drain Voltage (II)

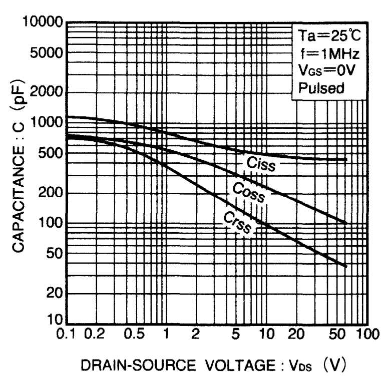


Fig.12 Typical Capacitance vs. Drain-Source Voltage

MOS FET

●Electrical characteristic curves

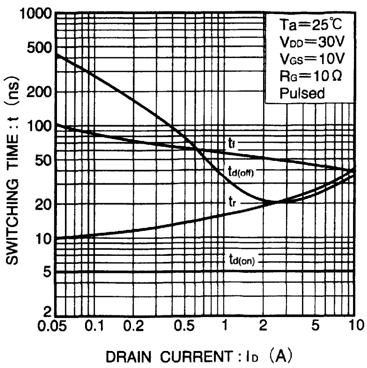


Fig.13 Switching Characteristics (See Figure. 15 and 16 for measurement circuits)

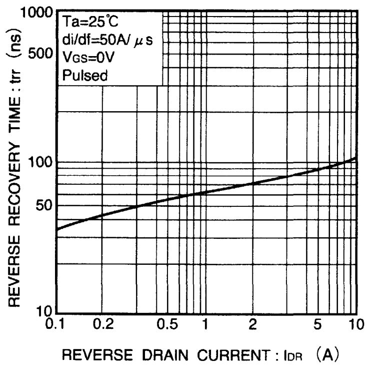


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

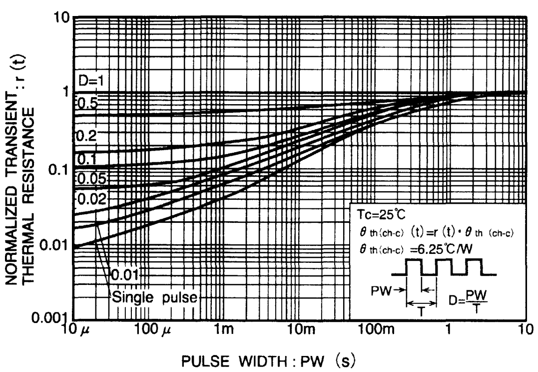


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

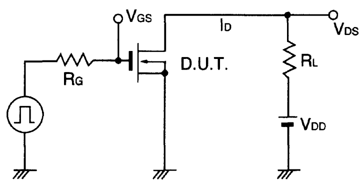


Fig.15 Switching Time Measurement Circuit

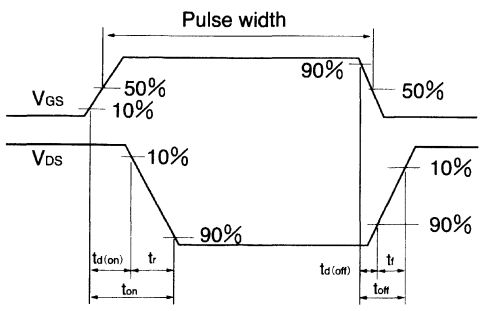


Fig.16 Switching Time Waveforms

Small switching (100V, 5A)

2SK2504

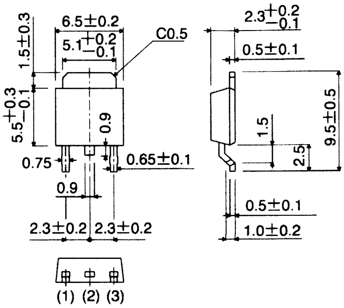
●Features

1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Low-voltage drive (4V).
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure

Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : CPT3
EIAJ : SC-63

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	100	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	5	A
	Pulsed	I_{DP}*	20	A
Drain reverse current	Continuous	I_{DR}	5	A
	Pulsed	I_{DRP}*	20	A
Total power dissipation (Tc=25°C)		P_D	20	W
Channel temperature		Tch	150	°C
Storage temperature		Tstg	−55~150	°C

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Taping
	Code	TL
	Basic ordering unit (pieces)	2500
2SK2504		○

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	10	μA	V_{DS}=100V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	—	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.18	0.22	Ω	I_D=2.5A, V_{GS}=10V
		—	0.25	0.28		I_D=2.5A, V_{GS}=4V
Forward propagation admittance	$\|Y_{fs}\|$*	4	—	—	S	V_{DS}=10V, I_D=2.5A
Input capacitance	C_{iss}	—	520	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	175	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	60	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	5	—	ns	I_D=2.5A, V_{DD}≒50V
Rise time	t_r	—	20	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	50	—	ns	R_L=20Ω
Fall time	t_f	—	20	—	ns	R_G=10Ω

* Pw≦300μs, Duty cycle≦1%

●Electrical characteristic curves

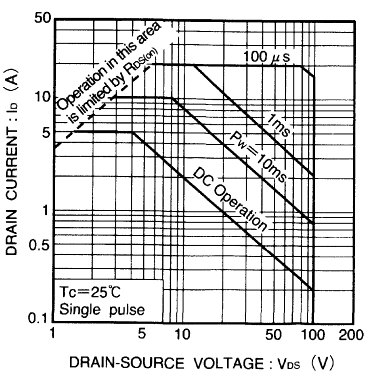


Fig.1 Maximum Safe Operating Area

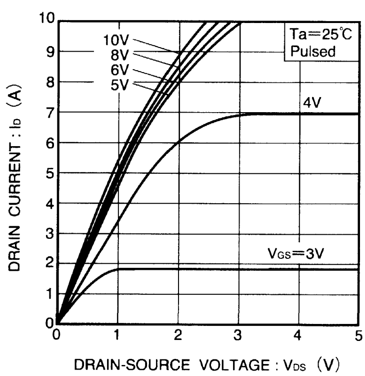


Fig.2 Typical Output Characteristics

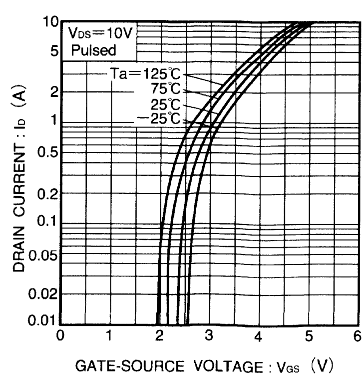


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

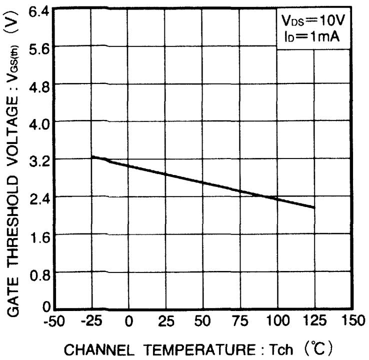


Fig.4 Gate Threshold Voltage vs. Channel Temperature

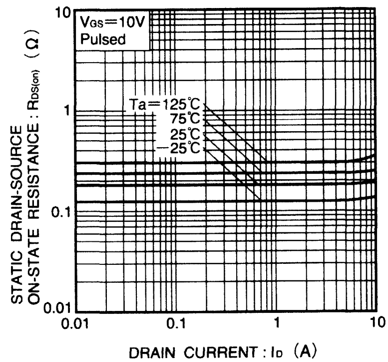


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (I)

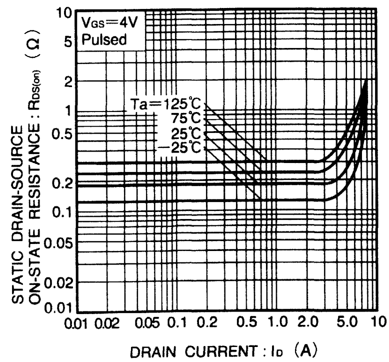


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (Ⅱ)

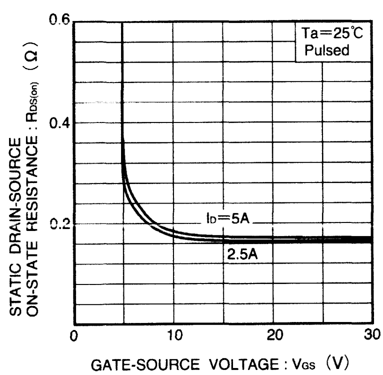


Fig.7 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

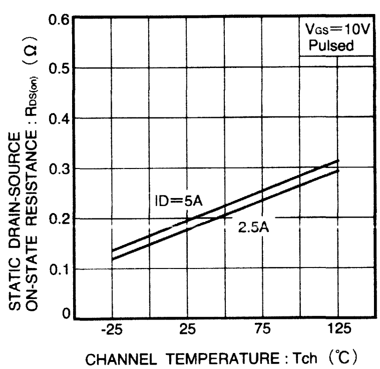


Fig.8 Static Drain-Source On-State Resistance vs. Channel Temperature

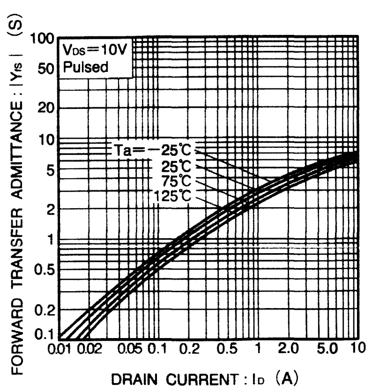


Fig.9 Forward Transfer Admittance vs. Drain Current

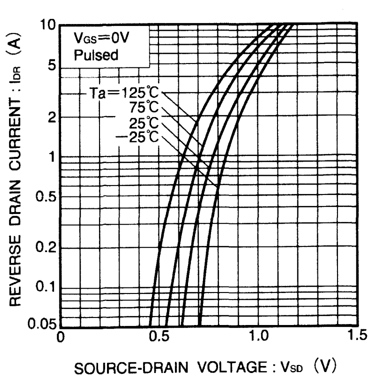


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (I)

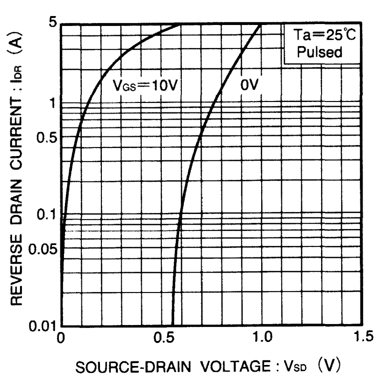


Fig.11 Reverse Drain Current vs. Source-Drain Voltage (Ⅱ)

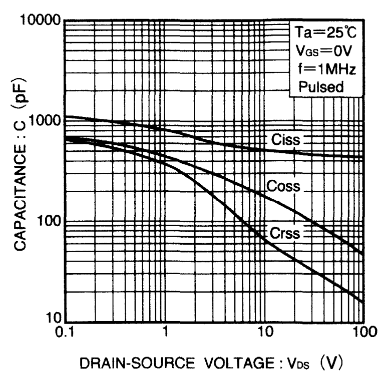


Fig.12 Typical Capacitance vs. Drain-Source Voltage

● Electrical characteristic curves

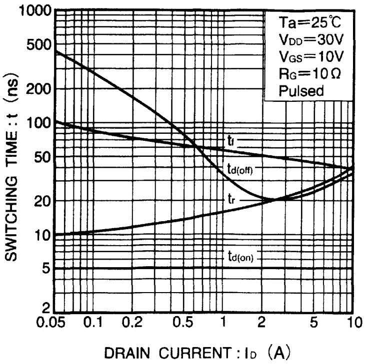


Fig.13 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

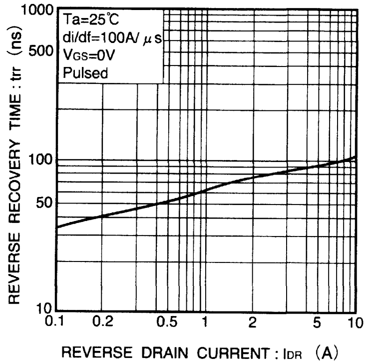


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

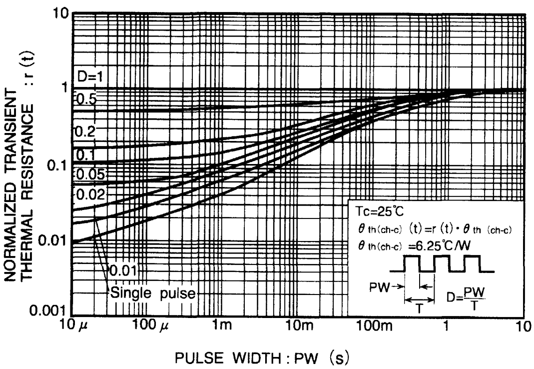


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

● Switching characteristics measurement circuit

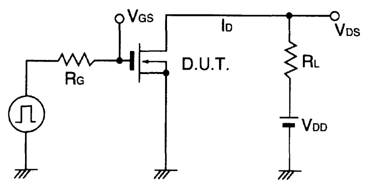


Fig.16 Switching Time Measurement Circuit

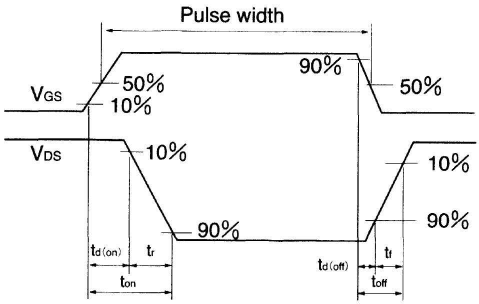


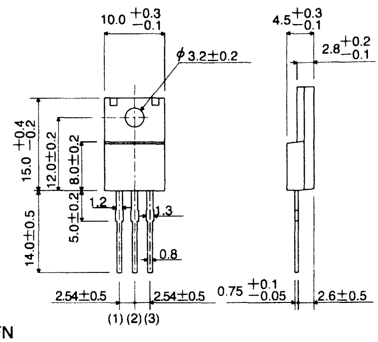
Fig.17 Switching Time Waveforms

Switching (250V, 16A)
2SK2711

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : TO-220FN

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	250	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	16	A
	Pulsed	I_{DP}*	48	A
Drain reverse current	Continuous	I_{DR}	16	A
	Pulsed	I_{DRP}*	48	A
Total power dissipation (Tc=25℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55～150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2711		○

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	250	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=250V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.2	0.25	Ω	I_D=8A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$*	5	10	—	S	V_{DS}=10V, I_D=8A
Input capacitance	C_{iss}	—	1260	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	400	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	100	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	19	—	ns	I_D=8A, V_{DD}≒100V
Rise time	t_r	—	30	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	72	—	ns	R_L=12.5Ω
Fall time	t_f	—	25	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	210	—	ns	I_{DR}=16A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	1.6	—	μC	di/dt=100A/μs

* Pw≦300μs, Duty cycle≦1%

●Electrical characteristic curves

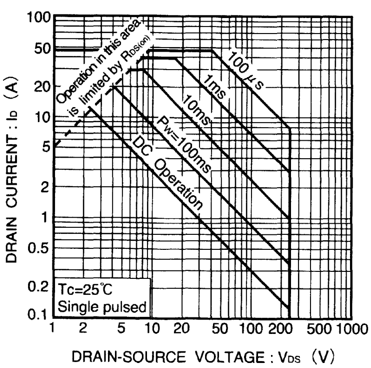


Fig.1 Maximum Safe Operating Area

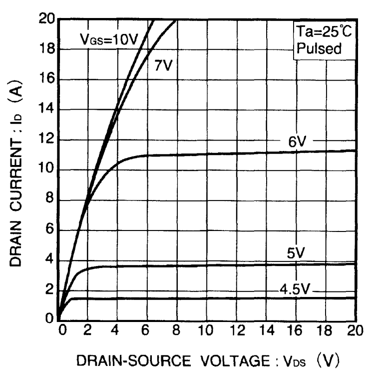


Fig.2 Typical Output Characteristics

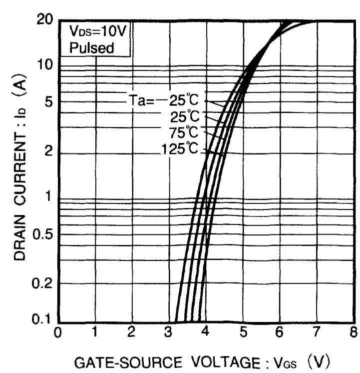


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

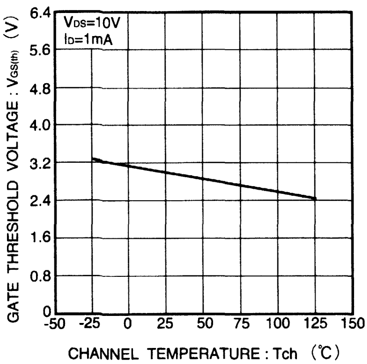


Fig.4 Gate Threshold Voltage vs. Channel Temperature

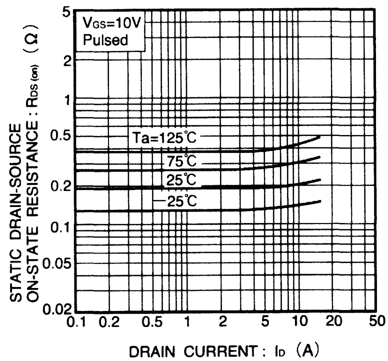


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

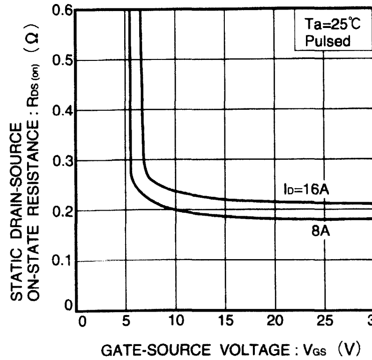


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltag

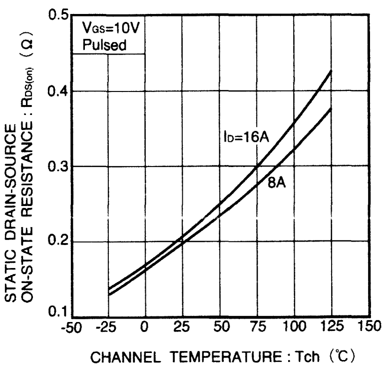


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

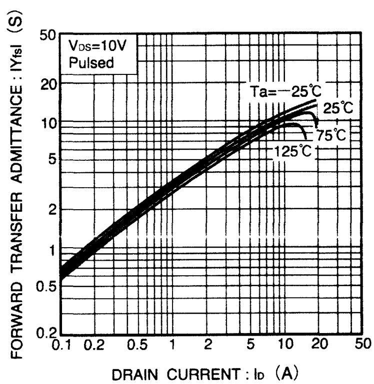


Fig.8 Forward Transfer Admittance vs. Drain Current

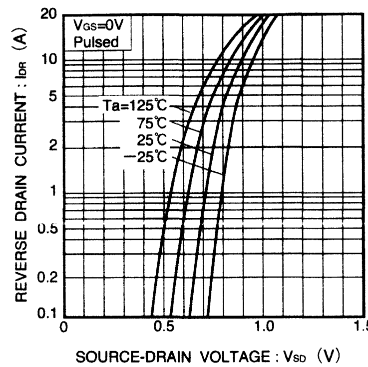


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

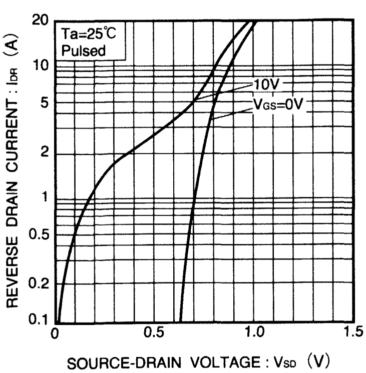


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

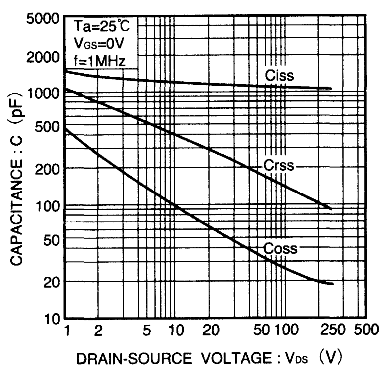


Fig.11 Typical Capacitance vs. Drain-Souce Voltage

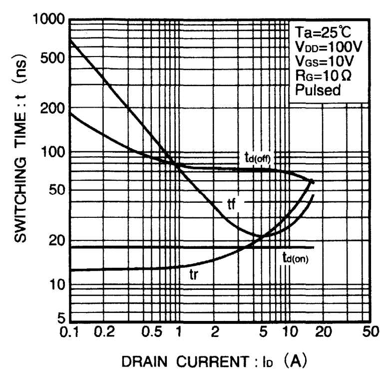


Fig.12 Switching Characteristic (See Figure. 16 and 17 for measurement circuits)

MOS FET

●Electrical characteristic curves

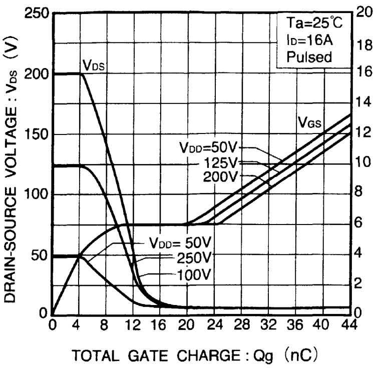


Fig.13 Dynamic Input Characteristics (See Figure. 18 for measurement circuit)

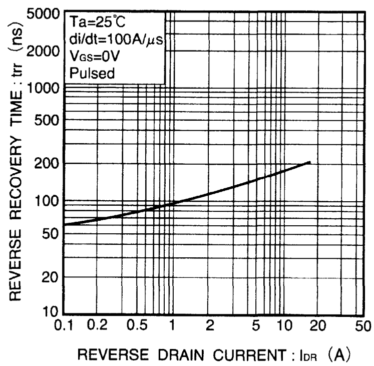


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

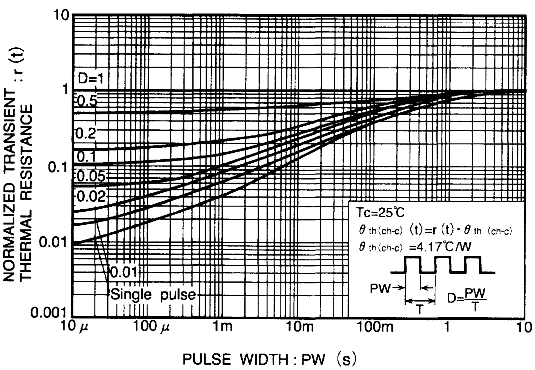


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

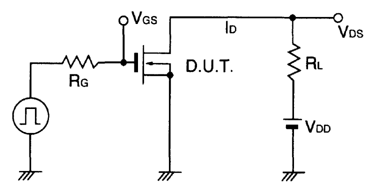


Fig.16 Switching Time Measurement Circuit

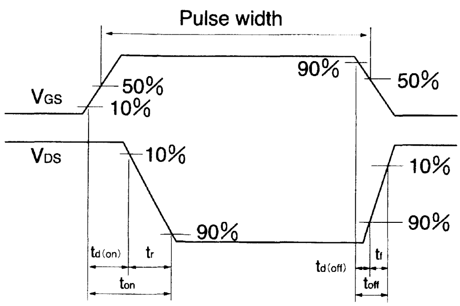


Fig.17 Switching Time Waveforms

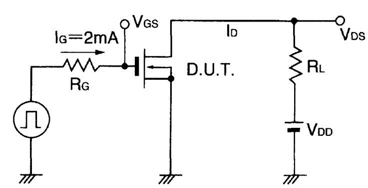


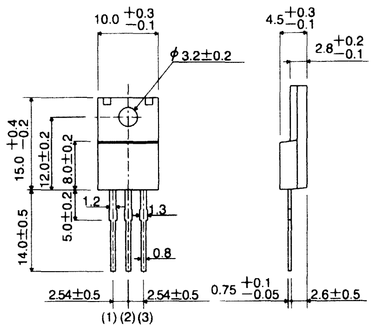
Fig.18 Gate Charge Measurement Circuit

Switching (450V, 5A)
2SK2713

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : TO-220FN

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	450	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	5	A
	Pulsed	I_{DP}*	20	A
Drain reverse current	Continuous	I_{DR}	5	A
	Pulsed	I_{DRP}*	20	A
Total power dissipation (Tc=25℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2713		○

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	450	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=450V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	1	1.4	Ω	I_D=2.5A, V_{GS}=10V
Forward propagation admittance	$\lvert Y_{fs} \rvert$	1	3.0	—	S	V_{DS}=10V, I_D=2.5A
Input capacitance	C_{iss}	—	600	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	135	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	53	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	14	—	ns	I_D=2.5A, V_{DD}≒150V
Rise time	t_r	—	17	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	50	—	ns	R_L=60Ω
Fall time	t_f	—	35	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	300	—	ns	I_{DR}=5A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	1.8	—	μC	di/dt=100A/μs

●Electrical characteristic curves

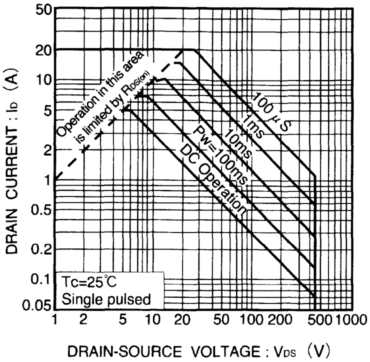


Fig.1 Maximum Safe Operating Area

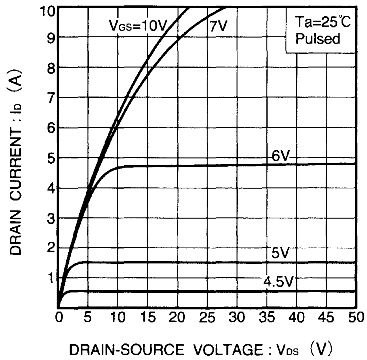


Fig.2 Typical Output Characteristics

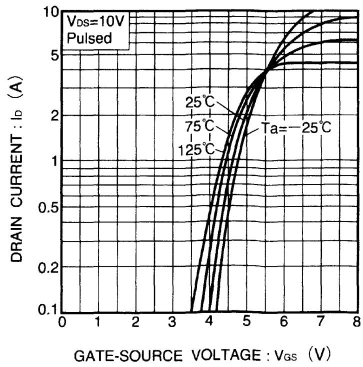


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

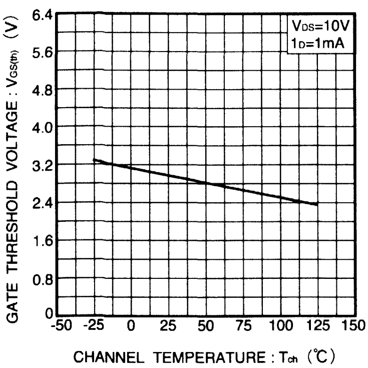
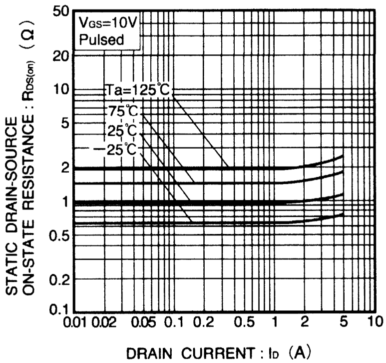


Fig.4 Gate Threshold Voltage vs. Channel Temperature



Fin.5 Static Drain-Source On-State Resistance vs. Drain Current

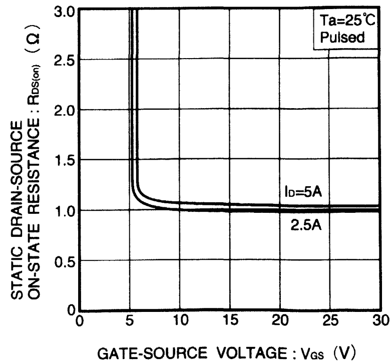


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

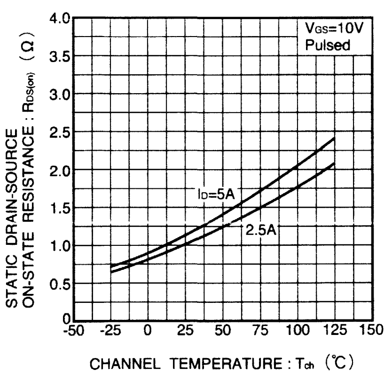


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

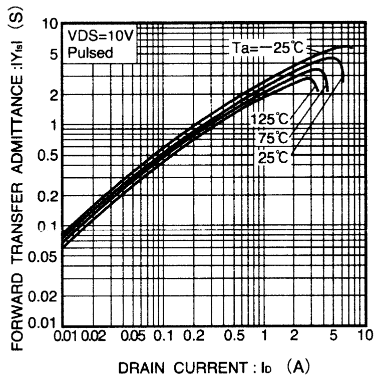


Fig.8 Forward Transfer Admittance vs. Drain Current

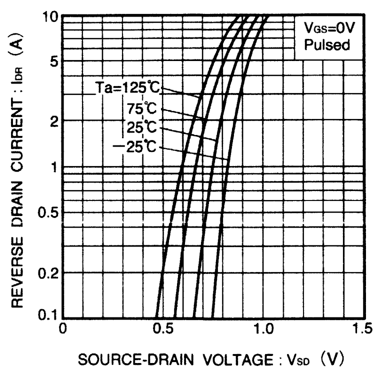


Fig.9 Reverse Drain Current vs. Source-Drain Voltage

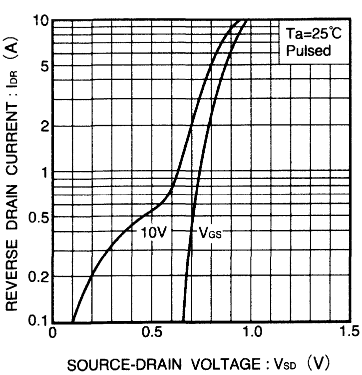


Fig.10 Reverse Drain Current vs. Source-Drain Voltage

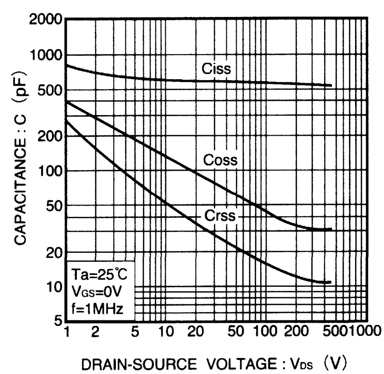


Fig.11 Typical Capacitance vs. Drain-Souce Voltage

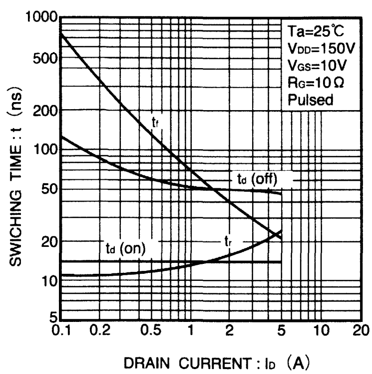


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

MOS FET

●Electrical characteristic curves

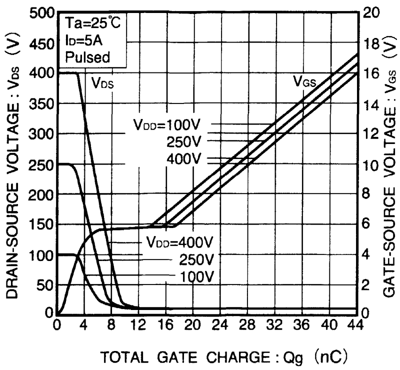


Fig.13 Dynamic Input Characteristics (See Figure. 18 for measurement circuit)

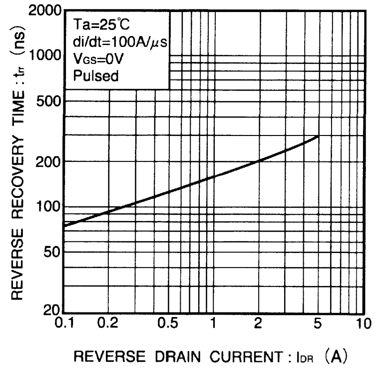


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

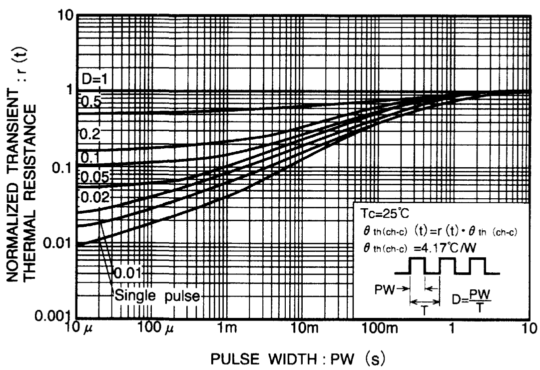


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

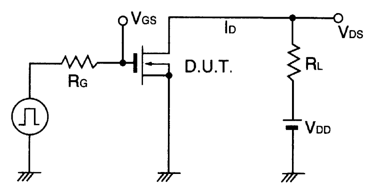


Fig.16 Switching Time Measurement Circuit

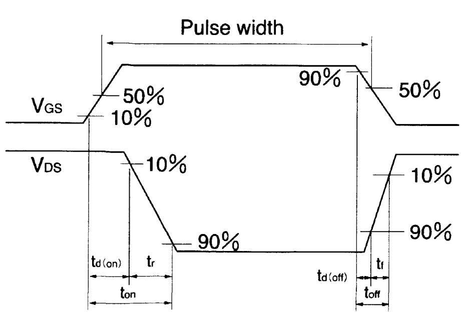


Fig.17 Switching Time Waveforms

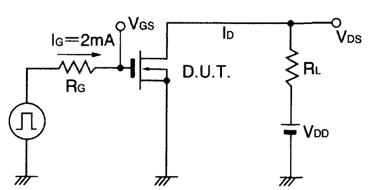


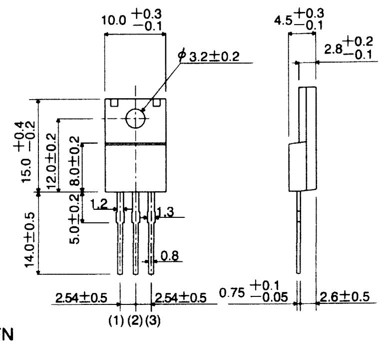
Fig.18 Gate Charge Measurement Circuit

Switching (500V, 10A)
2SK2714

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	500	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	10	A
	Pulsed	I_{DP}*	40	A
Drain reverse current	Continuous	I_{DR}	10	A
	Pulsed	I_{DRP}*	40	A
Total power dissipation (Tc=25°C)		P_D	30	W
Channel temperature		Tch	150	°C
Storage temperature		Tstg	−55~150	°C

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2714		○

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	500	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=500V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.75	0.9	Ω	I_D=5A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$*	3	6.5	—	S	V_{DS}=10V, I_D=5A
Input capacitance	C_{iss}	—	1060	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	235	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	93	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	19	—	ns	I_D=5A, V_{DD}≒150V
Rise time	t_r	—	26	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	78	—	ns	R_L=30Ω
Fall time	t_f	—	26	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	560	—	ns	I_{DR}=10A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	5	—	μC	di/dt=100A/μs

* Pw≦300μs, Duty cycle≦1%

●Electrical characteristic curves

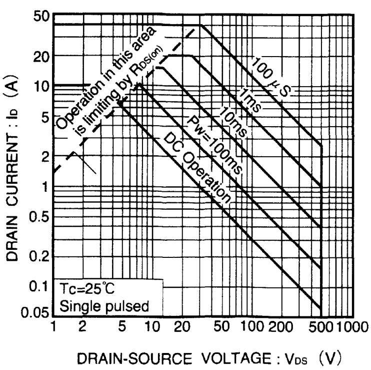


Fig.1 Maximum Safe Operating Area

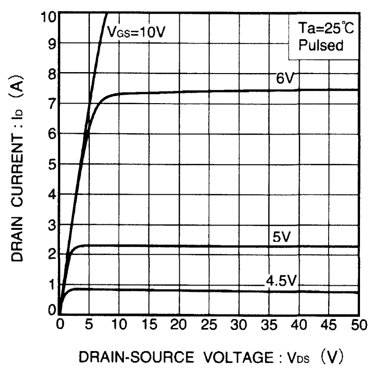


Fig.2 Typical Output Characteristics

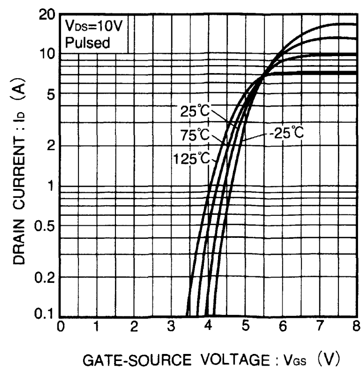


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

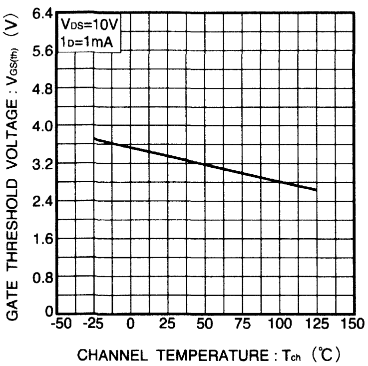


Fig.4 Gate Threshold Voltage vs. Channel Temperature

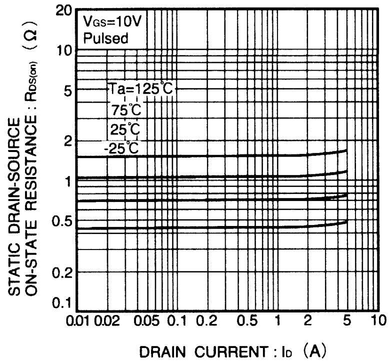


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

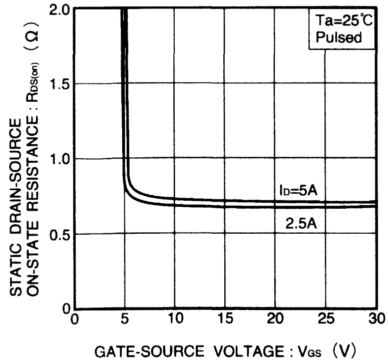


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

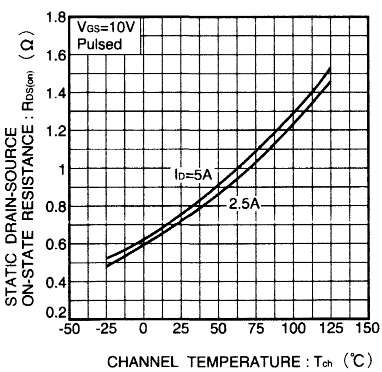


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

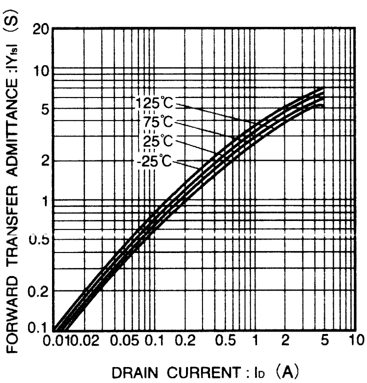


Fig.8 Forward Transfer Admittance vs. Drain Current

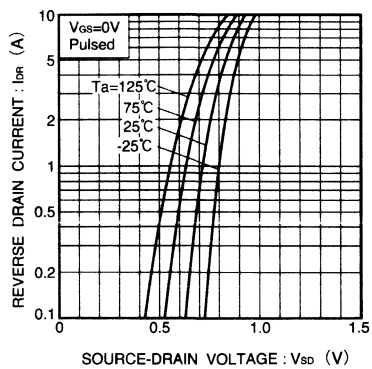


Fig.9 Reverse Drain Curren vs. Source-Drain Voltage (I)

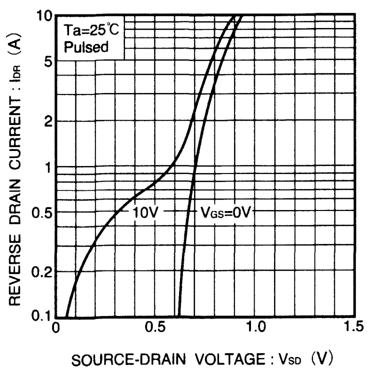


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

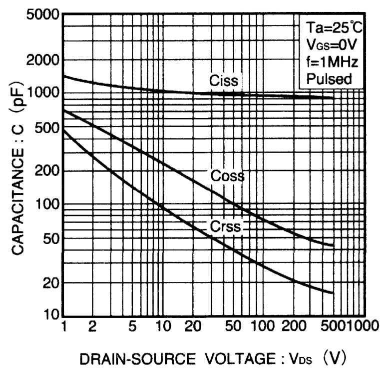


Fig.11 Typical Capacitance vs. Drain-Source Voltage

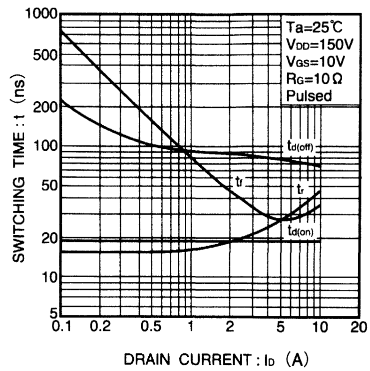


Fig.12 Switching Characteristics (See Figs. 16 and 17 for measurement circuits)

MOS FET

●Electrical characteristic curves

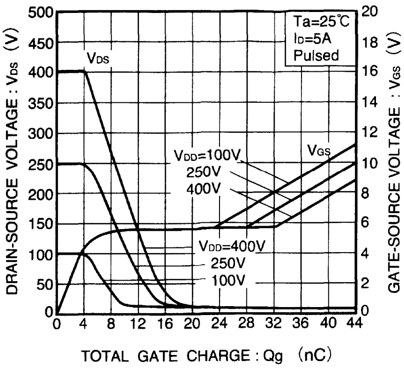


Fig.13 Dynamic Input Characteristics (See Fig. 18 for measurement circuit)

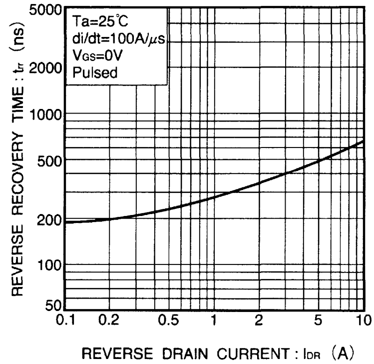


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

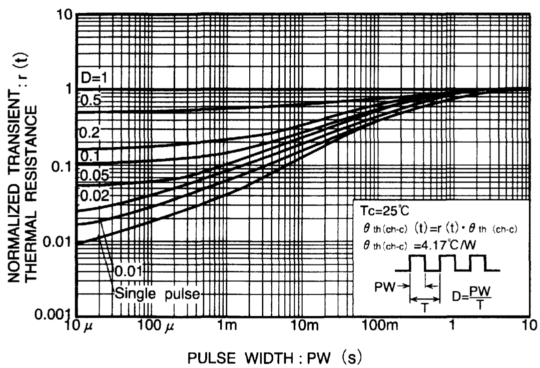


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

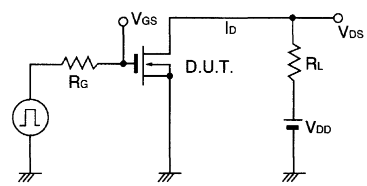


Fig.16 Switching Time Measurement Circuit

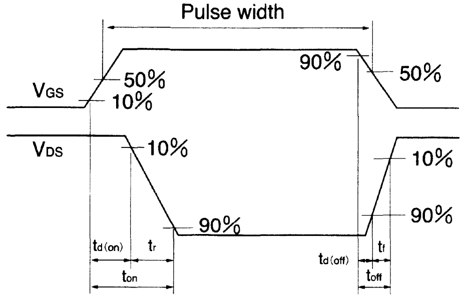


Fig.17 Switching Time Waveforms

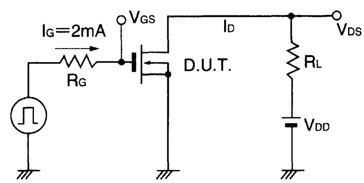


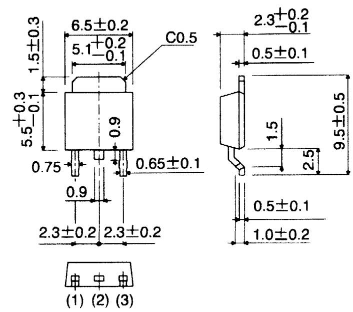
Fig.18 Gate Charge Measurement Circuit

Small switching (500V, 2A)
2SK2715

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : CPT3
EIAJ : SC-63

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	500	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	2	A
	Pulsed	I_{DP} *	6	A
Drain reverse current	Continuous	I_{DR}	2	A
	Pulsed	I_{DRP} *	6	A
Total power dissipation (Tc=25°C)		P_D	20	W
Channel temperature		Tch	150	°C
Storage temperature		Tstg	−55~150	°C

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	TL
	Basic ordering unit (pieces)	2500
2SK2715		○

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	500	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=500V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-resistance	$R_{DS(on)}$	—	3	4	Ω	I_D=1A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$	0.6	1.5	—	S	V_{DS}=10V, I_D=1A
Input capacitance	C_{iss}	—	280	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	58	—	pF	V_{GS}=0V
Return capacitance	C_{rss}	—	23	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	I_D=1A, V_{DD}≒150V
Rise time	t_r	—	12	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	30	—	ns	R_L=150Ω
Fall time	t_f	—	63	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	410	—	ns	I_{DR}=2A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	1.7	—	μC	di/dt=100A/μs

●Electrical characteristic curves

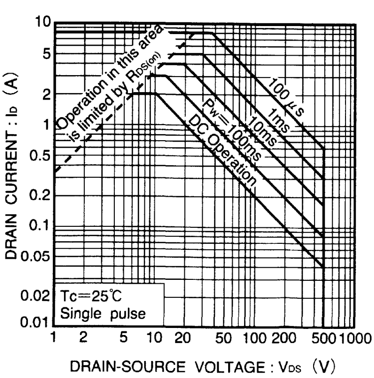


Fig.1 Maximum Safe Operating Area

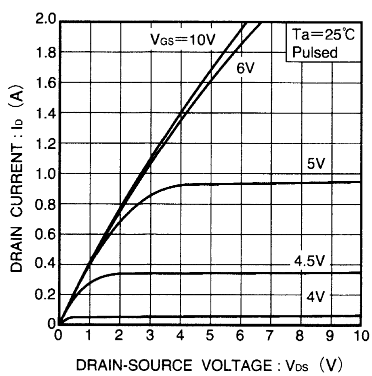


Fig.2 Typical Output Characteristics

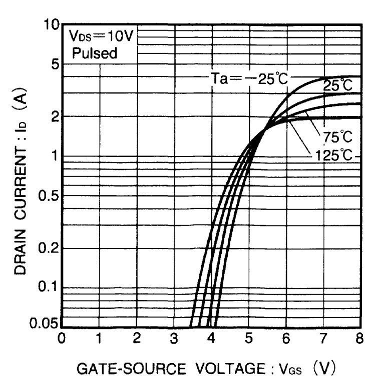


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

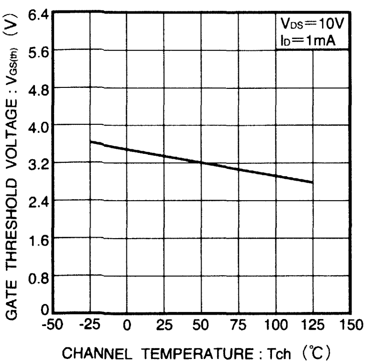


Fig.4 Gate Threshold Voltage vs. Channel Temperature

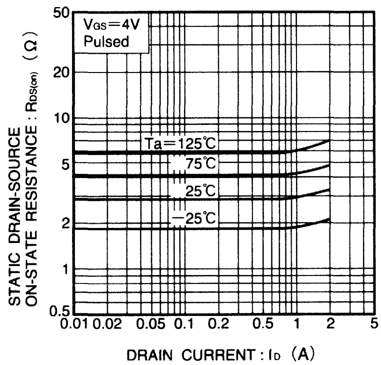


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

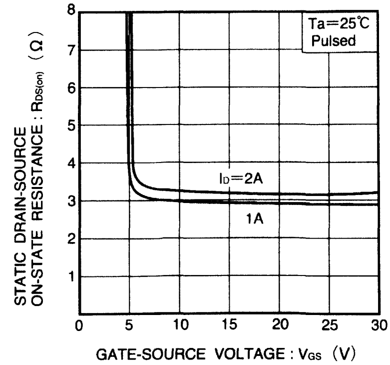


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

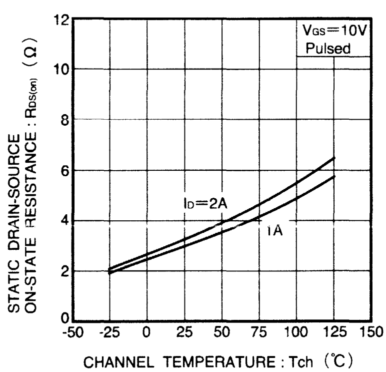


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

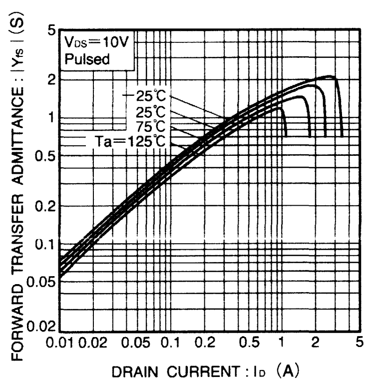


Fig.8 Forward Transfer Admittance vs. Drain Current

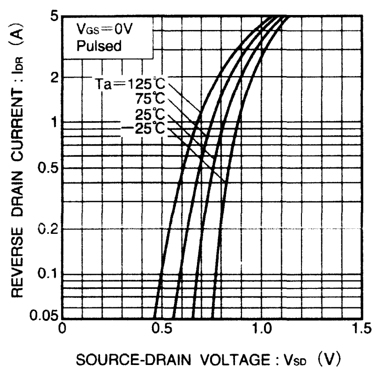


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

MOS FET

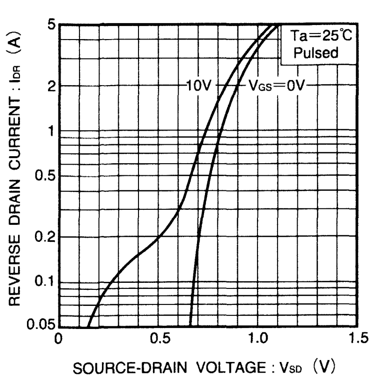


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (Ⅱ)

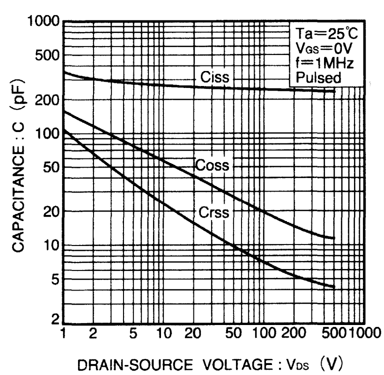


Fig.11 Typical Capacitance vs. Drain-Source Voltage

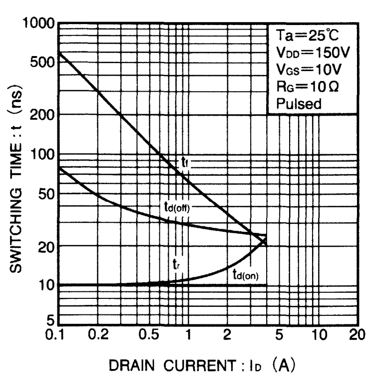


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

●Electrical characteristic curves

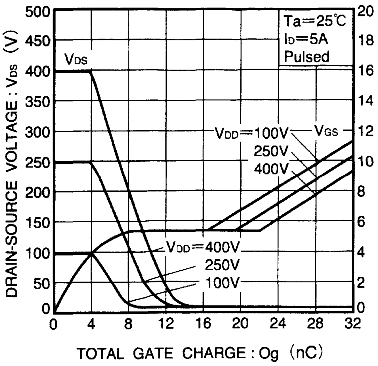


Fig.13 Dynamic Input Characteristics (See Fig. 18 for measurement circuit)

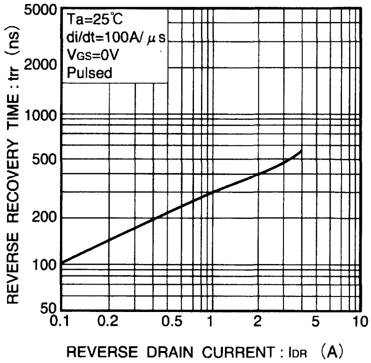


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

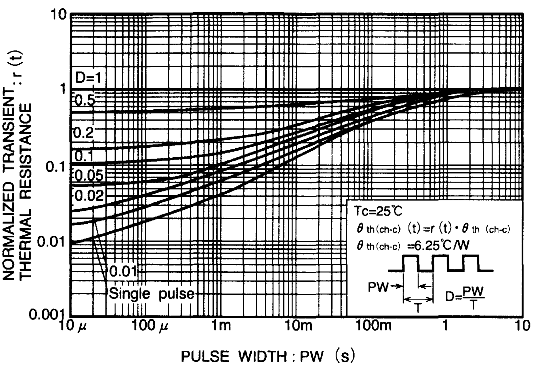


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

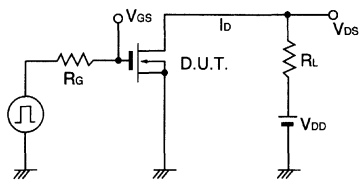


Fig.16 Switching Time Measurement Circuit

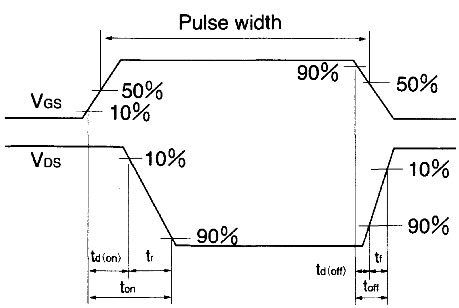


Fig.17 Switching Time Waveforms

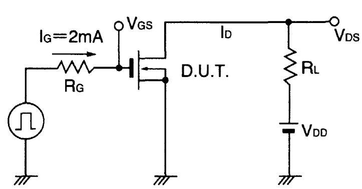


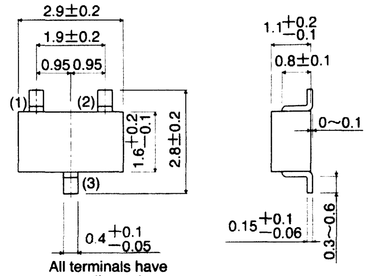
Fig.18 Gate Charge Measurement Circuit

Interface and switching (30V, 200mA)
2SK2731

● Features
1) Low on-resistance.
2) High-speed switching.
3) Low-voltage drive (4V).
4) Easily designed drive circuits.
5) Easy to use in parallel.

● Structure
Silicon N-channel
MOSFET transistor

● External dimensions (Units: mm)



ROHM : SMT3
E I A J : SC-59

Abbreviated symbol: KL

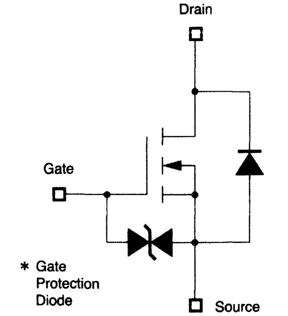
(1) Source
(2) Gate
(3) Drain

● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	30	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	200	mA
	Pulsed	I_{DP}*	800	mA
Drain reverse current	Continuous	I_{DR}	200	mA
	Pulsed	I_{DRP}*	800	mA
Total power dissipation		P_D	200	mW
Channel temperature		Tch	150	°C
Storage temperature		Tstg	−55~150	°C

* Pw≦10 μs, Duty cycle≦1%

● Equivalent circuit



*A protection diode has been built in between the gate and the source to protect against static electricity when the product is in use.
Use the protection circuit when fixed voltages are exceeded.

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	–	–	±10	μA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	–	–	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	–	–	10	μA	V_{DS}=30V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	–	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	–	1.5	2.8	Ω	I_D=0.1A, V_{GS}=10V
		–	2.8	4.5		I_D=0.1A, V_{GS}=4V
Forward propagation admittance	$\|Y_{fs}\|$*	100	–	–	mS	V_{DS}=10V, I_D=0.1A
Input capacitance	C_{iss}	–	25	–	pF	V_{DS}=10V
Output capacitance	C_{oss}	–	15	–	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	–	10	–	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	–	15	–	ns	I_D=0.1A, V_{DD}≒15V
Rise time	t_r	–	20	–	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	–	90	–	ns	R_L=150Ω
Fall time	t_f	–	100	–	ns	R_G=10Ω

* Pw≦300μs、Duty cycle≦1%

●Packaging specifications

Type	Package	Taping
	Code	T146
	Basic ordering unit (pieces)	3000
2SK2731		○

●Electrical characteristic curves

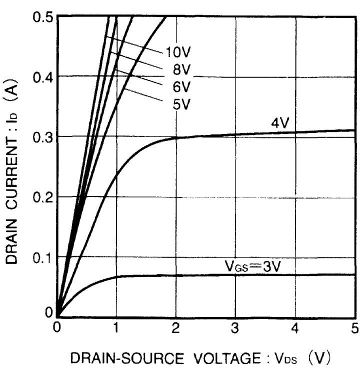


Fig.1 Typical Output Characteristics

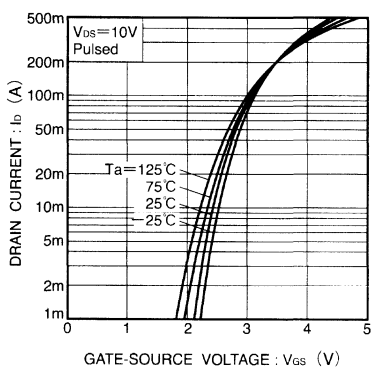


Fig.2 Typical Transfer Characteristics

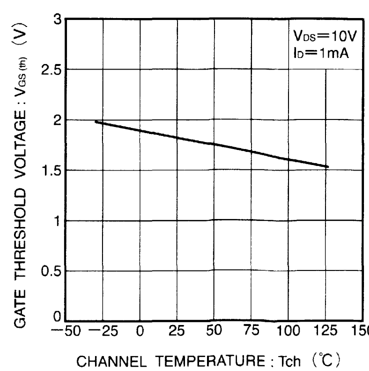


Fig.3 Gate Threshold Voltage vs. Channel Temperature

●Electrical characteristic curves

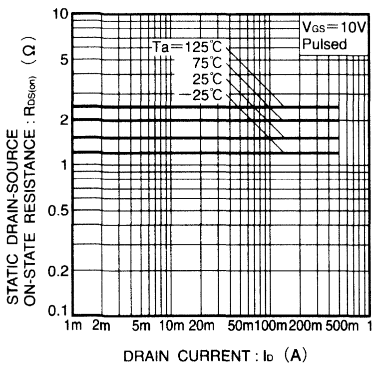


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current (I)

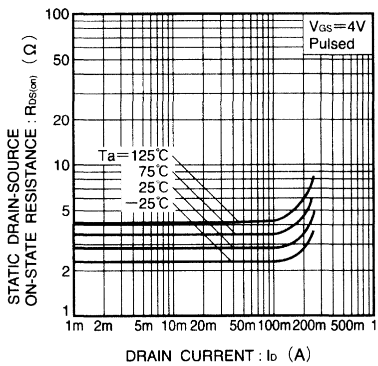


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (II)

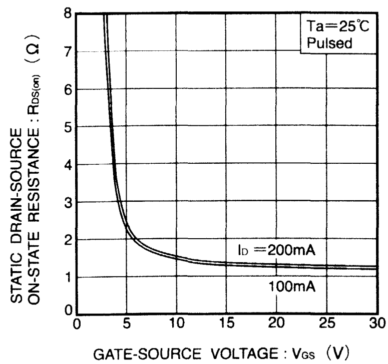


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

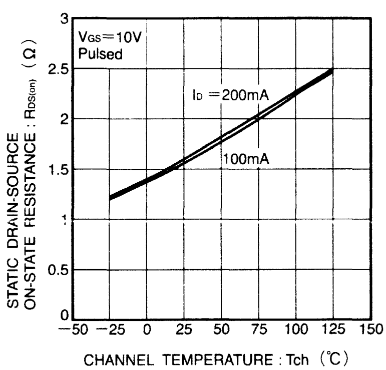


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

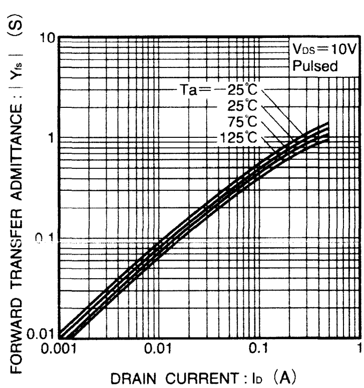


Fig.8 Forward Transfer Admittance vs. Drain Current

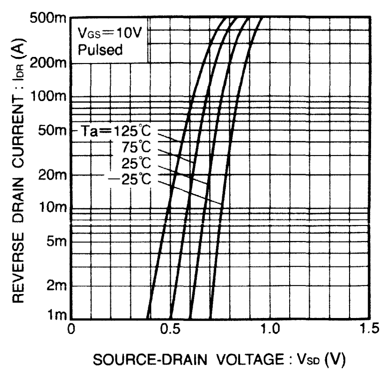


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

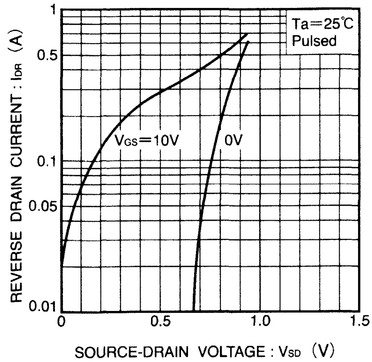


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

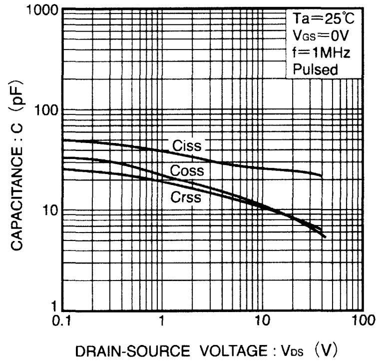


Fig.11 Typical Capacitance vs. Drain-Source Voltage

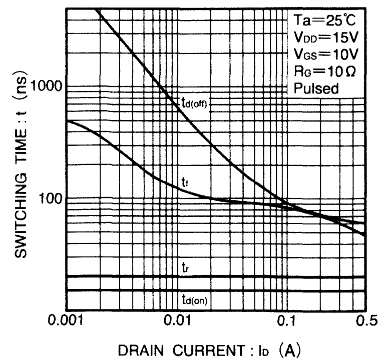


Fig.12 Switching Characteristics (See Figure. 13 and 14 for measurement circuits)

MOS FET

●Switching characteristics measurement circuit

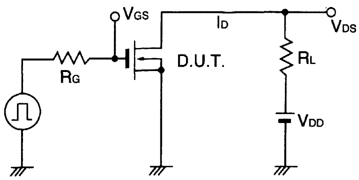


Fig.13 Switching Time Measurement Circuit

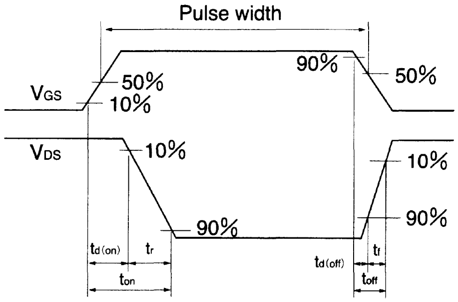


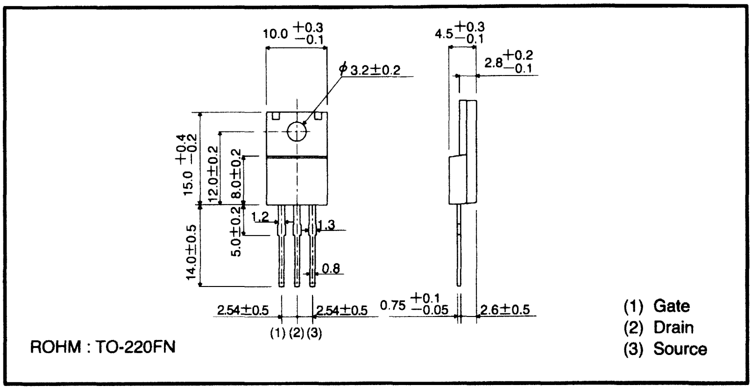
Fig.14 Switching Time Waveforms

Switching (300V, 16A)
2SK2739

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	300	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	16	A
	Pulsed	I_{DP}*	48	A
Drain reverse current	Continuous	I_{DR}	16	A
	Pulsed	I_{DRP}*	48	A
Total power dissipation (Tc=25°C)		P_D	30	W
Channel temperature		Tch	150	°C
Storage temperature		Tstg	−55~150	°C

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2739		○

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	300	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=300V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	0.27	0.33	Ω	I_D=8A, V_{GS}=10V
Forward transfer admittance	$\|Y_{fs}\|$*	5	10	—	S	V_{DS}=10V, I_D=8A
Input capacitance	C_{iss}	—	1240	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	350	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	73	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	19	—	ns	I_D=8A, V_{DD}≒100V
Rise time	t_r	—	24	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	66	—	ns	R_L=12.5Ω
Fall time	t_f	—	22	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	230	—	ns	I_{DR}=16A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	1.8	—	μC	di/dt=100A/μs

* Pw≦300μs, Duty cycle≦1%

● Electrical characteristic curves

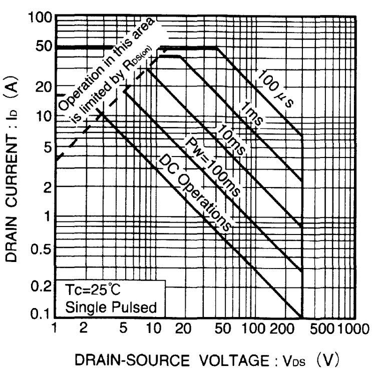


Fig.1 Maximum Safe Operating Area

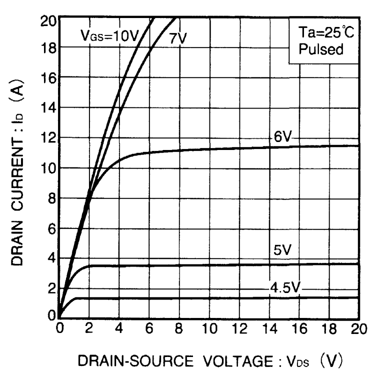


Fig.2 Typical Output Characteristics

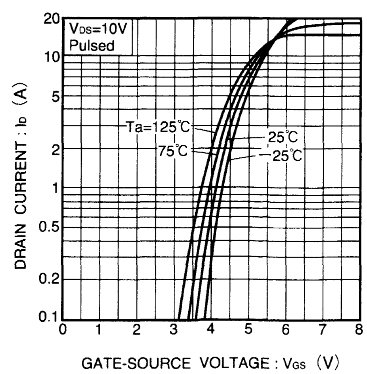


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

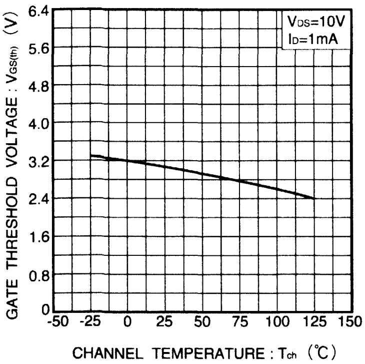
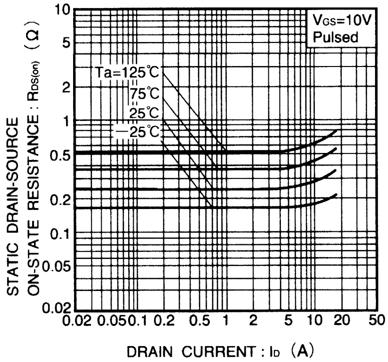


Fig.4 Gate Threshold Voltage vs. Channel Temperature



Fin.5 Static Drain-Source On-State Resistance vs. Drain Current

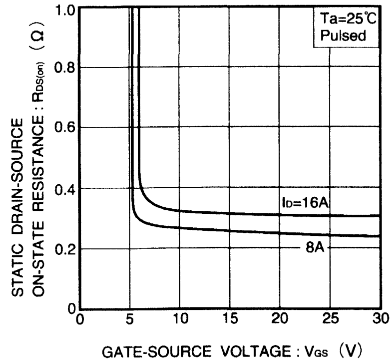


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

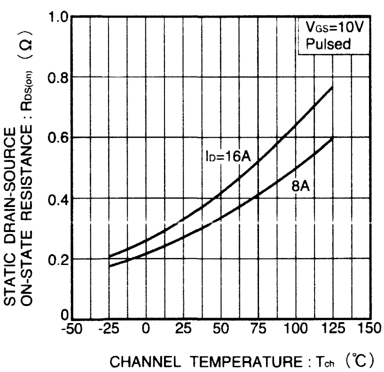


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

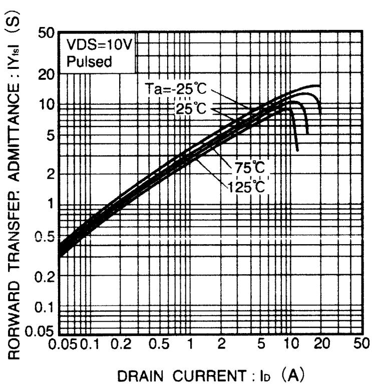


Fig.8 Forward Transfer Admittance vs. Drain Current

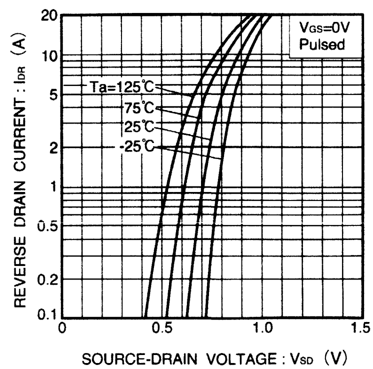


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

MOS FET

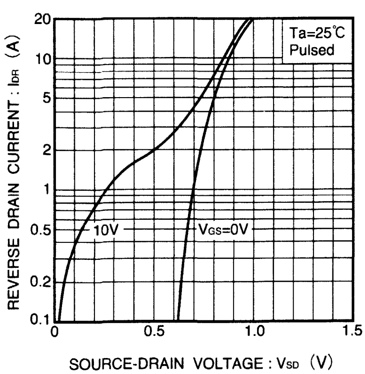


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

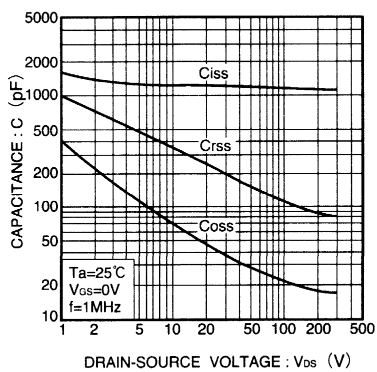


Fig.11 Typical Capacitance vs. Drain-Source Voltage

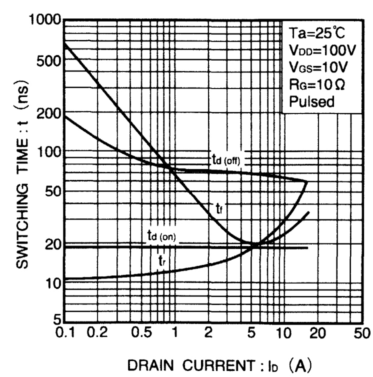


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

●Electrical characteristic curves

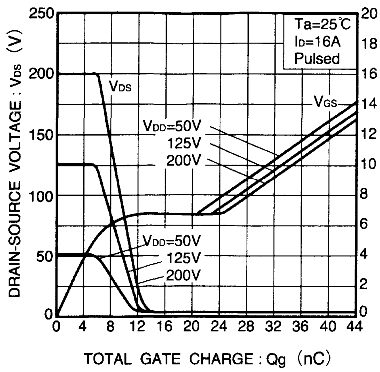


Fig.13 Dynamic Input Characteristics (See Fig. 18 for measurement circuit)

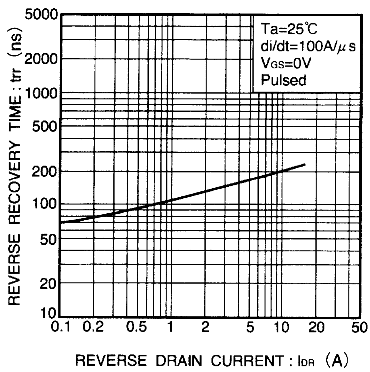


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

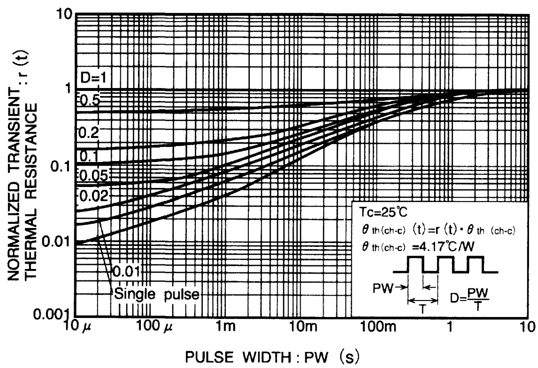


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

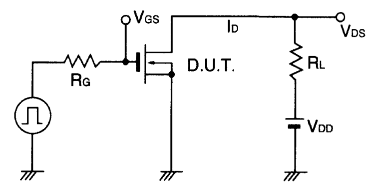


Fig.16 Switching Time Measurement Circuit

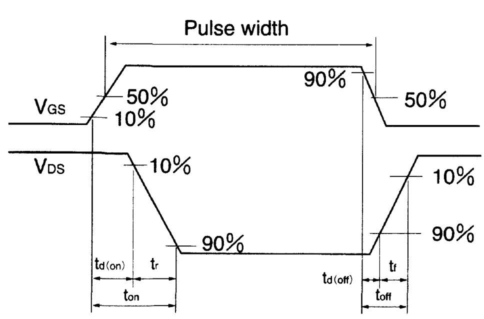


Fig.17 Switching Time Waveforms

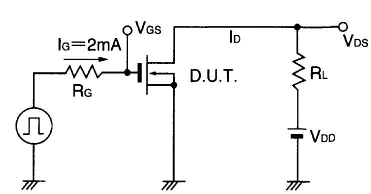


Fig.18 Gate Charge Measurement Circuit

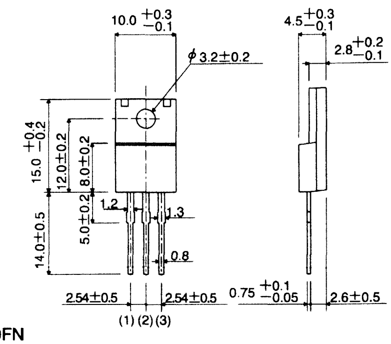
Switching (600V, 7A)

2SK2740

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate source voltage guaranteed at V_{GSS} = ±30V
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : TO-220FN

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	600	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	7	A
	Pulsed	I_{DP} *	28	A
Drain reverse current	Continuous	I_{DR}	7	A
	Pulsed	I_{DRP} *	28	A
Total power dissipation(Tc=℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55～150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type		
	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2740		○

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	600	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=600V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	1	1.2	Ω	I_D=4A, V_{GS}=10V
Forward transfer admittance	$\lvert Y_{fs} \rvert$*	3	6	—	S	V_{DS}=10V, I_D=4A
Input capacitance	C_{iss}	—	1050	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	210	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	80	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	19	—	ns	I_D=4A, V_{DD}≒150V
Rise time	t_r	—	22	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	79	—	ns	R_L=37.5Ω
Fall time	t_f	—	30	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	590	—	ns	I_{DR}=7A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	4.6	—	μC	di/dt=100A/μs

* Pw≦300μs, Duty cycle≦1%

●Electrical characteristic curves

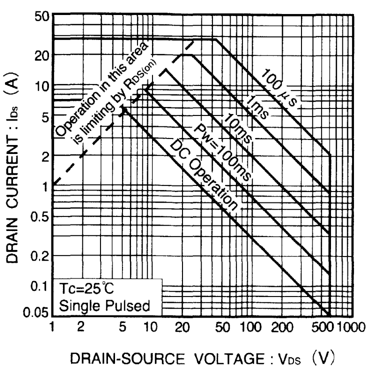


Fig.1 Maximum Safe Operating Area

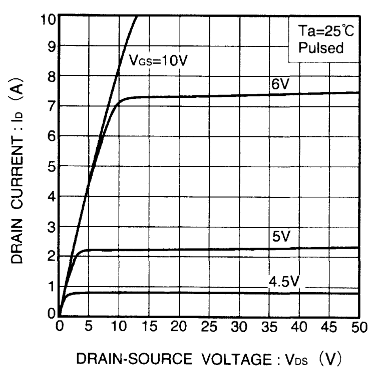


Fig.2 Typical Output Characteristics

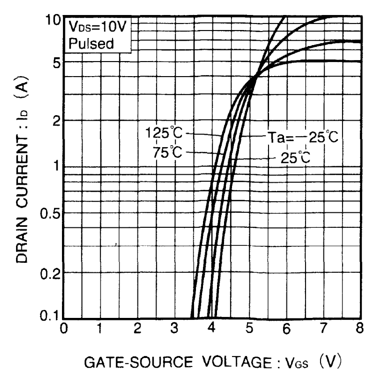


Fig.3 Typical Transfer Characteristics

● Electrical characteristic curves

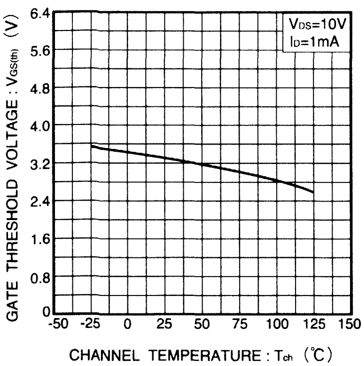


Fig.4 Gate Threshold Voltage vs. Channel Temperature

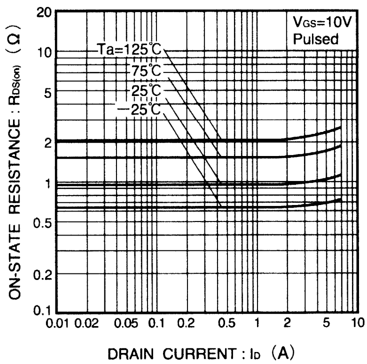


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

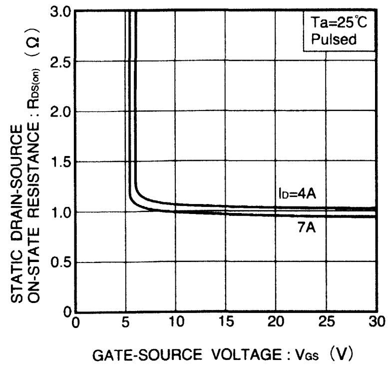


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

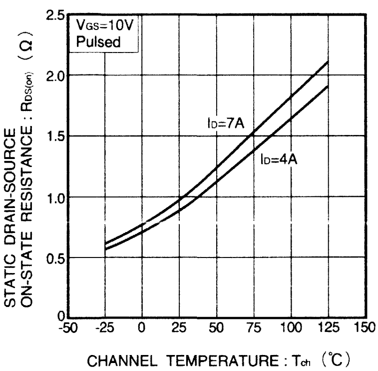


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

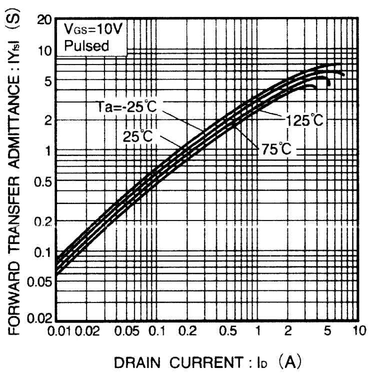


Fig.8 Forward Transfer Admittance vs. Drain Current

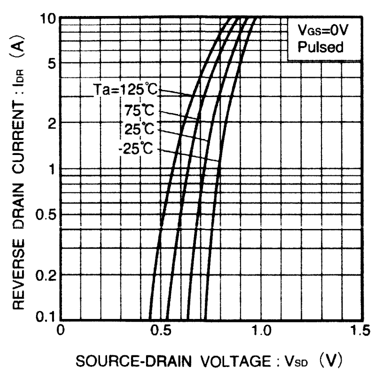


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (Ⅰ)

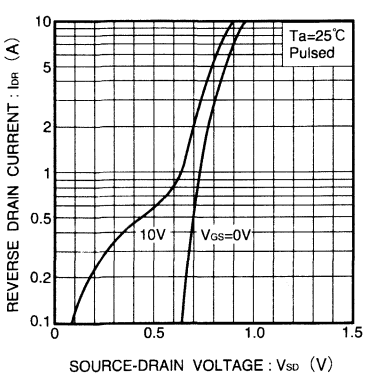


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (Ⅱ)

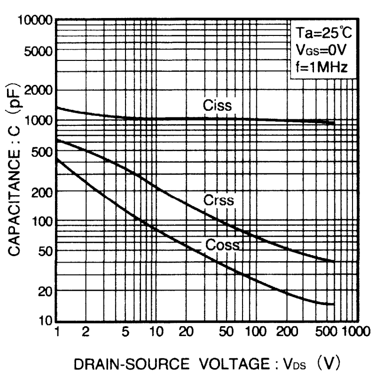


Fig.11 Typical Capacitance vs. Drain-Source Voltage

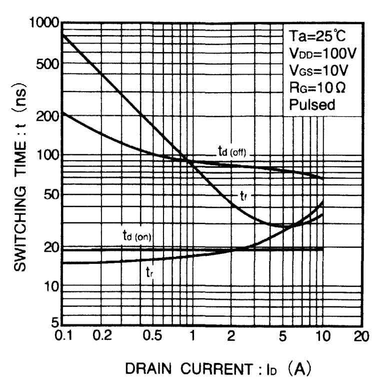


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

MOS FET

● Electrical characteristic curves

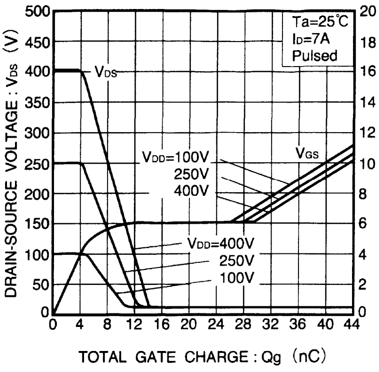


Fig.13 Dynamic Input Characteristics
(See Fig. 18 for measurement circuit)

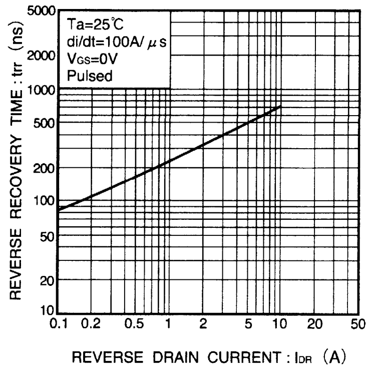


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

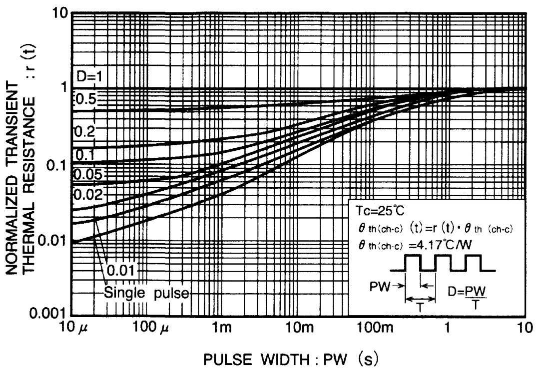


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

● Switching characteristics measurement circuit

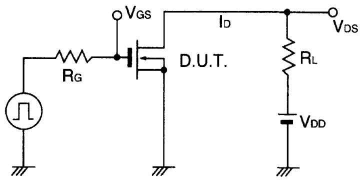


Fig.16 Switching Time Measurement Circuit

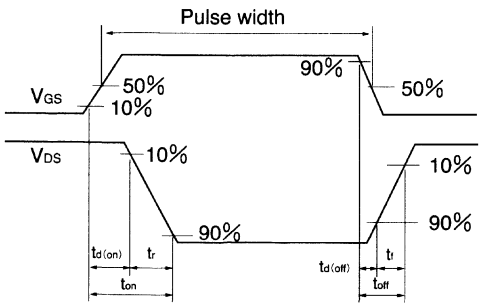


Fig.17 Switching Time Waveforms

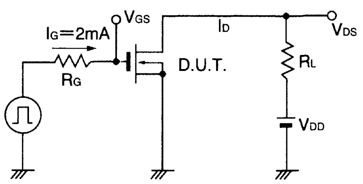


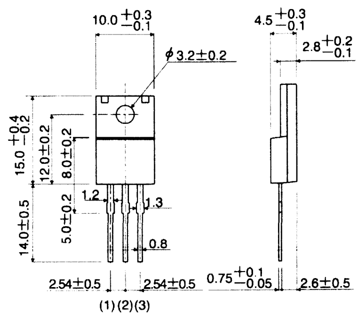
Fig.18 Gate Charge Measurement Circuit

Switching (600V, 4A)
2SK2792

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS} = ±30V
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : TO-220FN

(1) Gate
(2) Drain
(3) Source

MOS FET

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	600	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	4	A
	Pulsed	I_{DP}*	16	A
Drain reverse current	Continuous	I_{DR}	4	A
	Pulsed	I_{DRP}*	16	A
Total power dissipation (Tc=25℃)		P_D	30	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type		
	Package	Bulk
	Code	−
	Basic ordering unit (pieces)	500
2SK2792		○

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	600	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=600V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	1.8	2.4	Ω	I_D=2A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$	1	2.7	—	S	V_{DS}=10V, I_D=2A
Input capacitance	C_{iss}	—	610	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	120	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	53	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	14	—	ns	I_D=2A, V_{DD}≒150V
Rise time	t_r	—	15	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	48	—	ns	R_L=75Ω
Fall time	t_f	—	34	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	540	—	ns	I_{DR}=4A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	3.1	—	μC	di/dt=100A/μs

● Electrical characteristic curves

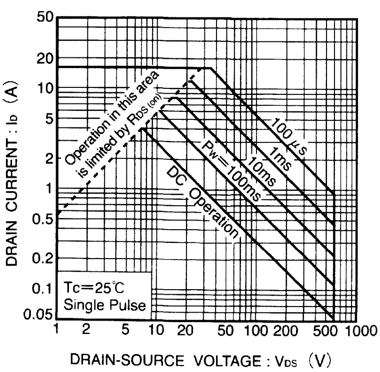


Fig.1 Maximum Safe Operating Area

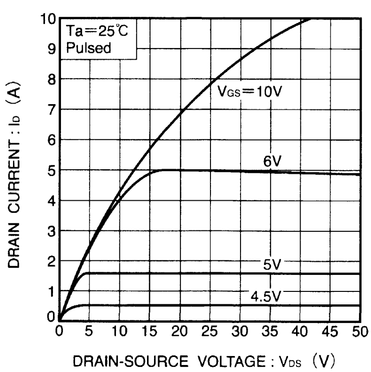


Fig.2 Typical Output Characteristics

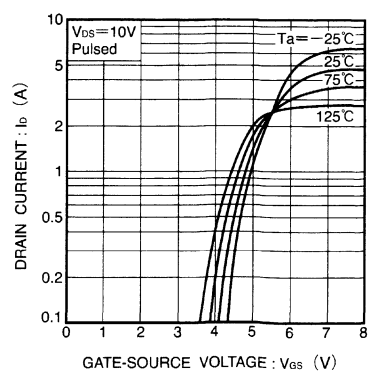


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

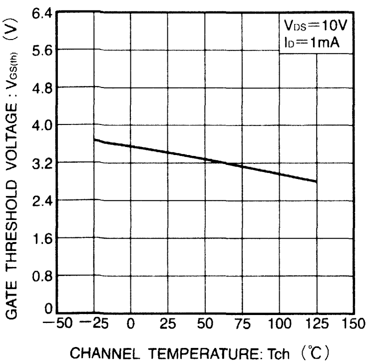


Fig.4 Gate Threshold Voltage vs. Channel Temperature

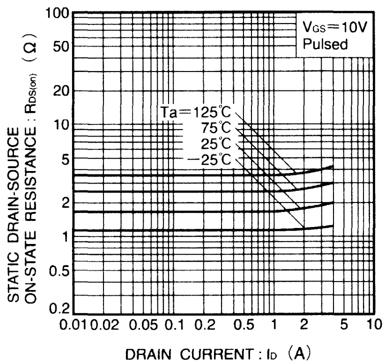


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

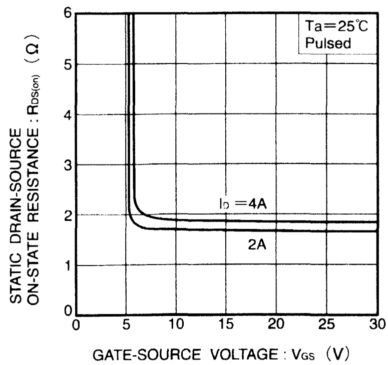


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

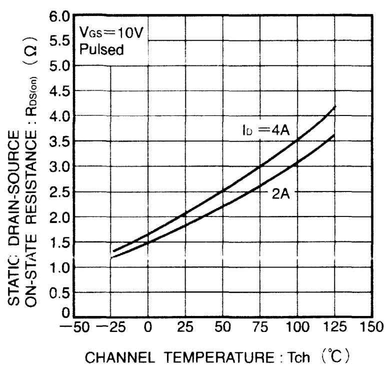


Fig.7 Static Drain-Source On-state Resistance vs. Channel Temperature

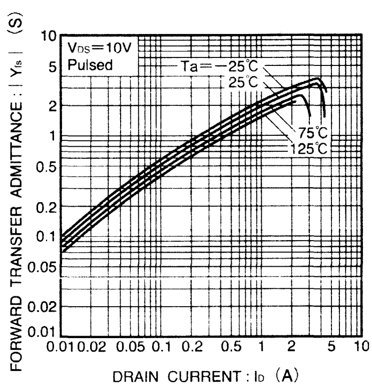


Fig.8 Forward Transfer Admittance vs. Drain Current

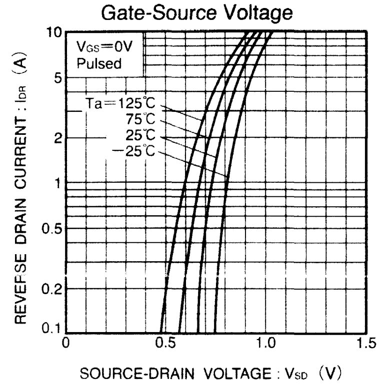


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

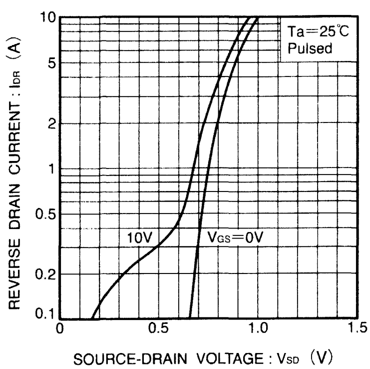


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

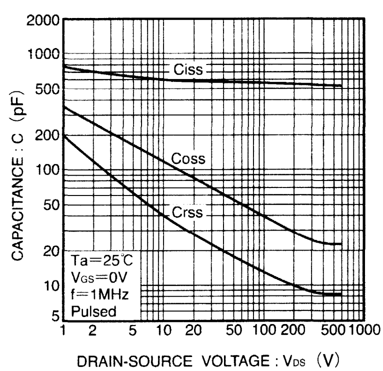


Fig.11 Typical Capacitance vs. Drain-Source Voltage

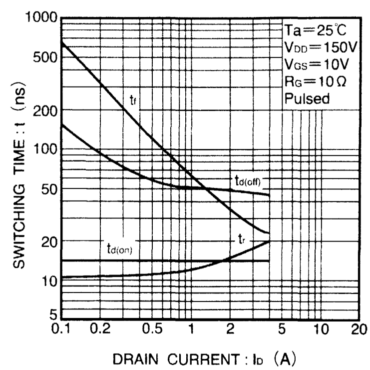


Fig.12 Switching Characteristics (See Figure. 16 and 17 for Measurement Circuits)

MOS FET

●Electrical characteristic curves

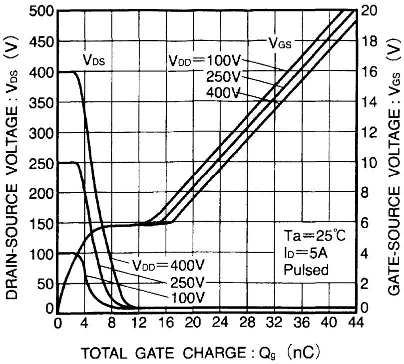


Fig.13 Dynamic Input Characteristics (See Figure. 18 for Measurement Circuit)

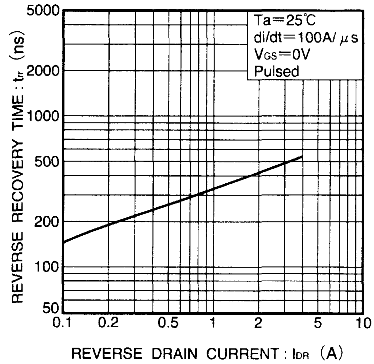


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

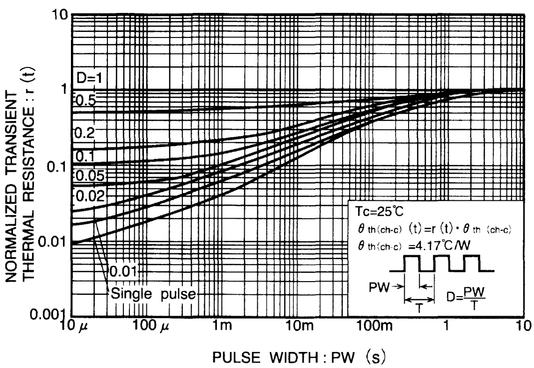


Fig. 15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

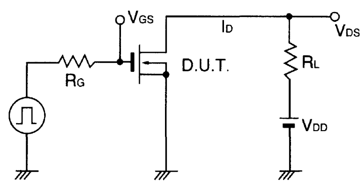


Fig.16 Switching Time Measurement Circuit

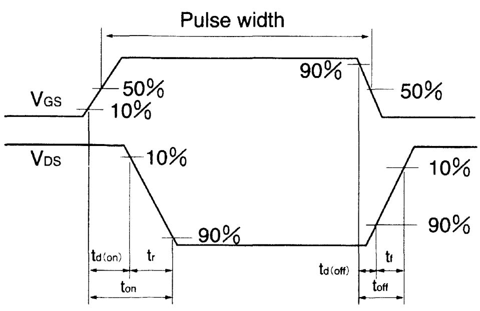


Fig.17 Switching Time Waveforms

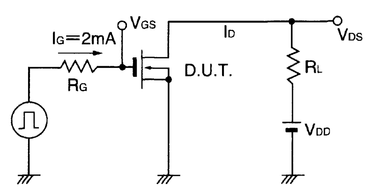


Fig.18 Gate Charge Measurement Circuit

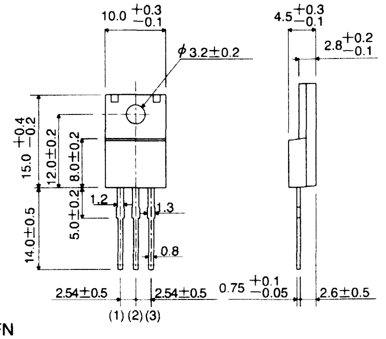
Switching (500V, 5A)

2SK2793

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-sonrce voltage gnaranteed at V_{GSS} = ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Unit: mm)



ROHM : TO-220FN

(1) Gate
(2) Drain
(3) Source

●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	500	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	5	A
	Pulsed	I_{DP}*	20	A
Drain reverse current	Continuous	I_{DR}	5	A
	Pulsed	I_{DRP}*	20	A
Total power dissipation (Tc=25°C)		P_D	30	W
Channel temperature		Tch	150	°C
Storage temperature		Tstg	−55~150	°C

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2793		○

MOS FET

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	500	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=500V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	1.1	1.5	Ω	I_D=2.5A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$	1	3	—	S	V_{DS}=10V, I_D=2.5A
Input capacitance	C_{iss}	—	600	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	135	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	52	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	14	—	ns	I_D=2.5A, V_{DD}≒150V
Rise time	t_r	—	15	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	48	—	ns	R_L=60Ω
Fall time	t_f	—	30	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	420	—	ns	I_{DR}=5A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	2.6	—	μC	di/dt=100A/μs

●Electrical characteristic curves

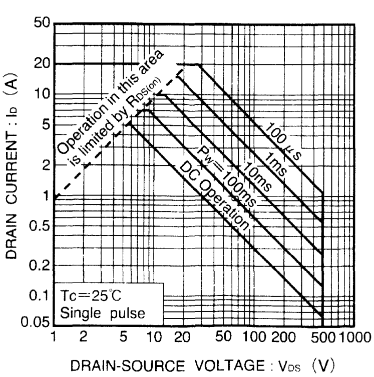


Fig.1 Maximum Safe Operating Area

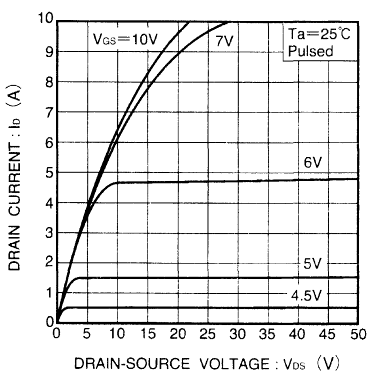


Fig.2 Typical Output Characteristics

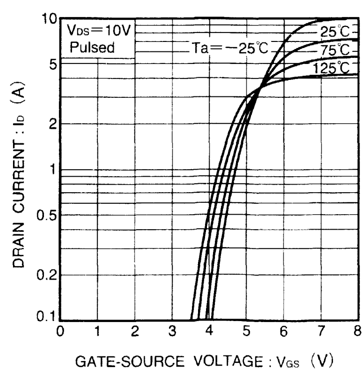


Fig.3 Typical Transfer Characteristics

● Electrical characteristic curves

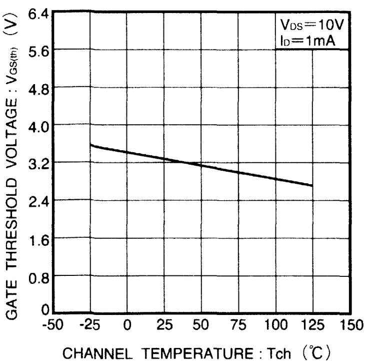


Fig.4 Gate Threshold Voltage vs. Channel Temperature

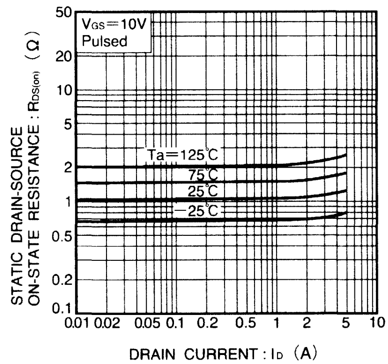


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

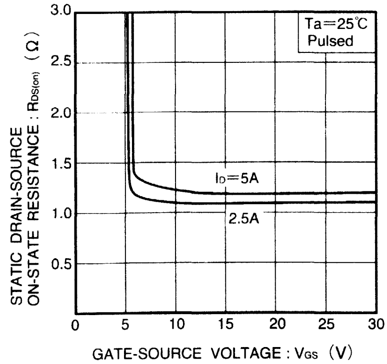


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

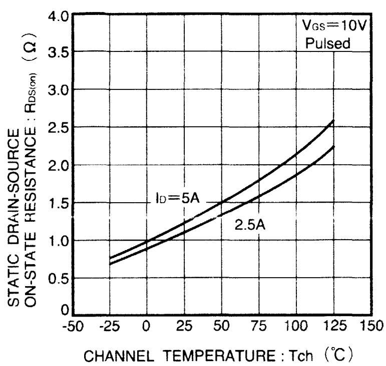


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

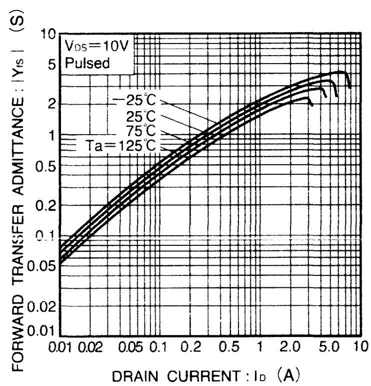


Fig.8 Forward Transfer Admittance vs. Drain Current

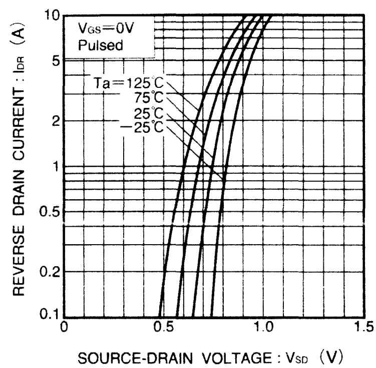


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

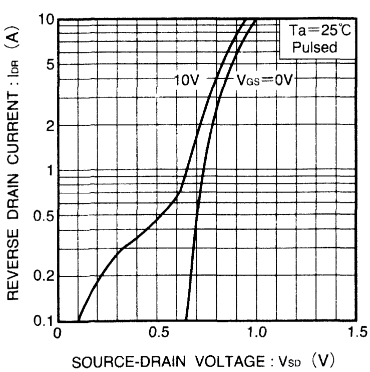


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

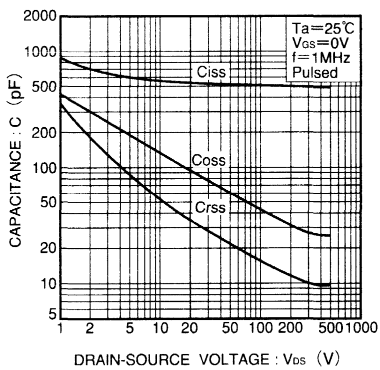


Fig.11 Typical Capacitance vs. Drain-Source Voltage

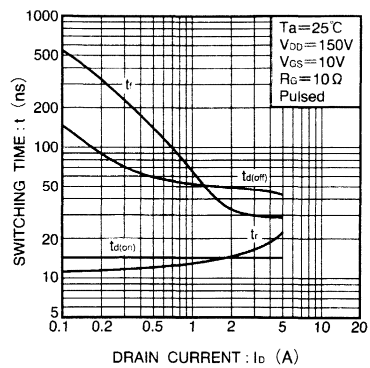


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

MOS FET

●Electrical characteristic curves

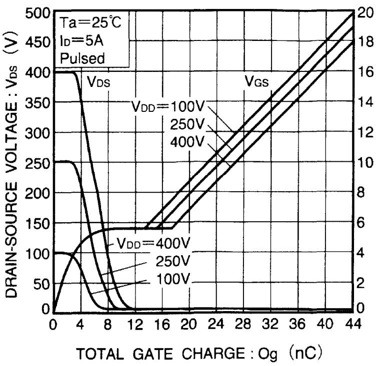


Fig.13 Dynamic Input Characteristics (See Fig. 18 for measurement circuit))

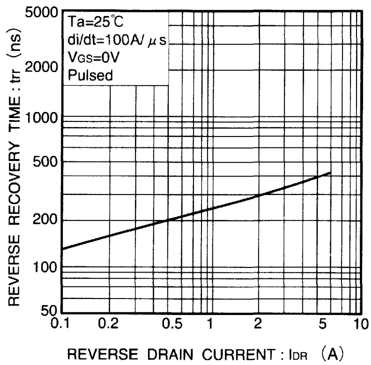


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

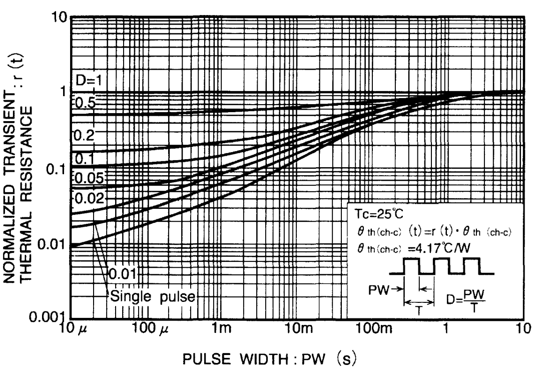


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

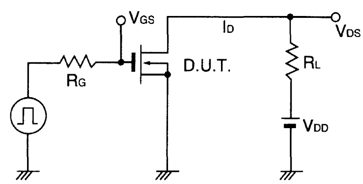


Fig.16 Switching Time Measurement Circuit

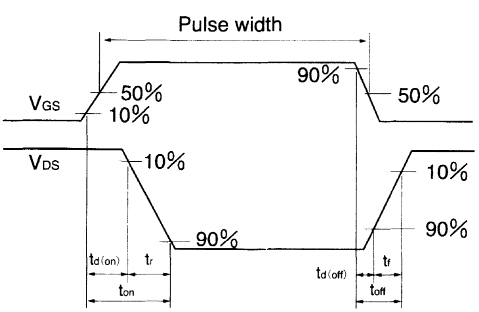


Fig.17 Switching Time Waveforms

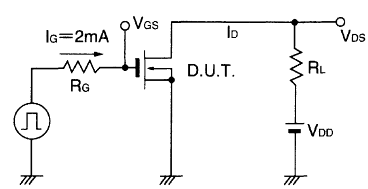


Fig.18 Gate Charge Measurement Circuit

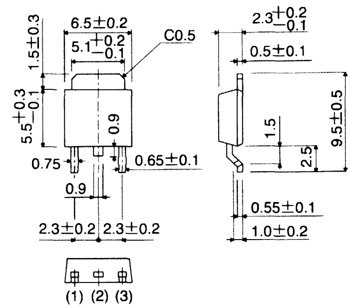
Small switching (200V, 3A)

2SK2887

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Gate-source voltage guaranteed at V_{GSS}= ±30V.
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



ROHM : CPT3
EIAJ : SC-63

(1) Gate
(2) Drain
(3) Source

MOS FET

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	200	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	Continuous	I_D	3	A
	Pulsed	I_{DP}*	12	A
Drain reverse current	Continuous	I_{DR}	3	A
	Pulsed	I_{DRP}*	12	A
Total power dissipation (Tc=25℃)		P_D	20	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type		
	Package	Bulk
	Code	TL
	Basic ordering unit (pieces)	2500
2SK2715		○

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±30V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	200	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	100	μA	V_{DS}=200V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	2	—	4	V	V_{DS}=10V, I_D=1mA
Drain-source on-resistance	$R_{DS(on)}$	—	0.7	0.9	Ω	I_D=1.5A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$	0.6	1.5	—	S	V_{DS}=10V, I_D=1.5A
Input capacitance	C_{iss}	—	230	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	100	—	pF	V_{GS}=0V
Return capacitance	C_{rss}	—	35	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	I_D=1.5A, V_{DD}≒100V
Rise time	t_r	—	12	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	26	—	ns	R_L=68Ω
Fall time	t_f	—	34	—	ns	R_G=10Ω
Reverse recovery time	t_{rr}	—	96	—	ns	I_{DR}=3A, V_{GS}=0V
Reverse recovery load	Q_{rr}	—	0.59	—	μC	di/dt=100A/μs

●Electrical characteristic curves

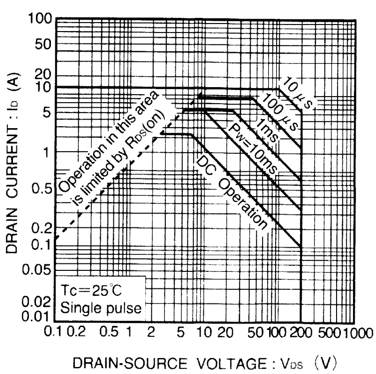


Fig.1 Maximum Safe Operating Area

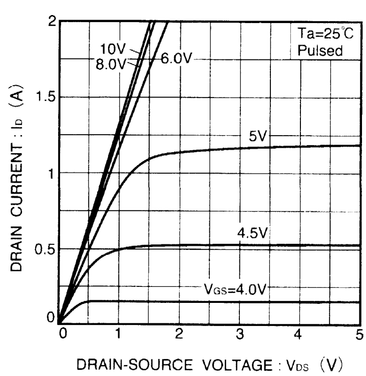


Fig.2 Typical Output Characteristics

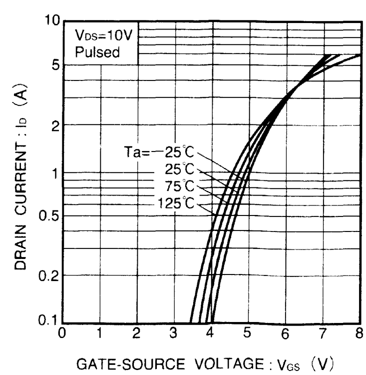


Fig.3 Typical Transfer Characteristics

●Electrical characteristic curves

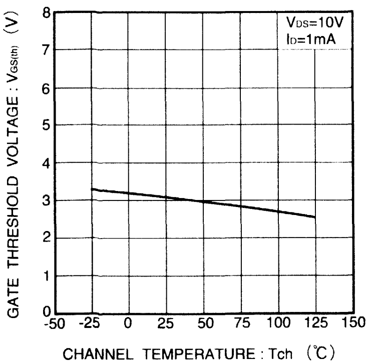


Fig.4 Gate Threshold Voltage vs. Channel Temperature

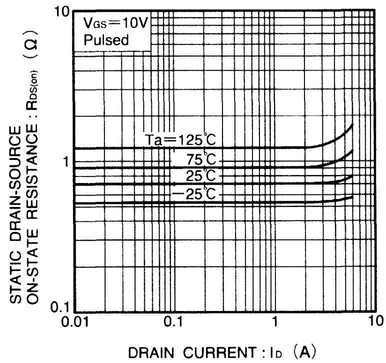


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

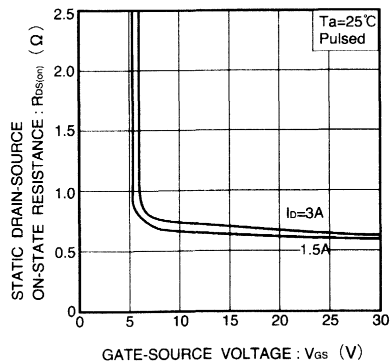


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

MOS FET

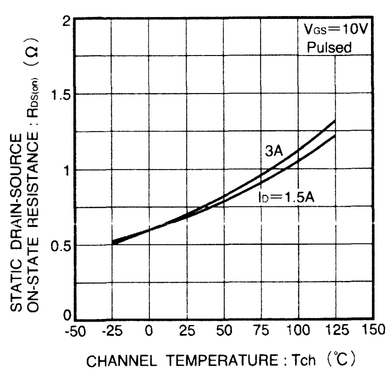


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

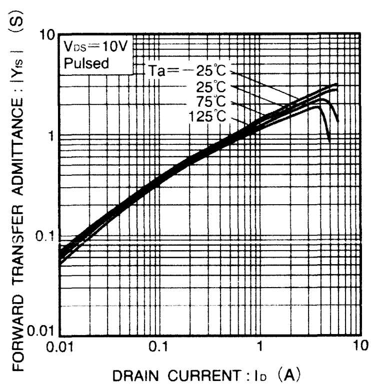


Fig.8 Forward Transfer Admittance vs. Drain Current

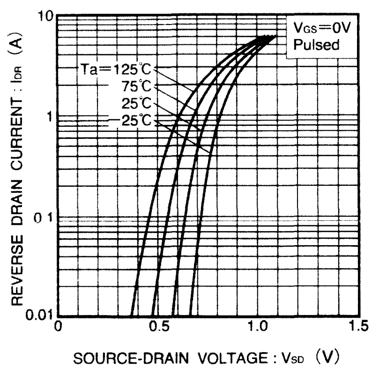


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (I)

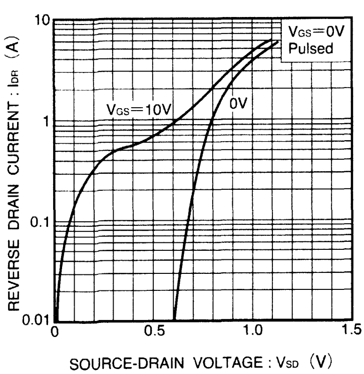


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (II)

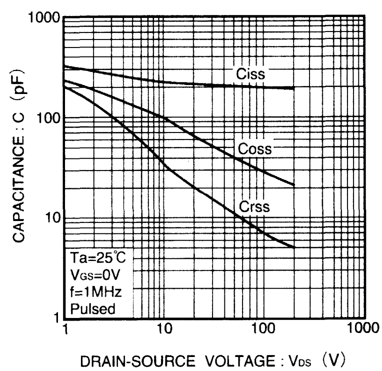


Fig.11 Typical Capacitance vs. Drain-Souce Voltage

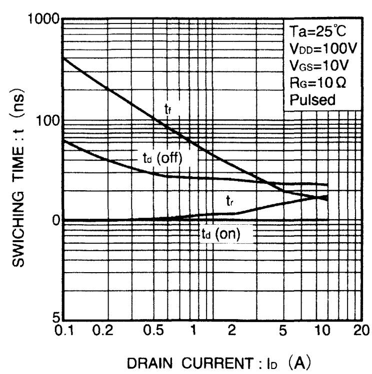


Fig.12 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

●Electrical characteristic curves

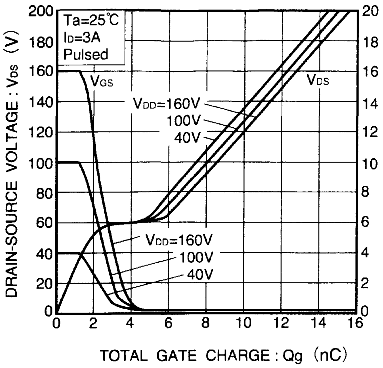


Fig.13 Dynamic Input Characteristics (See Fig. 18 for measurement circuit)

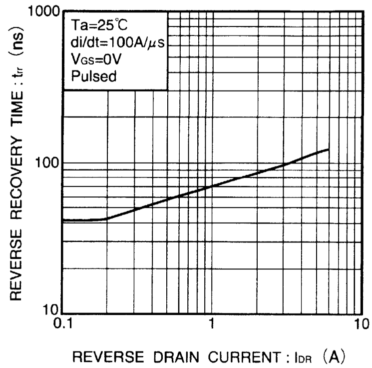


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

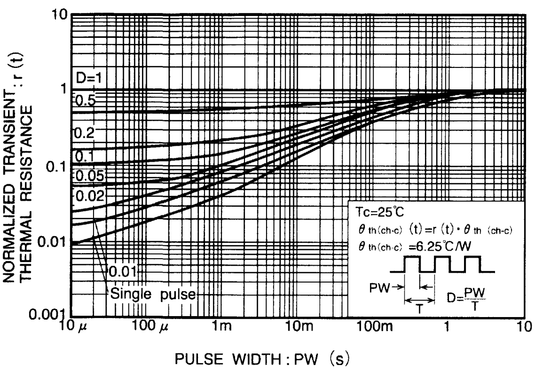


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

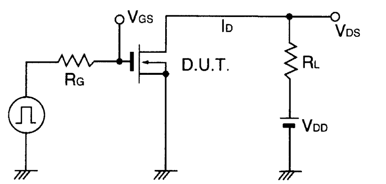


Fig.16 Switching Time Measurement Circuit

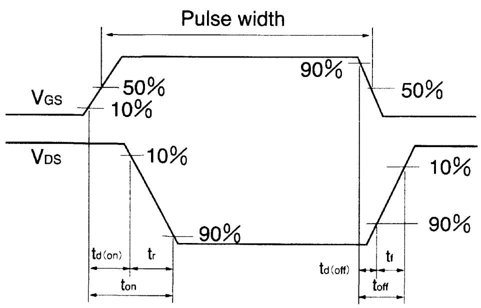


Fig.17 Switching Time Waveforms

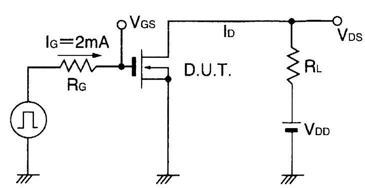


Fig.18 Gate Charge Time Measurement Circuit

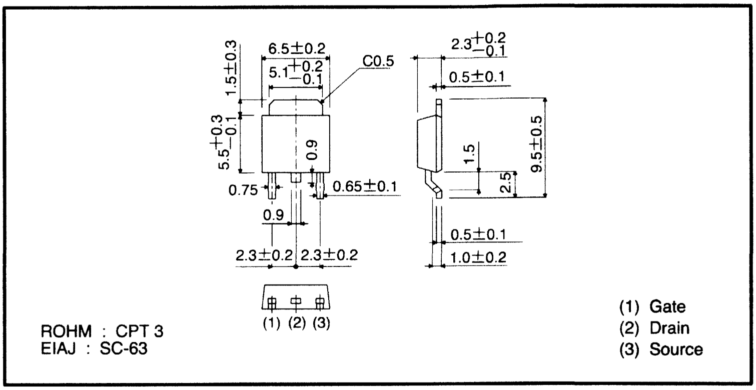
Small switching (60V, 8A)

RK3055E

●Features
1) Low on-resistance.
2) High-speed switching.
3) Wide SOA (safe operating area).
4) Low-voltage drive (4V).
5) Easily designed drive circuits.
6) Easy to use in parallel.

●Structure
Silicon N-channel
MOSFET transistor

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	60	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	8	A
	Pulsed	I_{DP}*	20	A
Drain reverse current	Continuous	I_{DR}	8	A
	Pulsed	I_{DRP}*	20	A
Total power dissipation (Tc=25℃)		P_D	20	W
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

* Pw≦10 μs, Duty cycle≦1%

●Packaging specifications

Type	Package	Taping
	Code	TL
	Basic ordering unit (pieces)	2500
RK3055E		○

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	—	—	±100	nA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D=1mA, V_{GS}=0V
Drain cutoff current	I_{DSS}	—	—	10	μA	V_{DS}=60V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	—	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$	—	—	0.15	Ω	I_D=4A, V_{GS}=10V
Forward propagation admittance	$\|Y_{fs}\|$*	4	—	—	S	V_{DS}=10V, I_D=4A
Input capacitance	C_{iss}	—	520	—	pF	V_{DS}=10V
Output capacitance	C_{oss}	—	240	—	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	—	100	—	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$	—	5	—	ns	I_D=2.5A, V_{DD}≒30V
Rise time	t_r	—	20	—	ns	V_{GS}=10V
Turn-off delay time	$t_{d(off)}$	—	50	—	ns	R_L=12Ω
Fall time	t_f	—	20	—	ns	R_G=10Ω

* Pw≦300μs, Duty cycle≦1%

●Electrical characteristic curves

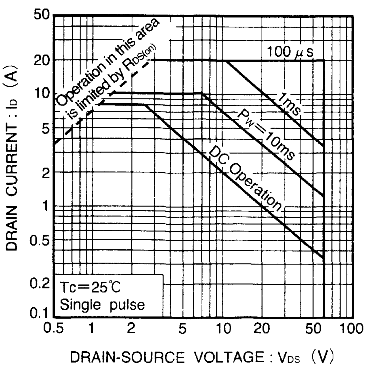


Fig.1 Maximum Safe Operating Area

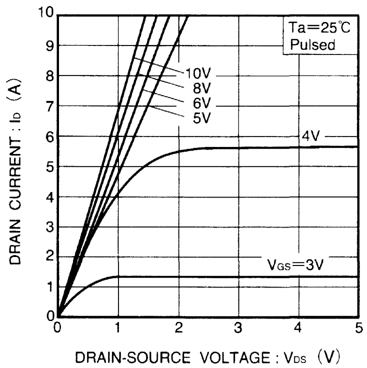


Fig.2 Typical Output Characteristics

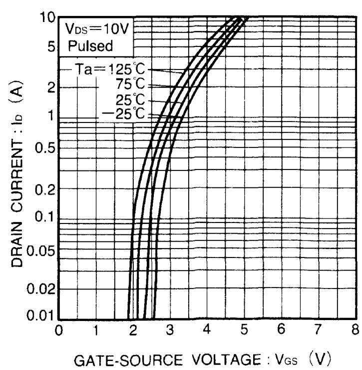


Fig.3 Typical Transfer Characteristics

● Electrical characteristic curves

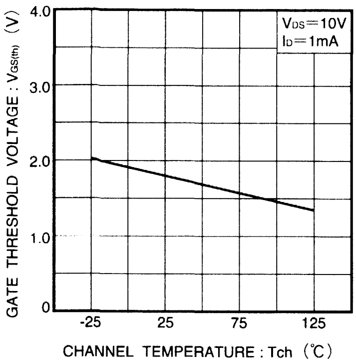


Fig.4 Gate Threshold Voltage vs. Channel Temperature

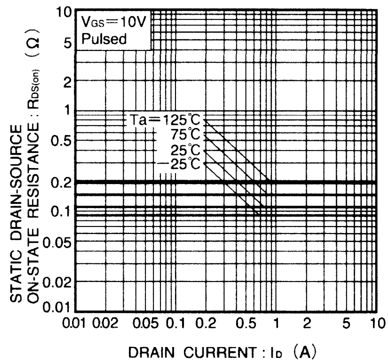


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (I)

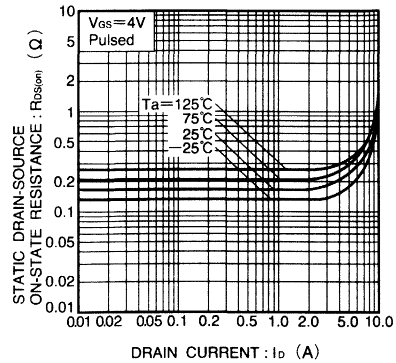


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (II)

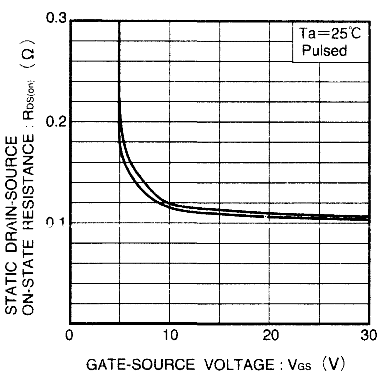


Fig.7 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

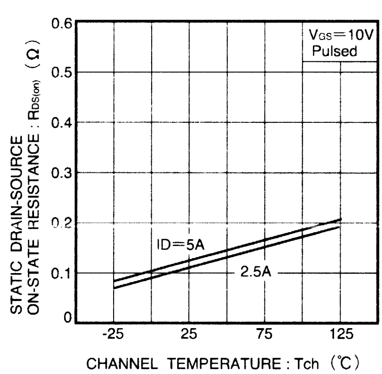


Fig.8 Static Drain-Source On-State Resistance vs. Channel Temperature

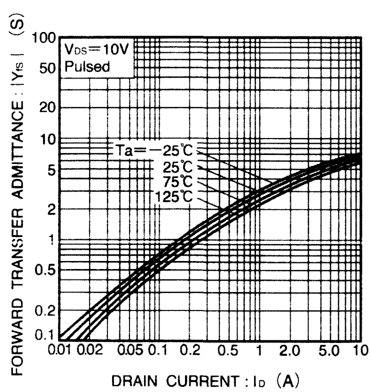


Fig.9 Forward Transfer Admittance vs. Drain Current

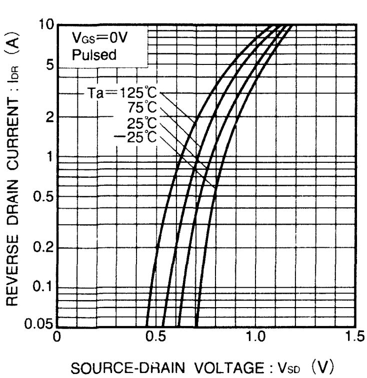


Fig.10 Reverse Drain Current vs. Source-Drain Voltage (I)

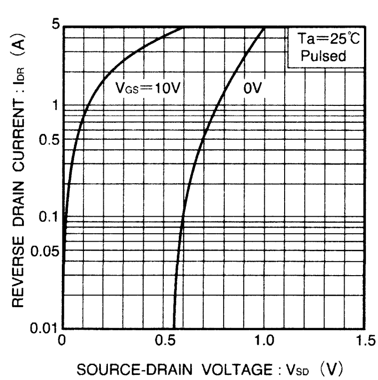


Fig.11 Reverse Drain Current vs. Source-Drain Voltage (II)

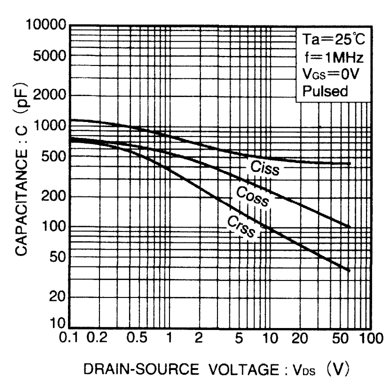


Fig.12 Typical Capacitance vs. Drain-Source Voltage

● Electrical characteristic curves

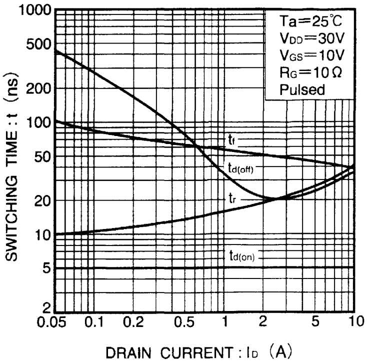


Fig.13 Switching Characteristics (See Figure. 16 and 17 for measurement circuits)

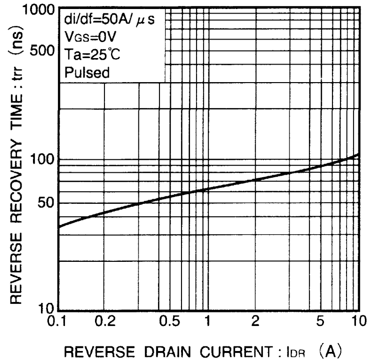


Fig.14 Reverse Recovery Time vs. Reverse Drain Current

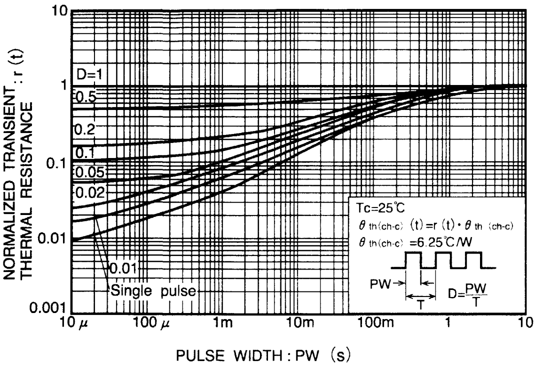


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

● Switching characteristics measurement circuit

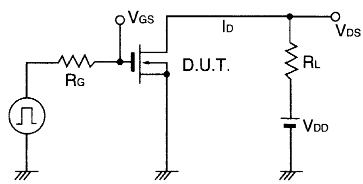


Fig.16 Switching Time Measurement Circuit

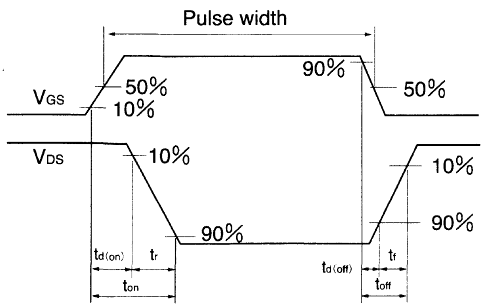


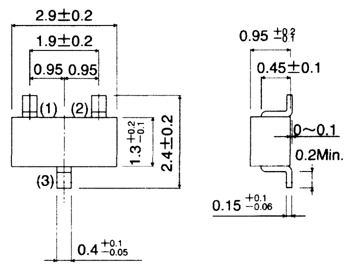
Fig.17 Switching Time Waveforms

Interfaces and switching (60V, 115mA)
RK7002

● Features
1) Low on-resistance.
2) High-speed switching.
3) Low-voltage drive (4V).
4) Easily designed drive circuits.
5) Easy to use in parallel.

● Structure
Silicon N-channel
MOSFET transistor

● External dimensions (Units: mm)



All terminals have same dimensions

ROHM : SST3
EIAJ : SOT-23

Abbreviated symbol: RKM

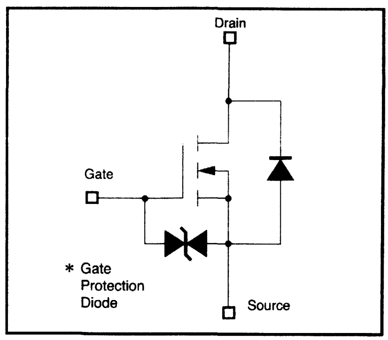
(1) Source
(2) Gate
(3) Drain

● Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	60	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	115	mA
	Pulsed	I_{DP} *1	800	mA
Drain reverse current	Continuous	I_{DR}	115	mA
	Pulsed	I_{DRP} *1	800	mA
Total power dissipation		P_D *2	225	mW
Channel temperature		Tch	150	℃
Storage temperature		Tstg	−55~150	℃

*1 Pw≦10 μs, Duty cycle≦1%
*2 When using 1 × 0.75 × 0.062 inch glass epoxy board.

● Equivalent circuit



*A protection diode has been built in between the gate and the source to protect against static electricity when the product is in use.
Use the protection circuit when fixed voltages are exceeded.

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate leakage current	I_{GSS}	–	–	±10	μA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	–	–	V	I_D=10μA, V_{GS}=0V
Drain cutoff current	I_{DSS}	–	–	1	μA	V_{DS}=60V, V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	1	1.85	2.5	V	V_{DS}=10V, I_D=1mA
Drain-source on-state resistance	$R_{DS(on)}$*	–	–	7.5	Ω	I_D=0.5A, V_{GS}=10V
		–	–	7.5		I_D=0.05A, V_{GS}=5V
Forward transfer admittance	$\lvert Y_{fs}\rvert$*	8	–	–	mS	V_{DS}=10V, I_D=0.2A
Input capacitance	C_{iss}	–	25	50	pF	V_{DS}=25V
Output capacitance	C_{oss}	–	10	25	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	–	3	5	pF	f=1MHz
Turn-on delay time	$t_{d(on)}$*	–	12	20	ns	I_D=0.2A, V_{DD}≒30V, V_{GS}=10V,
Turn-off delay time	$t_{d(off)}$*	–	20	30	ns	R_L=150Ω, R_G=10Ω

* Pw≦300μs, Duty cycle≦1%

●Packaging specifications

Type		
	Package	Taping
	Code	T106
	Basic ordering unit (pieces)	3000
RK7002		○

●Electrical characteristic curves

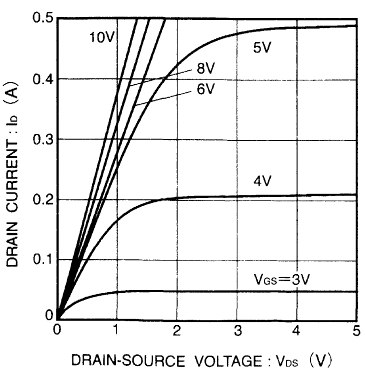


Fig.1 Typical Output Characteristics

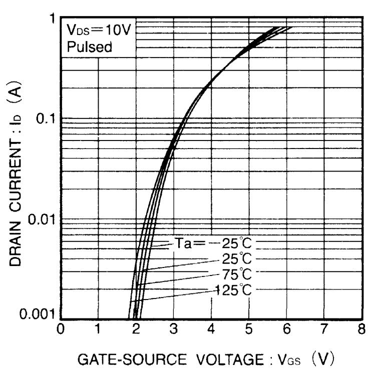


Fig.2 Typical Transfer Characteristics

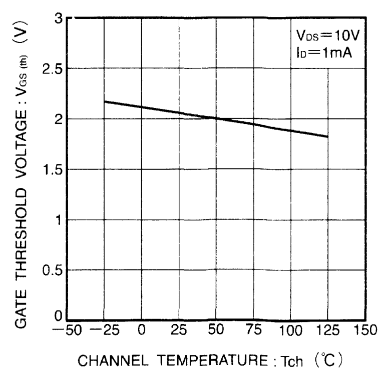


Fig.3 Gate Threshold Voltage vs. Channel Temperature

● Electrical characteristic curves

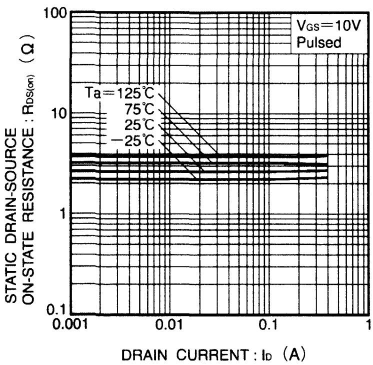


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current (I)

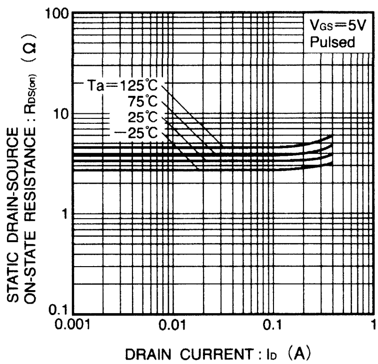


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (II)

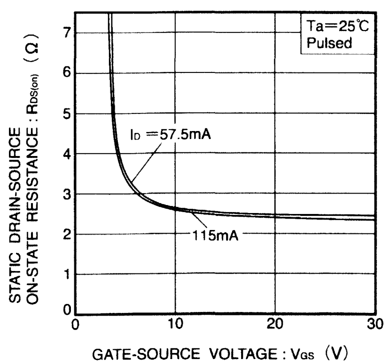


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

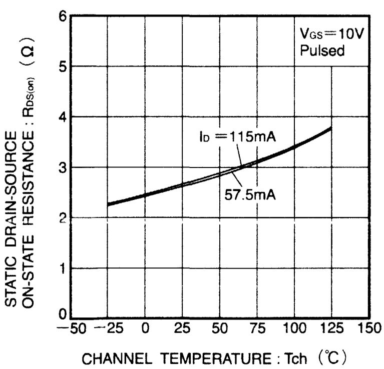


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

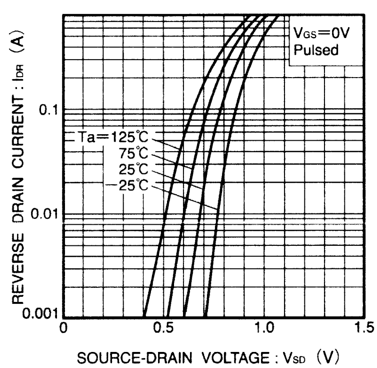


Fig.8 Reverse Drain Current vs. Source-Drain Voltage (I)

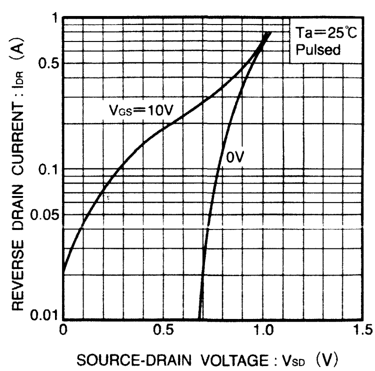


Fig.9 Reverse Drain Current vs. Source-Drain Voltage (II)

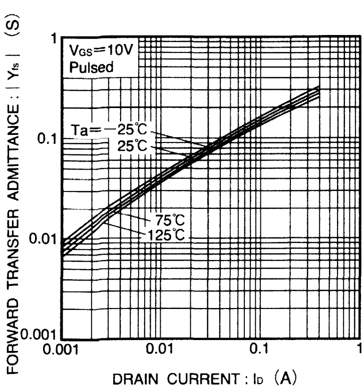


Fig.10 Forward Transfer Admittance vs. Drain Current

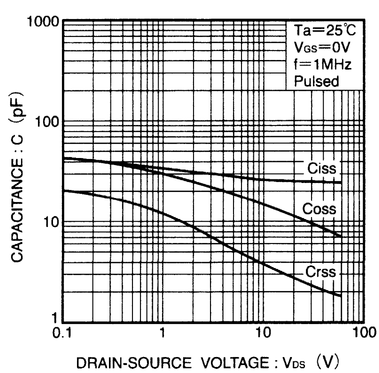


Fig.11 Typical Capacitance vs. Drain-Source Voltage

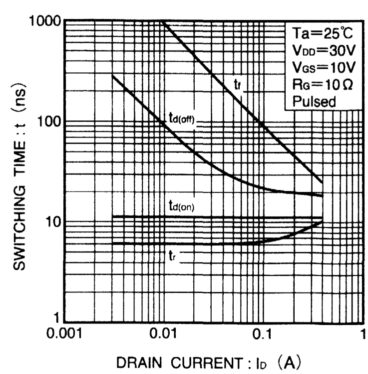


Fig.12 Switching Characteristics (See Figure. 13 and 14 for measurement circuits)

●Switching characteristics measurement circuit

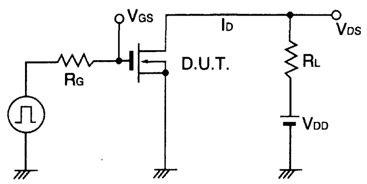


Fig.13 Switching Time Measurement Circuit

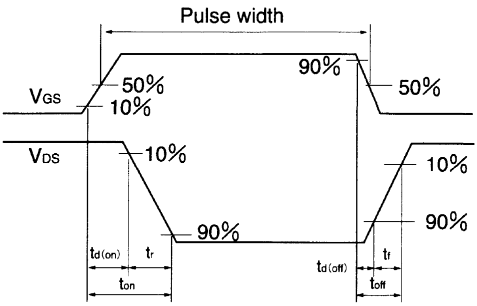


Fig.14 Switching Time Waveforms

General Purpose Transistor (–50V, 0.15A)

2SA1037AK / 2SA1576A / 2SA1774 / 2SA933AS

●Features

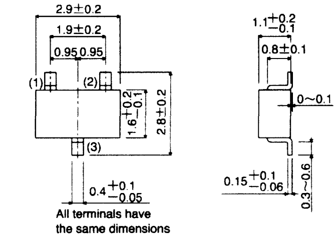
1) Excellent h_{FE} linearity.
2) Complements the 2SC2412K/ 2SC4081/2SC4617/2SC1740S.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)

2SA1037AK

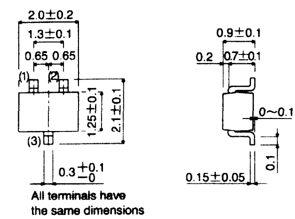


ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol: F ∗

2SA1576A

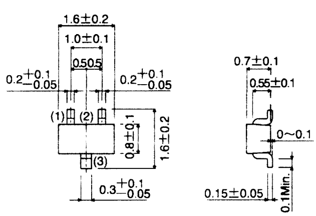


ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol: F ∗

2SA1774

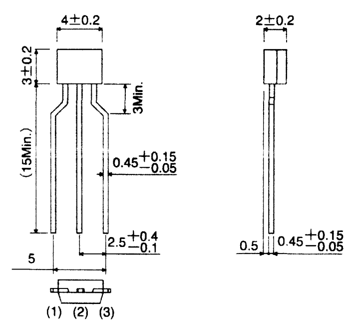


ROHM : EMT3

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol: F ∗

2SA933AS



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

∗ Denotes h_{FE}

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−60	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−6	V
Collector current		I_C	−0.15	A (DC)
Collector power dissipation	2SA1037AK, 2SA1576A	P_C	0.2	W
	2SA1774		0.15	
	2SA933AS		0.3	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−50mA/−5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=−6V, I_C=−1mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V, I_E=2mA, f=30MHz
Output capacitance	Cob	—	3.5	—	pF	V_{CB}=−12V, I_E=0A, f=1MHz

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping			
		Code	T146	T106	TL	TP
		Basic ordering unit (pieces)	3000	3000	3000	5000
2SA1037AK	QRS		○	—	—	—
2SA1576A	QRS		—	○	—	—
2SA1774	QRS		—	—	○	—
2SA933AS	QRS		—	—	—	○

h_{FE} values are classified as follows :

Item	Q	R	S
h_{FE}	120~270	180~390	270~560

● Electrical characteristic curves

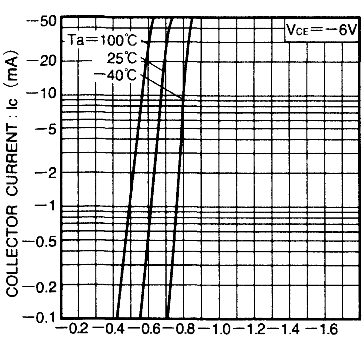


Fig.1 Grounded emitter propagation characteristics

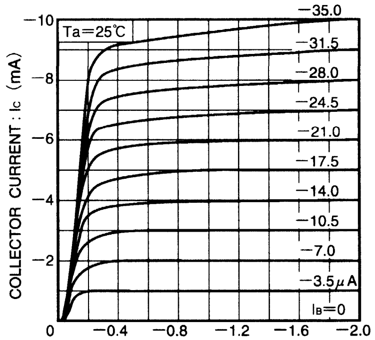


Fig.2 Grounded emitter output characteristics (Ⅰ)

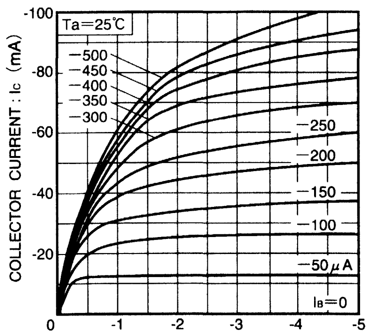


Fig.3 Grounded emitter output characteristics (Ⅱ)

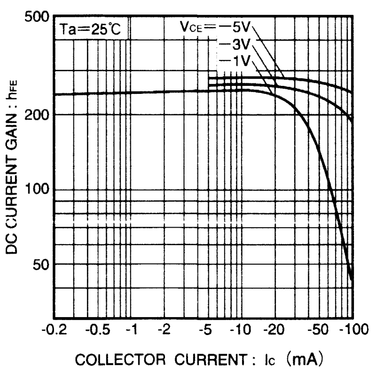


Fig.4 DC current gain vs. collector current (Ⅰ)

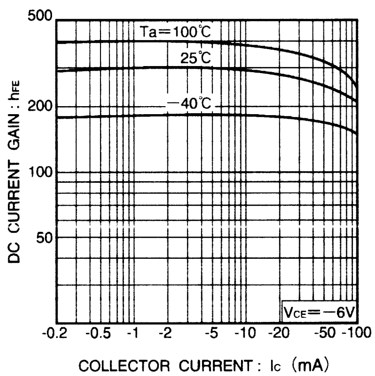


Fig.5 DC current gain vs. collector current (Ⅱ)

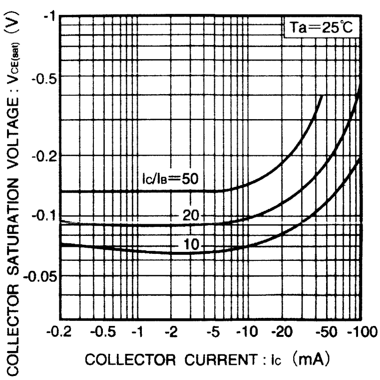


Fig.6 Collector-emitter saturation voltage vs. collector current (Ⅰ)

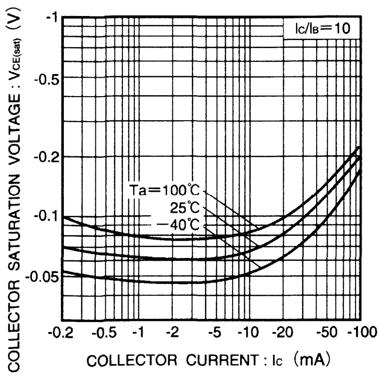


Fig.7 Collector-emitter saturation voltage vs. collector current (Ⅱ)

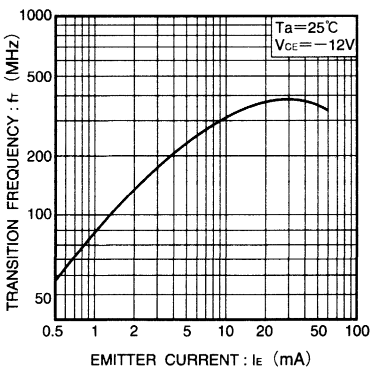


Fig.8 Gain bandwidth product vs. emitter current

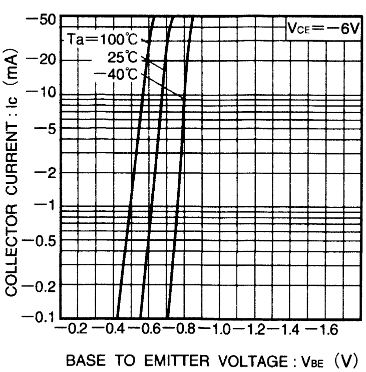


Fig.1 Grounded emitter propagation characteristics

Bi-polar transistors

Low $V_{CE(SAT)}$ Transistor (–20V, –3A)

2SB1424 / 2SA1585S

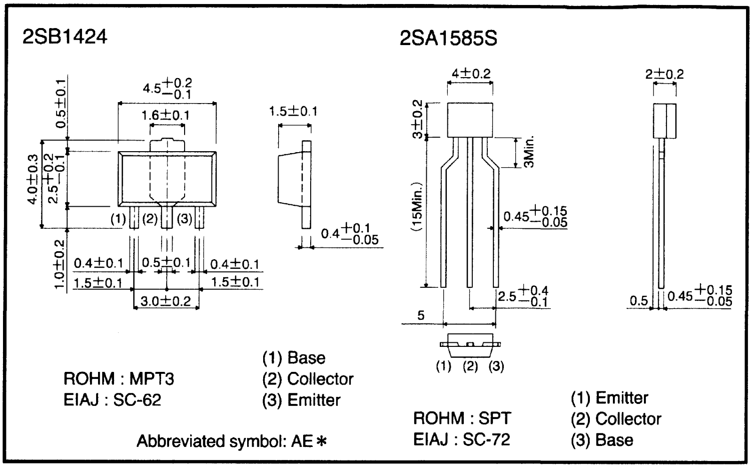
●Features

1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} = -0.2V$ (Typ.)
   ($I_C/I_B = -2A/-0.1A$)
2) Excellent DC current gain characteristics.
3) Complements the 2SD2150/2SC4115S.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)



∗ Denotes h_{FE}

●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−20	V
Collector-emitter voltage		V_{CEO}	−20	V
Emitter-base voltage		V_{EBO}	−6	V
Collector current	2SB1424	I_C	−3	A
	2SA1585S		−2	
		I_{CP}	−5	A (Pulse) ∗
Collector power dissipation	2SB1424	P_C	0.6	W
	2SA1585S		0.4	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

∗ Single pulse Pw=10ms

(96-596-A74)

ROHM

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−20	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−20	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−20V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−2A/−0.1A
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=−2V, I_C=−0.1A
Transition frequency	f_T	—	240	—	MHz	V_{CE}=−2V, I_E=0.5A, f=100MHz
Output capacitance	Cob	—	35	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

●Packaging specifications and f_{FE}

Type	h_{FE}	Package	Taping	
		Code	TP	T100
		Basic ordering unit (pieces)	5000	1000
2SA1585S	QR		○	—
2SB1424	QR		—	○

h_{FE} values are classified as follows :

Item	Q	R
h_{FE}	120∼270	180∼390

●Electrical characteristic curves

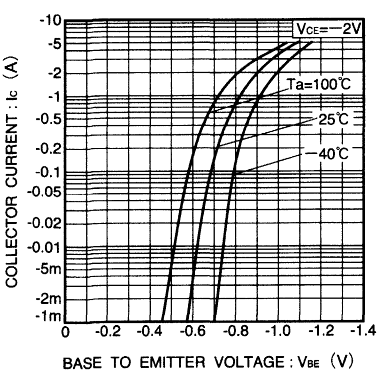


Fig.1 Grounded emitter propagation characteristics

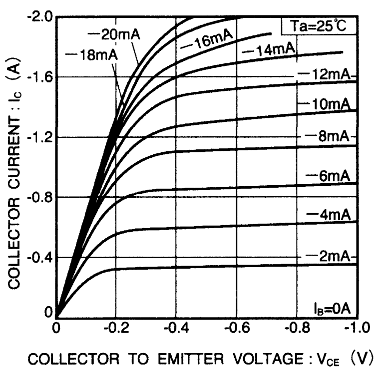


Fig.2 Grounded emitter output characteristics (I)

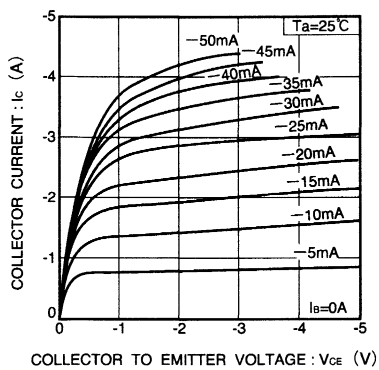


Fig.3 Grounded emitter output characteristics (II)

●Electrical characteristic curves

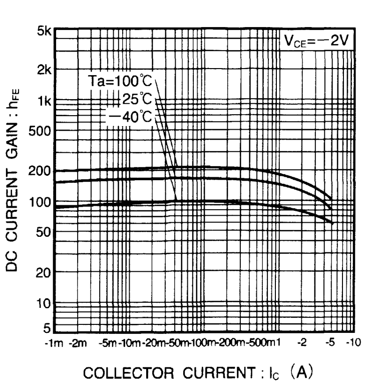


Fig.4 DC current gain vs. collector current

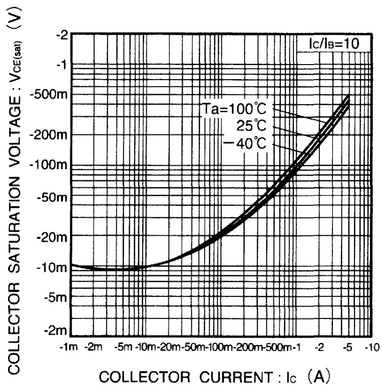


Fig.5 Collector-emitter saturation voltage vs. collector current (Ⅰ)

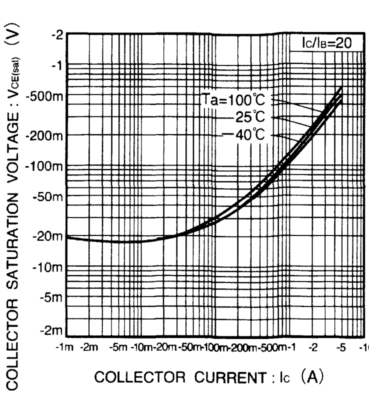


Fig.6 Collector-emitter saturation voltage vs. collector current (Ⅱ)

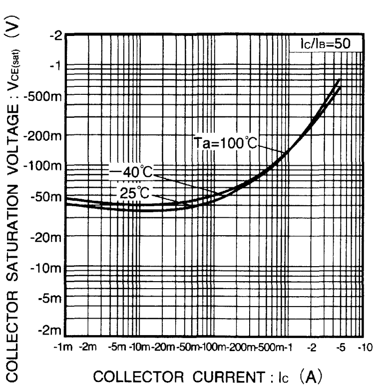


Fig.7 Collector-emitter saturation voltage vs. collector current (Ⅲ)

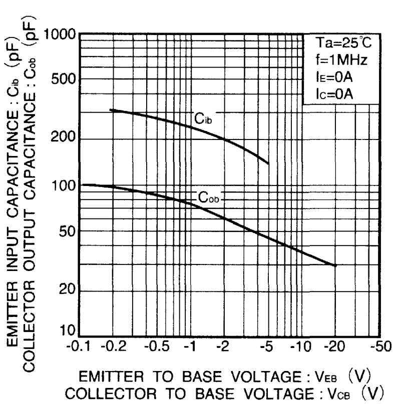


Fig.8 Gain bandwidth product vs. emitter current
Collector output capacitance vs. collector-base voltage

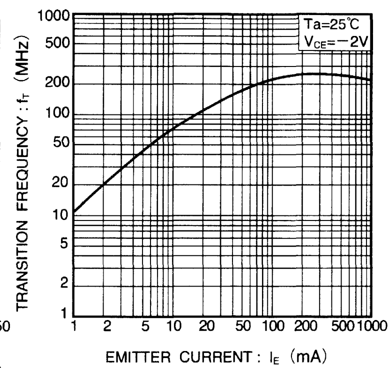


Fig.9 Emitter input capacitance vs. emitter base voltage

Medium Power Transistor (−32V, − 0.5A)

2SA1036K/2SA1577/2SA854S

●Features

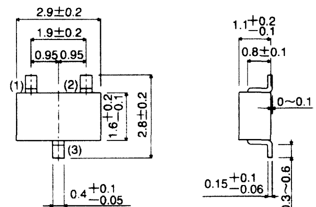
1) Large Ic.
$I_{CMax.} = -500mA$
2) Low $V_{CE(sat)}$. Optimal for low-voltage operation.
3) Complements the 2SC2411K/ 2SC1741S/2SC4097.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)

2SA1036K



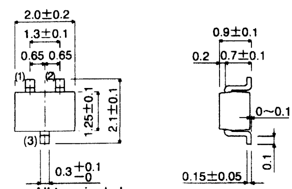
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol: H∗

2SA1577



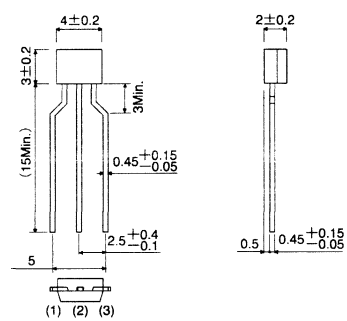
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol: H∗

2SA854S



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

∗ Denotes hFE

● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−40	V	
Collector-emitter voltage	V_{CEO}	−32	V	
Emitter-base voltage	V_{EBO}	−5	V	
Collector current	I_C	−0.5	A	*
Collector power dissipation	P_C	0.2	W	
Junction temperature	Tj	150	°C	
Storage temperature	Tstg	−55~150	°C	

* $P_{C\,MAX.}$ must not be exceeded.

● Electrical characteristics (Ta = 25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−40	—	—	V	I_C=−100 μA
Collector-emitter breakdown voltage		BV_{CEO}	−32	—	—	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−5	—	—	V	I_E=−100 μA
Collector cutoff current		I_{CBO}	—	—	−1	μA	V_{CB}=−20V
Emitter cutoff current		I_{EBO}	—	—	−1	μA	V_{EB}=−4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	−0.4	V	I_C/I_B=−100mA/−10mA
DC current transfer ratio	2SA1036K, 2SA1577	h_{FE}	82	—	390	—	V_{CE}=−3V, I_C=−10mA
	2SA854S		120	—	390	—	I_C/I_B=−500mA/−50mA
Transition frequency		f_T	—	200	—	MHz	V_{CE}=−5V, I_E=20mA, f=100MHz
Output capacitance	2SA1036K, 2SA1577	Cob	—	7	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz
	2SA854S		—	8	—	pF	

● Packaging specifications and h_{FE}

		Package	Taping		
		Code	T146	T106	TP
Type	h_{FE}	Basic ordering unit (pieces)	3000	3000	5000
2SA1036K	PQR		○	—	—
2SA1577	PQR		—	○	—
2SA854S	QR		—	—	○

h_{FE} values are classified as follows.

Item	P	Q	R
h_{FE}	82~180	120~270	180~390

●Electrical characteristic curves

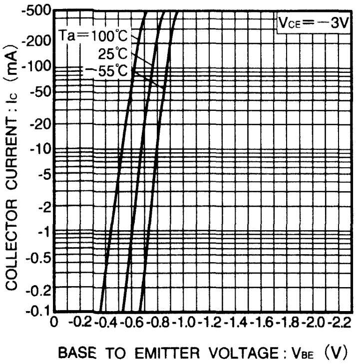


Fig.1 Grounded emitter propagation

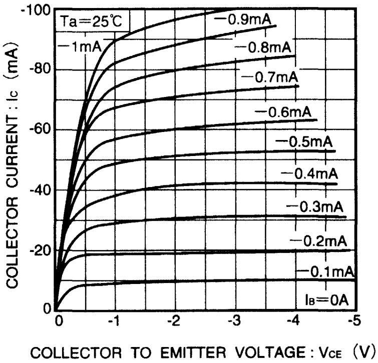


Fig.2 Grounded emitter output characteristics (I)

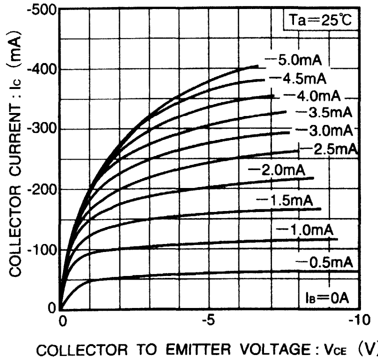


Fig.3 Grounded emitter output characteristics (II)

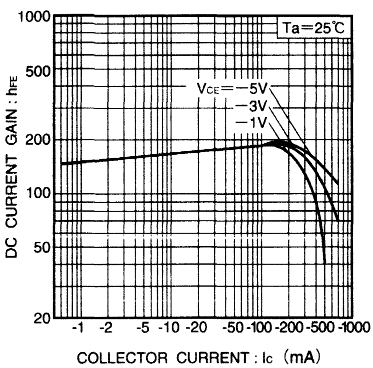


Fig.4 DC current gain vs. collector current (I)

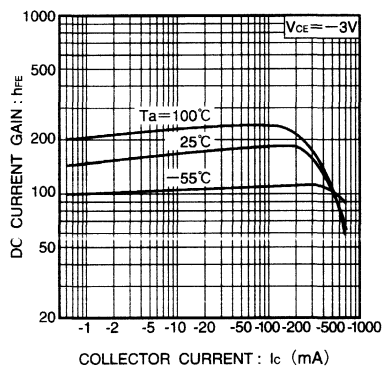


Fig.5 DC current gain vs. collector current (II)

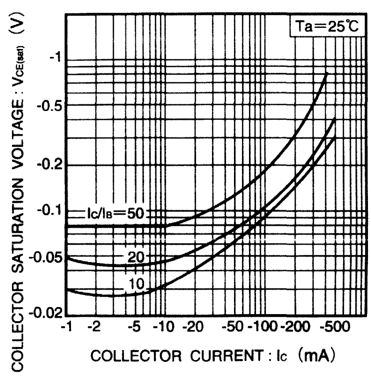


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

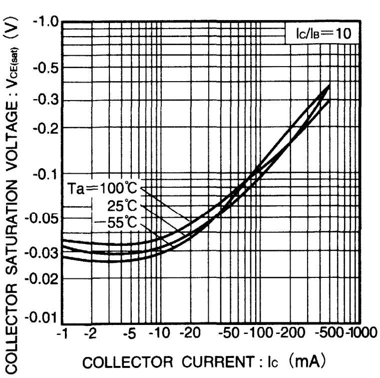


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

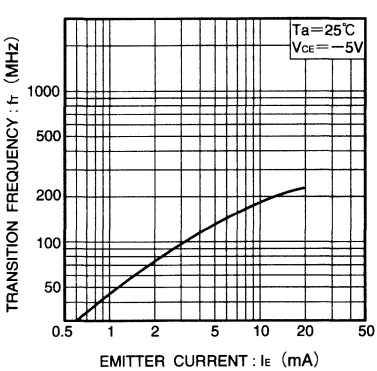


Fig.8 Gain bandwidth product vs. emitter current

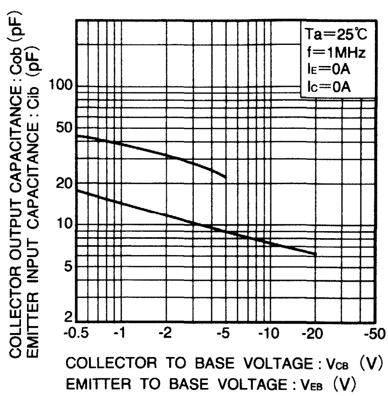


Fig.9 Collector output capacitance vs. collector-base voltage Emitter input capacitance vs. emitter-base voltage

Medium Power Transistor (−32V, −1A)

2SB1132/2SA1515S/2SB1237

●Features

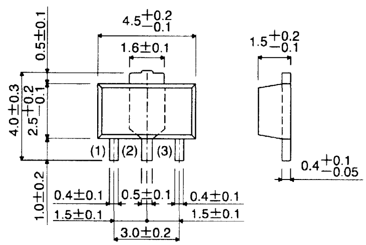
1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} = -0.2V$ (Typ.)
   ($I_C/I_B = -500mA/-50mA$)
2) Compliments 2SD1664/2SD1858.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)

2SB1132

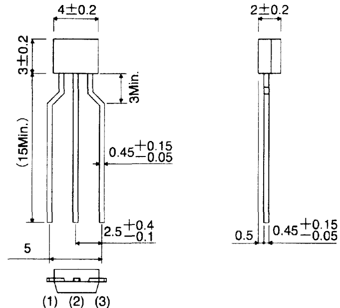


ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

Abbreviated symbol: BA∗

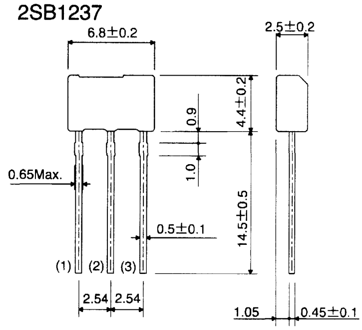
2SA1515S



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

2SB1237



ROHM : ATV

(1) Emitter
(2) Collector
(3) Base

*Denotes h_{FE}

(96-120-B12)

ROHM

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−40	V
Collector-emitter voltage		V_{CEO}	−32	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−1	A (DC)
			−2	A (Pulse) *1
Collector power dissipation	2SB1132	P_C	0.5	W
			2	W *2
	2SA1515S		0.3	W
	2SB1237		1	W *3
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55～150	℃

*1 Single pulse Pw=100ms
*2 On 40 x 40 x 0.7 mm ceramic board.
*3 Printed circuit board 1.7 mm thick, collector copper platingt 1cm² or large.

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−40	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage		BV_{CEO}	−32	—	—	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current		I_{CBO}	—	—	−0.5	μA	V_{CB}=−20V
Emitter cutoff current		I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	−0.2	−0.5	V	I_C/I_B=−500mA/−50mA *
DC current transfer ratio	2SB1132, 2SB1237	h_{FE}	82	—	390	—	V_{CE}=−3V, I_C=−0.1A *
	2SA1515S		120	—	390	—	
Transition frequency		f_T	—	150	—	MHz	V_{CE}=−5V, I_E=50mA, f=30MHz
Output capacitance		Cob	—	20	30	pF	V_{CB}=−10V, I_E=0A, f=1MHz

* Measured using pulse current.

●Packaging specifications and h_{FE}

		Package	Taping		
		Code	T100	TP	TU2
Type	h_{FE}	Basic ordering unit (pieces)	1000	5000	2500
2SB1132	PQR		○	—	—
2SA1515S	QR		—	○	—
2SB1237	PQR		—	—	○

h_{FE} values are classified as follows :

Item	P	Q	R
h_{FE}	82～180	120～270	180～390

Bi-polar transistors

● Electrical characteristic curves

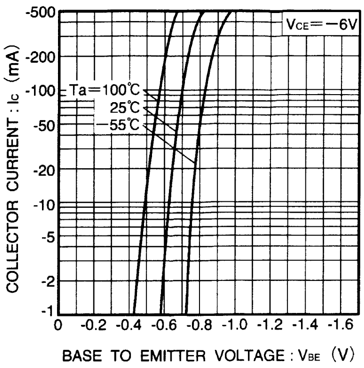


Fig.1 Grounded emitter propagation characteristics

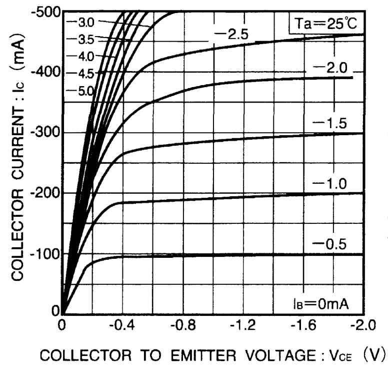


Fig.2 Grounded emitter output characteristics

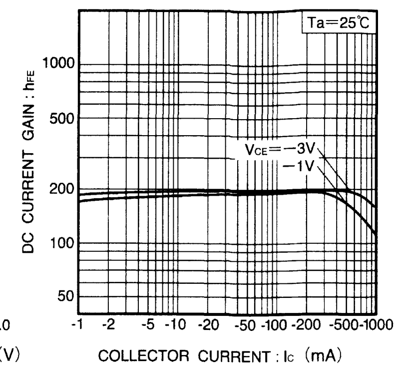


Fig.3 DC current gain vs. collector current (I)

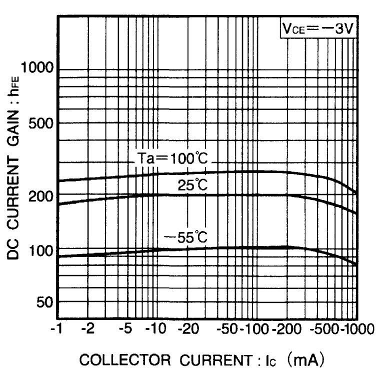


Fig.4 DC current gain vs. collector current (II)

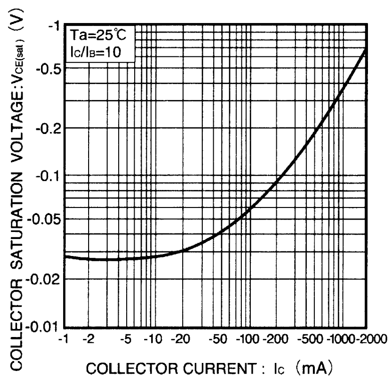


Fig.5 Collector-emitter saturation voltage vs. collector current

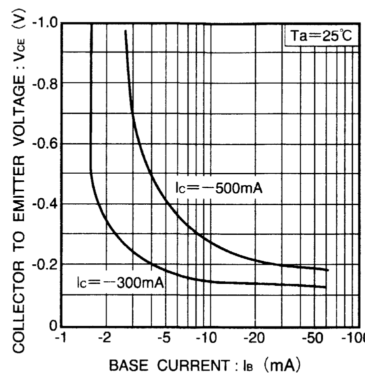


Fig.6 Collector-emitter saturation voltage vs. base current

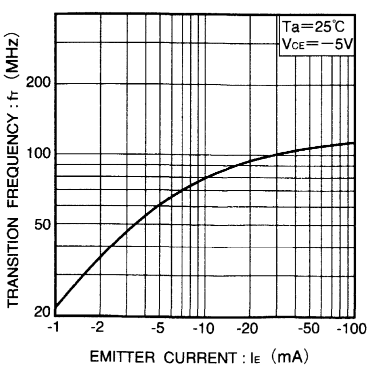


Fig.7 Gain bandwidth product vs. emitter current

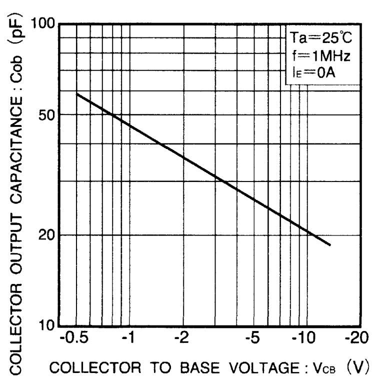


Fig.8 Collector output capacitance vs. collector-base voltage

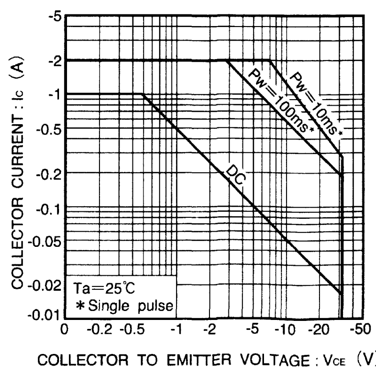


Fig.9 Safe operation area (2SB1132)

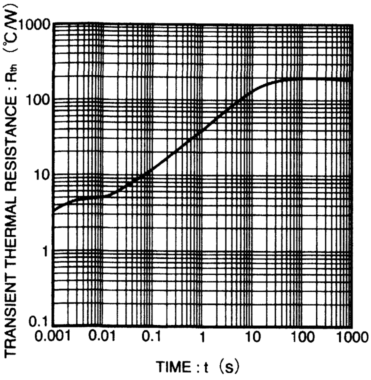


Fig.10 Transient thermal resistance (2SB1132)

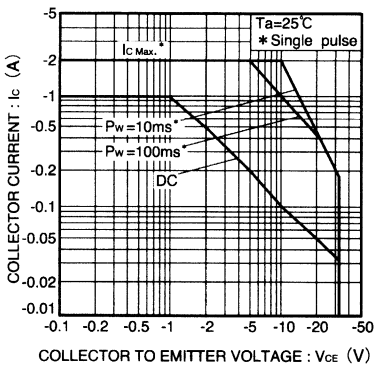


Fig.11 Safe operation area (2SB1237)

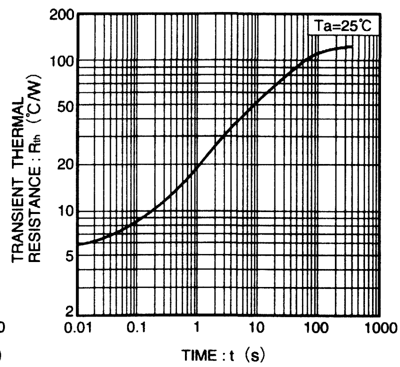


Fig.12 Transient thermal resistance (2SB1237)

Bi-polar transistors

Low Frequency Transistor (20V, 5A)

2SB1386/2SB1412/2SB1326/2SB1436

●Features

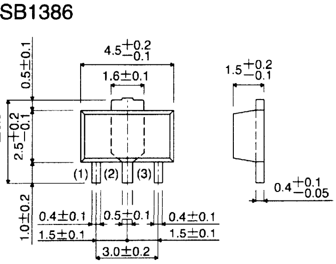
1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} = -0.35V$ (Typ.)
   $(I_C/I_B = -4A/-0.1A)$
2) Excellent DC current gain characteristics.
3) Complements the 2SD2098/2SD2118/2SD2097/2SD2166.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)

2SB1386

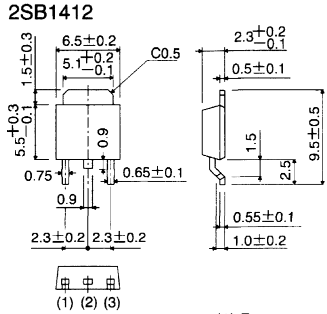


ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

Abbreviated symbol: BH *

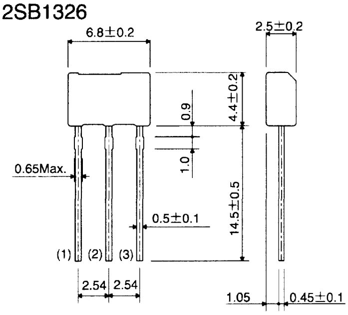
2SB1412



ROHM : CPT3
EIAJ : SC-63

(1) Base
(2) Collector
(3) Emitter

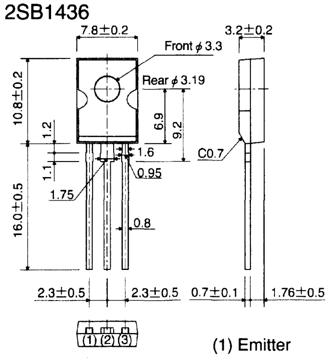
2SB1326



ROHM : ATV

(1) Emitter
(2) Collector
(3) Base

2SB1436



ROHM : TO-126FP

(1) Emitter
(2) Collector
(3) Base

* Denotes h_{FE}

96-141-B204)

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−30	V
Collector-emitter voltage		V_{CEO}	−20	V
Emitter-base voltage		V_{EBO}	−6	V
Collector current		I_C	−5	A (DC)
			−10	A (Pulse) ∗1
Collector power dissipation	2SB1386	P_C	0.5	W ∗2
			2	
	2SB1412		1	
			10	W (Tc=25℃)
	2SB1326		1	W ∗3
	2SB1436		1.5	
			5	W (Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 Single pulse Pw=10ms
∗2 On 40 x 40 x 0.7 mm ceramic board.
∗3 Printed circuit board glass epoxy board 1.6 mm thick with copper platingt 1cm² or larger.

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage		BV_{CBO}	−30	—	—	V	I_C=−50μA	
Collector-emitter breakdown voltage		BV_{CEO}	−20	—	—	V	I_C=−1mA	
Emitter-base breakdown voltage		BV_{EBO}	−6	—	—	V	I_E=−50μA	
Collector cutoff current		I_{CBO}	—	—	−0.5	μA	V_{CB}=−20V	
Emitter cutoff current		I_{EBO}	—	—	−0.5	μA	V_{EB}=−5V	
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	−1.0	V	I_C/I_B=−4A/−0.1A	∗
			−0.4	—	—		I_C/I_B=−2A/−0.05A	∗
DC current transfer ratio	2SB1386,2SB1412	h_{FE}	82	—	390	—	V_{CE}=−2V, I_C=−0.5A	∗
	2SB1326		120	—	390	—		∗
	2SB1436		180	—	390	—		∗
Transition frequency		f_T	—	120	—	MHz	V_{CE}=−6V, I_E=50mA, f=30MHz	
Output capacitance		Cob	—	60	—	pF	V_{CB}=−20V, I_E=0A, f=1MHz	

∗Measured using pulse current.

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping			Bulk
		Code	T100	TL	TV2	—
		Basic ordering unit (pieces)	1000	2500	2500	1000
2SB1386	PQR		○	—	—	—
2SB1412	PQR		—	○	—	—
2SB1326	QR		—	—	○	—
2SB1436	R		—	—	—	○

h_{FE} values are classified as follows :

Item	P	Q	R
h_{FE}	82～180	120～270	180～390

●Electrical characteristic curves

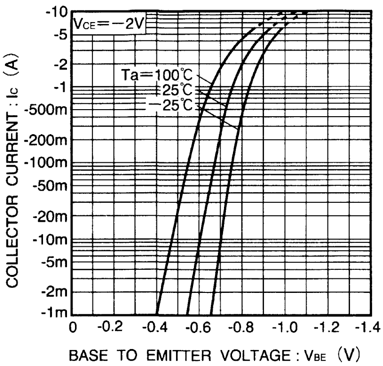


Fig.1 Grounded emitter propagation characteristics

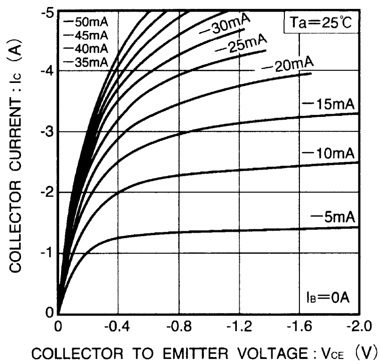


Fig.2 Grounded emitter output characteristics

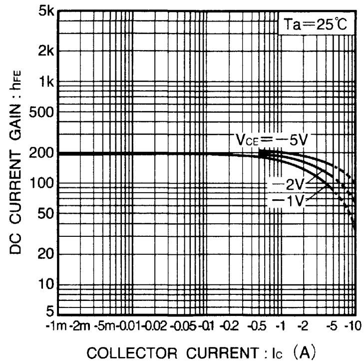


Fig.3 DC current gain vs. collector current (I)

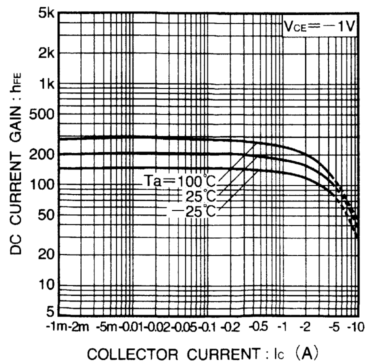


Fig.4 DC current gain vs. collector current (II)

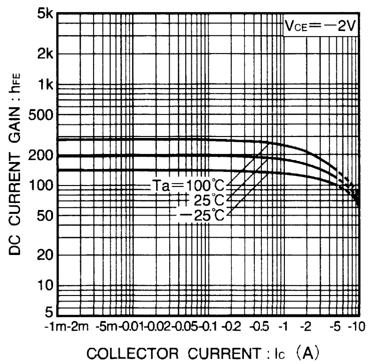


Fig.5 DC current gain vs. collector current (III)

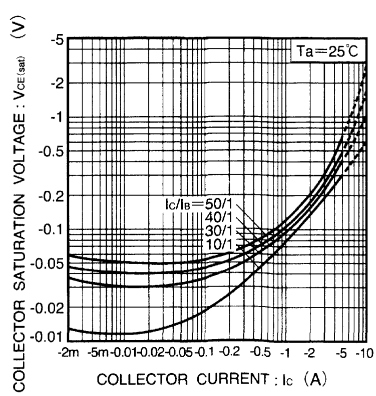


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

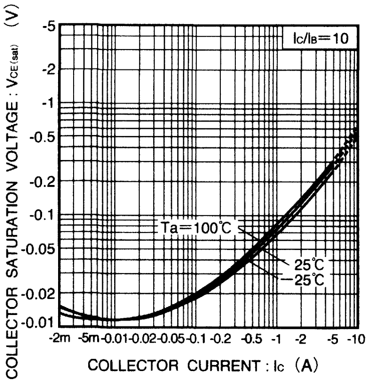


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

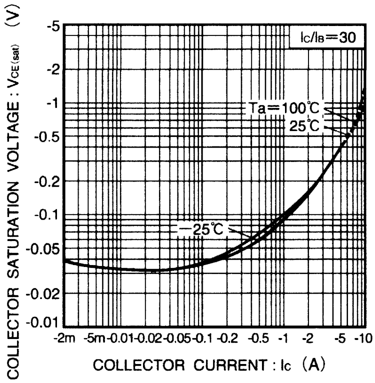


Fig.8 Collector-emitter saturation voltage vs. collector current (III)

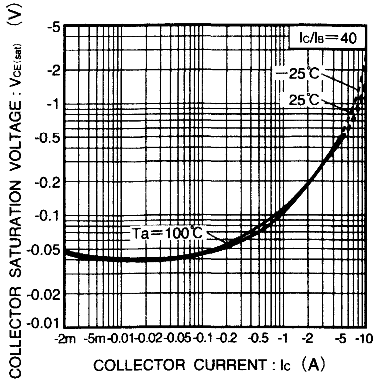


Fig.9 Collector-emitter saturation voltage vs. collector current (IV)

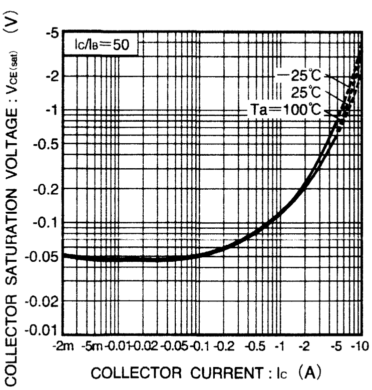


Fig.10 Collector-emitter saturation voltage vs. collector current (V)

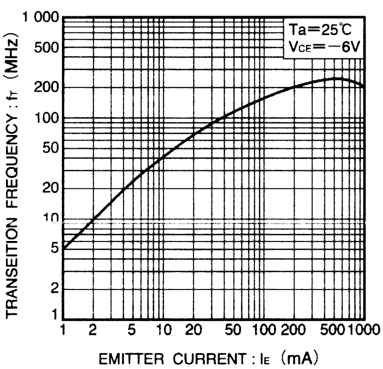


Fig.11 Gain bandwidth product vs. emitter current

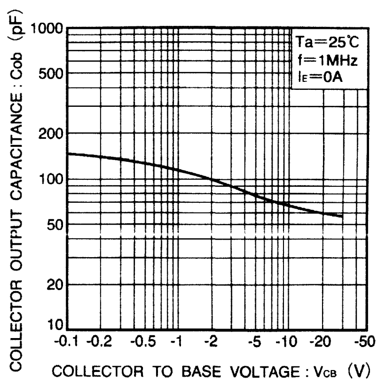


Fig.12 Collector output capacitance vs. collector-base voltage

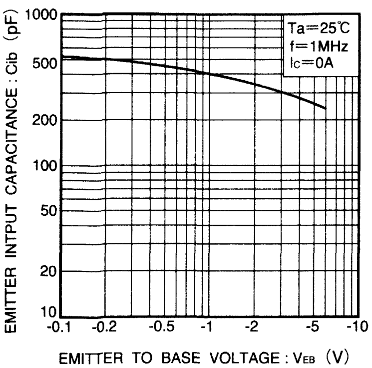


Fig.13 Emitter input capacitance vs. emitter-base voltage

Medium power Transistor(–32V, –2A)

2SB1188/2SB1182/2SB1240/2SB891F/ 2SB822/2SB1277/2SB911M

●Features

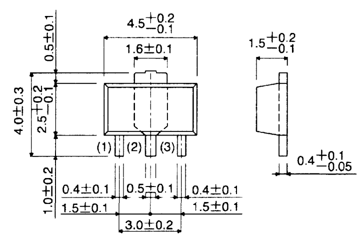
1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} = -0.5V$ (Typ.)
   $(I_C/I_B = -2A/-0.2A)$
2) Complements the 2SD1766/ 2SD1758/2SD1862/2SD1189F/ 2SD1055/2SD19192/SD1227M.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)

2SB1188

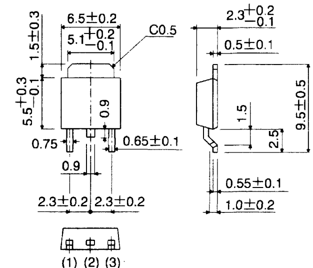


ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

Abbreviated symbol: BC ∗

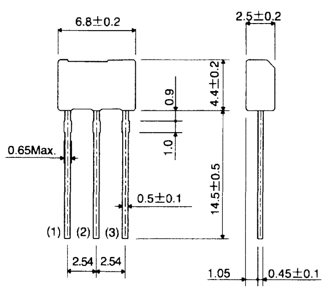
2SB1182



ROHM : CPT3
EIAJ : SC-63

(1) Base
(2) Collector
(3) Emitter

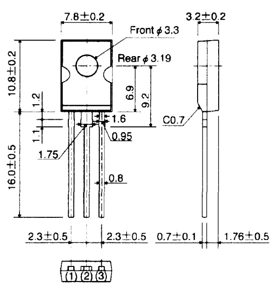
2SB1240



ROHM : ATV

(1) Emitter
(2) Collector
(3) Base

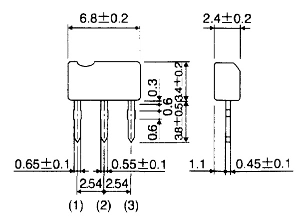
2SB891F



ROHM : TO-126FP

(1) Emitter
(2) Collector
(3) Base

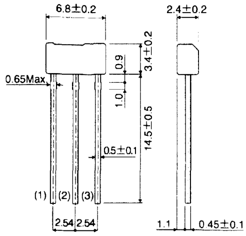
2SB822



ROHM : FTR

(1) Emitter
(2) Collector
(3) Base

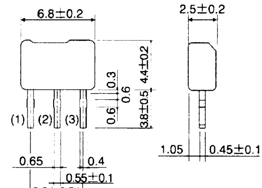
2SB1277



ROHM : FTL

(1) Emitter
(2) Collector
(3) Base

2SB911M



ROHM : ATR
EIAJ : SC-71

(1) Emitter
(2) Collector
(3) Base

*Denotes h_{FE}

(96-131-B24)

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−40	V
Collector-emitter voltage		V_{CEO}	−32	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−2	A (DC)
			−3	A (Pulse) ∗1
Collector power dissipation	2SB1188	P_C	0.5	W ∗2
			2	
	2SB1182		10	W(Tc=25℃)
	2SB1240,2SB911M		1	W ∗3
	2SB891F		1.2	
			5	W(Tc=25℃)
	2SB822,2SB1277		0.75	W
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 Single pulse Pw=100ms
∗2 On 40 x 40 x 0.7 mm ceramic board is used.
∗3 Printed circuit board 1.7mm thick, collector copper plating 1cm² or larger.

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−40	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage		BV_{CEO}	−32	—	—	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current		I_{CBO}	—	—	−1	μA	V_{CB}=−20V
Emitter cutoff current		I_{EBO}	—	—	−1	μA	V_{EB}=−4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	−0.5	−0.8	V	I_C/I_B=−2A/−0.2A ∗
DC current transfer ratio	2SB1188,2SB1182 2SB1240,2SB891F	h_{FE}	82	—	390	—	V_{CE}=−3V, I_C=−0.5A ∗
	2SB822,2SB1277 2SB891F		120	—	390		
Transition frequency		f_T	—	100	—	MHz	V_{CE}=−5V, I_E=0.5A, f=30MHz
Output capacitance		Cob	—	50	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

* Measured using pulse current.

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping				Bulk	
		Code	T100	TL	TU2	TL2	—	—
		Basic ordering unit (pieces)	1000	2500	2500	2500	1000	2000
2SB1188	PQR		○	—	—	—	—	—
2SB1182	PQR		—	○	—	—	—	—
2SB1240	QR		—	—	○	—	—	—
2SB891F	PQR		—	—	—	—	○	—
2SB822	Q		—	—	—	—	—	○
2SB1277	Q		—	—	—	○	—	—
2SB911M	Q		—	—	—	—	—	○

h_{FE} values are classified as follows :

Item	P	Q	R
h_{FE}	82~180	120~270	180~390

●Electrical characteristic curves

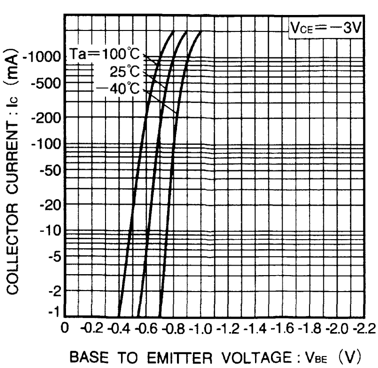


Fig.1 Grounded emitter propagation characteristics

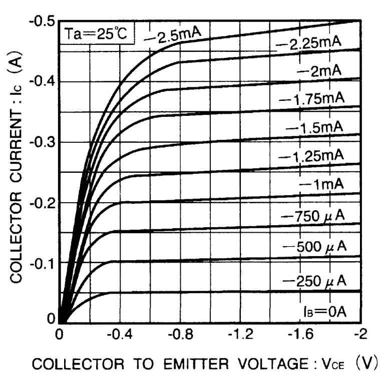


Fig.2 Grounded emitter output characteristics

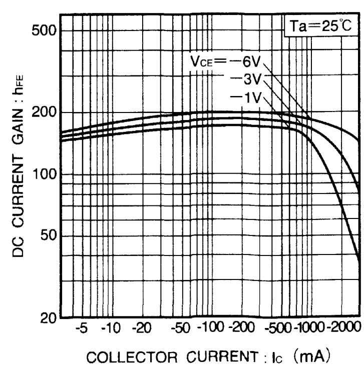


Fig.3 DC current gain vs. collector current (I)

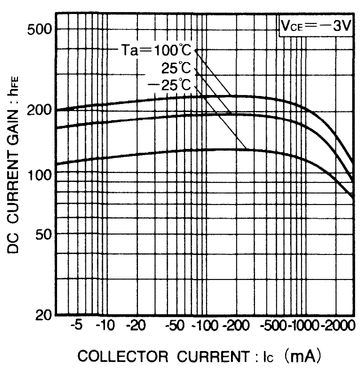


Fig.4 DC current gain vs. collector current (Ⅱ)

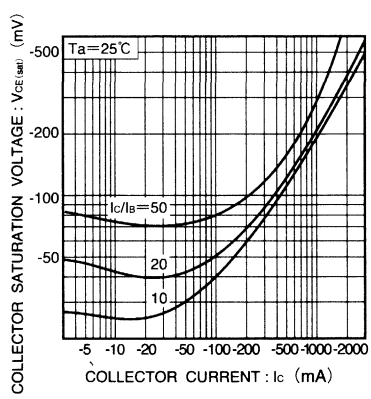


Fig.5 Collector-emitter saturation voltage vs. collector current (Ⅰ)

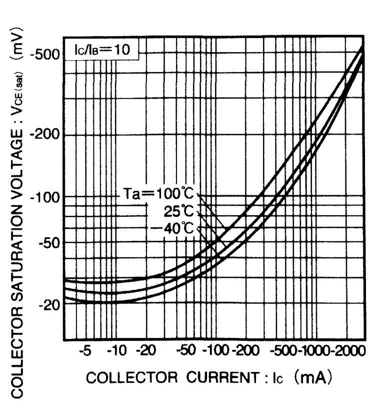


Fig.6 Collector-emitter saturation voltage vs. collector current (Ⅱ)

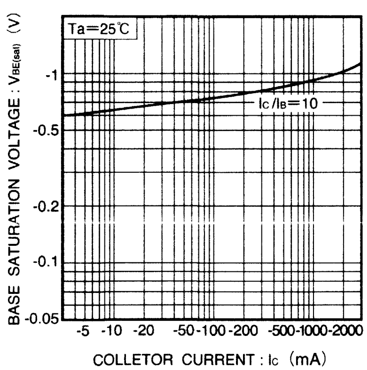


Fig.7 Base-emitter saturation voltage vs. collector current

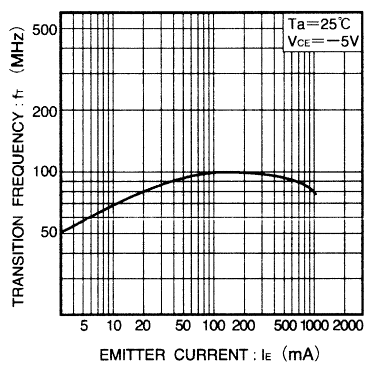


Fig.8 Gain bandwidth product vs. emitter current

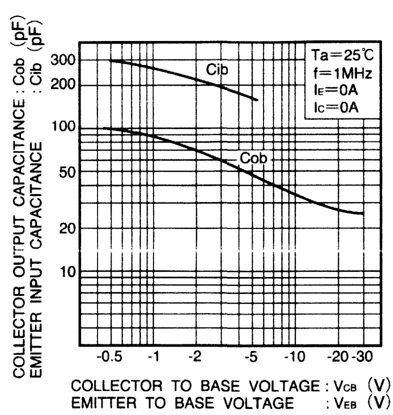


Fig.9 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

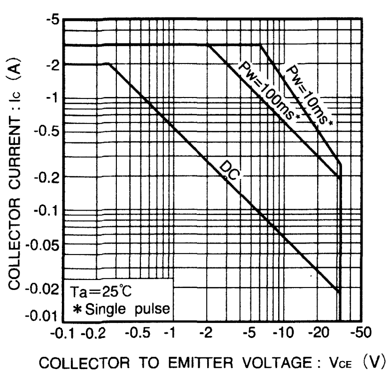


Fig.10 Safe operation area (2SB1188)

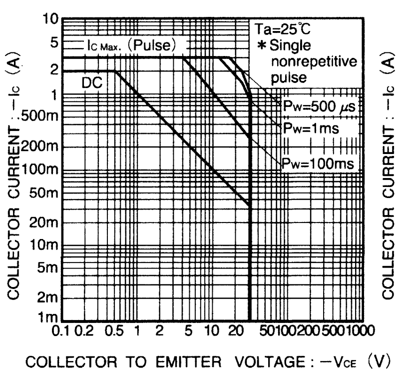


Fig.11 Safe operation area (2SB1182)

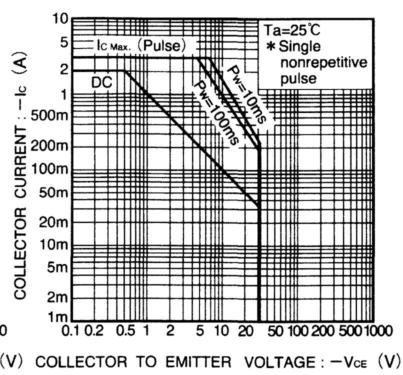


Fig.12 Safe operation area (2SB891)

Bi-polar transistors

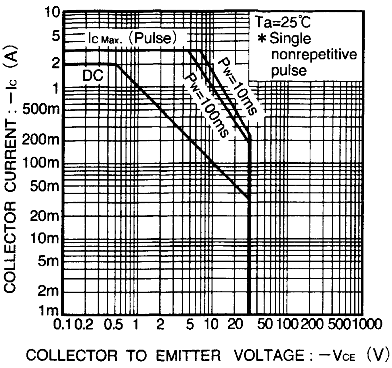


Fig.13 Safe operation area (2SB891 (TO-126M))

Power Transistor (– 80V, –1A)

2SB1260/2SB1181/2SB1241

● Features

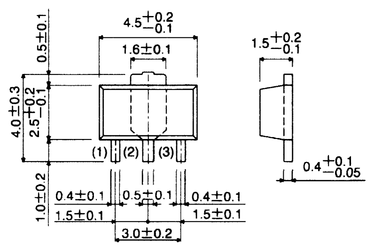
1) High breakdown voltage and high current.
   $V_{CEO} = -80V$, $I_C = -1A$
2) Good h_{FE} linearity.
3) Low $V_{CE(sat)}$.
4) Complements the 2SD1898 / 2SD1863 / 2SD1733.

● Structure

Epitaxial planar type
PNP silicon transistor

● External dimensions (Units: mm)

2SB1260

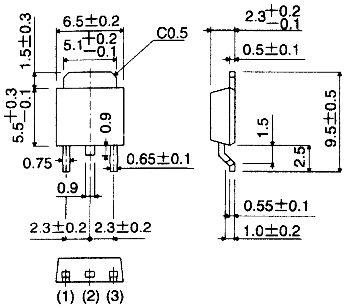


ROHM : MPT3
EIAJ : SC-62

Abbreviated symbol: BH ∗

(1) Base
(2) Collector
(3) Emitter

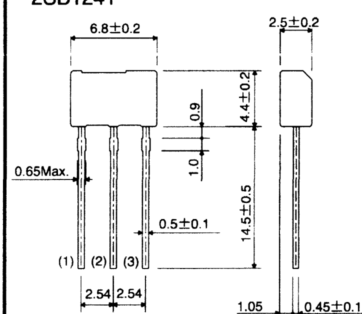
2SB1181



ROHM : CPT3
EIAJ : SC-63

(1) Base
(2) Collector
(3) Emitter

2SB1241



ROHM : ATV

(1) Emitter
(2) Collector
(3) Base

∗ Denotes h_{FE}

(96-123-B54)

● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−80	V
Collector-emitter voltage		V_{CEO}	−80	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−1	A (DC)
		I_{CP}	−2	A (Pulse) ∗1
Collector power dissipation	2SB1260	P_C	0.5	W
			2	W ∗2
	2SB1241, 2SB1181		1	W ∗3
	2SB1181		10	W (Tc=25°C)
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55∼150	°C

∗1 Single pulse Pw=100ms
∗2 On 40 x 40 x 0.7 mm ceramic board.
∗3 Printed circuit board 1.7mm thick, collector copper plating 1cm² or larger.

● Electrical characteristics (Ta = 25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−80	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage		BV_{CEO}	−80	—	—	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current		I_{CBO}	—	—	−1	μA	V_{CB}=−60V
Emitter cutoff current		I_{EBO}	—	—	−1	μA	V_{EB}=−4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	−0.4	V	I_C/I_B=−500mA/−50mA
DC current transfer ratio	2SB1260, 2SB1181	h_{FE}	82	—	390	—	V_{CE}=−3V, I_C=−0.1A
	2SB1241		120	—	390	—	
Transition frequency	2SB1260, 2SB1241	f_T	—	100	—	MHz	V_{CE}=−5V, I_E=50mA, f=30MHz
	2SB1181		—	100	—	MHz	V_{CE}=−10V, I_E=50mA, f=30MHz
Output capacitance		Cob	—	25	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

● Packaging specifications and h_{FE}

		Package	Taping	
		Code	TL	TV2
Type	h_{FE}	Basic ordering unit (pieces)	2500	2500
2SB1260	PQR		○	—
2SB1241	QR		—	○
2SB1181	PQR		○	—

h_{FE} values are classified as follows :

Item	P	Q	R
h_{FE}	82∼180	120∼270	180∼390

● Electrical characteristic curves

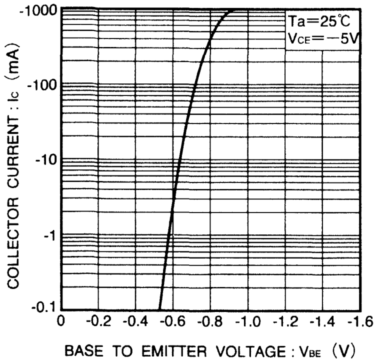


Fig.1 Grounded emitter propagation characteristics

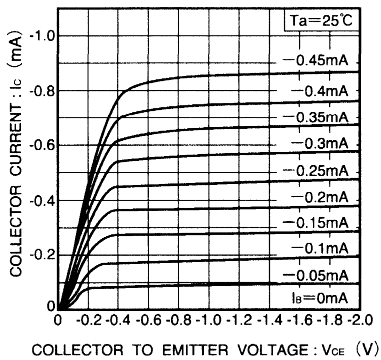


Fig.2 Grounded emitter output characteristics

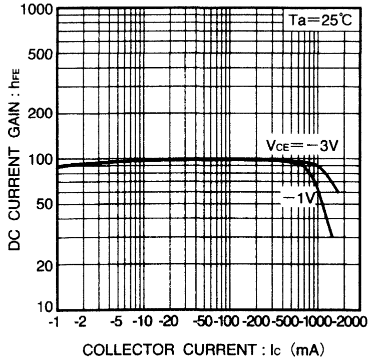


Fig.3 DC current gain vs. collector current

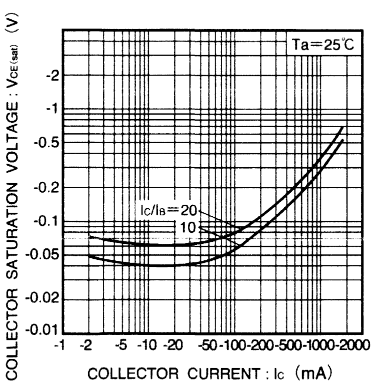


Fig.4 Collector-emitter saturation voltage vs. collector current

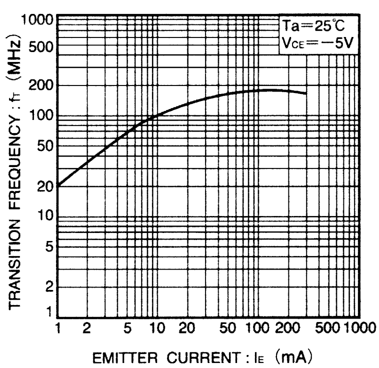


Fig.5 Gain bandwidth product vs. emitter current

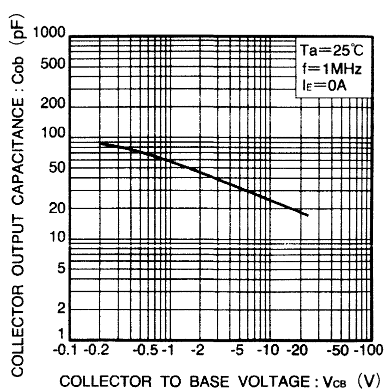


Fig.6 Collector output capacitance vs. collector-base voltage

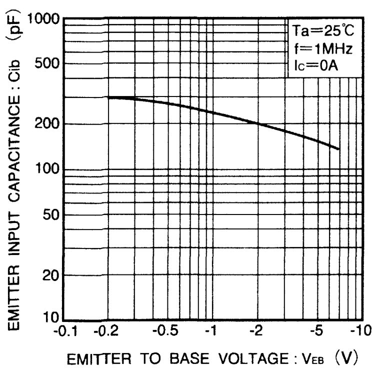


Fig. 7 Emitter input capacitance vs. emitter-base voltage

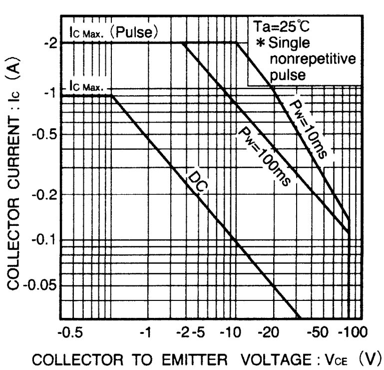


Fig. 8 Safe operating area (2SB1260)

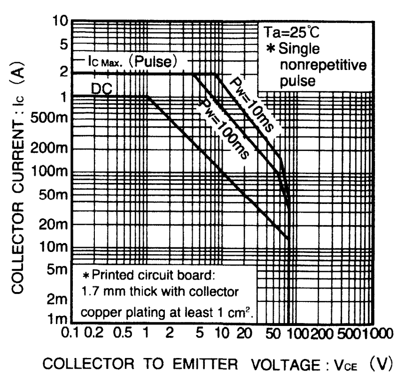


Fig.9 Safe operating area (2SB1241)

●Electrical characteristic curves

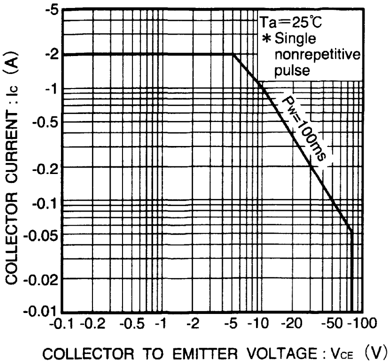


Fig.10 Safe operating area (2SB1181)

Power Transistor (−60V, −3A)

2SB1184/2SB1243/2SB1185

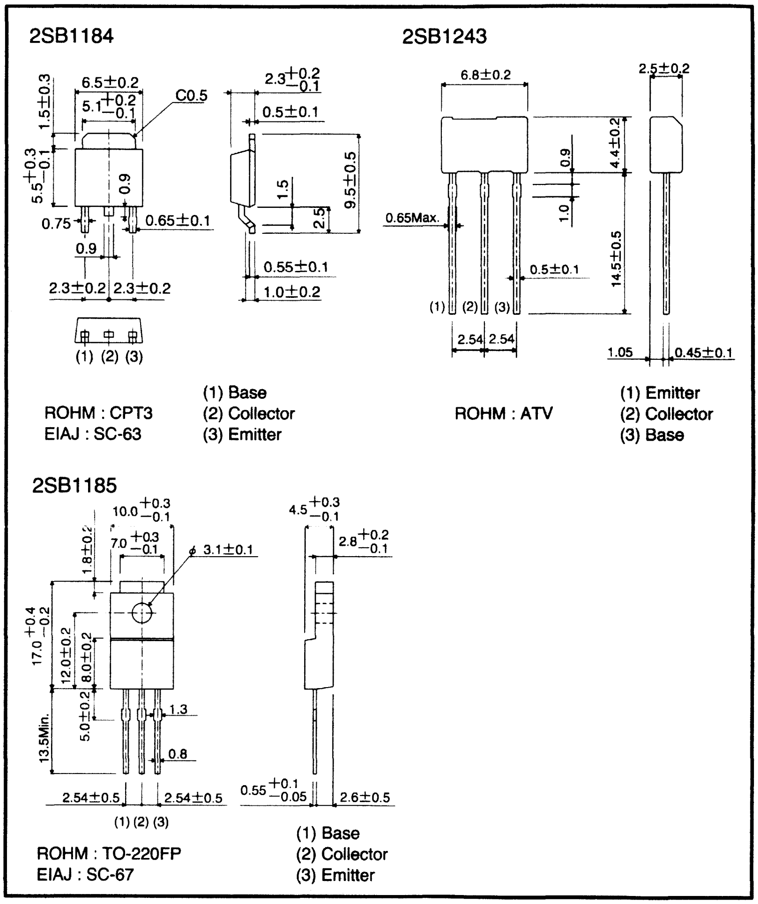
●Features

1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} = -0.5V$ (Typ.)
   ($I_C/I_B = -2A/-0.2A$)
2) Complements the 2SD1760/2SD1864/2SD1762.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−60	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−3	A (DC)
		I_{CP}	−4.5	A (Pulse) ∗1
Collector power dissipation	2SB1184	P_C	1	W
			15	W (Tc=25℃)
	2SB1243		1	W ∗2
	2SB1185		2	W ∗2
			25	W (Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 Single pulse Pw=100ms
∗2 Printed circuit board 1.7mm thick, collector copper plating 1cm² or larger.

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage		BV_{CBO}	−60	—	—	V	I_C=−50μA	
Collector-emitter breakdown voltage		BV_{CEO}	−50	—	—	V	I_C=−1mA	
Emitter-base breakdown voltage		BV_{EBO}	−5	—	—	V	I_E=−50μA	
Collector cutoff current		I_{CBO}	—	—	−1	μA	V_{CB}=−40V	
Emitter cutoff current		I_{EBO}	—	—	−1	μA	V_{EB}=−4V	
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	−1	V	I_C/I_B=−2A/−0.2A	∗
Base-emitter saturation voltage		$V_{BE(sat)}$	—	—	−1.5	V	I_C/I_B=−2A/−0.2A	∗
DC current transfer ratio	2SB1184, 2SB1243	h_{FE}	82	—	390	—	V_{CE}=−3V, I_C=−0.5A	∗
	2SB1185		60	—	320	—		
Transition frequency		f_T	—	70	—	MHz	V_{CE}=−5V, I_E=0.5A, f=30MHz	
Output capacitance		Cob	—	50	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz	

∗ Measured using pulse current.

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping		Bulk
		Code	TL	TV2	—
		Basic ordering unit (pieces)	2500	2500	200
2SB1184	PQR		○	—	—
2SB1243	PQR		—	○	—
2SB1185	DEF		—	—	○

h_{FE} values are classified as follows :

Item	D	E	F
h_{FE}	60~120	100~200	160~320

Item	P	Q	R
h_{FE}	82~180	120~270	180~390

●Electrical characteristic curves

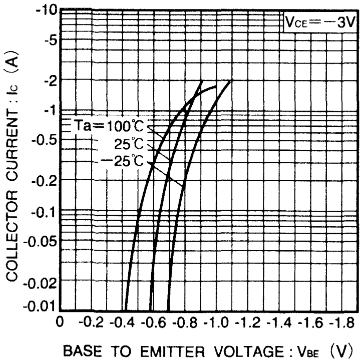


Fig.1 Grounded emitter propagation characteristics

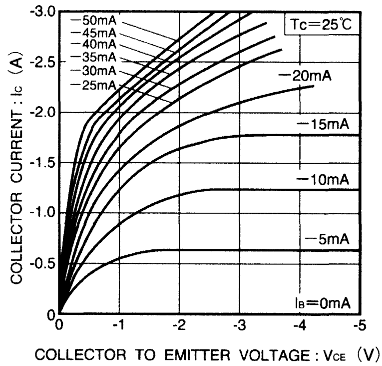


Fig.2 Grounded emitter output characteristics (I)

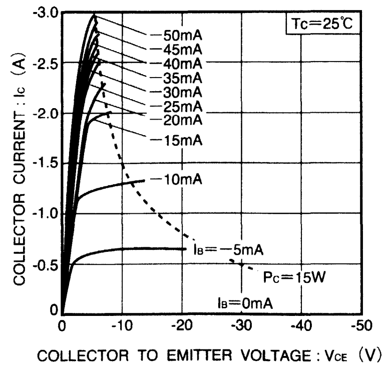


Fig.3 Grounded emitter output characteristics (Ⅱ)

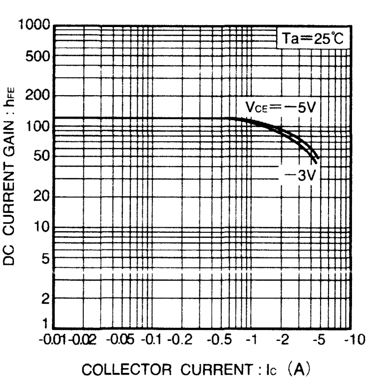


Fig.4 DC current gain vs. collector current (I)

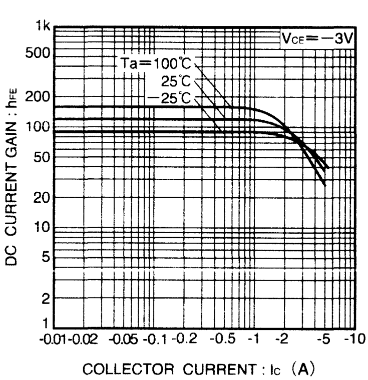


Fig.5 DC current gain vs. collector current (Ⅱ)

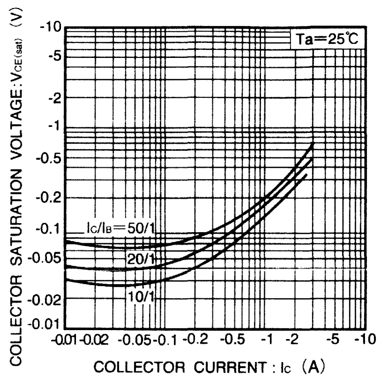


Fig.6 Collector-emitter saturation voltage vs.collector current

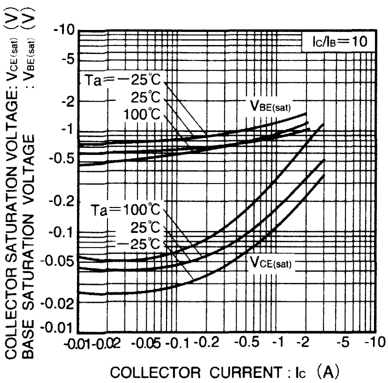


Fig.7 Collector-emitter saturation voltage vs. collector current
Base-emitter saturation voltage vs. collector current

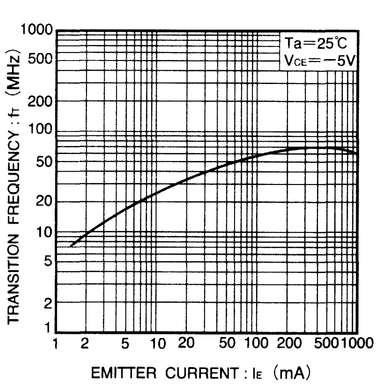


Fig.8 Gain bandwidth product vs. emitter current

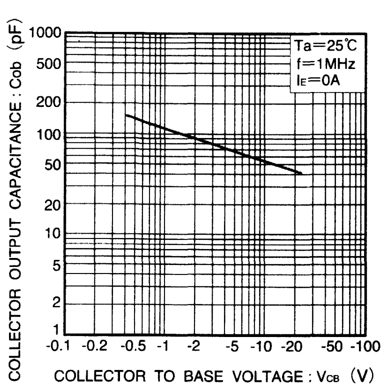


Fig.9 Collector output capacitance vs. collector base voltage

Bi-polar transistors

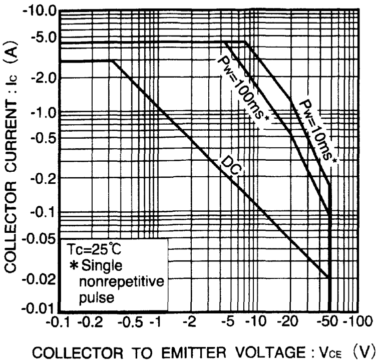


Fig.10 Safe operation area (2SB1184)

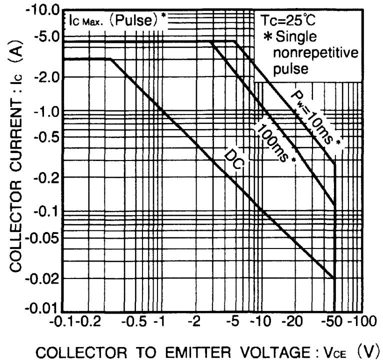


Fig.11 Safe operation area (2SB1243)

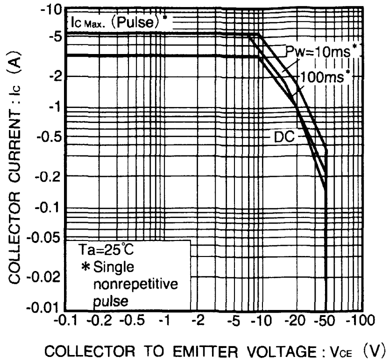


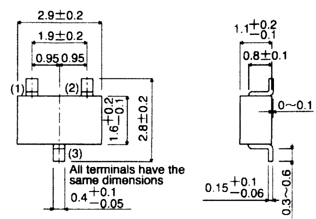
Fig.12 Safe operation area (2SB1185)

Low Frequency Transistor (−32V, − 0.8A)
2SB1197K

●Features
1) Low $V_{CE(sat)}$.
$V_{CE(sat)} \leqq -0.5V$
$(I_C / I_B = -0.5A / -50mA)$
2) $I_C = -0.8A$.
3) Complements the 2SD1781K.

●Structure
Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)



ROHM : SMT3
EIAJ : SC-59
Abbreviated symbol: AH ∗
(1) Emitter
(2) Base
(3) Collector

∗ Denotes h_{FE}

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−40	V
Collector-emitter voltage	V_{CEO}	−32	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−0.8	A
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−40	−	−	V	$I_C = -50\mu A$
Collector-emitter breakdown voltage	BV_{CEO}	−32	−	−	V	$I_C = -1mA$
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	$I_E = -50\mu A$
Collector cutoff current	I_{CBO}	−	−	−0.5	μA	$V_{CB} = -20V$
Emitter cutoff current	I_{EBO}	−	−	−0.5	μA	$V_{EB} = -4V$
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−0.5	V	$I_C/I_B = -0.5A/-50mA$
DC current transfer ratio	h_{FE}	120	−	390	−	$V_{CE} = -3V$, $I_C = -100mA$
Transition frequency	f_T	50	200	−	MHz	$V_{CE} = -5V$, $I_E = 50mA$, f = 100MHz
Output capacitance	Cob	−	12	30	pF	$V_{CB} = -10V$, $I_E = 0A$, f = 1MHz

(96-134-B92)

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping
		Code	T146
		Basic ordering unit (pieces)	3000
2SB1197K	QR		○

h_{FE} values are classified as follows :

Item	Q	R
h_{FE}	120～270	180～390

●Electrical characteristic curves

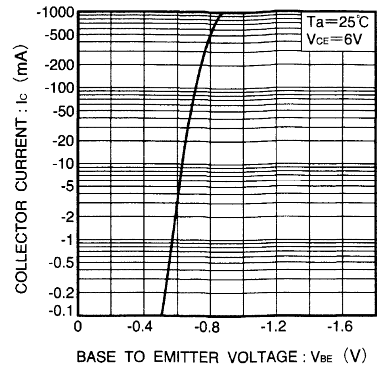


Fig.1 Grounded emitter propagation characteristics

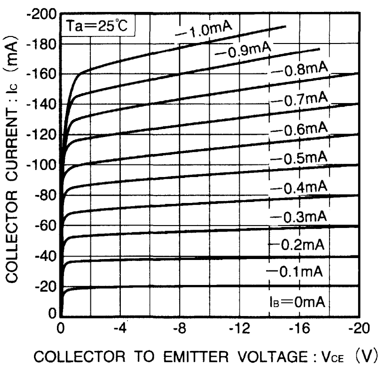


Fig.2 Grounded emitter output characteristics (I)

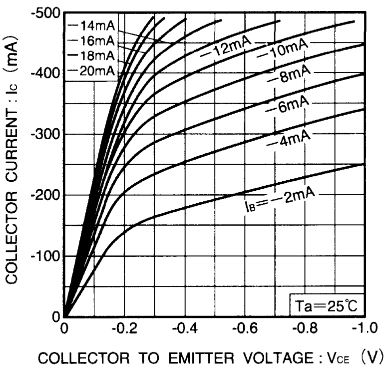


Fig.3 Grounded emitter output characteristics (II)

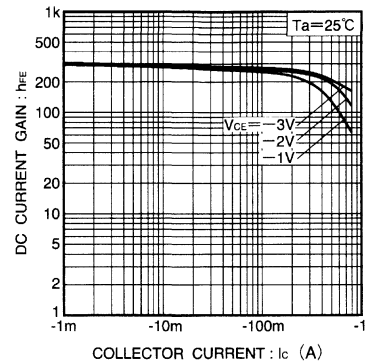


Fig.4 DC current gain vs. collector current

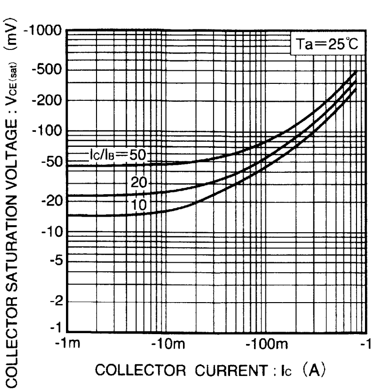


Fig.5 Collector-emitter saturation voltage vs. collector current

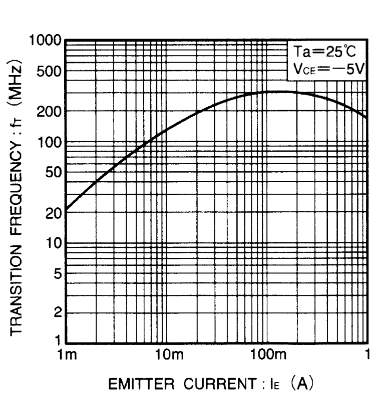


Fig.6 Gain bandwidth product vs. emitter current

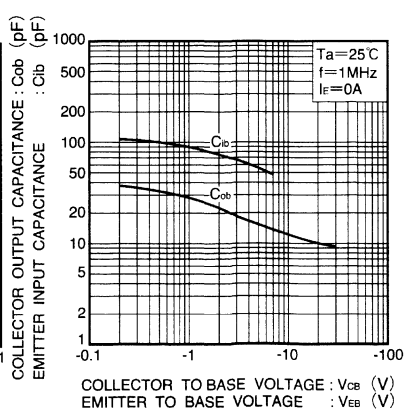


Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Low-frequency Transistor (−80V, − 0.5A)

2SB1198K

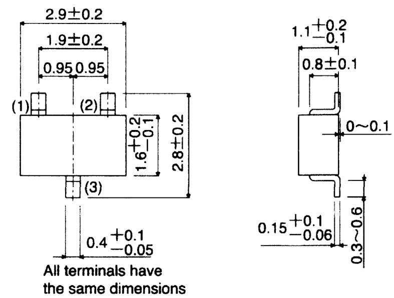
●Features

1) Low $V_{CE(sat)}$.
   $V_{CE(sat)}$ = −0.2V (Typ.)
   (I_C/I_B = −0.5A/−50mA)
2) High breakdown voltage.
   BV_{CEO} = −80V
3) Complements the 2SD1782K.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Unit:s mm)



ROHM : SMT3
EIAJ : SC-59

Abbreviated symbol: AK*

(1) Emitter
(2) Base
(3) Collector

* Denotes h_{FE}

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CEO}	−80	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−0.5	A
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−80	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−80	—	—	V	I_C=−2mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	−0.2	−0.5	V	I_C/I_B=−0.5A/−50mA
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=−3V, I_C=−0.1A
Transition frequency	f_T	—	180	—	MHz	VCE=−10V, IE=50mA, f=100MHz
Output capacitance	Cob	—	11	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(96-136-B93)

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping
		Code	T146
		Basic ordering unit (pieces)	3000
2SB1198K	QR		○

h_{FE} values are classified as follows :

Item	Q	R
h_{FE}	120～270	180～390

●Electrical characteristic curves

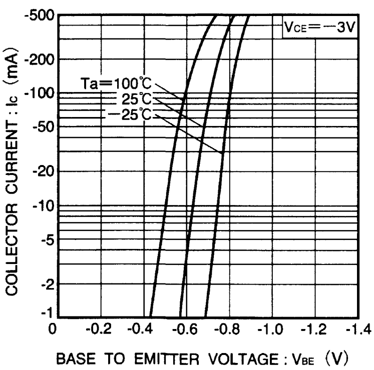


Fig.1 Grounded emitter propagation characteristics

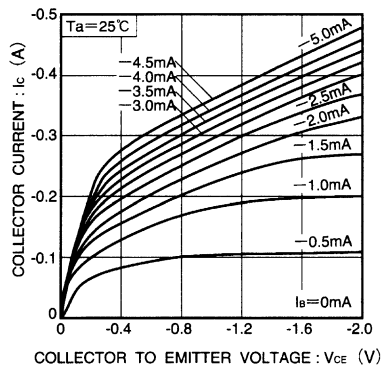


Fig.2 Grounded emitter output characteristics

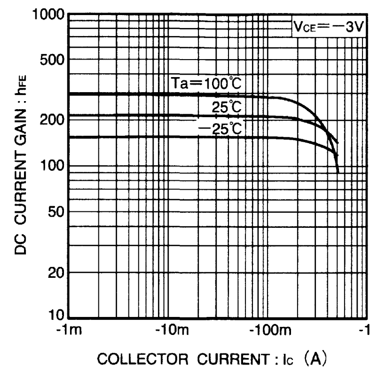


Fig.3 DC current gain vs. collector current

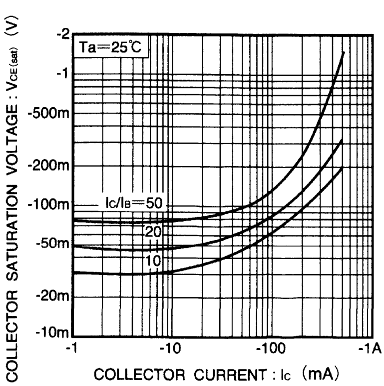


Fig.4 Collector-emitter saturation voltage vs. collector current (I)

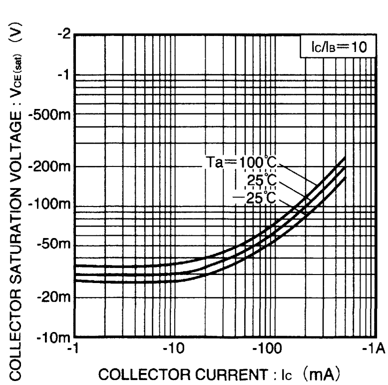


Fig.5 Collector-emitter saturation voltage vs. collector current (II)

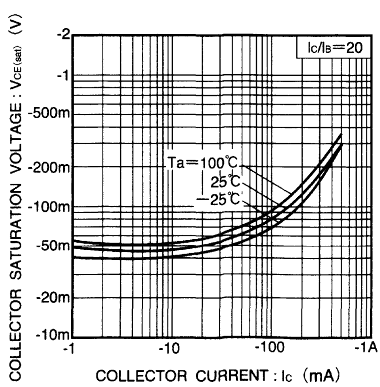


Fig.6 Collector-emitter saturation voltage vs. collector current (III)

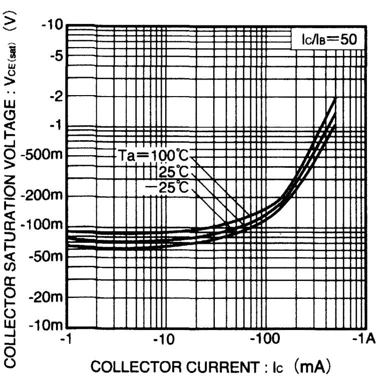


Fig.7 Collector-emitter saturation voltage vs. collector current (Ⅳ)

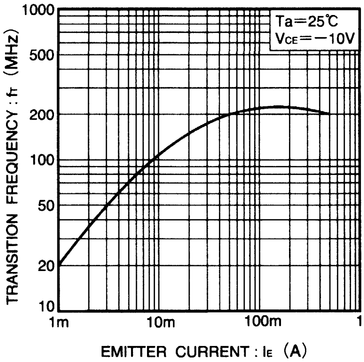


Fig.8 Gain bandwidth product vs. emitter current

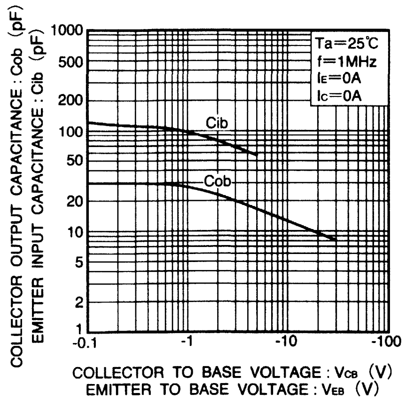


Fig.9 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Bi-polar transistors

High-current gain Medium Power Transistor (20V, 0.5A)

2SD2114K/2SD2144S

●Features

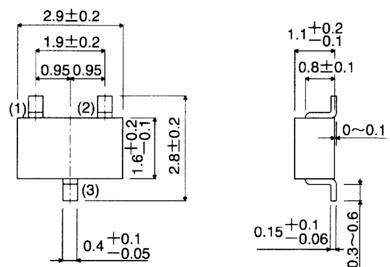
1) High DC current gain.
   h_{FE} = 1200 (Typ.)
2) High emitter-base voltage.
   V_{EBO} = 12V (Min.)
3) Low $V_{CE(sat)}$.
   $V_{CE(sat)}$ = 0.18V (Typ.)
   (I_C/I_B = 500mA/20A)

●Structure

Epitaxial planar type
NPN silicon transistor

●External dimensions (Units: mm)

2SD2114K



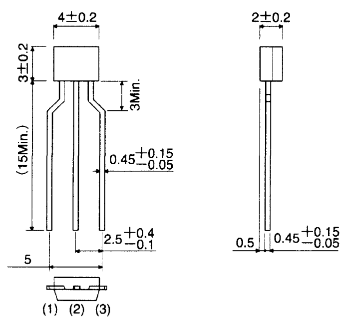
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Abbreviated symbol: BB *

(1) Emitter
(2) Base
(3) Collector

2SD2144S



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

* Denotes h_{FE}

(96-232-C107)

ROHM

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	25	V
Collector-emitter voltage		V_{CEO}	20	V
Emitter-base voltage		V_{EBO}	12	V
Collector current		I_C	0.5	A (DC)
			1	A (Pulse) *
Collector power dissipation	2SD2114K	P_C	0.2	W
	2SD2144S		0.3	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

* Single pulse Pw=100ms

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	25	—	—	V	I_C=10 μA
Collector-emitter breakdown voltage		BV_{CEO}	20	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	12	—	—	V	I_E=10 μA
Collector cutoff current		I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current		I_{EBO}	—	—	0.5	μA	V_{EB}=10V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	0.18	0.4	V	I_C/I_B=500mA/20mA
DC current transfer ratio	2SD2114K	h_{FE}	820	—	2700	—	V_{CE}=3V, I_C=10mA
	2SD2144S		560	—	2700	—	
Transition frequency		f_T	—	350	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz
Output capacitance		Cob	—	8.0	—	pF	V_{CB}=10V, I_E=0A, f=1MHz
Output On-resistance		Ron	—	0.8	—	pF	I_B=1mA, Vi=100mV(rms), f=1kHz

* Measured using pulse current

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping	
		Code	T146	TP
		Basic ordering unit (pieces)	3000	5000
2SD2114K	VW		○	—
2SD2144S	UVW		—	○

h_{FE} values are classified as follows :

Item	U	V	W
h_{FE}	560~1200	820~1800	1200~2700

●Electrical characteristic curves

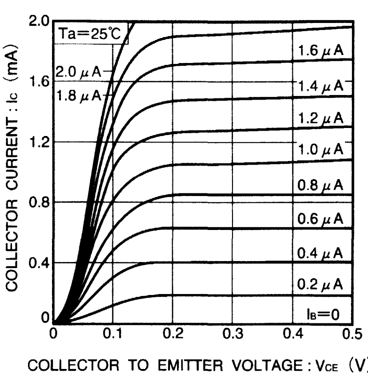


Fig.1 Grounded emitter output characteristics (I)

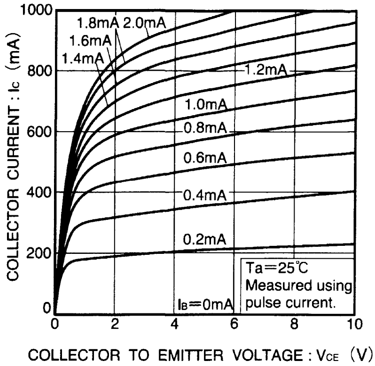


Fig.2 Grounded emitter output characteristics (Ⅱ)

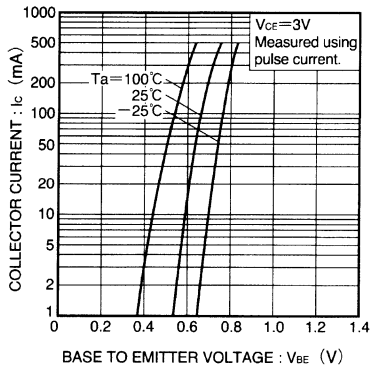


Fig.3 Grounded emitter propagation characteristics

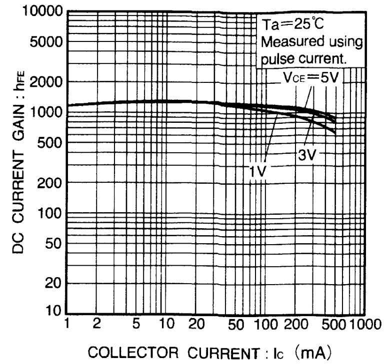


Fig.4 DC current gain vs. collector current (Ⅰ)

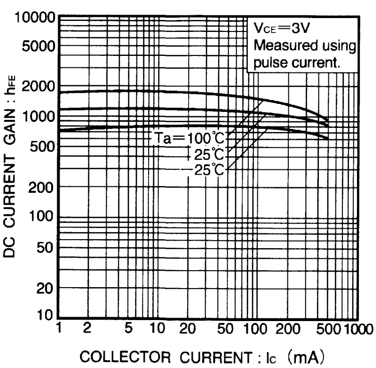


Fig.5 DC current gain vs. collector current (Ⅱ)

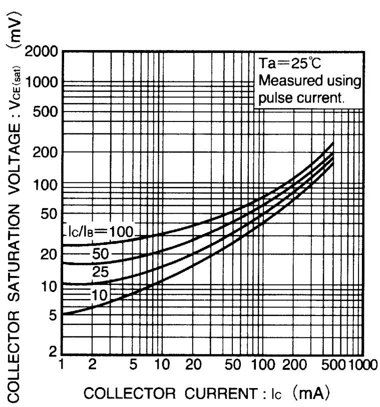


Fig.6 Collector-emitter saturation voltage vs. collector current (Ⅰ)

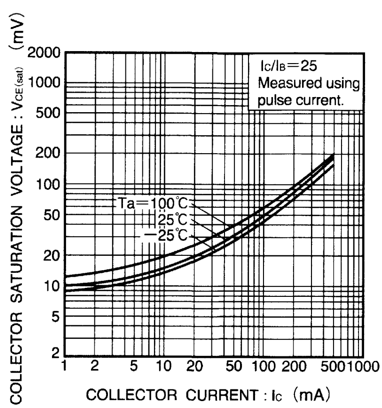


Fig.7 Collector-emitter saturation voltage vs. collector current (Ⅱ)

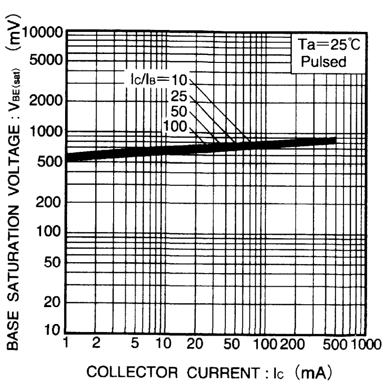


Fig.8 Base-emitter saturation voltage vs. collector current (Ⅰ)

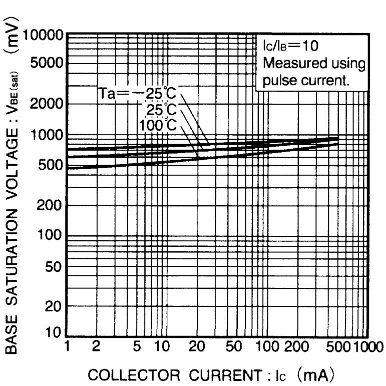


Fig.9 Base-emitter saturation voltage vs. collector current (Ⅱ)

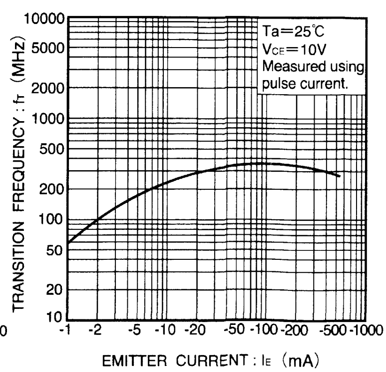


Fig.10 Gain bandwidth product vs. emitter current

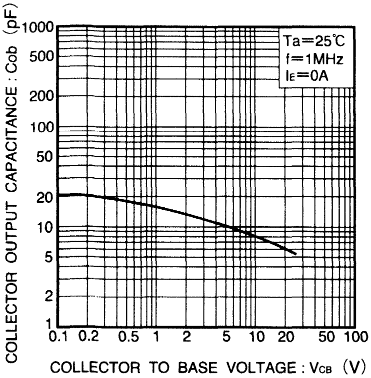


Fig.11 Collector output capacitance vs. collector-base voltage

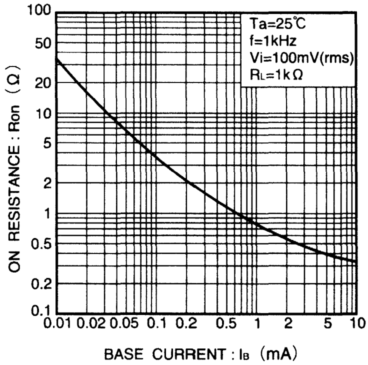
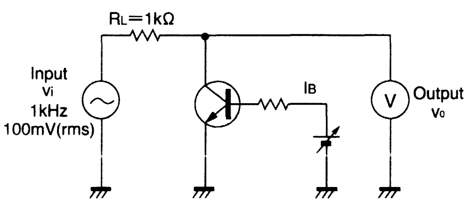


Fig.12 Output-on resistance vs. base current

●Ron measurement circuit



$$Ron = \frac{V_o}{V_i - V_o} \times R_L$$

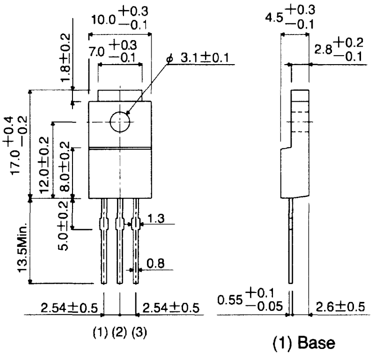
High Voltage Switching Transistor (400V, 2A)
2SC3969/2SC5161

● Features
1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} = 0.15V$ (Typ.)
   ($I_C/I_B = 1A/0.2A$)
2) High breakdown voltage.
   $V_{CEO} = 400V$
3) Fast switching.
   $t_r \leqq 1.0\mu s$
   ($I_C = 0.8A$)

● Structure
Three-layer, diffused planar type
NPN silicon transistor

● External dimensions (Units: mm)

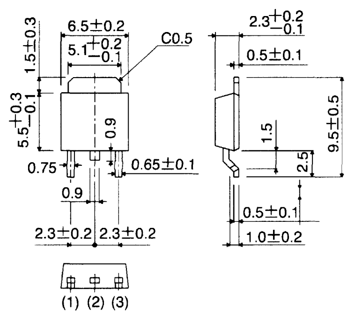
2SC3969



ROHM : TO-220FP
EIAJ : SC-67

(1) Base
(2) Collector
(3) Emitter

2SC5161



ROHM : CPT 3
EIAJ : SC-63

(1) Base
(2) Collector
(3) Emitter

(96-698-C14)

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	400	V
Collector-emitter voltage		V_{CEO}	400	V
Emitter-base voltage		V_{EBO}	7	V
Collector current		I_C	2	A (DC)
		I_{CP}	4	A (Pulse) ∗
Collector power dissipation	2SC3969	P_C	2	W
			20	W (Tc=25℃)
	2SC5161		1	W
			10	W (Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗ Single pulse Pw=10ms

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	400	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	400	—	—	V	I_C=1mA
Collector-emitter voltage	$V_{CEO(SUS)}$	400	—	—	V	I_C=1.0A, I_{B1}=0.1A, L=1mH ∗2
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	10	μA	V_{CB}=400V
Emitter cutoff current	I_{EBO}	—	—	10	μA	V_{EB}=7V
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	—	1	V	I_C/I_B=1A/0.2A
Base-emitter saturation voltage	$V_{BE\ (sat)}$	—	—	1.5	V	I_C/I_B=1A/0.2A
DC current transfer ratio	h_{FE}	25	—	50	—	V_{CE}=5V, I_C=0.1A
Transition frequency	f_T	—	10	—	MHz	V_{CE}=10V, I_E=−0.5A, f=5MHz ∗1
Output capacitance	Cob	—	30	—	pF	V_{CB}=10V, I_E=0A, f=1MHz
Turn-on time	t_{ON}	—	—	1	μs	I_C=0.8A, R_L=250Ω I_{B1}=−I_{B2}=0.08A V_{CC}≒200V Refer to measurement circuit diagram
Storage time	t_{stg}	—	—	2.5	μs	
Fall time	t_f	—	—	1	μs	

∗1 Measured using pulse current
∗2 2SC3969

●Packaging specifications and h_{FE}

		Package name	Bulk	Taping
		Symbol		TL
Type	h_{FE}	Basic order increment (pieces)	500	2500
2SC3969	B		○	—
2SC5161	B		—	○

h_{FE} values are classified as follows :

Item	B
h_{FE}	25~50

● Electrical characteristic curves

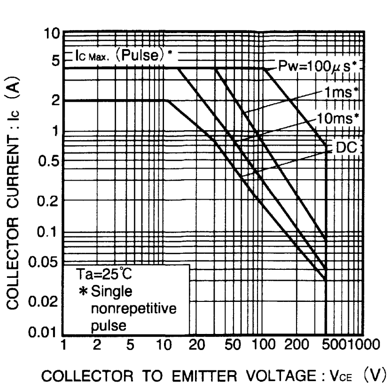


Fig.1 Safe operating area (2SC3969)

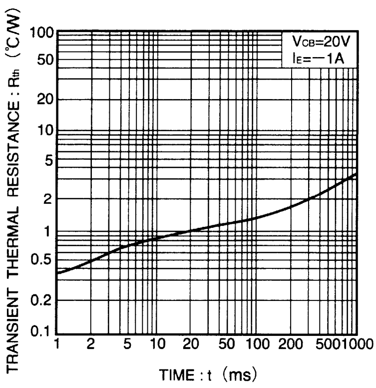


Fig.2 Transient thermal resistance (2SC3969)

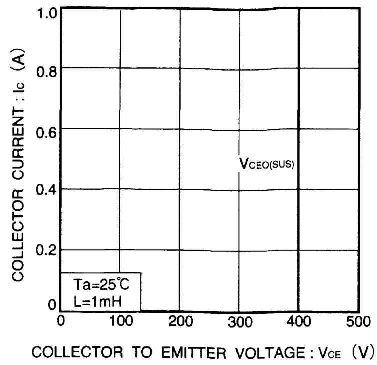


Fig.3 Reverse bias safe operating area

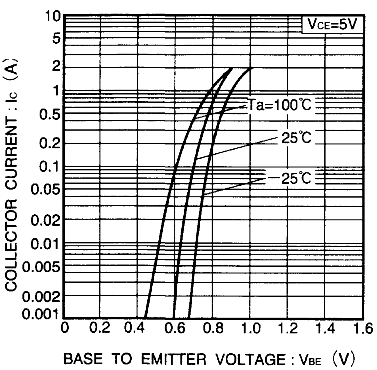


Fig.4 Grounded emitter propagation characteristics

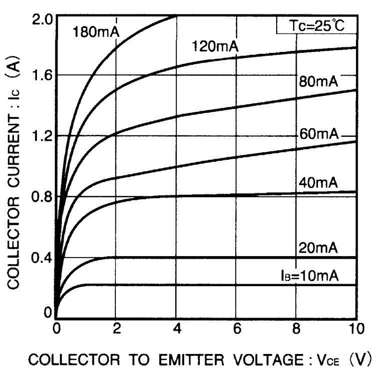


Fig.5 Grounded emitter output characteristics

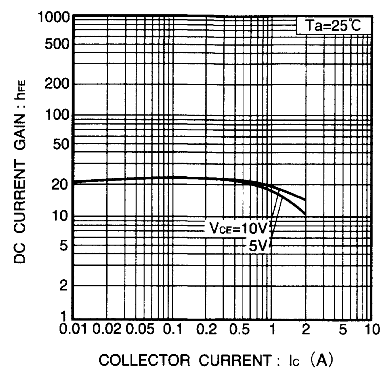


Fig.6 DC current gain vs. collector current (I)

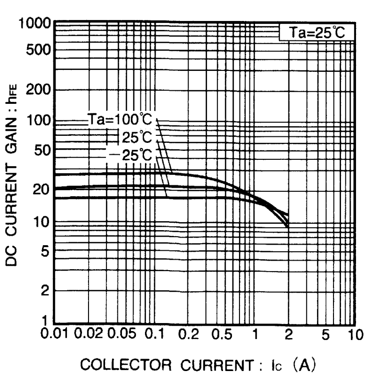


Fig.7 DC current gain vs. collector current (II)

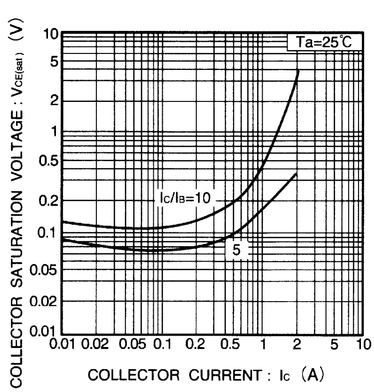


Fig.8 Collector-emitter saturation voltage vs. collector current

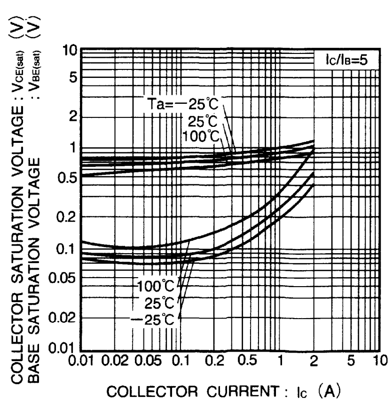


Fig.9 Collector-emitter saturation voltage vs. collector current
Base-emitter saturation voltage vs. collector current

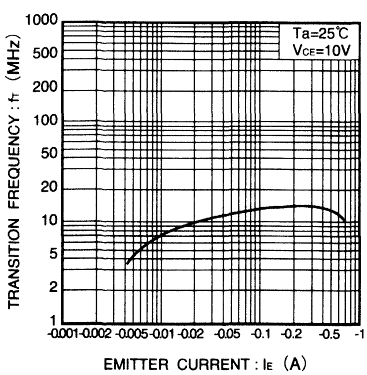


Fig.10 Gain bandwidth product vs. emitter current

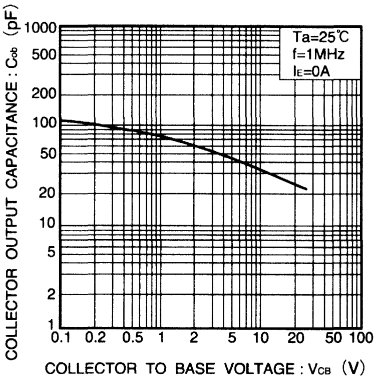


Fig.11 Collector output capacitance vs. collector-base voltage

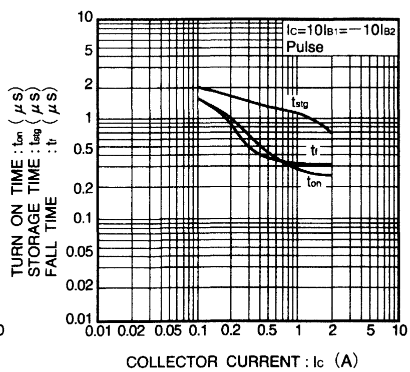
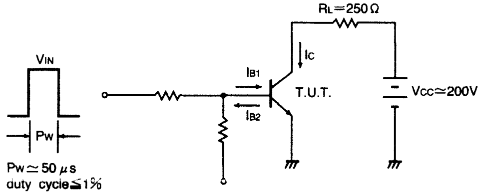
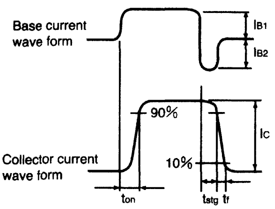


Fig.12 Switching time vs. collector current

●Switching characteristics measurement circuit





Bi-polar transistors

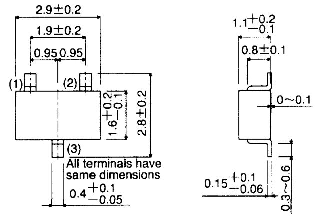
General Purpose Transistor (50V, 0.15A)
2SC2412K/2SC4081/2SC4617/2SC1740S

●Features
1) Low Cob.
   Cob = 2.0pF (Typ.)
2) Complements the 2SA1037AK/2SA1576A/2SA1774/2SA933AS.

●Structure
Epitaxial planar type
NPN silicon transistor

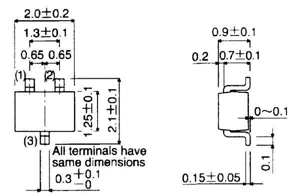
●External dimensions (Units: mm)

2SC2412K



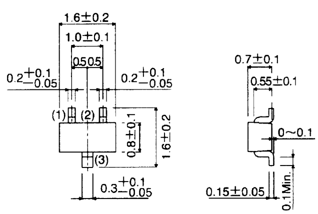
ROHM : SMT3
EIAJ : SC-59
(1) Emitter
(2) Base
(3) Collector
Abbreviated symbol: B∗

2SC4081



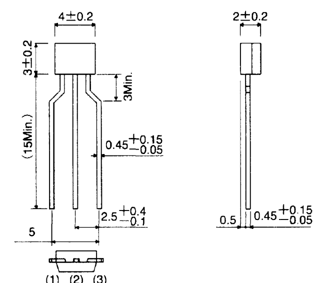
ROHM : UMT3
EIAJ : SC-70
(1) Emitter
(2) Base
(3) Collector
Abbreviated symbol: B∗

2SC4617



Abbreviated symbol: B∗
ROHM : EMT3
(1) Emitter
(2) Base
(3) Collector

2SC1740S



ROHM : SPT
EIAJ : SC-72
(1) Emitter
(2) Collector
(3) Base

●Absolute maximum ratings (Ta = 25°C) *Denotes hFE

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	60	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	7	V
Collector current		I_C	0.15	mA
Collector power dissipation	2SC2412K, 2SC4081	P_C	0.2	mW
	2SC4617		0.15	
	2SC1740S		0.3	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

(96-158-C22)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=7V
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=6V, I_C=1mA
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	—	0.4	V	I_C/I_B=50mA/5mA
Transition frequency	f_T	—	180	—	MHz	V_{CE}=12V, I_E=−2mA, f=100MHz
Output capacitance	Cob	—	2	3.5	pF	V_{CB}=12V, I_E=0A, f=1MHz

●Packaging specifications and h_{FE}

		Package	Taping			Bulk
		Code	T146	T106	TL	TP
Type	h_{FE}	Basic ordering unit (pieces)	3000	3000	3000	5000
2SC2412K	QRS		○	—	—	—
2SC4081	QRS		—	○	—	—
2SC4617	QRS		—	—	○	—
2SC1740S	QRS		—	—	—	○

h_{FE} values are classified as follows :

Item	Q	R	S
h_{FE}	120~270	180~390	270~560

●Electrical characteristic curves

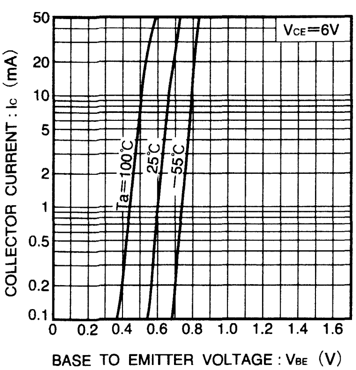


Fig.1 Grounded emitter propagation characteristics

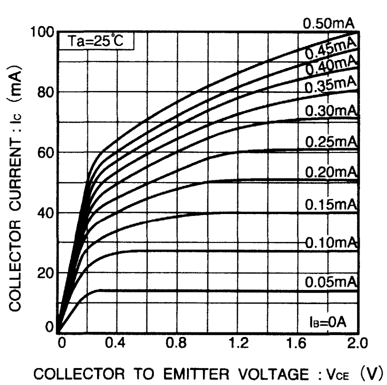


Fig.2 Grounded emitter output characteristics (I)

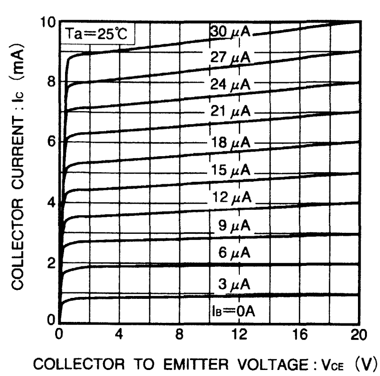


Fig.3 Grounded emitter output characteristics (II)

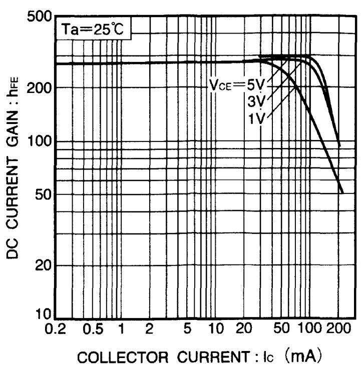


Fig.4 DC current gain vs. collector current (I)

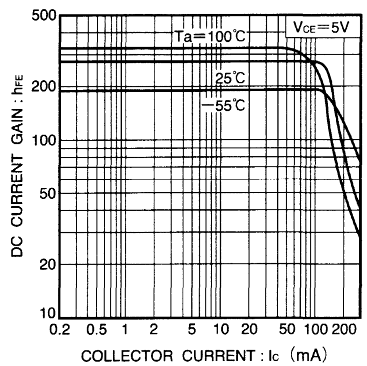


Fig.5 DC current gain vs. collector current (II)

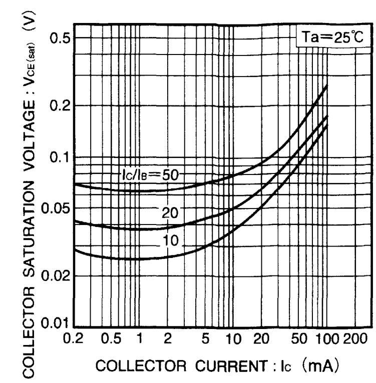


Fig.6 Collector-emitter saturation voltage vs. collector current

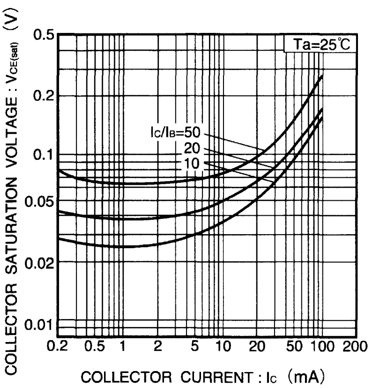


Fig. 7 Collector-emitter saturation voltage vs. collector current (I)

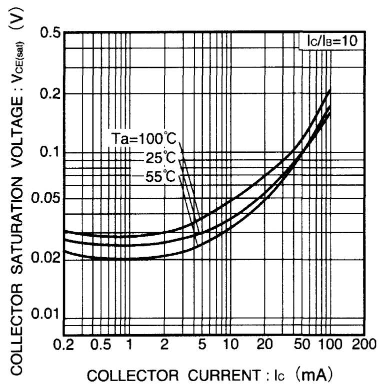


Fig.8 Collector-emitter saturation voltage vs. collector current (II)

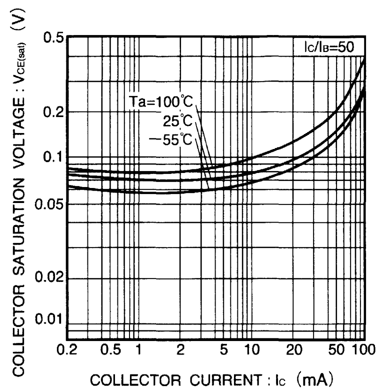


Fig. 9 Collector-emitter saturation voltage vs. collector current (III)

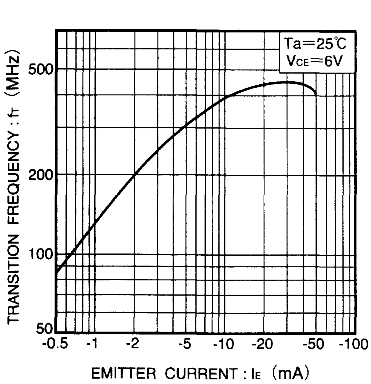


Fig.10 Gain bandwidth product vs. emitter current

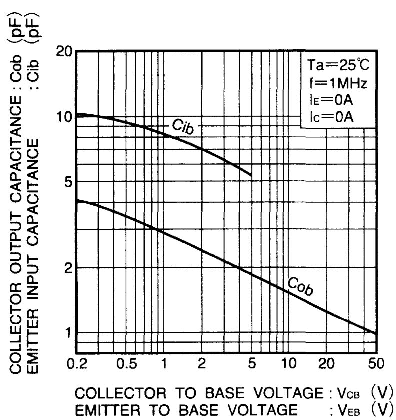


Fig.11 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

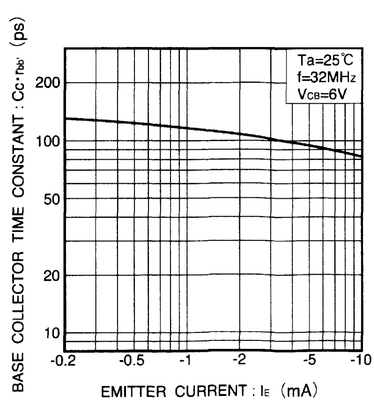


Fig.12 Base-collector time constant vs. emitter current

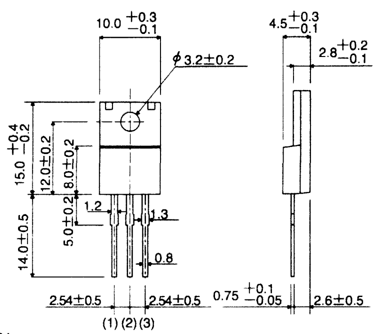
High Voltage Switching Transistor (Power supply)

2SC5113

●Features

1) High-speed switching.
   t_{stg} = 0.8 μs (Typ.) (I_C = 2.5A)
   t_f = 0.08 μs (Typ.) (I_C = 2.5A)
2) High breakdown voltage.
   V_{CBO} = 700V
   V_{CEO} = 450V
3) Low $V_{CE(sat)}$.
   $V_{CE(sat)}$ = 0.3V (Typ.) (I_C / I_B = 2.5A/0.5A)
4) Wide SOA (safe operating area) under reverse bias for strong protection against damage.

●External dimensions (Units: mm)



(1) Base
(2) Collector
(3) Emitter

ROHM : TO-220FN

●Applications

Switching power supplies
Fluorescent light, charge and other switching circuits

●Structure

Duplex diffused planar type
NPN silicon transistor

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	700	V
Collector-emitter voltage	V_{CEO}	450	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	5	A
	I_{CP}	10	A *
Base current	I_C	2	A
	I_{CP}	4	A *
Collector power dissipation	P_C	2	W
		35	W(Tc=25°C)
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

* Pw=10ms

(SPEC-C334)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter voltage	$V_{CEO(SUS)}$	450	—	—	V	I_C/I_B=100mA/0A
Collector-emitter breakdown voltage	BV_{CEO}	450	—	—	V	I_C=1mA
Collector-base breakdown voltage	BV_{CBO}	700	—	—	V	I_C=50 μA
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	50	μA	V_{CB}=700V, I_E=0A
	I_{CEO}	—	—	50	μA	V_{CE}=450V, I_B=0A
Emitter cutoff current	I_{EBO}	—	—	50	μA	V_{EB}=7V, I_C=0A
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	0.3	0.8	V	I_C/I_B=2.5A/0.5A *
Base-emitter saturation voltage	$V_{BE\ (sat)}$	—	0.9	1.5	V	I_C/I_B=2.5A/0.5A *
DC current transfer ratio	h_{FE}	5	—	—	—	V_{CE}=5V, I_C=1mA *
		10	—	30	—	V_{CE}=5V, I_C=2.5A *
Transition frequency	f_T	—	15	—	MHz	V_{CE}=10V, I_E=−0.5A, f=5MHz *
Output capacitance	Cob	—	60	—	pF	V_{CB}=10V, I_E=0A, f=1MHz
Turn-on time	t_{on}	—	—	0.5	μs	I_C=2.5A, R_L=60Ω, I_{B1}=0.5A, I_{B2}=−1A, V_{CC}=150V, Refer to measurement circuit diagram.
Storage time	t_{stg}	—	—	1.3	μs	
Fall time	t_f	—	—	0.15	μs	

* Measured using pulse current

●Electrical characteristic curves

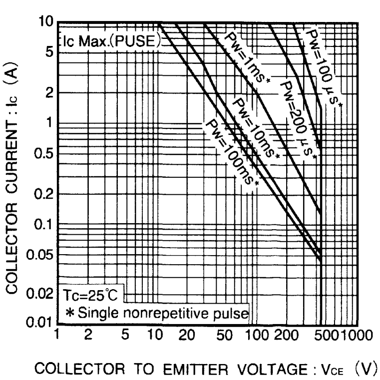


Fig.1 Safe operating area

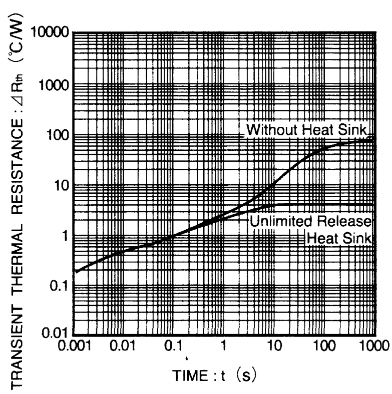


Fig.2 Transient resistance

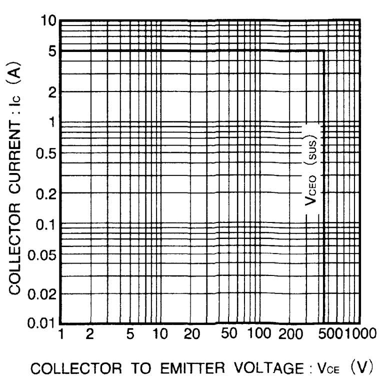


Fig.3 Reverse bias safe operating area

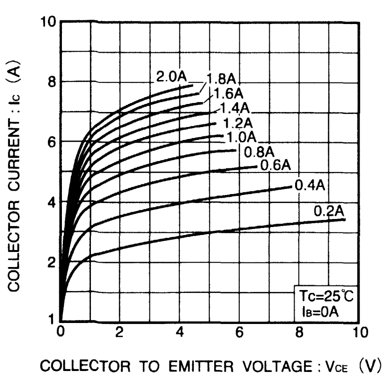


Fig.4 Grounded emitter output characteristics

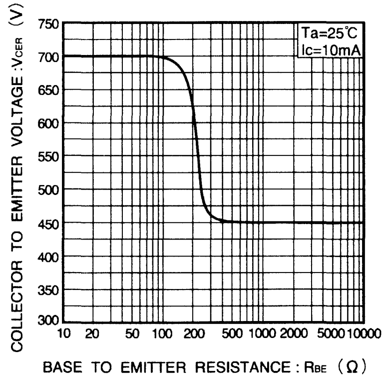


Fig.5 Collector-emitter voltage vs. base-emitter resistance

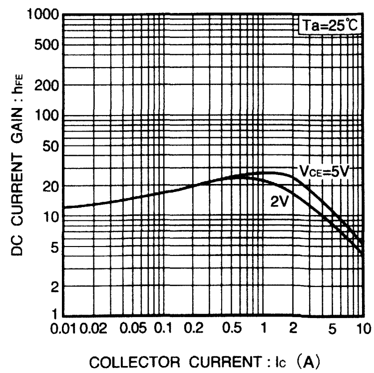


Fig.6 DC current gain vs. collector current (I)

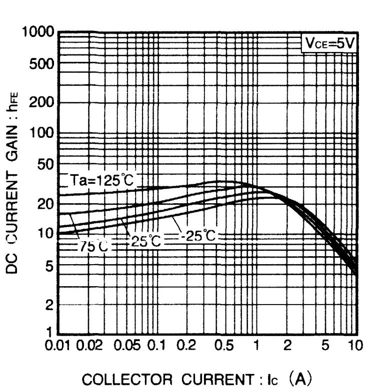


Fig. 7 DC current gain vs. collector current (II)

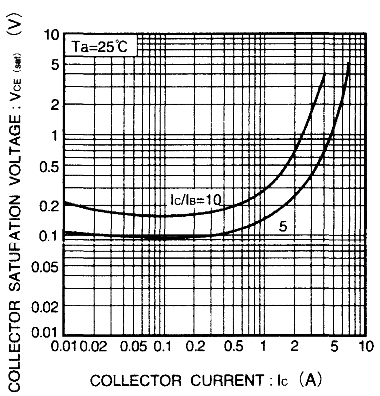


Fig.8 Collector-emitter saturation voltage vs. collector current

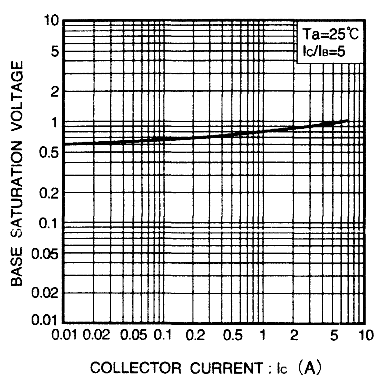


Fig.9 Base-emitter saturation voltage vs. collector current

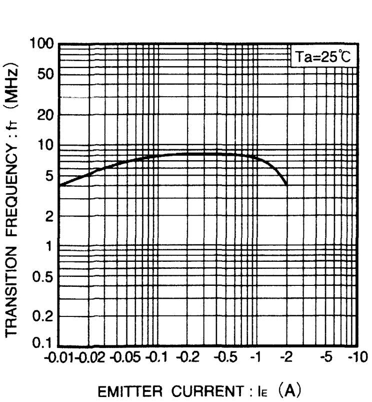


Fig.10 Gain bandwidth product vs. emitter current

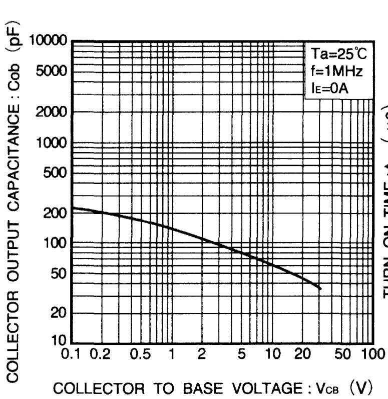


Fig.11 Collector output capacitance vs. collector-base voltage

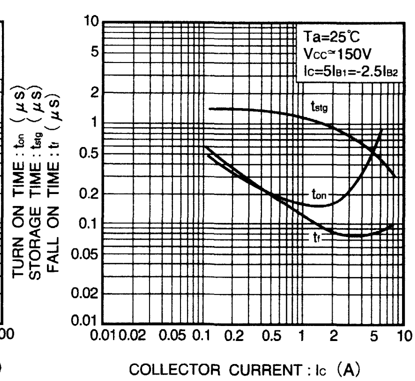
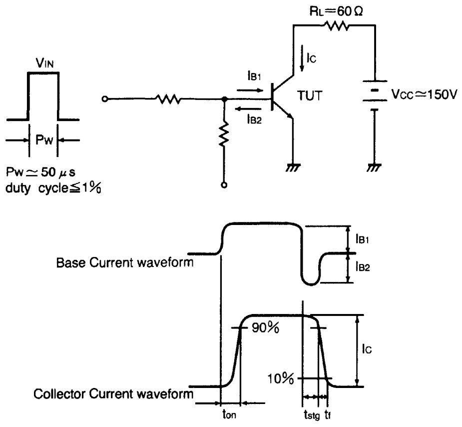


Fig.12 Switching characteristics



Switching time measurement circuit

Low-frequency Transistor (20V, 3A)

2SD2150/2SC4115S/2SD2264

●Features

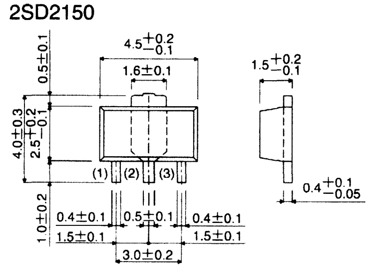
1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} = 0.2V$ (Typ.)
   ($I_C/I_B = 2A/0.1A$)
2) Excellent current gain characteristics.
3) Complements the 2SB1424/2SA1585S.

●Structure

Epitaxial planar type
NPN silicon transistor

●External dimensions (Units: mm)

2SD2150

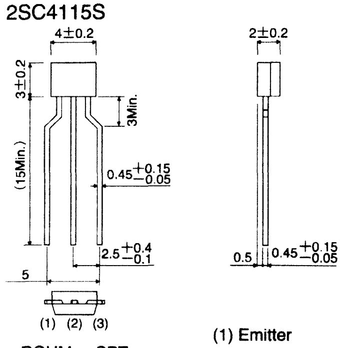


ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

Abbreviated symbol: CF ∗

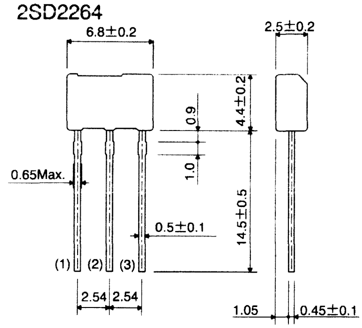
2SC4115S



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

2SD2264



ROHM : ATV

(1) Emitter
(2) Collector
(3) Base

∗ Denotes h_{FE}

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	40	V
Collector-emitter voltage		V_{CEO}	20	V
Emitter-base voltage		V_{EBO}	6	V
Collector current		I_C	3	A (DC)
			5	A (Pulse) ∗1
Collector power dissipation	2SD2150	P_C	0.5	W ∗2
	2SC4115S		0.3	
	2SD2264		1	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55～150	℃

∗1 Single pulse Pw=10ms
∗2 Printed circuit board 1.7mm thick, collector copper plating 1cm² or larger.

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	40	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage		BV_{CEO}	20	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	6	—	—	V	I_E=50 μA
Collector cutoff current		I_{CBO}	—	—	0.1	μA	V_{CB}=30V
Emitter cutoff current		I_{EBO}	—	—	0.1	μA	V_{EB}=5V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	0.2	0.5	V	I_C/I_B=2A/0.1A ∗
DC current transfer ratio	2SD2150	h_{FE}	180	—	560	—	V_{CE}=2V, I_C=0.1A
	2SC4115S		120	—	560		
	2SD2264		180	—	390		
Transition frequency		f_T	—	290	—	MHz	V_{CE}=2V, I_E=−0.5A, f=100MHz
Output capacitance		Cob	—	25	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

∗ Measured using pulse current.

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping		
		Code	T100	TP	TV2
		Basic ordering unit (pieces)	1000	5000	2500
2SD2150	RS		○	—	—
2SC4115S	QRS		—	○	—
2SD2264	R		—	—	○

h_{FE} values are classified as follows :

Item	Q	R	S
h_{FE}	120～270	180～390	270～560

● Electrical characteristic curves

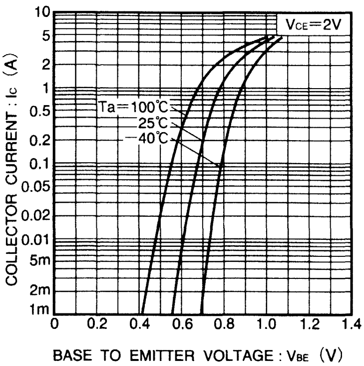


Fig.1 Grounded emitter propagation characteristics

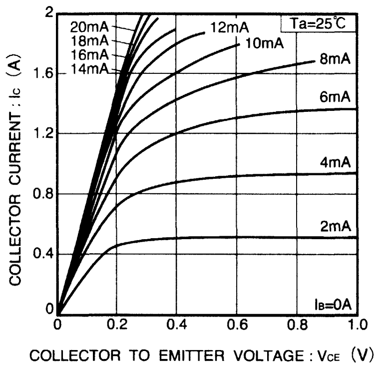


Fig.2 Grounded emitter output characteristics (I)

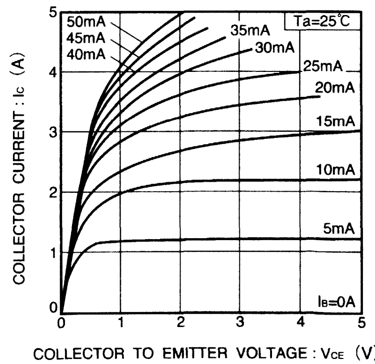


Fig.3 Grounded emitter output characteristics (II)

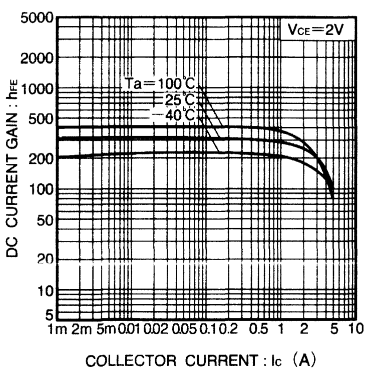


Fig.4 DC current gain vs. collector current

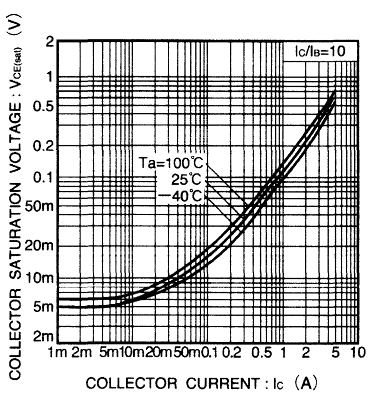


Fig.5 Collector-emitter saturation voltage vs. collector current (I)

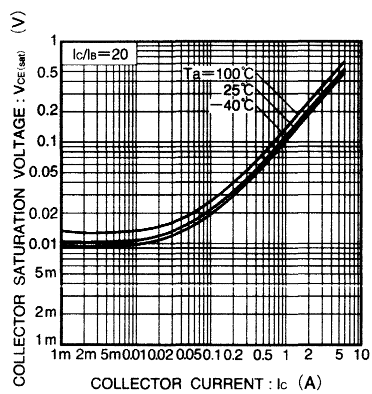


Fig.6 Collector-emitter saturation voltage vs. collector current (II)

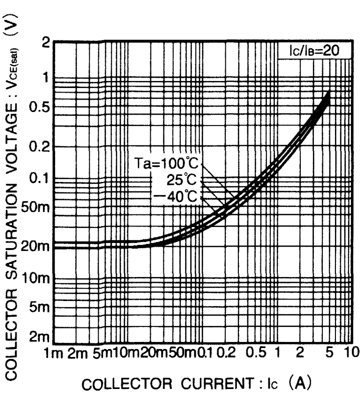


Fig.7 Collector-emitter saturation voltage vs. collector current (III)

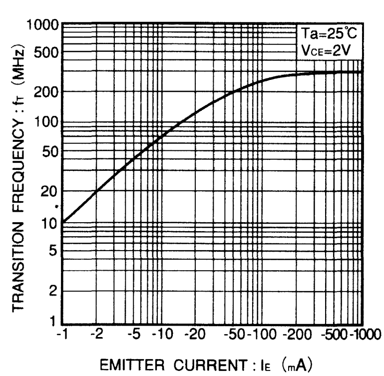


Fig.8 Gain bandwidth product vs. emitter current

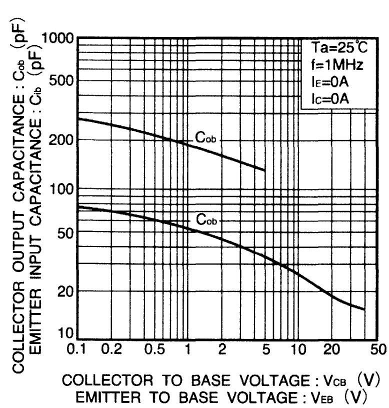


Fig.9 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Medium Power Transistor (32V, 0.5A)

2SC2411K/2SC4097/2SC1741S

● Features

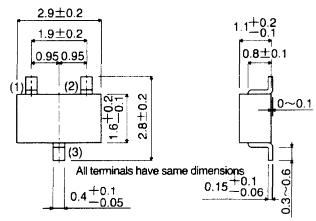
1) High $I_{CMax.}$
   $I_{CMax.}$ = 0.5mA
2) Low $V_{CE(sat)}$. Optimal for low voltage operation.
3) Complements the 2SA1036K/2SA1577/2SA854S.

● Structure

Epitaxial planar type
NPN silicon transistor

● External dimensions (Units: mm)

2SC2411K

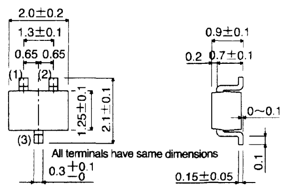


ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol: C *

2SC4097

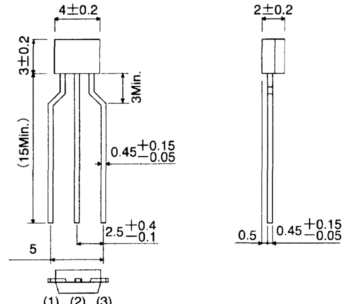


ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol: C *

2SC1741S



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

* Denotes h_{FE}

(96-156-D11)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	40	V
Collector-emitter voltage	V_{CEO}	32	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	0.5	A *
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Pc must not be exceeded.

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	40	—	—	V	I_C=100 μA
Collector-emitter breakdown voltage		BV_{CEO}	32	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	5	—	—	V	I_E=100 μA
Collector cutoff current		I_{CBO}	—	—	1	μA	V_{CB}=20V
Emitter cutoff current		I_{EBO}	—	—	1	μA	V_{EB}=4V
DC current transfer ratio	2SC2411K, 2SC4097	h_{FE}	82	—	390	—	V_{CE}=3V, I_C=10mA
	2SC1741S		120	—	560	—	
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=100mA/10mA
Transition frequency		f_T	—	250	—	MHz	V_{CE}=5V, I_E=−20mA, f=100MHz
Output capacitance		Cob	—	6.0	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

●Packaging specifications and h_{FE}

		Package	Taping		
		Code	T146	T106	TP
Type	h_{FE}	Basic ordering unit (pieces)	3000	3000	5000
2SC2411K	PQR		○	—	—
2SC4097	PQR		—	○	—
2SC1741S	QRS		—	—	○

h_{FE} values are classified as follows :

Item	P	Q	R	S
h_{FE}	82~180	120~270	180~390	270~560

Bi-polar transistors

●Electrical characteristic curves

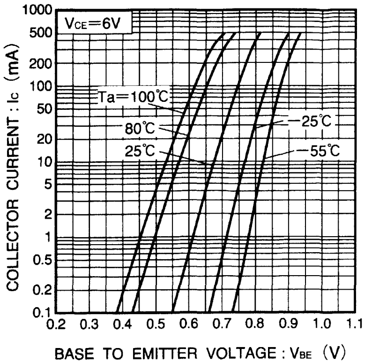


Fig.1 Grounded emitter propagation characteristics

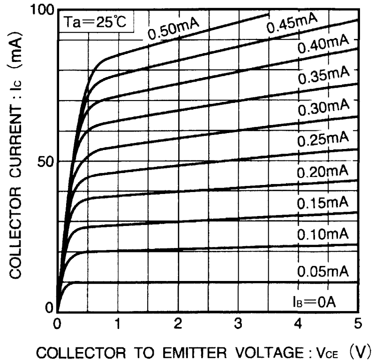


Fig.2 Grounded emitter output characteristics(I)

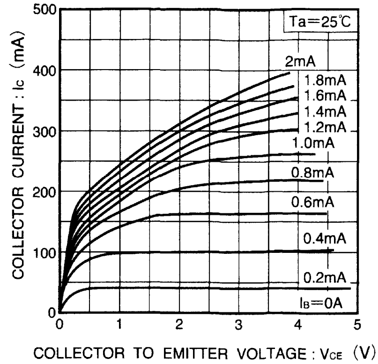


Fig.3 Grounded emitter output characteristics(II)

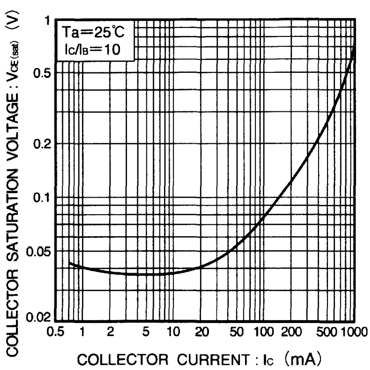


Fig.4 Collector-emitter saturation voltage vs. collector current

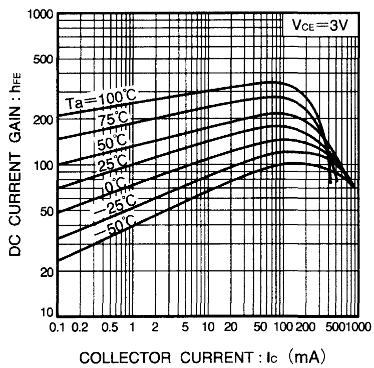


Fig.5 DC current gain vs. collector current

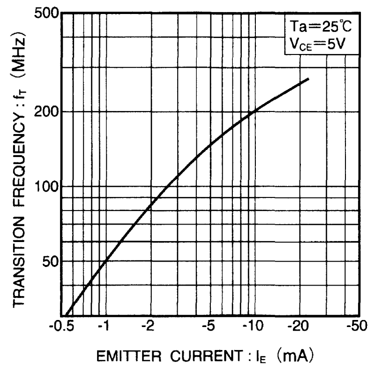


Fig. 6 Gain bandwidth product vs. emitter current

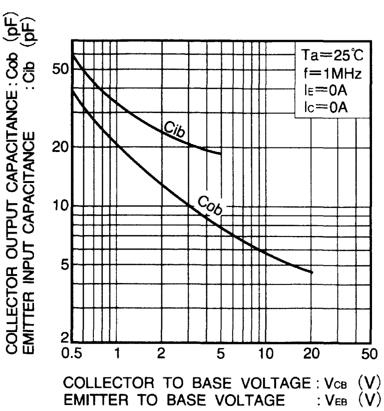


Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Medium Power Transistor (32V, 1A)

2SD1664 / 2SD1858

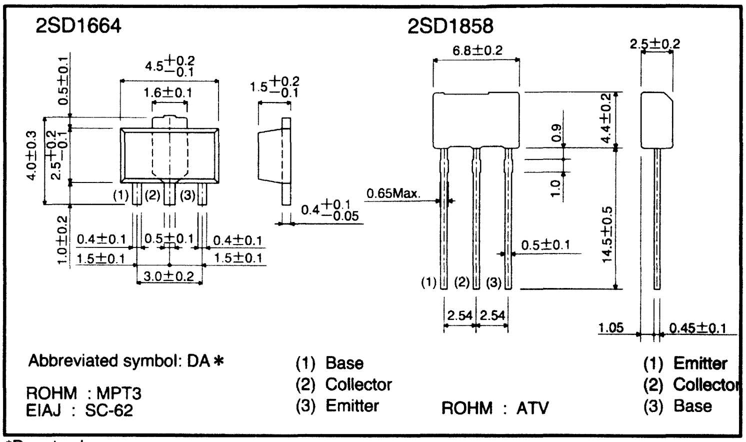
● Features

1) Low $V_{CE(sat)}$ = 0.15V (typical).
   (I_C/I_B = 500mA/50mA)
2) Complements the 2SB1132/2SB1237.

● Structure

Epitaxial planar type
NPN silicon transistor

● External dimensions (Units: mm)



*Denotes h_{FE}

● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	40	V
Collector-emitter voltage		V_{CEO}	32	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	1	A(DC)
			2	A(Pulse) *1
Collector power dissipation	2SD1664	P_C	0.5	W
			2	W *2
	2SD1858		1	*3
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

*1 Pw=20ms、Duty=1/2
*2 On 40 x 40 x 0.7 mm ceramic board.
*3 Printed circuit board 1.7 mm thick, collector copper plating 1cm² or larger.

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	40	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	32	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
DC current transfer ratio	h_{FE}	82	—	390	—	V_{CE}=3V, I_C=100mA
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.15	0.4	V	I_C/I_B=500mA/50mA
Transition frequency	f_T	—	150	—	MHz	V_{CE}=5V, I_E=−50mA, f=100MHz
Output capacitance	Cob	—	15	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

●Packaging specifications and h_{FE}

		Package	Taping	
		Code	T100	TV2
Type	h_{FE}	Basic ordering unit (pieces)	1000	2500
2SD1664	PQR		○	—
2SD1858	PQR		—	○

h_{FE} values are classified as follows :

Item	P	Q	R
h_{FE}	82～180	120～270	180～390

●Electrical characteristic curves

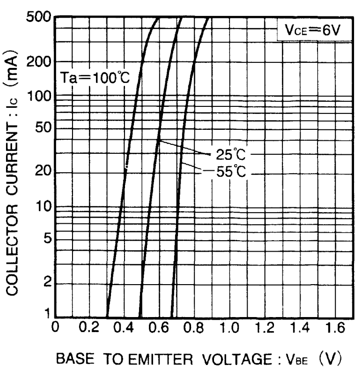


Fig.1 Grounded emitter propagation characteristics

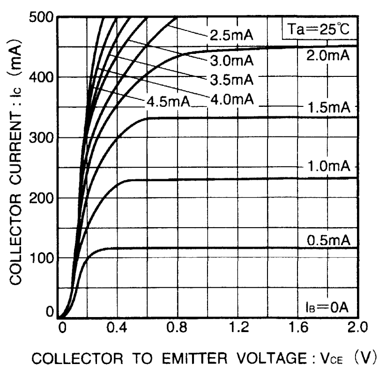


Fig.2 Grounded emitter output characteristics

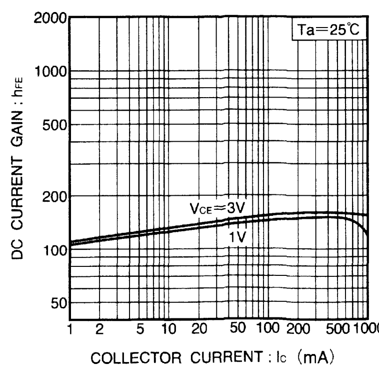


Fig.3 DC current gain vs. collector current (Ⅰ)

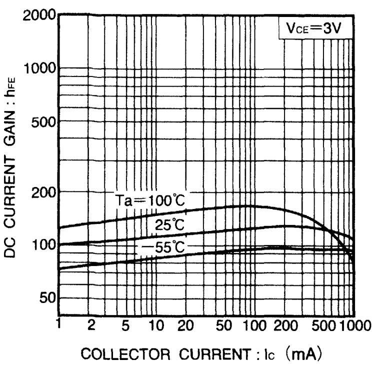


Fig.4 DC current gain vs. collector current (II)

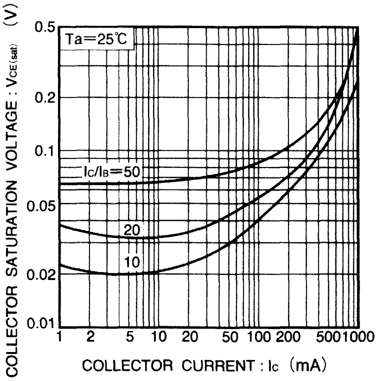


Fig.5 Collector-emitter saturation voltage vs. collector current (I)

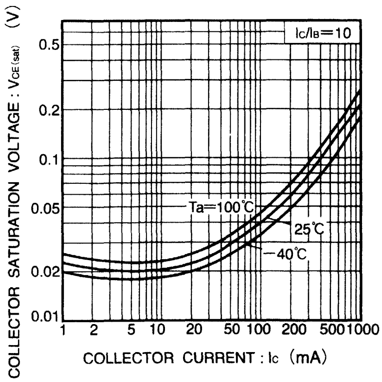


Fig.6 Collector-emitter saturation voltage vs. collector current (II)

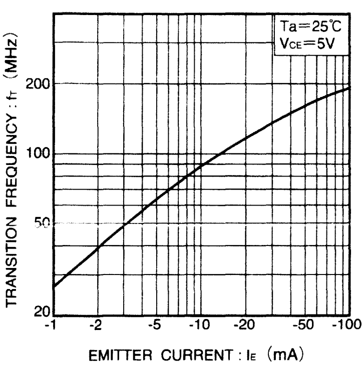


Fig.7 Gain bandwidth product vs. emitter current

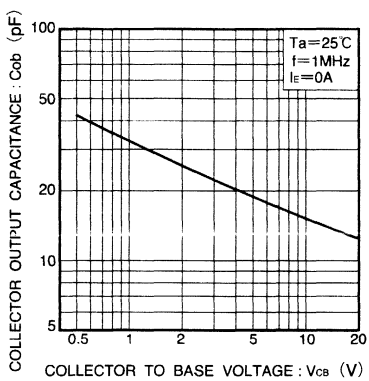


Fig.8 Collector output capacitance vs. collector-base voltage

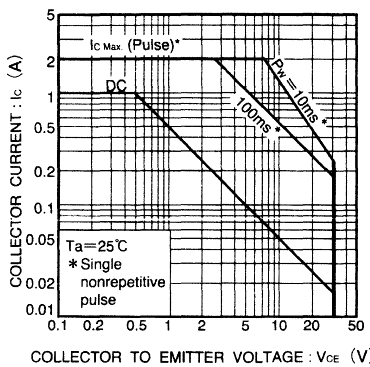


Fig.9 Safe operating area (2SD1664)

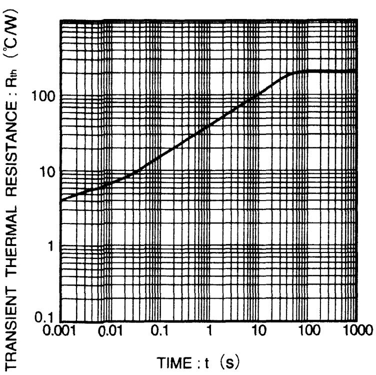


Fig.10 Transient thermal resistance (2SD1664)

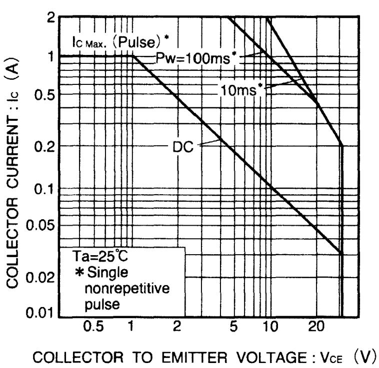


Fig.11 Safe operating area (2SD1858)

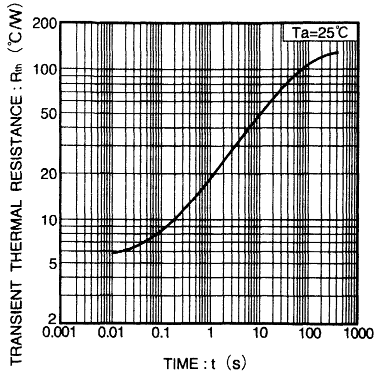


Fig.12 Transient thermal resistance (2SD1858)

Low $V_{CE(sat)}$ Transistor (Strobe flash)

2SD2098/2SD2118/2SD2097/2SD2166

●Features

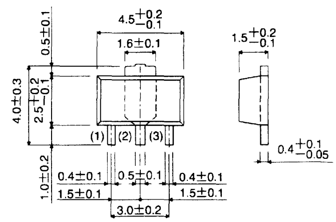
1) Low $V_{CE(sat)}$.
   $V_{CE(sat)}$ = 0.25V (Typ.)
   (I_C/I_B = 4A/0.1A)
2) Excellent DC current gain characteristics.
3) Complements the 2SB1386/2SB1412/2SB1326/2SB1436.

●Structure

Epitaxial planar type
NPN silicon transistor

●External dimensions (Units: mm)

2SD2098

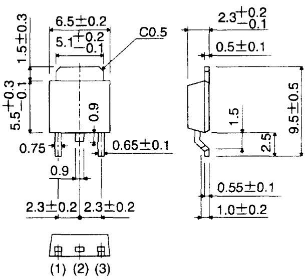


ROHM : MPT3
EIAJ : SC-62

Abbreviated symbol: AH*

(1) Base
(2) Collector
(3) Emitter

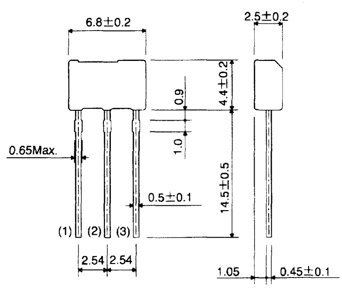
2SD2118



ROHM : CPT3
EIAJ : SC-63

(1) Base
(2) Collector
(3) Emitter

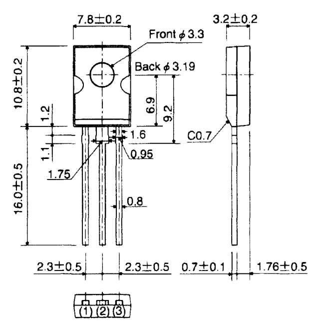
2SD2097



ROHM : ATV

(1) Emitter
(2) Collector
(3) Base

2SD2166



ROHM : TO-126FP

(1) Emitter
(2) Collector
(3) Base

*Denotes h_{FE}

(96-229-D204)

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	20	V
Emitter-base voltage		V_{EBO}	6	V
Collector current		I_C	5	A(DC)
		I_{CP}	10	A(Pulse) ∗1
Collector power dissipation	2SD2098	P_C	0.5	W ∗2
			2	
	2SD2118		1	
			10	W(Tc=25℃)
	2SD2097		1	W ∗3
	2SD2116		1.5	
			5	W(Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 Single pulse Pw=10ms
∗2 On 40 x 40 x 0.7 mm ceramic board.
∗3 Printed circuit board glass epoxy board 1.6 mm thick with copper platingt 1cm² or larger.

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	20	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=40V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.25	1.0	V	I_C/I_B=4A/0.1A ∗
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=2V, I_C=0.5A ∗
Transition frequency	f_T	—	150	—	MHz	V_{CE}=6V, I_E=−50mA, f=100MHz
Output capacitance	Cob	—	30	—	pF	V_{CB}=20V, I_E=0A, f=1MHz

∗ Measured using pulse current.

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping			Bulk
		Code	T100	TL	TV2	—
		Basic ordering unit (pieces)	1000	2500	2500	1000
2SD2098	QR		○	—	—	—
2SD2118	QR		—	○	—	—
2SD2097	QR		—	—	○	—
2SD2166	QR		—	—	—	○

h_{FE} values are classified as follows :

Item	Q	R
h_{FE}	120～270	180～390

●Electrical characteristic curves

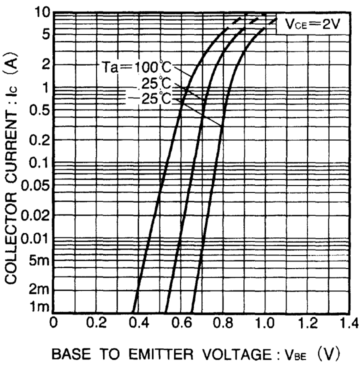


Fig.1 Grounded emitter propagation characteristics

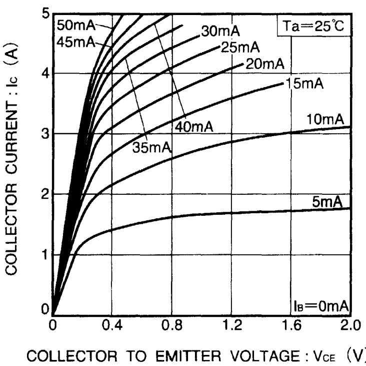


Fig.2 Grounded emitter output characteristics

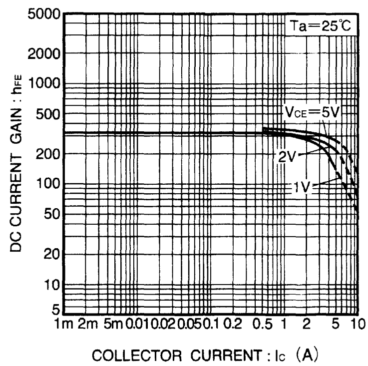


Fig.3 DC current gain vs. collector current (I)

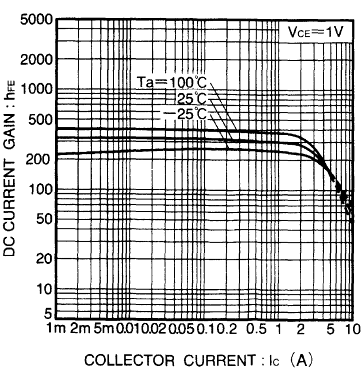


Fig.4 DC current gain vs. collector current (II)

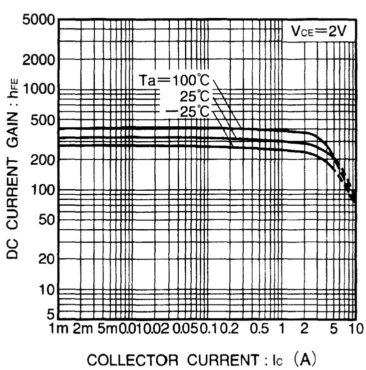


Fig.5 DC current gain vs. collector current (III)

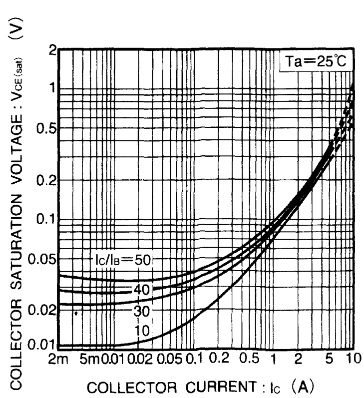


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

●Electrical characteristic curves

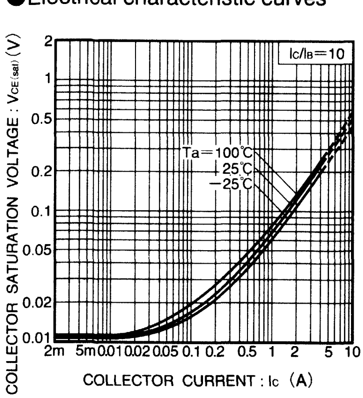


Fig.7 Collector-emitter saturation voltage vs. collector current (Ⅱ)

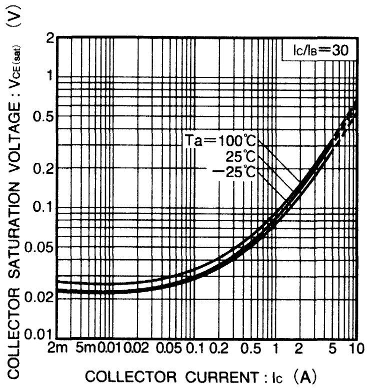


Fig.8 Collector-emitter saturation voltage vs. collector current (Ⅲ)

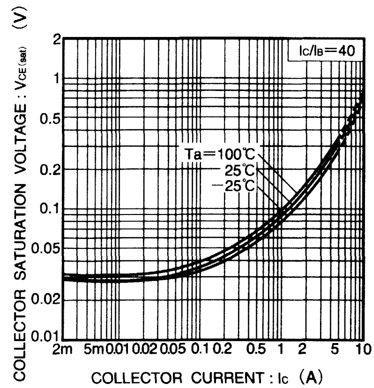


Fig.9 Collector-emitter saturation voltage vs. collector current (Ⅳ)

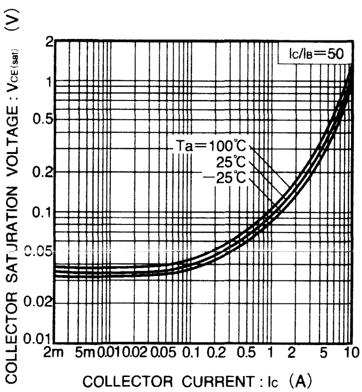


Fig.10 Collector-emitter saturation voltage vs. collector current (Ⅴ)

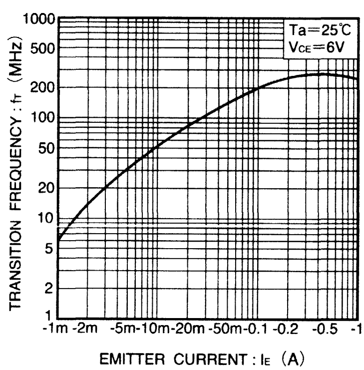


Fig.11 Gain bandwidth product vs. emitter current

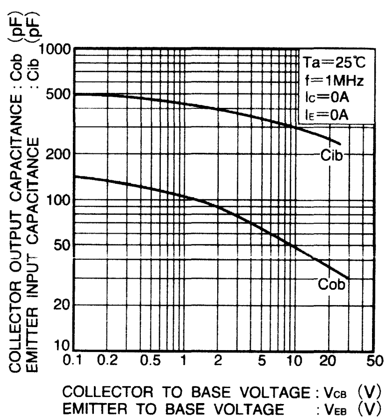


Fig.12 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

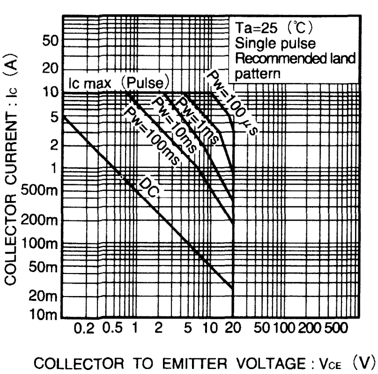


Fig.13 Safe operating area (2SD2098)

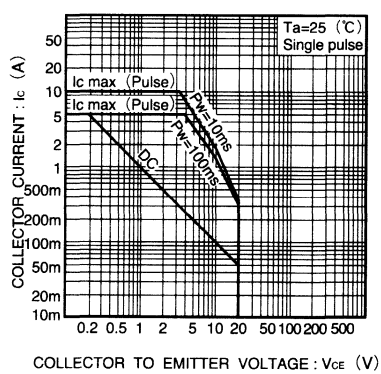


Fig.14 Safe operating area (2SD2118)

Bi-polar transistors

Medium Power Transistor (32V, 2A)
2SD1766/2SD1758/2SD1862/2SD1189F/ 2SD1055/2SD1919/2SD1227M

●Features

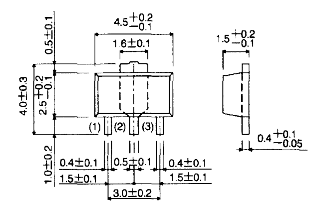
1) Low $V_{CE(sat)}$.
   $V_{CE(sat)}$ = 0.16V (Typ.)
   (I_C/I_B = 2A/0.2A)
2) Complements the 2SB1188/2SB1182/2SB1240/2SB891F/2SB822/2SB1277/2SB911M

●Structure

Epitaxial planar type
NPN silicon transistor

●External dimensions (Units: mm)

2SD1766

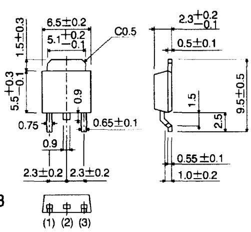


ROHM : MPT3
EIAJ : SC-62

Abbreviated symbol: DB∗

(1) Base
(2) Collector
(3) Emitter

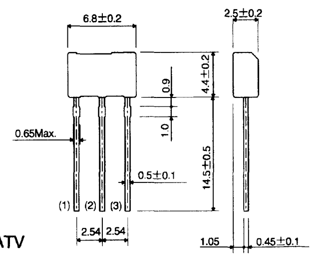
2SD1758



ROHM : CPT3
EIAJ : SC-63

(1) Base
(2) Collector
(3) Emitter

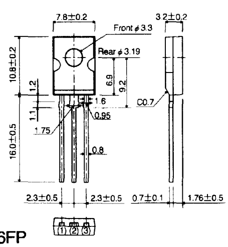
2SD1862



ROHM : ATV

(1) Emitter
(2) Collector
(3) Base

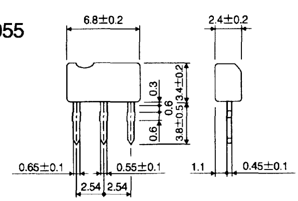
2SD1189F



ROHM : TO-126FP

(1) Emitter
(2) Collector
(3) Base

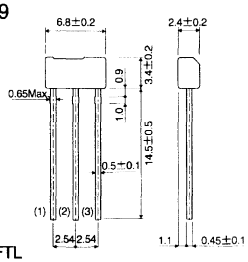
2SD1055



ROHM : FTR

(1) Emitter
(2) Collector
(3) Base

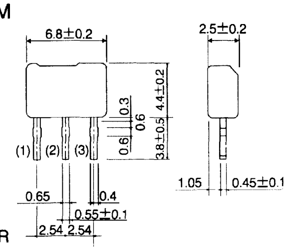
2SD1919



ROHM : FTL

(1) Emitter
(2) Collector
(3) Base

2SD1227M



ROHM : ATR
EIAJ : SC-71

(1) Emitter
(2) Collector
(3) Base

∗Denotes h_{FE}

(96-217-B24

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	40	V
Collector-emitter voltage		V_{CEO}	32	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	2	A(DC)
			2.5	A(Pulse) ∗1
Collector power dissipation	2SD1766	P_C	0.5	W
			2	W ∗2
	2SD1758		10	W (Tc=25℃)
	2SD1862,2SD1227M		1	W ∗3
	2SD1189F		1.2	W ∗3
			5	W (Tc=25℃)
	2SD1055,2SD1919		0.75	W
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 Single pulse Pw=20ms
∗2 On 40 x 40 x 0.7 mm ceramic board.
∗3 Printed circuit board: 1.7 mm thick, collector copper plating 1 cm^2 or more.

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	40	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage		BV_{CEO}	32	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current		I_{CBO}	—	—	1	μA	V_{CB}=20V
Emitter cutoff current		I_{EBO}	—	—	1	μA	V_{EB}=4V
DC current transfer ratio	2SD1766,2SD1758, 2SD1189F	h_{FE}	82	—	390	—	V_{CE}=3V, I_C=0.5A ∗
	2SD1862		120	—	390		
	2SD1055		180	—	390		
	2SD1919,2SD1227M		120	—	270		
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	0.5	0.8	V	I_C/I_B=2A/0.2A ∗
Transition frequency		f_T	—	100	—	MHz	V_{CE}=5V, I_E=−50mA, f=100MHz ∗
Output capacitance		Cob	—	30	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

∗ Measured using pulse current.

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping			Bulk		
		Symbol	T100	TL	TV2	—	—	TL2
		Basic ordering unit (pieces)	1000	2500	2500	1000	2000	2500
2SD1766	PQR		○	—	—	—	—	—
2SD1758	PQR		—	○	—	—	—	—
2SD1862	QR		—	—	○	—	—	—
2SD1189F	PQR		—	—	—	○	—	—
2SD1055	R		—	—	—	—	○	—
2SD1919	Q		—	—	—	—	—	○
2SD1227M	Q		—	—	—	—	○	—

h_{FE} values are classified as follows :

Item	P	Q	R
h_{FE}	82～180	120～270	180～390

●Electrical characteristic curves

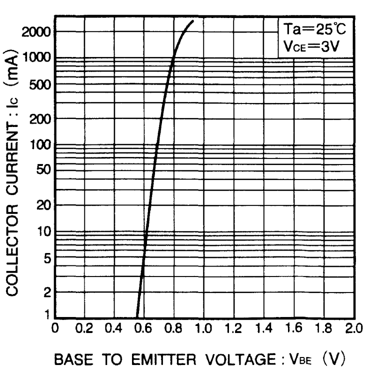


Fig.1 Grounded emitter propagation characteristics

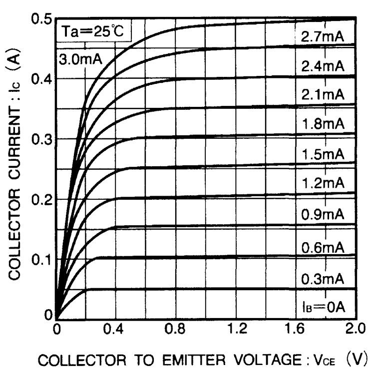


Fig.2 Grounded emitter output characteristics

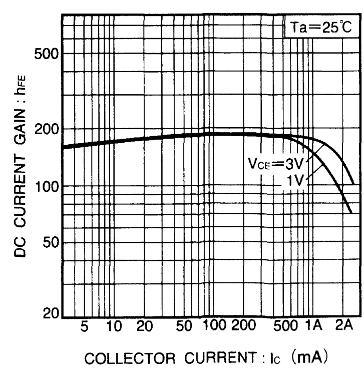


Fig.3 DC current gain vs. collector current

● Electrical characteristic curves

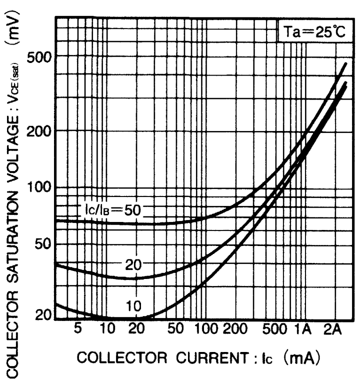


Fig.4 Collector-emitter saturation voltage vs. collector current

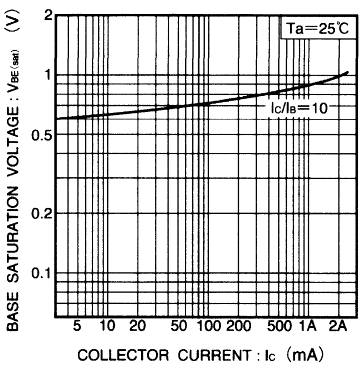


Fig.5 Collector-emitter saturation voltage vs. collector current

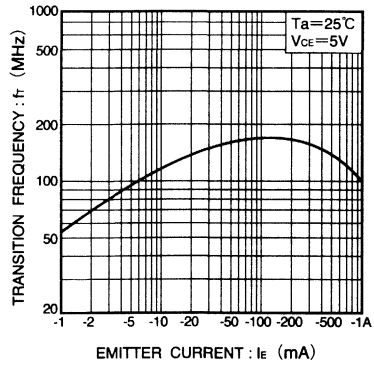


Fig.6 Transition frequency vs. emitter current

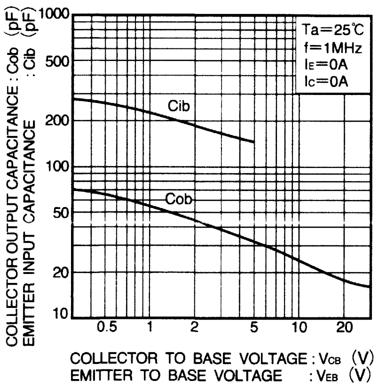


Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

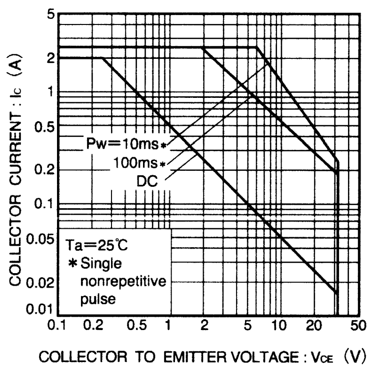


Fig.8 Safe operating area (2SD1766)

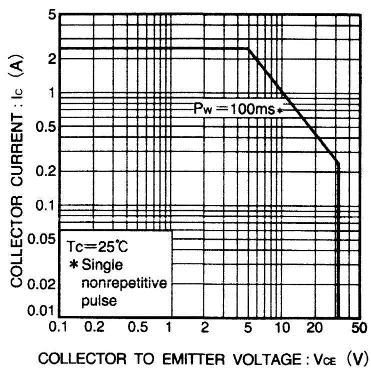


Fig.9 Safe operating area (2SD1758)

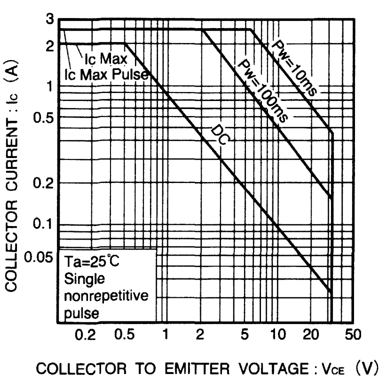


Fig.10 Safe operating area (2SD1862, 2SD1227M)

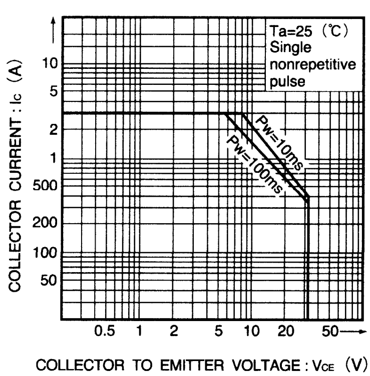


Fig.11 Safe operating area (2SD1189F)

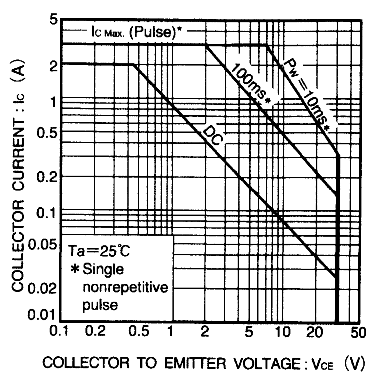


Fig.12 Safe operating area (2SD1055, 2SD1919)

Medium Power Transistor (80V, 1A)

2SD1898/2SD1733/2SD1768S/2SD1863/2SD1381F

●Features

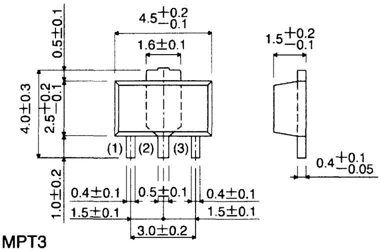
1) High V_{CEO}. V_{CEO} = 80V
2) High IC.
   I_C = 1A (DC)
3) Good h_{FE} linearity.
4) Low $V_{CE(sat)}$.
5) Complements the
   2SB1260/2SB1241/2SB1181.

●Structure

Epitaxial planar type
NPN silicon transistor

●External dimensions (Units: mm)

2SD1898

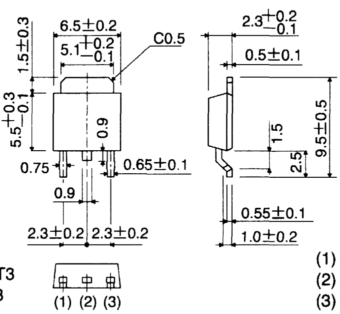


ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

Abbreviated symbol: DB

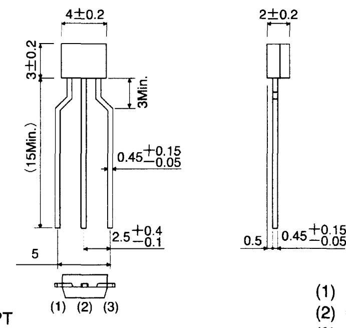
2SD1733



ROHM : CPT3
EIAJ : SC-63

(1) Base
(2) Collector
(3) Emitter

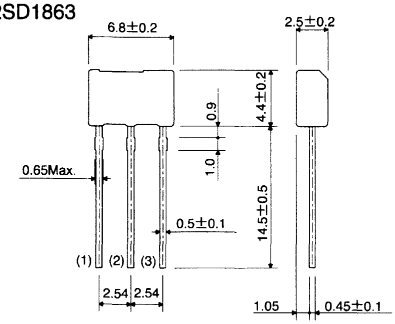
2SD1768S



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

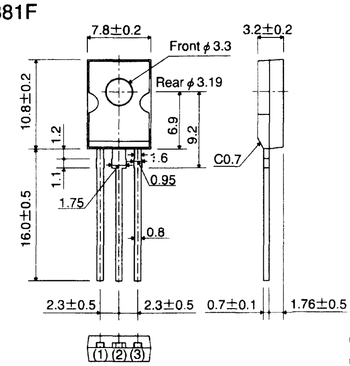
2SD1863



(1) Emitter
(2) Collector
(3) Base

ROHM : ATV

2SD1381F



ROHM : TO-126FP

(1) Emitter
(2) Collector
(3) Base

(96-739-D54)

● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	100	V
Collector-emitter voltage		V_{CEO}	80	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	1	A(DC)
			2	A(Pulse) ∗1
Collector power dissipation	2SD1893	P_C	0.5	W ∗3
			2	
	2SD1733		1	
			10	W(Tc=25°C)
	2SD1768S		0.3	W ∗2
	2SD1863		1	
			1.2	
	2SD1381F		5	W(Tc=25°C)
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

∗1 Pw=20ms、duty=1/2

∗2 Printed circuit board 1.7mm thick, collector copper plating $1cm^2$ or larger.

∗3 On 40×40×0.7mm ceramic bord.

● Electrical characteristics (Ta = 25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	100	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage		BV_{CEO}	80	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current		I_{CBO}	—	—	1	μA	V_{CB}=80V
Emitter cutoff current		I_{EBO}	—	—	1	μA	V_{EB}=4V
DC current transfer ratio	2SD1863	h_{FE}	180	—	390	—	V_{CE}/I_C=3V/0.5A ∗
	2SD1733, 2SD1898		82	—	390	—	
	2SD1768S		120	—	390	—	
	2SD1381F		82	—	270	—	
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	0.15	0.4	V	I_C/I_B=500mA/20mA
Transition frequency		f_T	—	100	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz
Output capacitance		Cob	—	20	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

∗ Measured using pulse current

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping				Bulk
		Code	T100	TL	TP	TV2	—
		Basic ordering unit (pieces)	1000	2500	5000	2500	2000
2SD1898	PQR		○	—	—	—	—
2SD1733	PQR		—	○	—	—	—
2SD1768S	QR		—	—	○	—	—
2SD1863	R		—	—	—	○	—
2SD1381F	PQ		—	—	—	—	○

h_{FE} values are classified as follows :

Item	P	Q	R
h_{FE}	82～180	120～270	180～390

●Electrical characteristic curves

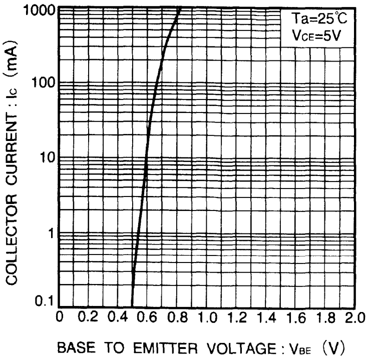


Fig.1 Grounded emitter propagation characteristics

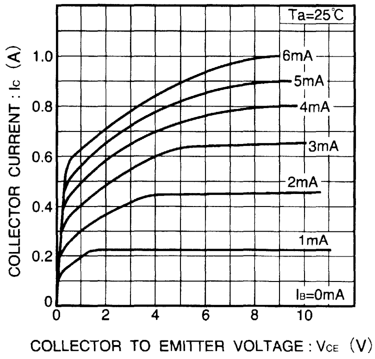


Fig.2 Grounded emitter output characteristics

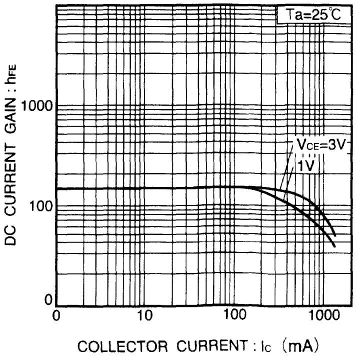


Fig.3 DC current gain vs. collector current

● Electrical characteristic curves

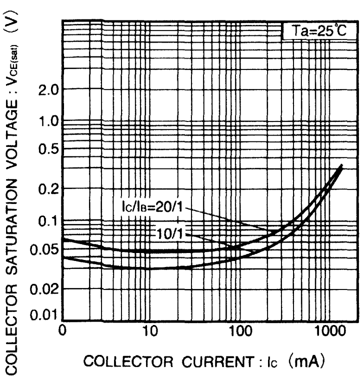


Fig.4 Collector-emitter saturation voltage vs. collector current

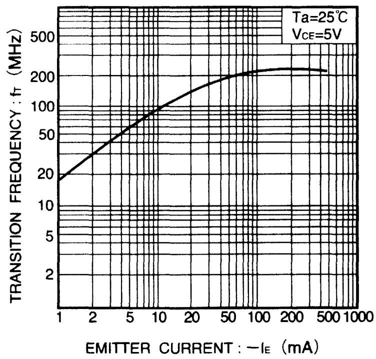


Fig.5 Gain bandwidth product vs. emitter current

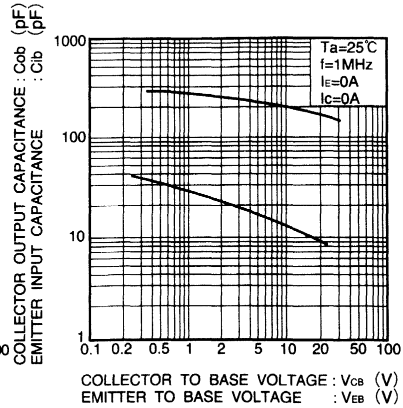


Fig.6 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

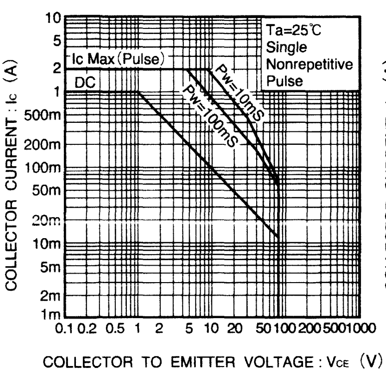


Fig.7 Safe operating area (2SD1863)

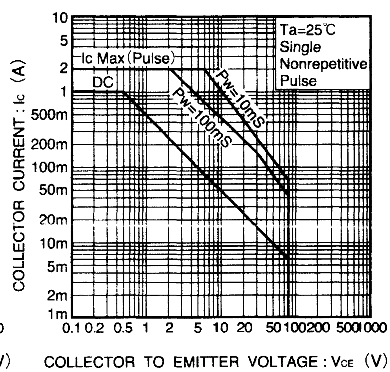


Fig.8 Safe operating area (2SD1898)

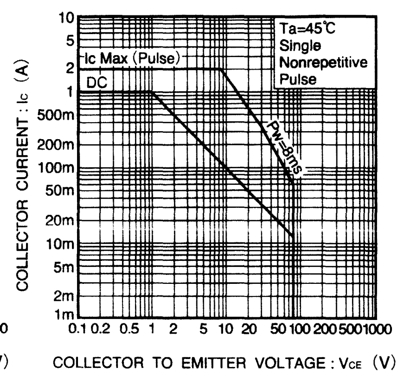


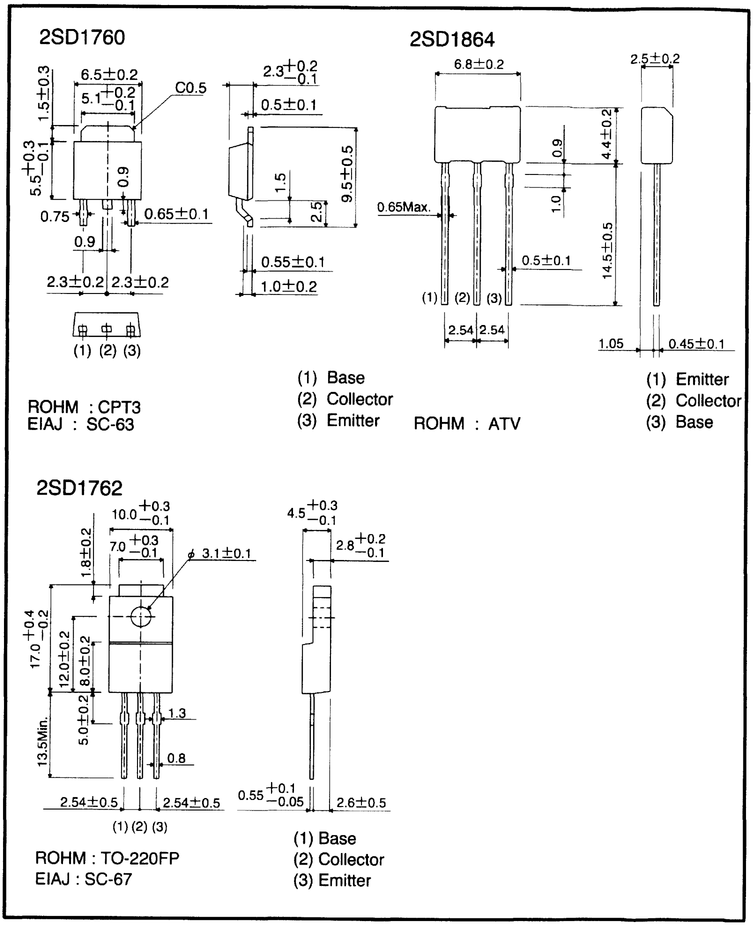
Fig.9 Safe operating area (2SD1381F)

Power Transistor (50V, 3A)
2SD1760/2SD1864/2SD1762

● Features
1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} = 0.5V$ (Typ.)
   ($I_C / I_B = 2A / 0.2A$)
2) Complements the 2SB1184/2SB1243/2SB1185.

● Structure
Epitaxial planar type
NPN silicon transistor

● External dimensions (Units: mm)



(96-214-D57)

ROHM

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	60	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	3	A(DC)
			4.5	A(Pulse) ＊1
Collector power dissipation	2SD1760	P_C	15	W(Tc=25℃)＊2
	2SD1864		1	W
	2SD1762		25	W(Tc=25℃)＊2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

＊1 Single pulse Pw=10ms
＊2 Printed circuit board 1.7mm thick, collector copper plating 1cm² or larger.

●Electrical characteristics (Ta = 25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage		BV_{CBO}	60	—	—	V	I_C=50 μA	
Collector-emitter breakdown voltage		BV_{CEO}	50	—	—	V	I_C=1mA	
Emitter-base breakdown voltage		BV_{EBO}	5	—	—	V	I_E=50 μA	
Collector cutoff current		I_{CBO}	—	—	1	μA	V_{CB}=40V	
Emitter cutoff current		I_{EBO}	—	—	1	μA	V_{EB}=4V	
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	0.5	1	V	I_C/I_B=2A/0.2A	＊
DC current transfer ratio	2SD1760, 2SD1864	h_{FE}	82	—	390	—	V_{CE}=3V, I_C=0.5A	＊
	2SD1762		60		320			
Transition frequency		f_T	—	90	—	MHz	V_{CE}=5V, I_E=−500mA, f=30MHz	＊
Output capacitance		Cob	—	40	—	pF	V_{CB}=10V, I_E=0A, f=1MHz	

＊ Measured using pulse current.

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping		Bulk
		Code	TL	TV2	—
		Basic ordering unit (pieces)	2500	2500	200
2SD1760	PQR		○	—	—
2SD1864	PQR		—	○	—
2SD1762	DEF		—	—	○

h_{FE} values are classified as follows :

Item	P	Q	R
h_{FE}	82~180	120~270	180~390

Item	D	E	F
h_{FE}	60~120	100~200	160~320

Bi-polar transistors

●Electrical characteristic curves

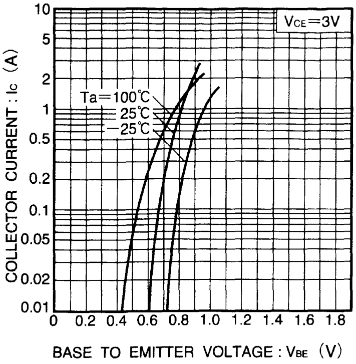


Fig.1 Grounded emitter propagation characteristics

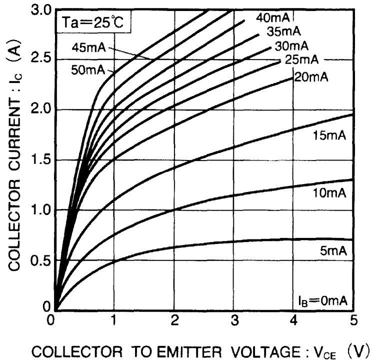


Fig.2 Grounded emitter output characteristics (I)

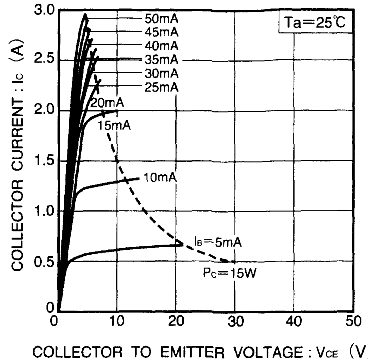


Fig.3 Grounded-emitter output characteristics (II)

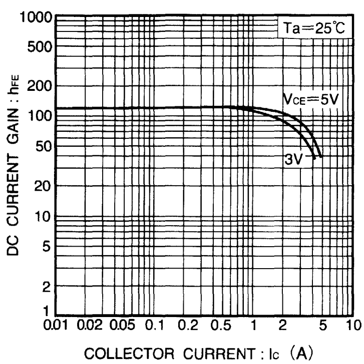


Fig.4 DC current gain vs. collector current (I)

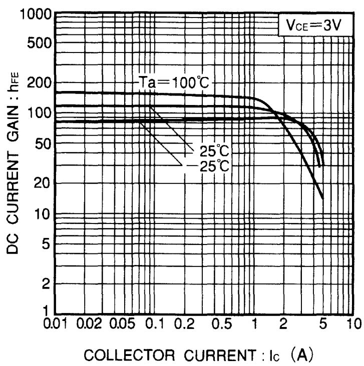


Fig.5 DC current gain vs. collector curren (II)

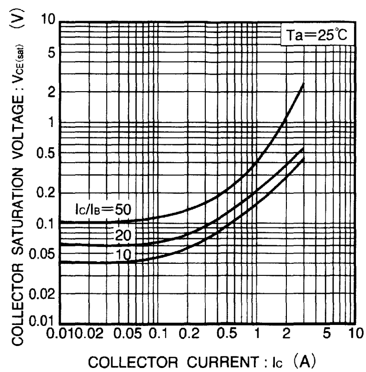


Fig.6 Collector-emitter saturation voltage vs. collector current

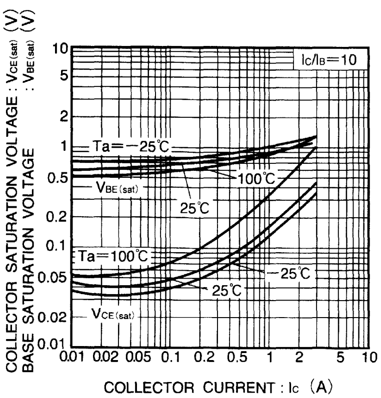


Fig.7 Collector-emitter saturation voltage vs. collector current
Base-emitter saturation voltage vs. collector current

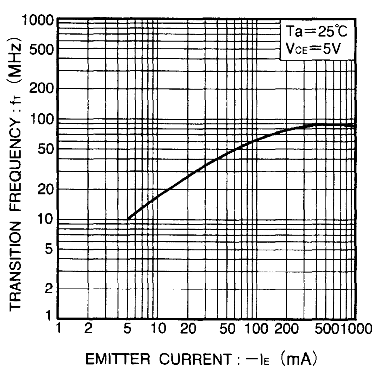


Fig.8 Gain bandwidth product vs. emitter current

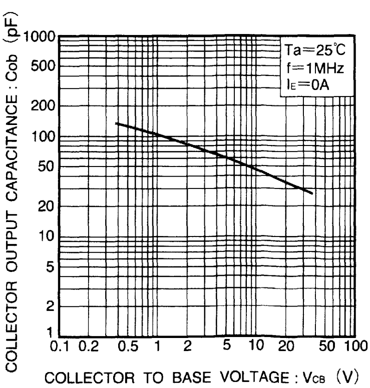


Fig.9 Collector output capacitance vs. collector-base voltage

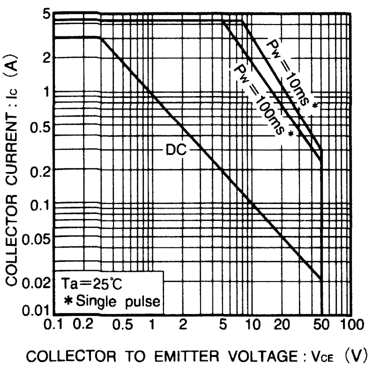


Fig.10 Safe operating area (2SD1760)

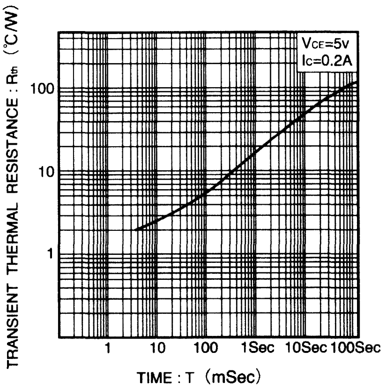


Fig.11 Transient thermal resistance (2SD1760)

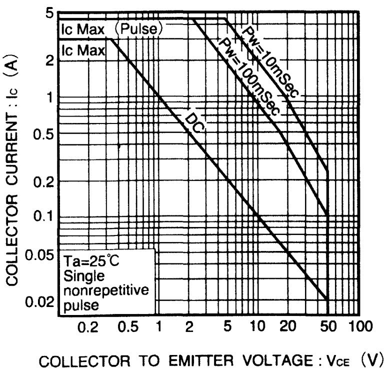


Fig.12 Safe operating area (2SD1864)

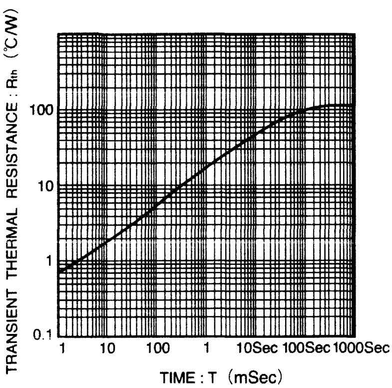


Fig.13 Transient thermal resistance (2SD1864)

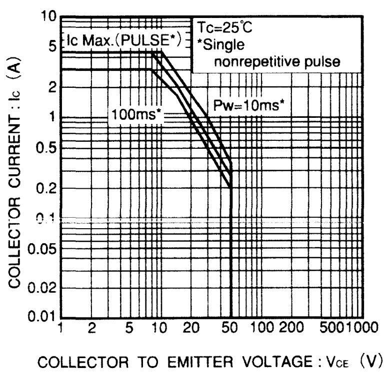


Fig.14 Safe operating area (2SD1762)

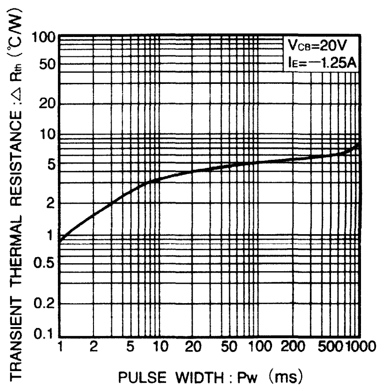


Fig.15 Transient thermal resistance (2SD1762)

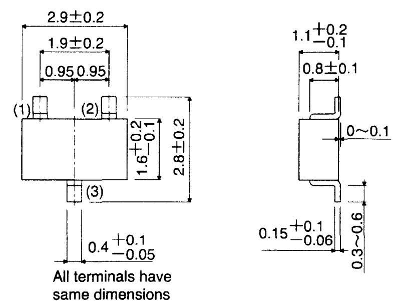
Bi-polar transistors

Medium Power Transistor (32V, 0.8A)
2SD1781K

●Features
1) Very low $V_{CE(sat)}$.
   $V_{CE(sat)} = -0.13V$ (Typ.)
   (I_C/I_B = 500mA/50mA)
2) High current capacity in compact package.
3) Complements the 2SB1147K.

●Structure
Epitaxial planar type
NPN silicon transistor

●External dimensions (Units: mm)



ROHM : SMT3
EIAJ : SC-59

Abbreviated symbol: AF *

(1) Emitter
(2) Base
(3) Collector

* Denotes h_{FE}

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	40	V
Collector-emitter voltage	V_{CEO}	32	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	0.8	A(DC)
		1.5	A(Pulse) *
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Single pulse Pw=100ms

(96-220-D92)

ROHM

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	40	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	32	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=500mA/50mA
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=3V, I_C=100mA
Transition frequency	f_T	—	150	—	MHz	V_{CE}=5V, I_E=−50mA, f=100MHz
Output capacitance	Cob	—	10	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping
		Code	T146
		Basic ordering unit (pieces)	3000
2SD1781K	QR		○

h_{FE} values are classified as follows :

Item	Q	R
h_{FE}	120~270	180~390

●Electrical characteristic curves

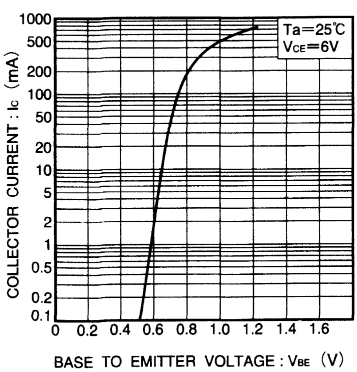


Fig.1 Grounded emitter propagation characteristics

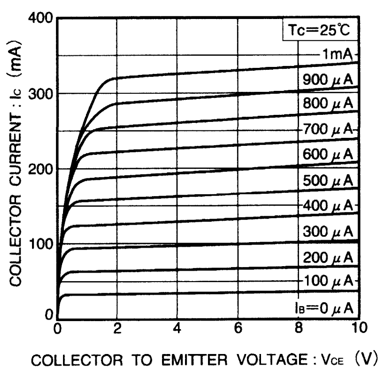


Fig.2 Grounded emitter output characteristics

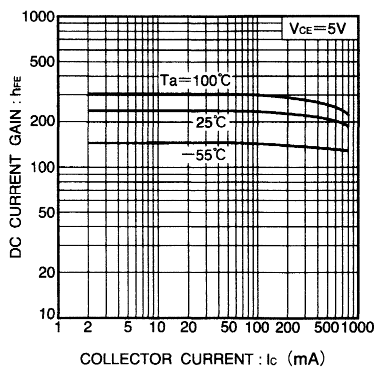


Fig.3 DC current gain vs. collector current

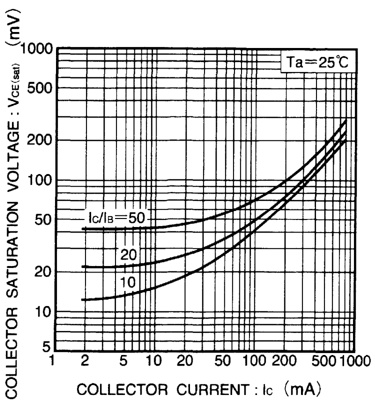


Fig.4 Collector-emitter saturation voltage vs. collector current (I)

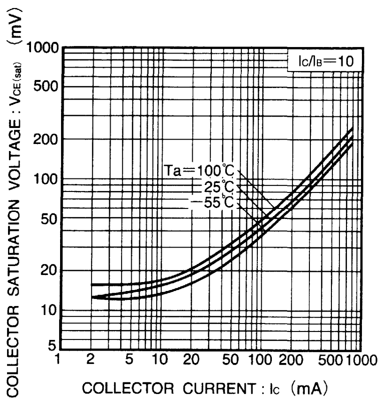


Fig.5 Collector-emitter saturation voltage vs. collector current (II)

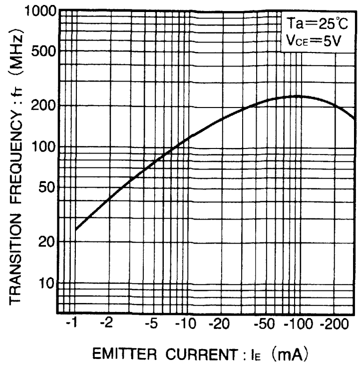


Fig.6 Gain bandwidth product vs. emitter current

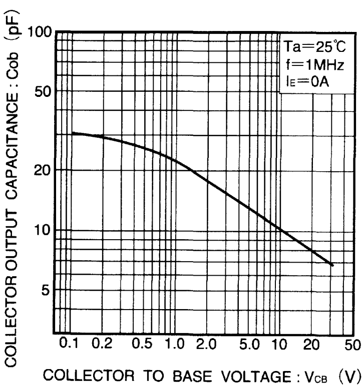


Fig.7 Collector output capacitance vs. collector-base voltage

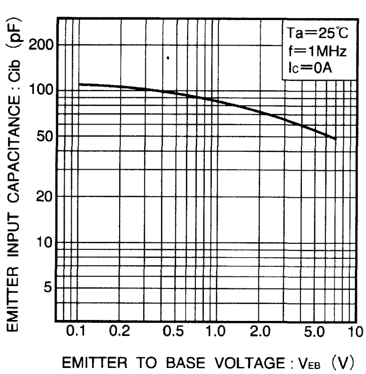


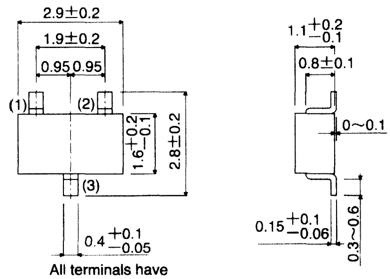
Fig.8 Emitter input capacitance vs. emitter-base voltage

Power Transistor (80V, 0.5A)
2SD1782K

●Features
1) Low $V_{CE(sat)}$.
$V_{CE(sat)} = 0.2V$ (Typ.)
($I_C / I_B = 0.5A/50mA$)
2) High breakdown voltage.
$BV_{CEO} = 80V$
3) Complements the 2SB1198K.

●Structure
Epitaxial planar type
NPN silicon transistor

●External dimensions (Units: mm)



* Denotes h_{FE}

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CEO}	80	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	0.5	A
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

(96-222-d93)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	80	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	80	—	—	V	I_C=2mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.2	0.5	V	I_C/I_B=500mA/50mA
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=3V, I_C=100mA
Transition frequency	f_T	—	180	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz
Output capacitance	Cob	—	7.5	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

●Packaging specifications and h_{FE}

Type	h_{FE}	Package name	Taping
		Symbol	T146
		Basic ordering unit (pieces)	3000
2SD1782K	QR		○

h_{FE} values are classified as follows :

Item	Q	R
h_{FE}	120~270	180~390

●Electrical characteristic curves

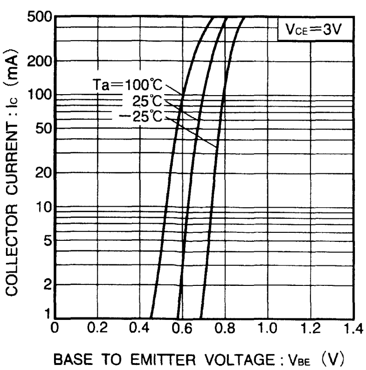


Fig.1 Grounded emitter propagation characteristics

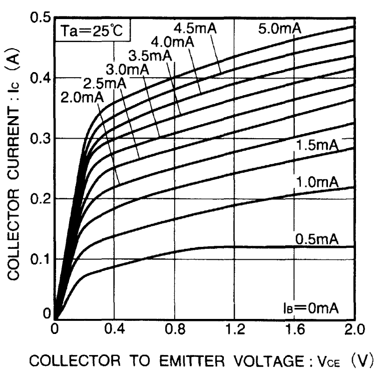


Fig.2 Grounded emitter output characteristics

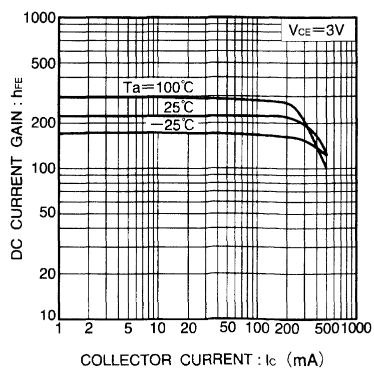


Fig.3 DC current gain vs. collector current

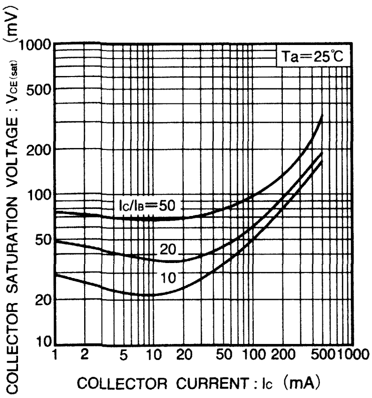


Fig.4 Collector-emitter saturation voltage vs. collector current (I)

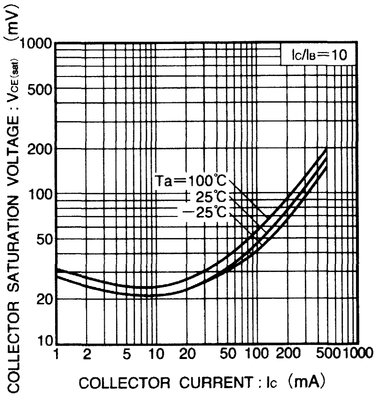


Fig.5 Collector-emitter saturation voltage vs. collector current (II)

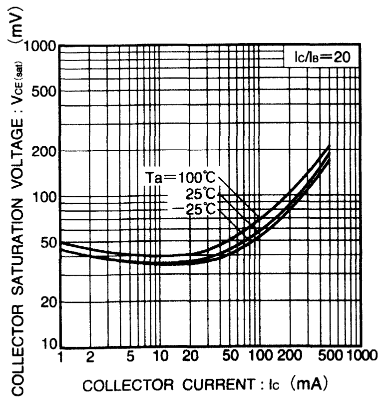


Fig.6 Collector-emitter saturation voltage vs. collector current (III)

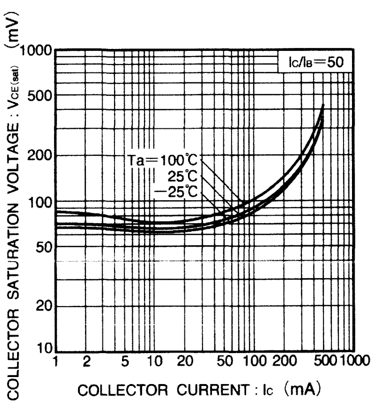


Fig.7 Collector-emitter saturation voltage vs. collector current (IV)

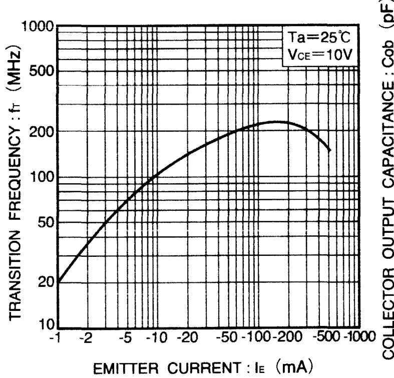


Fig.8 Gain bandwidth product vs. emitter current

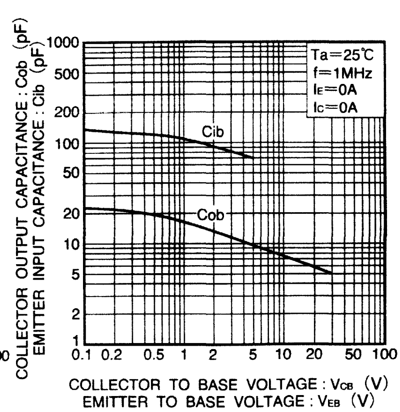


Fig.9 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Bi-polar transistors

High-voltage Amplifier Transistor (−210V, −30mA)
2SA821S

●**Features**

1) High breakdown voltage. (V_{CER}=−210V)
2) Complements the 2SC1651S.

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−210	V	
Collector-emitter voltage	V_{CEO}	−210	V	*
Emitter-base voltage	V_{EBO}	−5	V	
Collector current	I_C	−30	mA	
Collector power dissipation	P_C	250	mW	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* R_{BE}=10kΩ

●**Packaging specifications and h_{FE}**

Type	2SA821
Package	SPT
h_{FE}	PQ
Code	TP
Basic ordering unit (pieces)	5000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−210	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CER}	−210	—	—	V	I_C=−100μA, R_{BE}=10kΩ
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−1	μA	V_{CB}=−150V
Emitter cutoff current	I_{EBO}	—	—	−1	μA	V_{EB}=−4.5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−1	V	I_C/I_B=−2mA/−0.2mA
DC current transfer ratio	h_{FE}	56	—	270	—	V_{CE}/I_C=−3V/−5mA
Transition frequency	f_T	—	50	—	MHz	V_{CE}=−5V, I_E=2mA, f=30MHz
Output capacitance	Cob	—	8	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(94L-183-A35)

High-voltage Amplifier Transistor (210V, 30mA)
2SC1651S

●**Features**

1) High breakdown voltage. (V_{CEO}=210V)
2) Complements the 2SA821S.

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	210	V	
Collector-emitter voltage	V_{CEO}	210	V	*
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	30	mA	
Collector power dissipation	P_C	250	mW	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* R_{BE}=10KΩ

●**Packaging specifications and h_{FE}**

Type	2SC1651S
Package	SPT
h_{FE}	PQ
Code	TP
Basic ordering unit (pieces)	5000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	210	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CER}	210	—	—	V	I_C=100μA, R_{BE}=10kΩ
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	1	μA	V_{CB}=150V
Emitter cutoff current	I_{EBO}	—	—	1	μA	V_{EB}=4.5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1	V	I_C/I_B=2mA/0.2mA, f=30MHz
DC current transfer ratio	h_{FE}	82	—	270	—	V_{CE}/I_C=3V/5mA
Transition frequency	f_T	—	60	—	MHz	V_{CE}=5V, I_E=−2mA
Output capacitance	Cob	—	6	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

(94L-519-C35)

High-voltage Amplifier Transistor (−120V, −50mA)

2SA1579 / 2SA1514K

● Features

1) High breakdown voltage. (V_{CEO}=−120V)
2) Complements the 2SC4102/2SC3906K.

● Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−120	V
Collector-emitter voltage	V_{CEO}	−120	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−50	mA
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55～150	℃

● Packaging specifications and h_{FE}

Type	2SA1579	2SA1514K
Package	UMT3	SMT3
h_{FE}	RS	RS
Marking	R*	R*
Code	T106	T146
Basic ordering unit (pieces)	3000	3000

* Denotes h_{FE}

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−120	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−120	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−100V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−10mA/−1mA
DC current transfer ratio	h_{FE}	180	—	560	—	V_{CE}/I_C=−6V/−2mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V, I_E=2mA, f=30MHz
Output capacitance	Cob	—	3.2	—	pF	V_{CB}=−12V, I_E=0A, f=1MHz

(96-92-A41)

High-voltage Amplifier Transistor (120V, 50mA)

2SC4102 / 2SC3906K

● Features

1) High breakdown voltage. (V_{CEO}=120V)
2) Complements the 2SA1579/2SA1514K.

● Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	120	V
Collector-emitter voltage	V_{CEO}	120	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	50	mA
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55～150	℃

● Packaging specifications and h_{FE}

Type	2SC4102	2SC3906K
Package	UMT3	SMT3
h_{FE}	RS	RS
Marking	T*	T*
Code	T106	T146
Basic ordering unit (pieces)	3000	3000

* Denotes h_{FE}

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	120	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	120	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=100V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.5	V	I_C/I_B=10mA/1mA
DC current transfer ratio	h_{FE}	180	—	560	—	V_{CE}/I_C=6V/2mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=12V, I_E=−2mA, f=100MHz
Output capacitance	Cob	—	2.5	—	pF	V_{CB}=12V, I_E=0A, f=1MHz

(96-170-C41)

Power Transistor (−120V, −1.5A)

2SB1236 / 2SB1186

●Features

1) High breakdown voltage. (BV_{CEO}=−120V)
2) Low collector output capacitance. (Typ. 30pF at V_{CB}=−10V)
3) High transition frequency. (f_T=50MHz)
4) Complements the 2SD1857/2SD1763.

●Packaging specifications and h_{FE}

Type	2SB1236	2SB1186
Package	ATV	TO-220FP
h_{FE}	QR	EF
Code	TV2	−
Basic ordering unit (pieces)	2500	500

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−120	V
Collector-emitter voltage		V_{CEO}	−120	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−1.5	A (DC)
			−3	A (Pulse) *1
Collector power dissipation	2SB1236	P_C	1	W *2
	2SB1186		2	W
			20	W (Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 Single pulse Pw=100ms
*2 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−120	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage		BV_{CEO}	−120	−	−	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current		I_{CBO}	−	−	−1	μA	V_{CB}=−100V
Emitter cutoff current		I_{EBO}	−	−	−1	μA	V_{EB}=−4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	−2	V	I_C/I_B=−1A/−0.1A *
Base-emitter saturation voltage		$V_{BE(sat)}$	−	−	−1.5	V	I_C/I_B=−1A/−0.1A *
DC current transfer ratio	2SB1236	h_{FE}	120	−	390	−	V_{CE}/I_C=−5V/−0.1A
	2SB1186		100	−	320		
Transition frequency		f_T	−	50	−	MHz	V_{CE}=−5V, I_E=0.1A, f=30MHz
Output capacitance		Cob	−	30	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

*Measured using pulse current.

(94L-268-A56)

Power Transistor (120V, 1.5A)

2SC4132 / 2SD1857 / 2SD2343 / 2SD1763

●Features

1) High breakdown voltage. (BV_{CEO}=120V)
2) Low collector output capacitance. (Typ. 20pF at V_{CB}=10V)
3) High transition frequency. (f_T=80MHz)
4) Complements the 2SB1236/2SB1186.

●Packaging specifications and h_{FE}

Type	2SC4132	2SD1857	2SD2343	2SD1763
Package	MPT3	ATV	TO-126F	TO-220FP
h_{FE}	PQR	PQR	PQ	EF
Marking	CB*	−	−	−
Code	T100	TV2	−	−
Basic ordering unit (pieces)	1000	2500	1000	500

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	120	V
Collector-emitter voltage		V_{CEO}	120	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	2	A
		I_{CP}	3	A *1
Collector power dissipation	2SC4132	P_C	0.5	W *2
			2	W
	2SD1857		1	W
	2SD2343		1.5	W
			5	W(Tc=25℃)
	2SD1763		20	W(Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 Single pulse Pw=10ms
*2 On 40×40×0.7mm ceramic board.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	120	−	−	V	I_C=50μA
Collector-emitter breakdown voltage		BV_{CEO}	120	−	−	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	5	−	−	V	I_E=50μA
Collector cutoff current		I_{CBO}	−	−	1	μA	V_{CB}=100V
Emitter cutoff current		I_{EBO}	−	−	1	μA	V_{EB}=4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	0.4	V	I_C/I_B=1A/0.1A *
DC current transfer ratio	2SC4132,2SD1857	h_{FE}	82	−	390	−	V_{CE}/I_C=5V/0.1A
	2SD2343		82	−	270	−	
	2SD1763		100	−	320	−	
Transition frequency		f_T	−	80	−	MHz	V_{CE}=5V, I_E=−0.1A, f=30MHz *
Output capacitance		Cob	−	20	−	pF	V_{CB}=10V, I_E=0A, f=1MHz

*Measured using pulse current.

(96-175-C56)

Power Transistor (−160V, −1.5A)

2SB1275 / 2SB1236A / 2SB1569A / 2SB1186A

●Features

1) High breakdown voltage. (BV_{CEO}=−160V)
2) Low collector output capacitance. (Typ. 30pF at V_{CB}=10V)
3) High transition frequency. (f_T=50MHz)
4) Complements the 2SD1918/2SD1857A/2SC2400A/2SD1763A.

●Packaging specifications and h_{FE}

Type	2SB1275	2SB1236A	2SB1569A	2SB1186A
Package	CPT3	ATV	TO-220FN	TO-220FP
h_{FE}	NP	PQ	E	DE
Code	TL	TV2	−	−
Basic ordering unit (pieces)	2500	2500	500	500

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−160	V
Collector-emitter voltage		V_{CEO}	−160	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−1.5	A (DC)
			−3	A (Pulse) ＊1
Collector power dissipation	2SB1275	P_C	1	W(Tc=25℃)
			10	
	2SB1236A		1	W ＊2
	2SB1569A,2SB1186A		2	W
			20	W (Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

＊1 Sigle pulse Pw=100ms
＊2 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−160	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage		BV_{CEO}	−160	−	−	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current		I_{CBO}	−	−	−1	μA	V_{CB}=−120V
Emitter cutoff current		I_{EBO}	−	−	−1	μA	V_{EB}=−4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	−2	V	I_C/I_B=−1A/−0.1A ＊
Base-emitter saturation voltage		$V_{BE(sat)}$	−	−	−1.5	V	I_C/I_B=−1A/−0.1A ＊
DC current transfer ratio	2SB1275	h_{FE}	56	−	180	−	V_{CE}/I_C=−5V/−0.1A
	2SB1236A		82	−	270	−	
	2SB1569A		100	−	200	−	
	2SB1186A		60	−	200	−	
Transition frequency		f_T	−	50	−	MHz	V_{CE}=−5V , I_E=0.1A , f=30MHz
Output capacitance		Cob	−	30	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz

＊ Measured using pulse current.

(96-612-A58)

Power Transistor (160V, 1.5A)

2SD2211 / 2SD1918 / 2SD1857A / 2SD2400A / 2SD1763A

●Features

1) High breakdown voltage. (BV_{CEO}=160V)
2) Low collector output capacitance. (Typ. 20pF at V_{CB}=10V)
3) High transition frequency. (f_T=80MHz)
4) Complements the 2SB1275/2SB1236A/2SB1569A/2SB1186A.

●Packaging specifications and h_{FE}

Type	2SD2211	2SD1918	2SD1857A	2SD2400A	2SD1763A
Package	MPT3	CPT3	ATV	TO-220FN	TO-220FP
h_{FE}	QR	QR	PQ	E	DE
Marking	DQ＊	−	−	−	−
Code	T100	TL	TV2	−	−
Basic ordering unit (pieces)	1000	2500	2500	500	500

＊Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	160	V
Collector-emitter voltage		V_{CEO}	160	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	1.5	A (DC)
			3	A (Pulse) ＊1
Collector power dissipation	2SD1857A	P_C	1	W ＊2
	2SD2211		2	W ＊3
	2SD1918		1	
			10	W(Tc=25℃)
	2SD2400A,2SD1763A		2	W
			20	W(Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

＊1 Sigle pulse Pw=100ms
＊2 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.
＊3 On 40 x 40 x 0.7mm ceramic board.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	160	−	−	V	I_C=50μA
Collector-emitter breakdown voltage		BV_{CEO}	160	−	−	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	5	−	−	V	I_E=50μA
Collector cutoff current		I_{CBO}	−	−	1	μA	V_{CB}=120V
Emitter cutoff current		I_{EBO}	−	−	1	μA	V_{EB}=4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	2	V	I_C/I_B=1A/0.1A ＊
Base-emitter saturation voltage		$V_{BE(sat)}$	−	−	1.5	V	I_C/I_B=1A/0.1A ＊
DC current transfer ratio	2SD2211,2SD1918	h_{FE}	120	−	390	−	V_{CE}/I_C=5V/0.1A
	2SD1857A		82	−	270	−	
	2SD2400A		100	−	200	−	
	2SD1763A		60	−	200	−	
Transition frequency		f_T	−	80	−	MHz	V_{CE}=5V , I_E=−0.1A , f=30MHz
Output capacitance		Cob	−	20	−	pF	V_{CB}=10V , I_E=0A , f=1MHz

＊ Measured using pulse current.

(96-744-C58)

Medium Power Transistor (−80V, −0.7A)

2SB1189 / 2SB1238 / 2SB889F

●Features

1) High breakdown voltage and high current. (−80V, −0.7A)
2) Complements the 2SD1767/2SD1859/2SD1200F.

●Packaging specifications and h_{FE}

Type	2SB1189	2SB1238	2SB889F
Package	MPT3	ATV	TO-126FP
h_{FE}	PQR	PQR	Q
Marking	BD*	—	—
Code	T100	TV2	—
Basic ordering unit (pieces)	1000	2500	1000

*Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−80	V
Collector-emitter voltage		V_{CEO}	−80	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−0.7	A
Collector power dissipation	2SB1189	P_C	0.5	W
			2	W *1
	2SB1238		1	W *2
	2SB889F		5	W(Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 On 40×40×0.7mm ceramic board.
*2 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−80	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage		BV_{CEO}	−80	—	—	V	I_C=−2mA
Emitter-base breakdown voltage		BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current		I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current		I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	−0.2	−0.4	V	I_C/I_B=−500mA/−50mA
DC current transfer ratio	2SB1189,2SB1186A	h_{FE}	82	—	390	—	V_{CE}/I_C=−3V/−0.1A
	2SB889F		120	—	270	—	
Transition frequency		f_T	—	100	—	MHz	V_{CE}=−10V, I_E=50mA, f=100MHz
Output capacitance		Cob	—	14	20	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(96-618-B13)

Medium Power Transistor (80V, 0.7A)

2SD1767 / 2SD1859 / 2SD1200F

●Features

1) High breakdown voltage and high current. (80V, 0.7A)
2) Complements the 2SB1189/2SB1238/2SB889F.

●Packaging specifications and h_{FE}

Type	2SD1767	2SD1859	2SD1200F
Package	MPT3	ATV	TO-126FP
h_{FE}	PQR	QR	QR
Marking	DC*	—	—
Code	T100	TV2	—
Basic ordering unit (pieces)	1000	2500	1000

*Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	80	V
Collector-emitter voltage		V_{CEO}	80	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	0.7	A (DC)
			1	A (Pulse) *1
Collector power dissipation	2SD1767	P_C	0.5	W
			2	W *2
	2SD1859		1	W *3
	2SD1200F		5	W(Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 Pw=10ms, duty=1/2
*2 On 40×40×0.7mm ceramic board.
*3 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	80	—	—	V	I_C=50μA
Collector-emitter breakdown voltage		BV_{CEO}	80	—	—	V	I_C=2mA
Emitter-base breakdown voltage		BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current		I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current		I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	0.2	0.4	V	I_C/I_B=500mA/50mA
DC current transfer ratio	2SD1767	h_{FE}	82	—	390	—	V_{CE}/I_C=3V/0.1A
	2SD1859,2SD1200F		120	—	390	—	
Transition frequency		f_T	—	120	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz
Output capacitance		Cob	—	—	10	pF	V_{CB}=10V, I_E=0A, f=1MHz

(96-750-D13)

Power Transistor (−60V, −4A)

2SB1335

●Features

1) Low $V_{CE(sat)}$. (Typ.−0.5V at I_C/I_B=−3/−0.3A)
2) Excellent DC current gain characteristics.
3) Wide SOA (safe operating area).
4) Complements the 2SD1855.

●Packaging specifications and h_{FE}

Type	2SB1335
Package	TO-220FP
h_{FE}	EF
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CEO}	−60	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−4	A (DC)
		−6	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−80	−	−	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−60	−	−	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−80V
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.5	V	I_C/I_B=−3A/−0.3A *
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	−1.5	V	I_C/I_B=−3A/−0.3A *
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=−5V/−1A
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V , I_E=0.5A , f=5MHz *
Output capacitance	Cob	−	100	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz

* Measured using pulse current

(94L-356-B14)

Power Transistor (60V, 4A)

2SD1855

●Features

1) Low $V_{CE(sat)}$. (Typ. 0.3V at I_C/I_B=3/0.3A)
2) Excellent DC current gain characteristics.
3) Wide SOA (safe operating area).
4) Complements the 2SB1355.

●Packaging specifications and h_{FE}

Type	2SD1855
Package	TO-220FP
h_{FE}	EF
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CEO}	60	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	4	A (DC)
		6	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	80	−	−	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	60	−	−	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	−	−	V	I_E=50 μA
Collector cutoff current	I_{CBO}	−	−	10	μA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	−	−	10	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1	V	I_C/I_B=3A/0.3A *
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	1.5	V	I_C/I_B=3A/0.3A *
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=5V/1A
Transition frequency	f_T	−	8	−	MHz	V_{CE}=5V , I_E=−0.5A , f=5MHz *
Output capacitance	Cob	−	90	−	pF	V_{CB}=10V , I_E=0A , f=1MHz

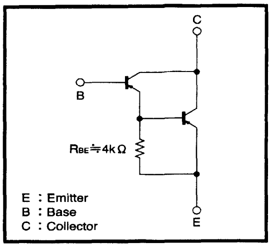
* Measured using pulse current

(94L-878-D14)

High-gain Amplifier Transistor (−32V, −0.3A)
2SB852K / 2SA830S

●Features
1) Darlington connection for high DC current gain.
2) Built-in 4 kΩ resistor between base and emitter.
3) Complements the 2SD1383K/2SD1645S.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	−40	V	
Collector-emitter voltage		V_{CES}	−32	V	*
Emitter-base voltage		V_{EBO}	−6	V	
Collector current		I_C	−0.3	A	
Collector power dissipation	2SB852K	P_C	0.2	W	
	2SA830S		0.3		
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55～150	℃	

* R_{BE}=0Ω

●Packaging specifications and h_{FE}

Type	2SB852K	2SA830S
Package	SMT3	SPT
h_{FE}	B	B
Marking	U*	—
Code	T146	TP
Basic ordering unit (pieces)	3000	5000

* Denotes h_{FE}

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−40	—	—	V	I_C=−100μA	
Collector-emitter breakdown voltage	BV_{CES}	−32	—	—	V	I_C=−1mA , RBE=0	
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−100μA	
Collector cutoff current	I_{CBO}	—	—	1	μA	V_{CB}=−24V	
Emitter cutoff current	I_{EBO}	—	—	1	μA	V_{EB}=−4.5V	
DC current transfer ratio	h_{FE}	5000	—	—	—	V_{CE}/I_C=−5V/−0.1A	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−1.5	V	I_C/I_B=−200mA/−0.4mA	*1
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−5V , I_E=−10mA , f=100MHz	*2
Output capacitance	Cob	—	3	—	pF	V_{CB}=−10V , I_E=0A , f=1MHz	

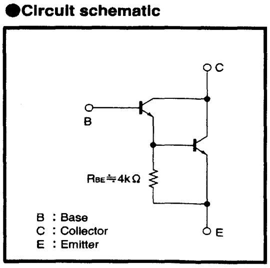
*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(96-118-B20)

High-gain Amplifier Transistor (32V, 0.3A)
2SD1383K/2SC1645S

●Features
1) Darlington connection for high DC current gain.
2) Built-in 4 kΩ resistor between base and emitter.
3) Complements the 2SD852K/2SA830S.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	40	V	
Collector-emitter voltage	V_{CES}	32	V	*2
Emitter-base voltage	V_{EBO}	6	V	
Collector current	I_C	0.3	A (DC)	
		1.5	A (Pulse)	*1
Collector power dissipation	P_C	0.2	W	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55～150	℃	

*1 Sigle pulse Pw=10ms *2 R_{BE}=0Ω

●Packaging specifications and h_{FE}

Type	2SD1383K	2SC1645S
Package	SMT3	SPT
h_{FE}	B	B
Marking	W*	—
Code	T146	TP
Basic ordering unit (pieces)	3000	5000

* Denotes h_{FE}

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	40	—	—	V	I_C=100μA	
Collector-emitter breakdown voltage	BV_{CES}	32	—	—	V	I_C=−1mA , RBE=0Ω	
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=100μA	
Collector cutoff current	I_{CBO}	—	—	1	μA	V_{CB}=24V	
Emitter cutoff current	I_{EBO}	—	—	1	μA	V_{EB}=4.5V	
DC current transfer ratio	h_{FE}	5000	—	—	—	V_{CE}/I_C=5V/0.1A	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1.5	V	I_C/I_B=200mA/0.4mA	*1
Transition frequency	f_T	—	250	—	MHz	V_{CE}=5V , I_E=−10mA , f=100MHz	*2
Output capacitance	Cob	—	5	—	pF	V_{CB}=10V , I_E=0A , f=1MHz	

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(96-205-D20)

High-speed Switching Transistor
2SA1952 / 2SA1906 / 2SA1757

●Features
1) High speed switching (tf : Typ. 0.15 μs at I_C=−3A)
2) Low $V_{CE(sat)}$. (Typ.−0.2V at I_C/I_B=−3/−0.15A)
3) Wide SOA (safe operating area)
4) Complements the 2SC5103/2SC4596.

●Packaging specifications and h_{FE}

Type	2SA1952	2SA1906	2SA1757
Package	CPT3	PSD3	TO-220FP
h_{FE}	Q	DEF	F
Code	TL	TL	−
Basic ordering unit (pieces)	3000	1000	500

●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−100	V
Collector-emitter voltage		V_{CEO}	−60	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−5	A
			−10	A (Pulse)
Collector power dissipation	2SA1757	P_C	2	W
	2SA1952		10	W(Tc=25°C)
	2SA1757, 2SA1906		25	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

●Electrical characteristics (Ta=25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−100	−	−	V	I_C=−50 μA
Collector-emitter voltage		$BV_{CEO(SUS)}$	−60	−	−	V	I_C/I_B=−3A/−0.3A, L=1mH
Collector-emitter breakdown voltage		BV_{CEO}	−60	−	−	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−5	−	−	V	I_E=−50 μA
Collector cutoff current		I_{CBO}	−	−	−10	μA	V_{CB}=−100V
Emitter cutoff current		I_{EBO}	−	−	−10	μA	V_{EB}=−5V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	−0.3	V	I_C/I_B=−3A/−0.15A
			−	−	−0.5	V	I_C/I_B=−4A/−0.2A
Base-emitter saturation voltage		$V_{BE(sat)}$	−	−	−1.2	V	I_C/I_B=−3A/−0.15A
			−	−	−1.5	V	I_C/I_B=−4A/−0.2A
DC current transfer ratio	2SA1952	h_{FE}	120	−	270	−	V_{CE}=−2V, I_C=−1A
	2SA1906		60	−	320	−	
	2SA1757		160	−	320	−	
Transition frequency		f_T	−	80	−	MHz	V_{CE}=−10V, I_E=0.5A, f=30MHz
Output capacitance		Cob	−	130	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz
Turn-on time		t_{on}	−	−	0.3	μs	I_C=−3A, R_L=10Ω
Storage time		t_{stg}	−	−	1.5	μs	I_{B1}=−I_{B2}=−0.15A
Fall time		t_f	−	−	0.3	μs	V_{CC}≒−30V

(96-603-A314)

High-speed Switching Transistor
2SC5103 / 2SC4596

●Features
1) Low $V_{CE(sat)}$. (Typ. 0.15V at I_C/I_B=3/0.15A)
2) High speed switching (tf : Typ. 0.1 μs at I_C=3A)
3) Wide SOA (safe operating area)
4) Complements the 2SA1952/2SA1757.

●Packaging specifications and h_{FE}

Type	2SC5103	2SC4596
Package	CPT3	TO-220FP
h_{FE}	PQ	EF
Code	TL	−
Basic ordering unit (pieces)	2500	500

●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	100	V
Collector-emitter voltage		V_{CEO}	60	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	5	A (DC)
			10	A (Pulse) *
Collector power dissipation	2SC5103	P_C	1	W
			2	
	2SC4596		10	W(Tc=25°C)
			25	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

* Single pulse Pw=100ms

●Electrical characteristics (Ta=25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	100	−	−	V	I_C=50 μA
Collector-emitter voltage		$BV_{CEO(SUS)}$	60	−	−	V	I_C/I_B=3A/0.3A, L=1mH
Collector-emitter breakdown voltage		BV_{CEO}	60	−	−	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	5	−	−	V	I_E=50 μA
Collector cutoff current		I_{CBO}	−	−	10	μA	V_{CB}=100V
Emitter cutoff current		I_{EBO}	−	−	10	μA	V_{EB}=5V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	0.15	0.3	V	I_C/I_B=3A/0.15A *
			−	−	0.5	V	I_C/I_B=4A/0.2A *
Base-emitter saturation voltage		$V_{BE(sat)}$	−	−	1.2	V	I_C/I_B=3A/0.15A *
			−	−	1.5	V	I_C/I_B=4A/0.2A *
DC current transfer ratio	2SC5103	h_{FE}	82	−	270	−	V_{CE}/I_C=2V/1A
	2SC4596		100	−	320	−	
Transition frequency		f_T	−	120	−	MHz	V_{CB}=10V, I_E=0.5A, f=30MHz *
Output capacitance		Cob	−	80	−	pF	V_{CE}=10V, I_E=0A, f=1MHz
Turn-on time		t_{on}	−	−	0.3	μs	I_C=3A, R_L=10Ω
Storage time		t_{stg}	−	−	1.5	μs	I_{B1}=−I_{B2}=0.15A
Fall time		t_f	−	0.1	0.3	μs	V_{CC}≒30V

* Measured using pulse current.

(96-199-C314)

High-voltage Switching (Audio output amplifier transistor, Stabilized power supply transistor)
2SA1964

●Features
1) Flat DC current gain characteristics.
2) High breakdown voltage. (BV_{CEO}=−160V)
3) High f_T. (Typ.150MHz)
4) Wide SOA (safe operating area).
5) Complements the 2SC5248.

●Packaging specifications and h_{FE}

Type	2SA1964
Package	TO-220FP
h_{FE}	DE
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−160	V
Collector-emitter voltage	V_{CEO}	−160	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−1.5	A
Collector power dissipation	P_C	2	W
		20	W(Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	−160	−	−	V	I_C=−1mA
Collector-base breakdown voltage	BV_{CBO}	−160	−	−	V	I_C=−50μA
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current	I_{CBO}	−	−	−1	μA	V_{CB}=−160V
Emitter cutoff current	I_{EBO}	−	−	−1	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1	V	I_C/I_B=−1A/−0.1A
DC current transfer ratio	h_{FE}	60	−	200	−	V_{CE}=−5V, I_C=−0.1A
Transition frequency	f_T	−	150	−	MHz	V_{CE}=−10V, I_E=−0.2A, f=100MHz
Output capacitance	Cob	−	35	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(SPEC-A315)

High-voltage Switching (Audio output amplifier transistor, Stabilized power supply transistor)
2SC5248

●Features
1) Flat DC current gain characteristics.
2) High breakdown voltage. (BV_{CEO}=160V)
3) High f_T. (Typ.150MHz)
4) Wide SOA (safe operating area).
5) Complements the 2SA1964.

●Packaging specifications and h_{FE}

Type	2SC5248
Package	TO-220FP
h_{FE}	DE
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	160	V
Collector-emitter voltage	V_{CEO}	160	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	1.5	A
Collector power dissipation	P_C	2	W
		20	W(Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Electrical characteristics (Ta=25℃)

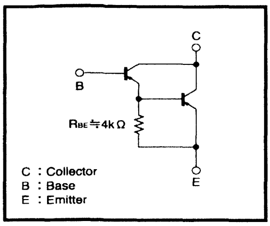
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	160	−	−	V	I_C=1mA
Collector-base breakdown voltage	BV_{CBO}	160	−	−	V	I_C=50μA
Emitter-base breakdown voltage	BV_{EBO}	5	−	−	V	I_E=50μA
Collector cutoff current	I_{CBO}	−	−	1	μA	V_{CB}=160V
Emitter cutoff current	I_{EBO}	−	−	1	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1	V	I_C/I_B=1A/0.1A
DC current transfer ratio	h_{FE}	60	−	200	−	V_{CE}=5V, I_C=0.1A
Transition frequency	f_T	−	150	−	MHz	V_{CE}=10V, I_E=0.2A, f=100MHz
Output capacitance	Cob	−	20	−	pF	V_{CB}=10V, I_E=0A, f=1MHz

(SPEC-C315)

Power Transistor (−40V, −2A)
2SB1183 / 2SB1239 / 2SB786F

●**Features**
1) Darlington connection for high DC current gain.
2) Built-in 4 kΩ resistor between base and emitter.
3) Complements the 2SD1759/2SD1861/2SD947F.

●**Circuit schematic**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−40	V
Collector-emitter voltage		V_{CER}	−40	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−2	A (DC)
			−3	A (Pulse) ＊1
Collector power dissipation	2SB1183	P_C	1	W
			10	W (Tc=25℃)
	2SB1239		1	W ＊2
	2SB786F		1.2	W
			5	W (Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

＊1 Sigle pulse Pw=10ms
＊2 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●**Packaging specifications and h_{FE}**

Type	2SB1183	2SB1239	2SB786F
Package	CPT3	ATV	TO-126FP
h_{FE}	1k~200k	1k~	1k~
Code	TL	T146	−
Basic ordering unit (pieces)	2500	2500	1000

●**Electrical characteristics** (Ta=25℃)

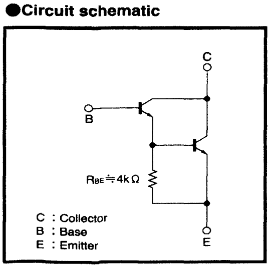
Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−40	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage		BV_{CER}	−40	−	−	V	I_C=−1mA , RBE=10kΩ
Emitter-base breakdown voltage		BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current		I_{CBO}	−	−	−1	μA	V_{CB}=−24V
Emitter cutoff current		I_{EBO}	−	−	−1	μA	V_{EB}=−4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	−1.5	V	I_C/I_B=−0.6A/−1.2mA
DC current transfer ratio	2SB1183	h_{FE}	1000	−	20000	−	V_{CE}/I_C=−2V/−0.5A
	2SB1239,2SB786F		1000	−	−	−	
Output capacitance		Cob	−	11	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz

(96-126-B23)

Power Transistor (40V, 2A)
2SD1759 / 2SD1861 / 2SD947F

●**Features**
1) Darlington connection for high DC current gain.
2) Built-in 4kΩ resistor between base and emitter.
3) Complements the 2SB1183/2SB1239/2SB786F.

●**Circuit schematic**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	40	V
Collector-emitter voltage		V_{CER}	40	V (R_{BE}=10kΩ)
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	2	A (DC)
			3	A (Pulse) ＊1
Collector power dissipation	2SD1861	P_C	1	W ＊2
	2SD1759		1	
			10	W(Tc=25℃)
	2SD947F		1.2	W
			5	W(Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

＊1 Sigle pulse Pw=10ms
＊2 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●**Packaging specifications and h_{FE}**

Type	2SD1759	2SD1861	2SD947F
Package	CPT3	ATV	TO-126FP
h_{FE}	1k~200k	1k~	1k~
Code	TL	TV2	−
Basic ordering unit (pieces)	2500	2500	1000

●**Electrical characteristics** (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	40	−	−	V	I_C=50μA
Collector-emitter breakdown voltage		BV_{CEO}	40	−	−	V	I_C=1mA , R_{BE}=10kΩ
Emitter-base breakdown voltage		BV_{EBO}	5	−	−	V	I_E=50μA
Collector cutoff current		I_{CBO}	−	−	1	μA	V_{CB}=24V
Emitter cutoff current		I_{EBO}	−	−	1	μA	V_{EB}=4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	1.5	V	I_C/I_B=0.6mA/1.2mA
DC current transfer ratio	2SD1759	h_{FE}	1000	−	20000	−	V_{CE}/I_C=3V/0.5A
	2SD1861,2SD947F		1000	−	−	−	
Output capacitance		Cob	−	11	−	pF	V_{CB}=10V , I_E=0A , f=1MHz

(94S-321-D23)

Bi-polar transistors

Power Transistor (−20V, −2A)
2SB1427

●Features
1) Low $V_{CE(sat)}$. (Typ.−0.5V at I_C/I_B=−1/−50mA)
2) Excellent DC current gain characteristics.

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−20	V
Collector-emitter voltage	V_{CEO}	−20	V
Emitter-base voltage	V_{EBO}	−6	V
Collector current	I_C	−2	A (DC)
		−3	A (Pulse) *1
Collector power dissipation	P_C	0.5	W
		2	*2
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

*1 Sigle pulse Pw=10ms
*2 On 40 x 40 x 0.7 mm ceramic board.

●Packaging specifications and h_{FE}

Type	2SB1427
Package	MPT3
h_{FE}	E
Marking	BJ *
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−20	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−20	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−16V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−1A/−50mA *
DC current transfer ratio	h_{FE}	390	—	820	—	V_{CE}/I_C=−6V/−0.5A
Transition frequency	f_T	—	90	—	MHz	V_{CE}=−10V , I_E=10mA , f=30MHz
Output capacitance	Cob	—	30	—	pF	V_{CB}=−10V , I_E=0A , f=1MHz

* Measured using pulse current.

(96-148-B24TJR)

High-gain Amplifier Transistor (25V, 2A)
2SD2153

●Features
1) Low $V_{CE(sat)}$. (Typ. 0.12V at I_C/I_B=1/20mA)
2) Excellent DC current gain characteristics.

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	30	V
Collector-emitter voltage	V_{CEO}	25	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	2	A (DC)
		3	A (Pulse) *
Collector power dissipation	P_C	0.5	W
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

* Sigle pulse Pw=10ms

●Packaging specifications and h_{FE}

Type	2SD2153
Package	MPT3
h_{FE}	UVW
Marking	DN *
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	25	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.12	0.5	V	I_C/I_B=1A/20mA *
DC current transfer ratio	h_{FE}	56	—	2700	—	V_{CE}/I_C=6V/0.5A
Transition frequency	f_T	—	110	—	MHz	V_{CE}=10V , I_E=−10mA , f=100MHz
Output capacitance	Cob	—	22	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

* Measured using pulse current.

(96-239-D24TJR)

Power Transistor (−80V, −7A)
2SB1290

●**Features**
1) Low $V_{CE(sat)}$. (Typ. −0.3V at I_C/I_B=−4/−0.4A)
2) Excellent DC current gain characteristics.
3) P_C=30W (T_C=25℃)
4) Wide SOA (safe operating area).
5) Complements the 2SD1833.

●**Packaging specifications and h_{FE}**

Type	2SB1290
Package	TO-220FP
h_{FE}	EF
Code	−
Basic ordering unit (pieces)	500

●**Absolute maximum ratings (Ta=25℃)**

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CEO}	−80	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−7	A (DC)
		−10	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (T_C=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●**Electrical characteristics (Ta=25℃)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−80	−	−	V	I_C=−50μA	
Collector-emitter breakdown voltage	BV_{CEO}	−80	−	−	V	I_C=−1mA	
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50μA	
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−80V	
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−4V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1	V	I_C/I_B=−4A/−0.4A	*
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	−1.5	V	I_C/I_B=−4A/−0.4A	*
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=−5V/−1A	
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V , I_E=0.5A , f=5MHz	
Output capacitance	Cob	−	200	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz	

* Measured using pulse current

(96-630-B55)

Power Transistor (80V, 7A)
2SD1833

●**Features**
1) Low $V_{CE(sat)}$. (Typ. 0.3V at I_C/I_B=4/0.4A)
2) Excellent DC current gain characteristics.
3) P_C=30W (T_C=25℃)
4) Wide SOA (safe operating area).
5) Complements the 2SB1290.

●**Packaging specifications and h_{FE}**

Type	2SD1833
Package	TO-220FP
h_{FE}	DEF
Code	−
Basic ordering unit (pieces)	500

●**Absolute maximum ratings (Ta=25℃)**

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	100	V
Collector-emitter voltage	V_{CEO}	80	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	7	A (DC)
		10	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (T_C=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●**Electrical characteristics (Ta=25℃)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	100	−	−	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	80	−	−	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	5	−	−	V	I_E=50μA	
Collector cutoff current	I_{CBO}	−	−	10	μA	V_{CB}=100V	
Emitter cutoff current	I_{EBO}	−	−	10	μA	V_{EB}=4V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1	V	I_C/I_B=4A/0.4A	*
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	1.5	V	I_C/I_B=4A/0.4A	*
DC current transfer ratio	h_{FE}	60	−	320	−	V_{CE}=5V , I_C=1A	*
Transition frequency	f_T	−	5	−	MHz	V_{CE}=5V , I_E=−0.5A , f=5MHz	*
Output capacitance	Cob	−	150	−	pF	V_{CB}=10V , I_E=0A , f=1MHz	

* Measured using pulse current

(96-741-D55)

Power Transistor (−60V, −5A)
2SB1292

●Features

1) Low $V_{CE(sat)}$. (Typ.−0.3V at I_C/I_B=−3/−0.3A)
2) Excellent DC current gain characteristics.
3) Pc = 30W(Tc=25℃)
4) Wide SOA (safe operating area).
5) Complements the 2SD1832.

●Packaging specifications and h_{FE}

Type	2SB1292
Package	TO-220FP
h_{FE}	EF
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−60	V
Collector-emitter voltage	V_{CEO}	−60	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−5	A (DC)
		−10	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−60	−	−	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.5	V	I_C/I_B=−3A/−0.3A *
Base-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.5	V	I_C/I_B=−3A/−0.3A *
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=5V/−1A
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V , I_E=0.5A , f=5MHz *
Output capacitance	Cob	−	150	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz

* Measured using pulse current

(94L-316-B75)

Power Transistor (60V, 5A)
2SD1832

●Features

1) Low $V_{CE(sat)}$. (Typ. 0.3V at I_C/I_B=3/0.3A)
2) Excellent DC current gain characteristics.
3) Pc =30W(Tc=25℃)
4) Wide SOA (safe operating area).
5) Complements the 2SB1292.

●Packaging specifications and h_{FE}

Type	2SD1832
Package	TO-220FP
h_{FE}	EF
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CEO}	60	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	5	A (DC)
		10	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	80	−	−	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	60	−	−	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	−	−	V	I_E=50μA
Collector cutoff current	I_{CBO}	−	−	10	μA	V_{CB}=80V
Emitter cutoff current	I_{EBO}	−	−	10	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1.0	V	I_C/I_B=3A/0.3A *
Base-emitter saturation voltage	$V_{CE(sat)}$	−	−	1.5	V	I_C/I_B=3A/0.3A *
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=5V/1A
Transition frequency	f_T	−	8	−	MHz	V_{CE}=5V , I_E=−50mA , f=5MHz *
Output capacitance	Cob	−	130	−	pF	V_{CB}=10V , I_E=0A , f=1MHz

* Measured using pulse current

(94L-872-D75)

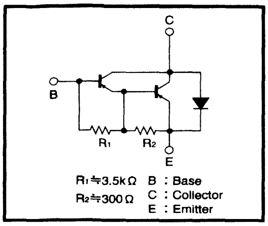
Power Transistor (−100V, −2A)

2SB1580 / 2SB1316 / 2SB1567 / 2SB1287

●Features

1) Darlington connection for high DC current gain.
2) Built-in resistor between base and emitter.
3) Built-in damper diode.
4) Complements the 2SD2195/2SD1980/2SD2398/2SD1765.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−100	V
Collector-emitter voltage		V_{CEO}	−100	V
Emitter-base voltage		V_{EBO}	−8	V
Collector current		I_C	−2	A (DC)
			−3	A (Pulse) *1
Collector power dissipation	2SB1580	P_C	2	W *2
	2SB1316		1	
			10	W(Tc=25℃)
	2SD1567,2SD1287		2	W
			20	W(Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 Single pulse Pw=100ms *2 On 40 x 40 x 0.7 mm ceramic board.

●Packaging specifications and h_{FE}

Type	2SB1580	2SB1316	2SB1567	2SB1287
Package	MPT3	CPT3	TO-220FN	TO-220FP
h_{FE}	1k~10k	1k~10k	1k~10k	1k~10k
Marking	BN*	—	—	—
Code	T100	TL	—	—
Basic ordering unit (pieces)	1000	2500	500	500

*Denotes h_{FE}

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−100	—	—	V	I_C=−50μA	
Collector-emitter breakdown voltage	BV_{CEO}	−100	—	—	V	I_C=−5mA	
Collector cutoff current	I_{CBO}	—	—	−10	μA	V_{CB}=−100V	
Emitter cutoff current	I_{EBO}	—	—	−3	mA	V_{EB}=−7V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−1.5	V	I_C/I_B=−1A/−1mA	*
DC current transfer ratio	h_{FE}	1000	—	10000	—	V_{CE}=−2V , I_C=−1A	*
Output capacitance	Cob	—	35	—	pF	V_{CB}=−10V , I_E=0A , f=1MHz	

* Measured using pulse current.

(96-139-B85)

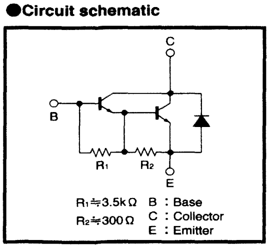
Power Transistor (100V, 2A)

2SD2195 / 2SD1980 / 2SD1867 / 2SD2398 / 2SD1765

●Features

1) Darlington connection for high DC current gain.
2) Built-in resistor between base and emitter.
3) Built-in damper diode.
4) Complements the 2SB1580/2SB1316/2SB1567/2SB1287.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	100	V
Collector-emitter voltage		V_{CEO}	100	V
Emitter-base voltage		V_{EBO}	6	V
Collector current		I_C	2	A (DC)
			3	A (Pulse) *1
Collector power dissipation	2SD2195	P_C	2	W *2
	2SD1980		1	W(Tc=25℃)
			10	
	2SD1867		1	W *3
	2SD2398,2SD1765		2	W(Tc=25℃)
			20	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 Single pulse Pw=100ms *2 On 40 x 40 x 0.7 mm ceramic board.
*3 Printed circuit board 1.7mm thick, collector plating $1cm^2$ or larger.

●Packaging specifications and h_{FE}

Type	2SD2195	2SD1980	2SD1867	2SD2398	2SD1765
Package	MPT3	CPT3	ATV	TO-220FN	TO-220FP
h_{FE}	1k~10k	1k~10k	1k~10k	1k~10k	1k~10k
Marking	DP*	—	—	—	—
Code	T100	TL	TV2	—	—
Basic ordering unit (pieces)	1000	2500	2500	500	500

*Denotes h_{FE}

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	100	—	—	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	100	—	—	V	I_C=5mA	
Collector cutoff current	I_{CBO}	—	—	10	μA	V_{CB}=100V	
Emitter cutoff current	I_{EBO}	—	—	3	mA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1.5	V	I_C=1A , I_B=1mA	*
DC current transfer ratio	h_{FE}	1000	—	10000	—	V_{CE}=2V , I_C=1A	*
Output capacitance	Cob	—	25	—	pF	V_{CB}=10V , I_E=0A , f=1MHz	

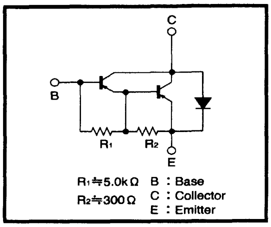
* Measured using pulse current.

(96-227-D85)

Power Transistor (−120V, −6A)
2SB1340

●Features
1) Darlington connection for high DC current gain.
2) Built-in resistor between base and emitter.
3) Built-in damper diode.
4) Complements the 2SD1889.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−120	V
Collector-emitter voltage	V_{CES}	−120	V
Emitter-base voltage	V_{EBO}	−6	V
Collector current	I_C	−6	A (DC)
		−10	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=10ms

●Packaging specifications and h_{FE}

Type	2SB1340
Package	TO-220FP
h_{FE}	2k~20k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−120	−	−	V	I_C=−50μA	
Collector-emitter breakdown voltage	BV_{CEO}	−120	−	−	V	I_C=−5mA	
Collector cutoff curren	I_{CBO}	−	−	−100	μA	V_{CB}=−120V	
Emitter cutoff current	I_{EBO}	−	−	−3	mA	V_{EB}=−5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.5	V	I_C/I_B=−3A/−6mA	*1
DC current transfer ratio	h_{FE}	2k	−	20k	−	V_{CE}/I_C=−3V/−2A	*1
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V , I_E=0.5A , f=10MHz	*2
Output capacitance	Cob	−	70	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz	

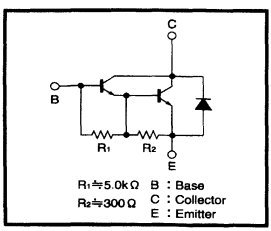
*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(96-650-B88)

Power Transistor (120V, 6A)
2SD1889

●Features
1) Darlington connection for high DC current gain.
2) Built-in resistor between base and emitter.
3) Built-in damper diode.
4) Complements the 2SB1340.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	120	V
Collector-emitter voltage	V_{CES}	120	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	6	A (DC)
		10	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SD1889
Package	TO-220FP
h_{FE}	2k~20k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	120	−	−	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	120	−	−	V	I_C=5mA	
Collector cutoff curren	I_{CBO}	−	−	100	μA	V_{CB}=120V	
Emitter cutoff current	I_{EBO}	−	−	3	mA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1.5	V	I_C/I_B=3A/6mA	*1
DC current transfer ratio	h_{FE}	2k	−	20k	−	V_{CE}/I_C=3V/2A	*1
Transition frequency	f_T	−	40	−	MHz	V_{CE}=5V , I_E=−0.2A , f=10MHz	*2
Output capacitance	Cob	−	50	−	pF	V_{CB}=10V , I_E=0A , f=1MHz	

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(96-765-D88)

Power Transistor (−80V, −4A)
2SA1635

●Features
1) Low $V_{CE(sat)}$. (Typ. −0.3V at I_C/I_B=−2/−0.2A)
2) Excellent DC current gain characteristics.
3) P_C =30W (Tc=25℃)
4) Wide SOA (safe operating area).
5) Complements the 2SC4008.

●Packaging specifications and h_{FE}

Type	2SA1635
Package	TO-220FP
h_{FE}	E
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CEO}	−80	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−4	A
		−6	A (Pulse)
Collector power dissipation	P_C	30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−80	−	−	V	I_C=−1mA
Collector-emitter breakdown voltage	BV_{CEO}	−80	−	−	V	I_C=−50μA
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−80V
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.5	V	I_C/I_B=−2A/−0.2A
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	−1.5	V	I_C/I_B=−2A/−0.2A
DC current transfer ratio	h_{FE}	100	−	200	−	V_{CE}/I_C=−4V/−1A
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−12V , I_E=0.5A
Output capacitance	Cob	−	80	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz

(90-173-B97)

Power Transistor (80V, 4A)
2SC4008

●Features
1) Low $V_{CE(sat)}$. (Typ. 0.3V at I_C/I_B=2/0.2A)
2) Excellent DC current gain characteristics.
3) P_C =30W(Tc=25℃)
4) Wide SOA (safe operating area).
5) Complements the 2SA1635.

●Packaging specifications and hFE

Type	2SC4008
Package	TO-220FP
h_{FE}	EFG
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	100	V
Collector-emitter voltage	V_{CEO}	80	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	4	A(DC)
		6	A(Pulse) *
Collector power dissipation	P_C	2	W
		30	W(Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	100	−	−	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	80	−	−	V	I_C=25mA
Emitter-base breakdown voltage	BV_{EBO}	6	−	−	V	I_E=50μA
Collector cutoff current	I_{CBO}	−	−	10	μA	V_{CB}=100V
Emitter cutoff current	I_{EBO}	−	−	10	μA	V_{EB}=6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1	V	I_C/I_B=2A/0.2A *
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	1.5	V	I_C/I_B=2A/0.2A *
DC current transfer ratio	h_{FE}	100	−	500	−	V_{CE}/I_C=4V/1A
Transition frequency	f_T	−	10	−	MHz	V_{CE}=12V , I_E=−0.2A , f=5MHz *
Output capacitance	Cob	−	60	−	pF	V_{CB}=10V , I_E=0A , f=1MHz

* Measured using pulse current.

(94L-646-D97)

Power Transistor (−50V、−3A)
2SB1308

●Features
1) Low $V_{CE(sat)}$. (Max. −0.45Vmax. at I_C/I_B=−1.5A/−0.15A)
2) Excellent DC current gain characteristics.
3) Complements the 2SD1963.

●Packaging specifications and h_{FE}

Type	2SB1308
Package	MPT3
h_{FE}	PQR
Marking	BF*
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−30	V
Collector-emitter voltage	V_{CEO}	−20	V
Emitter-base voltage	V_{EBO}	−6	V
Collector current	I_C	−3	A (DC)
		−5	A (Pulse) *1
Collector power dissipation	P_C	0.5	W
		2.0	W *2
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

*1 Sigle pulse Pw=100ms *2 On 40×40×0.7 ceramic board.

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−30	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−20	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−20V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−5V
DC current transfer ratio	h_{FE}	82	—	390	—	V_{CE}/I_C=−2V/−0.5A *
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.45	V	I_C/I_B=−1.5A/−0.15A *
Transition frequency	f_T	—	120	—	MHz	V_{CE}=−6V, I_E=50mA, f=30MHz
Output capacitance	Cob	—	60	—	pF	V_{CB}=−20V, I_E=0A, f=1MHz

* Measured using pulse current

(94S-166-B204)

Power Transistor (50V、3A)
2SD1963

●Features
1) Low $V_{CE(sat)}$. (Max. −0.45Vmax. at I_C/I_B=−1.5A/−0.15A)
2) Excellent DC current gain characteristics.
3) Complements the 2SB1308.

●Packaging specifications and h_{FE}

Type	2SD1963
Package	MPT3
h_{FE}	QRS
Marking	DG*
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	20	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	3	A (DC)
		5	A (Pulse) *
Collector power dissipation	P_C	0.5	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	20	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=40V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=5V
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}/I_C=2V/0.5A *
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.25	0.45	V	I_C/I_B=1.5A/0.15A *
Transition frequency	f_T	—	150	—	MHz	V_{CE}=6V, I_E=−50mA, f=100MHz
Output capacitance	Cob	—	35	—	pF	V_{CB}=20V, I_E=0A, f=1MHz

* Measured using pulse current

(94S-342-D204)

Power Transistor (−50V, −2A)
2SA1797 / 2SB1443

●Features
1) Low $V_{CE(sat)}$. (Max. −0.35V at I_C/I_B = −1V/−50mA)
2) Excellent DC current gain characteristics.
3) Complements the 2SA1797 and 2SC4672.

●Packaging specifications and h_{FE}

Type	2SA1797	2SB1443
Package	MPT3	ATV
h_{FE}	PQ	Q
Marking	AG *	—
Code	T100	TV2
Basic ordering unit (pieces)	1000	2500

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	−50	V	
Collector-emitter voltage		V_{CEO}	−50	V	
Emitter-base voltage		V_{EBO}	−6	V	
Collector current		I_C	−2	A (DC)	
			−5	A (Pulse)	*1
Collector power dissipation	2SA1797	P_C	0.5	W	
			2	W	*2
	2SB1443		1	W	*3
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

*1 Single pulse Pw=10ms
*2 On 40×40×0.7mm ceramic board.
*3 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage		BV_{CBO}	−50	—	—	V	I_C=−50μA	
Collector-emitter breakdown voltage		BV_{CEO}	−50	—	—	V	I_C=−1mA	
Emitter-base breakdown voltage		BV_{EBO}	−6	—	—	V	I_E=−50μA	
Collector cutoff current		I_{CBO}	—	—	−0.1	μA	V_{CB}=−50V	
Emitter cutoff current		I_{EBO}	—	—	−0.1	μA	V_{EB}=−5V	
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	−0.15	−0.35	V	I_C/I_B=−1A/−50mA	*
DC current transfer ratio	2SA1797	h_{FE}	82	—	270	—	V_{CE}/I_C=−2V/−0.5A	
	2SB1443		120	—	270	—		
Transition frequency		f_T	—	200	—	MHz	V_{CE}=−2V, I_E=0.5A, f=100MHz	*
Output capacitance		Cob	—	36	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz	

* Measured using pulse current.

(96-100-B208)

Low Frequency Transistor (50V, 2A)
2SC4672

●Features
1) Low $V_{CE(sat)}$. (Typ. 0.1V at I_C/I_B=1A/50mA)
2) Excellent DC current gain characteristics.
3) Complements the 2SA1797.

●Packaging specifications and h_{FE}

Type	2SC4672
Package	MPT3
h_{FE}	PQ
Marking	DK *
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	60	V	
Collector-emitter voltage	V_{CEO}	50	V	
Emitter-base voltage	V_{EBO}	6	V	
Collector current	I_C	2	A (DC)	
		5	A (Pulse)	*
Collector power dissipation	P_C	0.5	W	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* Sigle pulse Pw=10ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50μA	
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=60V	
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.1	0.35	V	I_C/I_B=1A/50mA	*
DC current transfer ratio	h_{FE}	82	—	270	—	V_{CE}=2V, I_C=0.5A	*
Transition frequency	f_T	—	210	—	MHz	V_{CE}=2V, I_E=−0.5A, f=100MHz	
Output capacitance	Cob	—	25	—	pF	V_{CB}=10V, I_E=0A, f=1MHz	

* Measured using pulse current.

(96-181-D208)

Low V_{CE} (sat) Transistor (DC-DC converter) (−20V, −10A)
2SA1834

●Features
1) Low $V_{CE(sat)}$. (Typ. −0.16V at I_C/I_B=−4V/−50mA)
2) High current capacity. (I_C=−10A/DC, −15A/10ms pulse)
3) Complements the 2SC5001.

●Packaging specifications and h_{FE}

Type	2SA1834
Package	CPT3
h_{FE}	RS
Code	TL
Basic ordering unit (pieces)	2500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−30	V	
Collector-emitter voltage	V_{CEO}	−20	V	
Emitter-base voltage	V_{EBO}	−6	V	
Collector current	I_C	−10	A	
	I_{CP}	−15	A	*
Base current	I_B	−2	A	
Collector power dissipation	P_C	1	W	
		10	W (Tc=25℃)	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* Sigle pulse Pw=10ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−30	—	—	V	I_C=−50μA	
Collector-emitter breakdown voltage	BV_{CEO}	−20	—	—	V	I_C=−1mA	
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50μA	
Collector cutoff current	I_{CBO}	—	—	−1	μA	V_{CB}=−20V	
Emitter cutoff current	I_{EBO}	—	—	−1	μA	V_{EB}=−5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	−0.16	−0.25	V	I_C/I_B=−4A/−0.05A	*
Base-emitter saturation voltage	$V_{BE(sat)}$	—	−0.9	−1.2	V	I_C/I_B=−4A/−0.05A	*
DC current transfer ratio	h_{FE1}	120	—	560	—	V_{CE}=−2V , I_C=−0.5A	*
	h_{FE2}	82	—	—	—	V_{CE}=−2V , I_C=−4A	*
Transition frequency	f_T	—	150	—	MHz	V_{CE}=−5V , I_E=1.5A , f=50MHz	
Output capacitance	Cob	—	220	—	pF	V_{CB}=−10V , I_E=0A , f=1MHz	

* Measured using pulse current.

(96-106-B217)

Low V_{CE} (sat) Transistor (Strobe flash) (20V, 10A)
2SC5001

●Features
1) Low $V_{CE(sat)}$. (Typ. 0.13V at I_C/I_B=4A/50mA)
2) High current capacity. (I_C=10A/DC, 15A/10ms pulse)
3) Complements the 2SA1834.

●Packaging specifications and h_{FE}

Type	2SC5001
Package	CPT3
h_{FE}	QR
Code	TL
Basic ordering unit (pieces)	2500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	30	V	
Collector-emitter voltage	V_{CEO}	20	V	
Emitter-base voltage	V_{EBO}	6	V	
Collector current	I_C	10	A	
	I_{CP}	15	A	*
Base current	I_B	2	A	
Collector power dissipation	P_C	1	W	
		10	W (Tc=25℃)	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* Sigle pulse Pw=10ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	20	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	1	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	1	μA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.13	0.25	V	I_C/I_B=4A/0.05A
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	1.2	V	I_C/I_B=4A/0.05A
DC current transfer ratio	h_{FE1}	120	—	390	—	V_{CE}/I_C=5V/0.1A
DC current transfer ratio	h_{FE2}	82	—	—	—	V_{CE}=2V , I_C=4A
Transition frequency	f_T	—	150	—	MHz	V_{CE}=5V , I_E=−1.5A , f=50MHz
Output capacitance	Cob	—	220	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

(96-193-D217)

Power Transistor (−15V, −1A)
2SB1590K

●**Features**
1) Low $V_{CE(sat)}$. (Max.−0.3V at I_C/I_B=−0.4A/−20mA)
2) I_C = −1A
3) Complements the 2SD2444K.

●**Absolute maximum ratings (Ta=25℃)**

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−15	V
Collector-emitter voltage	V_{CEO}	−15	V
Emitter-base voltage	V_{EBO}	−6	V
Collector current	I_C	−1	A (DC)
		−3	A (Pulse) *
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=10ms

●**Packaging specifications and h_{FE}**

Type	2SB1590K
Package	SMT3
h_{FE}	Q
Marking	BK*
Code	T146
Basic ordering unit (pieces)	3000

* Denotes h_{FE}

●**Electrical characteristics (Ta=25℃)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−15	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−15	−	−	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	−	−	V	I_E=−50μA
Collector cutoff current	I_{CBO}	−	−	−0.5	μA	V_{CB}=−12V
Emitter cutoff current	I_{EBO}	−	−	−0.5	μA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−0.3	V	I_C=−0.4A, I_B=−20mA
DC current transfer ratio	h_{FE1}	120	−	270	−	V_{CE}/I_C=−2V/−0.5A
DC current transfer ratio	h_{FE2}	80	−	−	−	V_{CE}=−2V, I_C=−800mA
Transition frequency	f_T	−	200	−	MHz	V_{CE}=−2V, I_E=50mA, f=100MHz
Output capacitance	Cob	−	15	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(96-150-B218)

Power Transistor (15V, 1A)
2SD2444K

●**Features**
1) Low $V_{CE(sat)}$. (Max. 0.3V at I_C/I_B=0.4A/20mA)
2) I_C = 1A
3) Complements the 2SB1590K.

●**Absolute maximum ratings (Ta=25℃)**

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	15	V
Collector-emitter voltage	V_{CEO}	15	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	1	A (DC)
		3	A (Pulse) *
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=10ms

●**Packaging specifications and h_{FE}**

Type	2SD2444K
Package	SMT3
h_{FE}	R
Marking	BS*
Code	T146
Basic ordering unit (pieces)	3000

* Denotes h_{FE}

●**Electrical characteristics (Ta=25℃)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	15	−	−	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	15	−	−	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	−	−	V	I_E=50μA
Collector cutoff current	I_{CBO}	−	−	0.5	μA	V_{CB}=12V
Emitter cutoff current	I_{EBO}	−	−	0.5	μA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	0.3	V	I_C=400mA, I_B=20mA
DC current transfer ratio	h_{FE}	180	−	390	−	V_{CE}/I_C=2V/50mA
Transition frequency	f_T	−	200	−	MHz	V_{CE}=2V, I_E=−50mA, f=100MHz
Output capacitance	Cob	−	15	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(96-247-D218)

Medium Power Transistor (−60V, −2A)
2SB1561

●**Features**
1) Low $V_{CE(sat)}$. (Typ. −0.15V at I_C/I_B = −1V/−50mA)
2) Collector-emitter voltage = −60 V
3) Pc = 2 W
(on 40 x 40 x 0.7 mm ceramic board).
4) Complements the 2SD2391.

●**Packaging specifications and h_{FE}**

Type	2SB1561
Package	MPT3
h_{FE}	Q
Marking	BL*
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●**Absolute maximum ratings (Ta=25℃)**

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−60	V	
Collector-emitter voltage	V_{CEO}	−60	V	
Emitter-base voltage	V_{EBO}	−6	V	
Collector current	I_C	−2	A	
	I_{CP}	−5	A	*1
Collector power dissipation	Pc	0.5	W	
		2		*2
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

*1 Sigle pulse Pw=10ms *2 On 40 x 40 x 0.7 mm ceramic board.

●**Electrical characteristics (Ta=25℃)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−60	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	−0.15	−0.35	V	I_C/I_B=−1A/−50mA *
DC current transfer ratio	h_{FE}	120	—	270	—	V_{CE}/I_C=−2V/−0.5A
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−2V , I_E=0.5A , f=100MHz *
Output capacitance	Cob	—	23	—	pF	V_{CB}=−10V , I_E=0A , f=1MHz

* Measured using pulse current

(94S-191-B228)

Medium Power Transistor (60V, 2A)
2SD2391

●**Features**
1) Low $V_{CE(sat)}$. (Typ. 0.13V at I_C/I_B=1V/50mA)
2) Collector-emitter voltage = 60 V
3) Pc = 2 W
(on 40 x 40 x 0.7 mm ceramic board).
4) Complements the 2SB1561.

●**Packaging specifications and h_{FE}**

Type	2SD2391
Package	MPT3
h_{FE}	Q
Marking	* DT
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●**Absolute maximum ratings (Ta=25℃)**

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	60	V	
Collector-emitter voltage	V_{CEO}	60	V	
Emitter-base voltage	V_{EBO}	6	V	
Collector current	I_C	2	A	
		6	A	*1
Collector power dissipation	Pc	0.5	W	
		2		*2
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

*1 Sigle pulse Pw=10ms *2 On 40 x 40 x 0.7 mm ceramic board.

●**Electrical characteristics (Ta=25℃)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	60	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.13	0.35	V	I_C/I_B=1A/50mA *
DC current transfer ratio	h_{FE}	120	—	270	—	V_{CE}/I_C=2V/0.5A
Transition frequency	f_T	—	210	—	MHz	V_{CE}=2V , I_E=−0.5A , f=100MHz *
Output capacitance	Cob	—	21	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

* Measured using pulse current

(94S-380-D228)

High-current gain Power Transistor (−60V, −3A)
2SB1639

●Features
1) High DC current gain. (Typ.440 at V_{CE}/I_C=−4V/−0.5A)
2) Low $V_{CE(sat)}$. (Typ.−0.2V at I_C/I_B=−2/−0.05A)
3) Complements the 2SD1944.

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−60	V
Collector-emitter voltage	V_{CEO}	−60	V
Emitter-base voltage	V_{EBO}	−6	V
Collector current	I_C	−3	A
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Packaging specifications and h_{FE}

Type	2SB1639
Package	TO-220FN
h_{FE}	H
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	−60	−	−	V	I_C=−1mA
Collector-base breakdown voltage	BV_{CBO}	−60	−	−	V	I_C=−50μA
Emitter-base breakdown voltage	BV_{EBO}	−6	−	−	V	I_E=−50μA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1	V	I_C/I_B=−1V/−0.05A
DC current transfer ratio	h_{FE}	400	−	800	−	V_{CE}=−4V, I_C=−0.5A
Transition frequency	f_T	−	60	−	MHz	V_{CE}=−5V, I_E=−0.5A, f=30MHz
Output capacitance	Cob	−	80	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(SPEC-B302)

High-current gain Power Transistor (60V, 3A)
2SD2318/2SD1944

●Features
1) High DC current gain.
2) Low $V_{CE(sat)}$. (Typ. 0.5V at I_C/I_B=2/0.5A)
3) Complements the 2SB1639.

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	80	V
Collector-emitter voltage		V_{CEO}	60	V
Emitter-base voltage		V_{EBO}	6	V
Collector current		I_C	3	A
			4.5	A (Pulse) *
Collector power dissipation	2SD2318	P_C	1	W
			15	W (Tc=25℃)
	2SD1944		2	W
			30	W (Tc=28℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SD2318	2SD1944
Package	CPT3	TO-220FP
h_{FE}	UV	HJK
Code	TL	−
Basic ordering unit (pieces)	2500	500

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage		BV_{CBO}	80	−	−	V	I_C=50μA	
Collector-emitter breakdown voltage		BV_{CEO}	60	−	−	V	I_C=1mA	
Emitter-base breakdown voltage		BV_{EBO}	6	−	−	V	I_E=50μA	
Collector cutoff current		I_{CBO}	−	−	100	μA	V_{CB}=80V	
Emitter cutoff current		I_{EBO}	−	−	100	μA	V_{EB}=6V	
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	1.0	V	I_C/I_B=2A/0.05A	*
Base-emitter saturation voltage		$V_{BE(sat)}$	−	−	1.5	V	I_C/I_B=2A/0.05A	*
DC current transfer ratio	2SD2318	h_{FE}	560	−	1800	−	V_{CE}/I_C=4V/0.5A	
	2SD1944		400	−	2000	−		
Transition frequency		f_T	−	50	−	MHz	V_{CE}=5V, I_E=−0.2A, f=10MHz	*
Output capacitance		Cob	−	60	−	pF	V_{CB}=10V, I_E=0A, f=1MHz	

* Measured using pulse current.

(96-244-D302)

Power Transistor (−60V, −3A)
2SB1566

●Features

1) Low $V_{CE(sat)}$. (Typ. −0.3V at I_C/I_B = −2/−0.2A)
2) Wide SOA (safe operating area).
3) Complements the 2SD2395.

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−60	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−3	A (DC)
	I_{CP}	−4.5	A (Pulse)
Collector power dissipation	P_C	2	W
		25	W (Tc=25°C)
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

●Packaging specifications and h_{FE}

Type	2SB1566
Package	TO-220FN
h_{FE}	EF
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−60	−	−	V	I_C=−50μA	
Collector-emitter breakdown voltage	BV_{CEO}	−50	−	−	V	I_C=−1mA	
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50μA	
Collector cutoff current	I_{CBO}	−	−	−1	μA	V_{CB}=−60V	
Emitter cutoff current	I_{EBO}	−	−	−1	μA	V_{EB}=−7V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1	V	I_C/I_B=−2A/−0.2A	*
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	−1.5	V	I_C/I_B=−2A/−0.2A	*
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=−3V/−0.5A	
Gain bandwidth product	f_T	−	60	−	MHz	V_{CE}=−5V, I_E=0.5A, f=5MHz	*
Collector output capacitance	Cob	−	40	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz	

* Measured using pulse current

(94L-459-B350)

Power Transistor (50V, 3A)
2SD2395

●Features

1) Low $V_{CE(sat)}$. (Typ. 0.2V at I_C/I_B=2/0.2A)
2) Wide SOA (safe operating area).
3) Complements the 2SB1566.

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	60	V	
Collector-emitter voltage	V_{CEO}	50	V	
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	3	A (DC)	
	I_{CP}	4.5	A (Pulse)	*
Collector power dissipation	P_C	2	W	
		25	W (Tc=25°C)	
Junction temperature	Tj	150	°C	
Storage temperature	Tstg	−55~150	°C	

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SD2395
Package	TO-220FN
h_{FE}	EF
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	60	−	−	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	50	−	−	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	5	−	−	V	I_E=50μA	
Collector cutoff current	I_{CBO}	−	−	1	μA	V_{CB}=40V	
Emitter cutoff current	I_{EBO}	−	−	1	μA	V_{EB}=4V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1	V	I_C/I_B=2A/0.2A	*
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	1.5	V	I_C/I_B=2A/0.2A	*
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=5V/0.5A	
Transition frequency	f_T	−	100	−	MHz	V_{CE}=5V, I_E=−0.5A, f=30MHz	*
Output capacitance	Cob	−	35	−	pF	V_{CB}=10V, I_E=0A, f=1MHz	

* Measured using pulse current

(94L-1101-D350)

Medium Power Transistor (−50V, −1A)
2SA1900

● **Features**
1) Low $V_{CE(sat)}$. (Typ. −0.15V at I_C/I_B = −500/−50mA)
2) Pc = 2W (On 40 × 40 × 0.7 mm ceramic board.)
3) Complements the 2SC5053.

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−60	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−1	A
		−2	A (Pulse) *1
Collector power dissipation	Pc	0.5	W
		2	W *2
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

*1 Sigle pulse Pw=10ms, Duty=1/2
*2 On 40 × 40 × 0.7 mm ceramic board.

●**Packaging specifications and h_{FE}**

Type	2SA1900
Package	MPT3
h_{FE}	Q
Marking	AL *
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−40V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.4	V	I_C/I_B=−500mA/−50mA
DC current transfer ratio	h_{FE}	120	—	270	—	V_{CE}/I_C=−3V/−0.5A
Transition frequency	f_T	—	150	—	MHz	V_{CE}=−5V, I_E=50mA, f=100MHz
Output capacitance	Cob	—	20	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(96-115-B352)

Medium Power Transistor (50V, 1A)
2SC5053

●**Features**
1) Low $V_{CE(sat)}$. (Typ. −0.12V at I_C/I_B=500/50mA)
2) Pc = 2 W (on 40 × 40 × 0.7 mm ceramic board)
3) Complements the 2SA1900

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	60	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	1	A (DC)
		2	A (Pulse) *1
Collector power dissipation	Pc	0.5	W
		2	W *2
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

*1 Sigle pulse Pw=20ms, Duty=1/2
*2 On 40 × 40 × 0.7 mm ceramic board.

●**Packaging specifications and h_{FE}**

Type	2SC5053
Package	MPT3
h_{FE}	QR
Marking	CG *
Code	T100
Basic ordering nuit (pieces)	1000

* Denotes h_{FE}

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=40V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=500mA/50mA
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}/I_C=3V/0.5A
Transition frequency	f_T	—	150	—	MHz	V_{CE}=5V, I_E=−50mA, f=100MHz
Output capacitance	Cob	—	15	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

(96-196-D352)

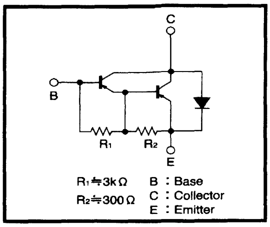
Power Transistor (−80V, −3A)

2SB1474 / 2SB1342

●Features

1) Darlington connection for a high h_{FE}.
2) Built-in resistor between base and emitter.
3) Built-in damper doide.
4) Complements the 2SD1933.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CES}	−80	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−4	A (DC)
		−6	A *
Collector power dissipation	P_C	1	W
		10	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SB1474	2SB1342
Package	CPT3	TO-220FP
h_{FE}	1k~10k	1k~10k
Code	TL	−
Basic ordering unit (pieces)	2500	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−80	−	−	V	I_C=−50μA	
Collector-emitter breakdown voltage	BV_{CEO}	−80	−	−	V	I_C=−1mA	
Collector cutoff current	I_{CBO}	−	−	−100	μA	V_{CB}=−80V	
Emitter cutoff current	I_{EBO}	−	−	−3	mA	V_{EB}=−5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−1	−1.5	V	I_C/I_B=−2A/−4mA	*1
DC current transfer ratio	h_{FE}	1000	5000	10000	−	V_{CE}/I_C=−3V/−2A	*1
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V , I_E=0.5A , f=10MHz	*2
Output capacitance	Cob	−	45	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz	

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(94S-181-B400)

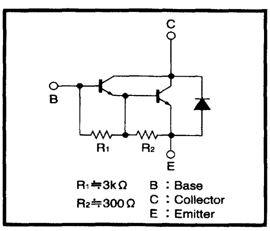
Power Transistor (80V, 4A)

2SD1933

●Features

1) Darlington connection for a high h_{FE}.
2) Built-in resistor between base and emitter.
3) Built-in damper doide.
4) Complements the 2SB1342.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CES}	80	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	4	A (DC)
		6	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SD1933
Package	TO-220FP
h_{FE}	1k~10k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-emitter breakdown voltage	BV_{CEO}	80	−	−	V	I_C=1mA	
Collector-base breakdown voltage	BV_{CBO}	80	−	−	V	I_C=50μA	
Collector cutoff current	I_{CBO}	−	−	100	μA	V_{CB}=80V	
Emitter cutoff current	I_{EBO}	−	−	3	mA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1.5	V	I_C/I_B=2A/4mA	*1
DC current transfer ratio	h_{FE}	1000	−	10000	−	V_{CE}/I_C=3V/2A	*1
Transition frequency	f_T	−	40	−	MHz	V_{CE}=5V , I_E=−0.2A , f=10MHz	*2
Output capacitance	Cob	−	35	−	pF	V_{CB}=10V , I_E=0A , f=1MHz	

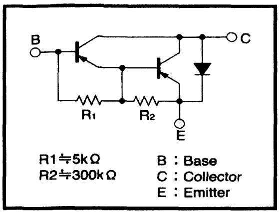
*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(94L-906-D400)

Power Transistor (−100V, −8A)
2SB1344

●Features
1) Darlington connection for high DC current gain.
2) Built-in resistor between base and emitter.
3) Built-in damper diode.
4) Complements the 2SD2025.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−100	V
Collector-emitter voltage	V_{CEO}	−100	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−8	A (DC)
		−10	A (Pulse) *
Power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Single pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SB1344
Package	TO-220FP
h_{FE}	1k~20k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−100	−	−	V	I_C=−50μA	
Collector-emitter breakdown voltage	BV_{CEO}	−100	−	−	V	I_C=−5mA	
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−100V	
Emitter cutoff current	I_{EBO}	−	−	−3	mA	V_{EB}=−5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−1.0	−1.5	V	I_C/I_B=−3A/−6mA	*1
DC current transfer ratio	h_{FE}	1000	10000	20000	−	V_{CE}/I_C=−3V/−2A	*1
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V , I_E=0.5A , f=10MHz	*2
Output capacitance	Cob	−	90	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz	

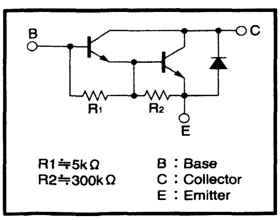
*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(94L-374-B403)

Power Transistor (100V, 8A)
2SD2025

●Features
1) Darlington connection for high DC current gain.
2) Built-in resistor between base and emitter.
3) Built-in damper diode.
4) Complements the 2SB1344.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	100	V
Collector-emitter voltage	V_{CEO}	100	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	8	A (DC)
		10	A (Pulse) *
Power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=10ms

●Packaging specifications and h_{FE}

Type	2SD2025
Package	TO-220FP
h_{FE}	1k~20k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	100	−	−	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	100	−	−	V	I_C=5mA	
Collector cutoff current	I_{CBO}	−	−	10	μA	V_{CB}=100V	
Emitter cutoff current	I_{EBO}	−	−	3	mA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1.5	V	I_C/I_B=3A/6mA	*1
DC current transfer ratio	h_{FE}	1000	−	20000	−	V_{CE}/I_C=3V/2A	*1
Transition frequency	f_T	−	40	−	MHz	V_{CE}=5V , I_E=−0.2A , f=10MHz	*2
Output capacitance	Cob	−	50	−	pF	V_{CB}=10V , I_E=0A , f=1MHz	

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

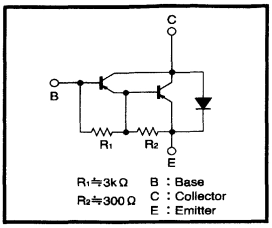
(94L-969-D403)

Power Transistor (−80V, −4A)
2SB1568

●Features

1) Darlington connection for a high h_{FE}.
2) Built-in resistor between base and emitter.
3) Built-in damper doide.
4) Complements the 2SD2399.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CES}	−80	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−4	A (DC)
	I_{CP}	−6	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SB1568
Package	TO-220FN
h_{FE}	1k~10k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−80	−	−	V	I_C=−50 μA	
Collector-emitter breakdown voltage	BV_{CEO}	−80	−	−	V	I_C=−1mA	
Collector cutoff current	I_{CBO}	−	−	−100	μA	V_{CB}=−80V	
Emitter cutoff current	I_{EBO}	−	−	−3	mA	V_{EB}=−5V	
DC current transfer ratio	h_{FE}	1000	5000	10000	−	V_{CE}=−3V , I_C=−2A	*1
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−1	−1.5	V	I_C/I_B=−2A/−4mA	*1
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V , I_E=0.5A , f=10MHz	*1, 2
Output capacitance	Cob	−	35	−	pF	V_{CB}=−10V , I_E=0A , f=1MHz	

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

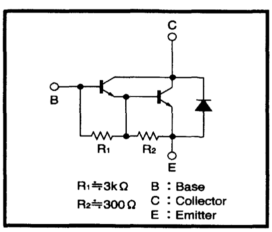
(96-670-B422)

Power Transistor (80V, 4A)
2SD2399

●Features

1) Darlington connection for a high h_{FE}.
2) Built-in resistor between base and emitter.
3) Built-in damper doide.
4) Complements the 2SB1568.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CES}	80	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	4	A (DC)
	I_{CP}	6	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SD2399
Package	TO-220FN
h_{FE}	1k~10k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	80	−	−	V	I_C=50 μA	
Collector-emitter breakdown voltage	BV_{CEO}	80	−	−	V	I_C=1mA	
Collector cutoff current	I_{CBO}	−	−	100	μA	V_{CB}=80V	
Emitter cutoff current	I_{EBO}	−	−	3	mA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1.5	V	I_C/I_B=2A/4mA	*1
DC current transfer ratio	h_{FE}	1000	−	10000	−	V_{CE}=3V , I_C=2A	*1
Transition frequency	f_T	−	40	−	MHz	V_{CE}=5V , I_E=−0.2A , f=10MHz	*1, 2
Output capacitance	Cob	−	35	−	pF	V_{CB}=10V , I_E=0A , f=1MHz	

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

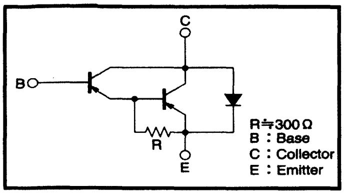
(96-825-D422)

Medium Power Transistor (Motor or Relay drive) (−80V, −4A)

2SB1616

●Features
1) Darlington connection for a high h_{FE}.
2) Built-in resistor between base and emitter.
3) Built-in damper doide.
4) Complements the 2SC4574.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CEO}	−80	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−4	A
	I_{CP}	−6	A (Pulse) *
Collector power dissipation	P_C	2	W (Ta=25℃)
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SB1616
Package	TO-220FP
h_{FE}	1k~10k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-emitter breakdown voltage	BV_{CEO}	−80	−	−	V	I_C=−1mA	
Collector-base breakdown voltage	BV_{CBO}	−80	−	−	V	I_C=−50μA	
Emitter-base breakdown voltage	BV_{EBO}	−7	−	−	V	I_E=−50μA	
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−80V	
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.5	V	I_C/I_B=−2A/−4mA	*1
DC current transfer ratio	h_{FE}	1000	−	10000	−	V_{CE}/I_C=−3V/−2A	*1
Transition frequency	f_T	−	20	−	MHz	V_{CE}=−5V, I_E=0.5A, f=10MHz	*2
Output capacitance	Cob	−	22	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz	

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

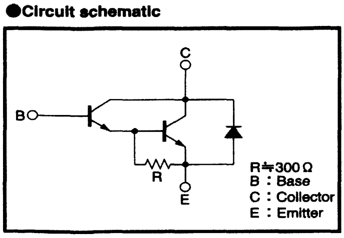
(SPEC-B426)

Power Transistor (80V, 4A)

2SD2478

●Features
1) Darlington connection for a high h_{FE}.
2) Built-in resistor between base and emitter.
3) Built-in damper doide.
4) Complements the 2SC4574.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CEO}	80	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	4	A (DC)
	I_{CP}	6	A (t=100ms)
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Packaging specifications and h_{FE}

Type	2SC4574
Package	TO-220FP
h_{FE}	1k~10k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	80	−	−	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	80	−	−	V	I_C=−1mA	
Collector cutoff current	I_{CBO}	−	−	100	μA	V_{CB}=80V	
Emitter cutoff current	I_{EBO}	−	−	10	μA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	1.5	V	I_C/I_B=2A/4mA	*1
DC current transfer ratio	h_{FE}	1000	−	10000	−	V_{CE}/I_C=3V/2A	*1
Transition frequency	f_T	−	40	−	MHz	V_{CE}=5V, I_E=−0.2A, f=10MHz	*2
Output capacitance	Cob	−	35	−	pF	V_{CB}=10V, I_E=0A, f=1MHz	

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(94L-1129-D426)

High-voltage Switching Transistor (Power Supply) (120V, 7A)
2SC4849

●**Features**

1) Low $V_{CE(sat)}$. (Typ. 0.17V at I_C/I_B=5/0.5A)
2) Fast switching. (tf : Typ. 0.18 µs at Ic=5A)
3) Wide SOA. (safe operating area)

●**Packaging specifications and h_{FE}**

Type	2SC4849
Package	TO−220FP
h_{FE}	E
Code	−
Basic ordering unit (pieces)	500

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	250	V
Collector-emitter voltage	V_{CEO}	120	V
Emitter-base voltage	V_{EBO}	12	V
Collector current	I_C	7	A
		15	A (t=100ms)
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	$V_{CEX(SUS)}$	125	—	—	V	I_{CP}=8A , I_{B1}=−I_{B2}=0.5A , I_C=5A , L=200 µH clamped
Collector cutoff current	I_{CBO}	—	—	10	µA	V_{CB}=100V
Collector cutoff current	I_{EBO}	—	—	10	µA	V_{EB}=12V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.6	V	I_C/I_B=5A/0.5A
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	1.2	V	I_C/I_B=5A/0.5A
DC current transfer ratio	h_{FE}	100	—	200	—	V_{CE}/I_C=5V/3A
Transition frequency	f_T	—	20	—	MHz	V_{CE}=10V , I_E=−0.5A
Output capacitance	Cob	—	150	—	pF	V_{CB}=10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	—	—	0.5	µs	I_C=5A , R_L=10Ω
Storage time	t_{stg}	—	—	2.5	µs	I_{B1}=−I_{B2}=0.5A
Fall time	t_f	—	—	0.5	µs	V_{CC}≒50V
Collector cutoff current	I_{CEO}	—	—	2	mA	V_{CE}=100V , Ta=125℃

(94L-712-C342)

Medium Power Transistor (Chroma Output) (300V, 0.1A)
2SC5147

●**Features**

1) High breakdown voltage. (BV_{CEO}=300V)
2) Low collector output capacitance. (Typ. 3pF at V_{CB}=30V)
3) Wide SOA. (safe operating area)
4) Ideal for color TV chroma output and amplification of video signals.

●**Packaging specifications and h_{FE}**

Type	2SC5147
Package	TO−220FN
h_{FE}	DE
Code	−
Basic ordering unit (pieces)	500

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	300	V
Collector-emitter voltage	V_{CEO}	300	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	100	mA (DC)
Collector power dissipation	P_C	2	W
		10	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	300	—	—	V	I_C=50 µA
Collector-emitter breakdown voltage	BV_{CEO}	300	—	—	V	I_C=100 µA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 µA
Collector cutoff current	I_{CBO}	—	—	0.5	µA	V_{CB}=200V
Emitter cutoff current	I_{EBO}	—	—	0.5	µA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.2	1	V	I_C/I_B=50mA/5mA *
DC current transfer ratio	h_{FE}	60	—	200	—	V_{CE}/I_C=10V/10mA
Transition frequency	f_T	50	100	—	MHz	V_{CE}=30V , I_E=−20mA , f=30MHz
Output capacitance	Cob	—	3	—	pF	V_{CB}=30V , I_E=0A , f=1MHz

* Measured using pulse current.

(96-736-C358)

High-Frequency Amplifier Transistor (18V, 1.5GHz)

2SC4725 / 2SC4082 / 2SC3837K

●Features

1) High f_T. (f_T=1.5GHz)
2) Small $C_c \cdot r_{bb'}$ and high gain. (Typ. 6ps)
3) Small NF.

●Packaging specifications and h_{FE}

Type	2SC4725	2SC4082	2SC3837K
Package	EMT3	UMT3	SMT3
h_{FE}	NP	NP	NP
Marking	AC*	1C*	AC*
Code	TL	T106	T146
Basic ordering unit (pieces)	3000	3000	3000

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	30	V
Collector-emitter voltage		V_{CEO}	18	V
Emitter-base voltage		V_{EBO}	3	V
Collector current		I_C	50	mA
Collector power dissipation	2SC4725	P_C	0.15	W
	2SC4082,2SC3837K		0.2	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=10μA
Collector-emitter breakdown voltage	BV_{CEO}	18	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	3	—	—	V	I_E=10μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=10V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=2V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.5	V	I_C/I_B=20mA/4mA
DC current transfer ratio	h_{FE}	56	—	180	—	V_{CE}/I_C=10V/10mA
Transition frequency	f_T	600	1500	—	MHz	V_{CB}=10V, I_C=10mA, f=200MHz
Output capacitance	Cob	—	0.9	1.5	pF	V_{CB}=10V, I_E=0A, f=1MHz
Collector-base time constant	$C_c \cdot r_{bb'}$	—	6	13	ps	V_{CB}=10V, I_C=10mA, f=31.8MHz
Noise factor	NF	—	4.5	—	dB	V_{CE}=12V, I_C=2mA, f=200MHz, Rg=50Ω

(94S-227-C101)

High-Frequency Amplifier Transistor (11V, 3.2GHz)

2SC4726 / 2SC4083 / 2SC3838K / 2SC4043S

●Features

1) High f_T. (f_T=3.2GHz)
2) Small $C_c \cdot r_{bb'}$ and high gain (Typ. 6ps)
3) Small NF.

●Packaging specifications and h_{FE}

Type	2SC4726	2SC4083	2SC3838K	2SC4043S
Package	EMT3	UMT3	SMT3	SPT
h_{FE}	NP	NP	NP	P
Marking	AD	1D	AD	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	20	V
Collector-emitter voltage		V_{CEO}	11	V
Emitter-base voltage		V_{EBO}	3	V
Collector current		I_C	50	mA
Collector power dissipation	2SC4726	P_C	0.15	W
	2SC4083,2SC3838K		0.2	
	2SC4043S		0.3	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	20	—	—	V	I_C=10μA
Collector-emitter breakdown voltage		BV_{CEO}	11	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	3	—	—	V	I_E=10μA
Collector cutoff current		I_{CBO}	—	—	0.5	μA	V_{CB}=10V
Emitter cutoff current		I_{EBO}	—	—	0.5	μA	V_{EB}=2V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	0.5	V	I_C/I_B=10mA/5mA
DC current transfer ratio	2SC4726,2SC4083	h_{FE}	56	—	180	—	V_{CE}/I_C=10V/5mA
	2SC3838K						
	2SC4043S		82	—	180		
Transition frequency		f_T	1.4	3.2	—	GHz	V_{CE}=10V, I_E=10mA, f=500MHz
Output capacitance		Cob	—	0.8	1.5	pF	V_{CB}=10V, I_E=0A, f=1MHz
Collector-base time constant		$C_c \cdot r_{bb'}$	—	4	12	ps	V_{CB}=10V, I_C=10mA, f=31.8MHz
Noise factor		NF	—	3.5	—	dB	V_{CE}=6V, I_C=2mA, f=500MHz, Rg=50Ω

(96-165-C102)

High-Voltage Amplifier Transistor (150V, 50mA)
2SC5274

●Features
1) High breakdown voltage. (V_{CEO}=150V)
2) Low collector output capacitance. (Typ.2pF at V_{CB}=12V)

●Packaging specifications and h_{FE}

Type	2SC5274
Package	EMT3
hFE	N
Marking	BV∗
Code	TL
Basic ordering unit (pieces)	3000

∗Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	150	V
Collector-emitter voltage	V_{CEO}	150	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	50	mA (DC)
		0.2	A (Pulse) ∗
Collector power dissipation	P_C	0.15	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

∗ Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	150	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	150	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=100V , I_E=0A
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V , I_C=0A
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.5	V	I_C/I_B=10mA/1mA
DC current transfer ratio	h_{FE}	56	—	120	—	V_{CE}/I_C=10V/10mA
Transition frequency	f_T	—	120	—	MHz	V_{CE}=12V , I_E=−10mA , f=30MHz
Output capacitance	Cob	—	2	—	pF	V_{CB}=12V , I_E=0A , f=1MHz

(96-203-C329)

High-voltage Switching Transistor (Camera strobes and Telephone, Power supply)

2SA1759

● Features
1) High breakdown voltage. (V_{CEO}=−400V)
2) Low $V_{CE(sat)}$. (Typ.−0.2V at I_C/I_B=−20/−2mA)
3) Fast switching. (tf : Typ. 1 μs at I_C=−100mA)
4) Wide SOA (safe operating area).
5) Complements the 2SA4505.

● Packaging specifications and h_{FE}

Type	2SA1759
Package	MPT3
h_{FE}	P
Marking	AH＊
Code	T100
Basic ordering unit (pieces)	3000

＊ Denotes h_{FE}

● Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−400	V	
Collector-emitter voltage	V_{CEO}	−400	V	
Emitter-base voltage	V_{EBO}	−7	V	
Collector current	I_C	−0.1	A(DC)	
		−0.2	A(Pulse)	＊1
Collector power dissipation	P_C	0.5	W	＊2
		2		
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

＊1 Single pulse Pw=100ms
＊2 On 40 x 40 x 0.7 mm ceramic board.

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−400	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−400	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−7	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−10	μA	V_{CB}=−400V
Emitter cutoff current	I_{EBO}	—	—	−10	μA	V_{EB}=−6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	−0.2	−0.5	V	I_C/I_B=−20mA/−2mA
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	−1.2	V	I_C/I_B=−20mA/−2mA
DC current transfer ratio	h_{FE}	82	—	180	—	V_{CE}=−10V , I_C=−10mA
Transition frequency	f_T	—	12	—	MHz	V_{CE}=−10V , I_E=10mA , f=5MHz
Output capacitance	Cob	—	13	—	pF	V_{CB}=−10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	—	0.7	—	μs	I_C=−100mA RL=1.5kΩ
Storage time	t_{stg}	—	1.8	—	μs	I_{B1}=−I_{B2}=−10mA
Fall time	t_f	—	1	—	μs	V_{CC}≒−150V

(96-97-A324)

Power Transistor (400V, 0.1A)

2SC4505 / 2SC4620

● Features
1) High breakdown voltage. (V_{CEO}=400V)
2) Low $V_{CE(sat)}$. (Typ.0.05V at I_C/I_B=10/1mA)
3) Fast switching. (tf : Typ. 1.7 μs at I_C=100mA)
4) Complements the 2SC4505 and the 2SA1759.

● Packaging specifications and h_{FE}

Type	2SC4505	2SC4620
Package	MPT3	ATV
h_{FE}	PQ	Q
Marking	CE＊	—
Code	T100	TV2
Basic ordering unit (pieces)	1000	2500

＊ Denotes h_{FE}

● Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	400	V	
Collector-emitter voltage		V_{CEO}	400	V	
Emitter-base voltage		V_{EBO}	7	V	
Collector current		I_C	0.1	A	
		I_{CP}	0.2	A	＊
Collector power dissipation	2SC4505	P_C	0.5	W	
	2SC4620		1		
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

＊ Sigle pulse Pw=20ms Duty=1/2

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	400	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	400	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	10	μA	V_{CB}=400V
Emitter cutoff current	I_{EBO}	—	—	10	μA	V_{EB}=6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.05	0.5	V	I_C=10mA , I_B=1mA
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	1.5	V	I_C=10mA , I_B=1mA
DC current transfer ratio	h_{FE}	82	—	270	—	V_{CE}/I_C=10V/10mA
Transition frequency	f_T	—	20	—	MHz	V_{CE}=10V , I_E=−10mA , f=10MHz
Output capacitance	Cob	—	7	—	pF	V_{CB}=10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	—	1	—	μs	I_C=100mA
Storage time	t_{stg}	—	5.5	—	μs	I_{B1}=−I_{B2}=10mA
Fall time	tf	—	1.7	—	μs	V_{CC}≒−150V

(96-178-C300)

High-gain Amplifier Transistor
2SC4137

●Features
1) Low $V_{CE(sat)}$. (Typ. −0.2V at I_C/I_B=50/5mA)
2) High DC current gain.

●Packaging specifications and h_{FE}

Type	2SC4137
Package	TO−126FP
h_{FE}	VW
Code	−
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	25	V
Collector-emitter voltage	V_{CEO}	20	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	100	mA (DC)
		200	mA (Pulse) *
Collector power dissipation	P_C	1	W
		4	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=10ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	25	−	−	V	I_C=10μA
Collector-emitter breakdown voltage	BV_{CEO}	20	−	−	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	−	−	V	I_E=10μA
Collector cutoff current	I_{CBO}	−	−	0.5	μA	V_{CB}=15V
Emitter cutoff current	I_{EBO}	−	−	0.5	μA	V_{EB}=6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	0.2	0.7	V	I_C/I_B=50mA/5mA
DC current transfer ratio	h_{FE}	820	−	2700	−	V_{CE}/I_C=3V/10mA
Transition frequency	f_T	−	400	−	MHz	V_{CE}=10V, I_E=−10mA, f=100MHz
Output capacitance	Cob	−	3	−	pF	V_{CB}=10V, I_E=0A, f=1MHz

(96-718-C110)

High-frequency Amplifier Transistor, RF Switching
2SC4774 / 2SC4713K

●Features
1) Very low output-on resistance (Ron).
2) Low capacitance.

●Packaging specifications and h_{FE}

Type	2SC4774	2SC4713K
Package	UMT3	SMT3
h_{FE}	S	S
Marking	BM*	BM*
Code	T106	T146
Basic ordering unit (pieces)	3000	3000

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	12	V
Collector-emitter voltage		V_{CEO}	6	V
Emitter-base voltage		V_{EBO}	3	V
Collector current		I_C	50	mA
Collector power dissipation	2SC4774	P_C	0.15	W
	2SC4713K		0.2	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	12	−	−	V	I_C=10μA
Collector-emitter breakdown voltage	BV_{CEO}	6	−	−	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	3	−	−	V	I_E=10μA
Collector cutoff current	I_{CBO}	−	−	0.5	μA	V_{CB}=10V
Emitter cutoff current	I_{EBO}	−	−	0.5	μA	V_{EB}=2V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	0.3	V	I_C/I_B=10mA/1mA
DC current transfer ratio	h_{FE}	270	−	560	−	V_{CE}/I_C=10V/10mA
Transition frequency	f_T	300	800	−	MHz	V_{CE}=5V, I_C=10mA
Output capacitance	Cob	−	1	1.7	pF	V_{CB}=10V, I_E=0A, f=1MHz
Output-on resistance	Ron	−	2	−	Ω	I_B=3mA, vi=100mVrms, f=500KHz

(96-183-C115)

High-voltage Switching Transistor (Telephone, Power supply)
2SA1807

● Features
1) High breakdown voltage (V_{CEO}=−600V)
2) Low $V_{CE(sat)}$. (Typ.−0.25V at I_C/I_B=−300/−60mA)
3) Fast switching. (tf : Typ.0.4 μs at I_C=−500mA)
4) Wide SOA (safe operating area).

● Packaging specifications and h_{FE}

Type	2SA1807
Package	CPT3
h_{FE}	NP
Code	TL
Basic ordering unit (pieces)	2500

● Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−600	V
Collector-emitter voltage	V_{CEO}	−600	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−1	A (DC)
		−2	A (Pulse) *
Collector power dissipation	P_C	1	W
		10	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Pw=100ms

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−600	−	−	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−600	−	−	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−7	−	−	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−600V
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−7V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−0.25	−1	V	I_C/I_B=−300mA/−60mA
Base-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.2	V	I_C/I_B=−300mA/−60mA
DC current transfer ratio	h_{FE}	56	−	180	−	V_{CE}=−5V , I_C=−100mA
Transition frequency	f_T	−	15	−	MHz	V_{CB}=−10V , I_E=50mA , f=5MHz
Output capacitance	Cob	−	40	−	pF	V_{CE}=−10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	−	0.2	−	μs	I_C=−500mA , R_L=500Ω
Storage time	t_{stg}	−	1.8	−	μs	I_{B1}=−I_{B2}=−100mA
Fall time	t_f	−	0.4	−	μs	V_{CC}≒−250V

(96-102-A331)

High-voltage Switching Transistor (Telephone, Power supply)
2SA1862

● Features
1) High breakdown voltage (V_{CEO}=−400V)
2) Low $V_{CE(sat)}$. (Typ.−0.3V at I_C/I_B=−500/−100mA)
3) Fast switching. (tf : Typ.0.4 μs at I_C=−1A)
4) Wide SOA (safe operating area).

● Packaging specifications and h_{FE}

Type	2SA1862
Package	CPT3
h_{FE}	P
Code	TL
Basic ordering unit (pieces)	2500

● Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−400	V
Collector-emitter voltage	V_{CEO}	−400	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−2	A (DC)
		−4	A (Pulse) *
Collector power dissipation	P_C	1	W
		10	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Single pulse Pw=10ms

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−400	−	−	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−400	−	−	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−7	−	−	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−400V
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−0.3	−0.5	V	I_C/I_B=−0.5A/−0.1A
Base-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.2	V	I_C/I_B=−0.5A/−0.1A
DC current transfer ratio	h_{FE}	82	−	180	−	V_{CE}=−5V , I_C=−0.1A
Transition frequency	f_T	−	18	−	MHz	V_{CB}=−10V , I_E=0.1A , f=5MHz
Output capacitance	Cob	−	30	−	pF	V_{CE}=−10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	−	0.2	−	μs	I_C=−1A , R_L=150Ω
Storage time	t_{stg}	−	1.8	−	μs	I_{B1}=−I_{B2}=−0.2A
Fall time	t_f	−	0.4	−	μs	V_{CC}≒150V

(96-109-A343)

High-voltage switching Transistor (Camera strobes and Telephone, Power supply)
2SA1920

●Features

1) High breakdown voltage. (V_{CEO}=−400V)
2) Low $V_{CE(sat)}$. (Typ.−0.2V at I_C/I_B=−20/−2mA)
3) Fast switching. (tf : Typ. 1 μs at I_C=−100mA)
4) Wide SOA (safe operating area).

●Packaging specifications and h_{FE}

Type	2SA1920
Package	ATV
h_{FE}	P
Marking	—
Code	TV2
Basic ordering unit (pieces)	2500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−600	V	
Collector-emitter voltage	V_{CEO}	−600	V	
Emitter-base voltage	V_{EBO}	−7	V	
Collector current	I_C	−0.1	A(DC)	
		−0.2	A (Pulse)	*1
Collector power dissipation	P_C	1	W	*2
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

*1 Single pulse Pw=100ms
*2 On 40 x 40 x 0.7 mm ceramic board.

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−600	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−600	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−7	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−10	μA	V_{CB}=−400V
Emitter cutoff current	I_{EBO}	—	—	−10	μA	V_{EB}=−6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	−0.2	−0.5	V	I_C/I_B=−20mA/−2mA
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	−1.2	V	I_C/I_B=−20mA/−2mA
DC current transfer ratio	h_{FE}	82	—	180	—	V_{CE}=−10V , I_C=−10mA
Transition frequency	f_T	—	12	—	MHz	V_{CE}=−10V , I_E=10mA , f=5MHz
Output capacitance	Cob	—	13	—	pF	V_{CB}=−10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	—	0.7	—	μs	I_C=−100mA R_L=1.5kΩ
Storage time	t_{stg}	—	1.8	—	μs	I_{B1}=−I_{B2}=−10mA
Fall time	t_f	—	1	—	μs	V_{CC}≒−150V

(SPEC-A324)

High-speed Switching Transistor (−60V, −12A)
2SA1870

●Features

1) High speed switching (tf : Typ. 0.17 μs at I_C=−6A)
2) Low $V_{CE(sat)}$. (Typ.−0.2V at I_C/I_B=−6/−0.3A)
3) Wide SOA (safe operating area)

●Packaging specifications and h_{FE}

Type	2SA1870
Package	PSD3
h_{FE}	EF
Code	TL
Basic ordering unit (pieces)	1000

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−100	V	
Collector-emitter voltage	V_{CEO}	−60	V	
Emitter-base voltage	V_{EBO}	−5	V	
Collector current	I_C	−12	A	
		−20	A (Pulse)	*
Collector power dissipation	P_C	35	W (T_C=25℃)	
		1.5	W	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−100	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	$BV_{CEO(SUS)}$	−60	—	—	V	I_C=−6A , I_B=−0.6A , L=1mH
Collector-emitter breakdown voltage	BV_{CEO}	−60	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−10	μA	V_{CB}=−100V
Emitter cutoff current	I_{EBO}	—	—	−10	μA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	−0.2	−0.3	V	I_C/I_B=−6A/−0.3A
		—	—	−0.5	V	I_C/I_B=−8A/−0.4A
Base-emitter saturation voltag	$V_{BE(sat)}$	—	—	−1.2	V	I_C/I_B=−6A/−0.3A
		—	—	−1.5	V	I_C/I_B=−8A/−0.4A
DC current transfer ratio	h_{FE}	100	—	320	—	V_{CE}=−2V , I_C=−2A
Transition frequency	f_T	—	80	—	MHz	V_{CB}=−10V , I_E=−1A , f=30MHz
Output capacitance	Cob	—	250	—	pF	V_{CE}=−10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	—	—	0.3	μs	I_C=−6A
Storage time	t_{stg}	—	—	1.5	μs	I_{B1}=−I_{B2}=−0.3A
Fall time	t_f	—	0.17	0.3	μs	V_{CC}≒−30V

(96-113-A325)

High-voltage switching Transistor
2SC4061K / 2SC3415S / 2SC4015 / 2SC3271F

●Features

1) High breakdown voltage. (BV_{CEO}=300V)
2) Low collector output capacitance. (Typ. 3pF at V_{CB}=30V)
3) Ideal for surge protection on telephone lines.

●Packaging specifications and h_{FE}

Type	2SC4061K	2SC3415S	2SC4015	2SC3271F
Package	SMT3	SPT	ATV	TO−126F
h_{FE}	NP	NP	N	N
Marking	AN∗	−	−	−
Code	T146	TP	TV2	−
Basic ordering unit (pieces)	3000	5000	2500	1000

∗ Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	300	V
Collector-emitter voltage		V_{CEO}	300	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector power dissipation	2SC4061K	P_C	0.2	W
	2SC3415S		0.3	
	2SC4015		1	∗
	2SC3271F		1.2	
			5	W (Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55∼150	℃

∗ Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	300	−	−	V	I_C=50 μA
Collector-emitter breakdown voltage		BV_{CEO}	300	−	−	V	I_C=100 μA
Emitter-base breakdown voltage		BV_{EBO}	5	−	−	V	I_E=50 μA
Collector cutoff current		I_{CBO}	−	−	0.5	μA	V_{CB}=200V
Emitter cutoff current		I_{EBO}	−	−	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	2	V	I_C/I_B=50mA/5mA
DC current transfer ratio	2SC4061K, 2SC3415S	h_{FE}	56	−	180	−	V_{CE}/I_C=10V/10mA
	2SC4015, 2SC3271F		56	−	120	−	
Gain bandwidth product		f_T	50	100	−	MHz	V_{CE}=30V , I_E=−10mA , f=100MHz
Collector output capacitance		Cob	−	3	−	pF	V_{CB}=30V , I_E=0A , f=1MHz

(96-172-C52)

High-voltage Switching Transistor (Power supply)
2SC4938 / 2SC4129

●Features

1) Low $V_{CE(sat)}$. (Typ. 0.6V at I_C/I_B=5/1A)
3) Fast switching (tf : Max. 1 μs at I_C=4A)
3) Wide SOA (safe operating area).

●Packaging specifications and h_{FE}

Type	2SC4938	2SC4129
Package	PSD3	TO−220FP
h_{FE}	B	AB
Code	TL	−
Basic ordering unit (pieces)	1000	500

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	400	V
Collector-emitter voltage		V_{CEO}	400	V
Emitter-base voltage		V_{EBO}	7	V
Collector current		I_C	5	A
		I_{CP}	7	A ∗
Collector power dissipation	2SC4938	P_C	1.5	W
			35	W (Tc=25℃)
	2SC4129		30	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55∼150	℃

∗ Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	400	−	−	V	I_C=50 μA
Collector-emitter breakdown voltage		BV_{CEO}	400	−	−	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	7	−	−	V	I_E=50 μA
Collector cutoff current		I_{CBO}	−	−	10	μA	V_{CB}=400V
Emitter cutoff current		I_{EBO}	−	−	10	μA	V_{EB}=5V
Collector-emitter saturation voltage		$V_{CE(sat)}$	−	−	1	V	I_C/I_B=5A/1A ∗
Collector-emitter saturation voltage		$V_{BE(sat)}$	−	−	1.5	V	I_C/I_B=5A/1A ∗
DC current transfer ratio	2SC4938	h_{FE}	25	−	50	−	V_{CE}/I_C=5V/2A
	2SC4129		16	−	50	−	
Transition frequency		f_T	−	15	−	MHz	V_{CB}=10V , I_E=−0.5A , f=5MHz ∗
Output capacitance		Cob	−	80	−	pF	V_{CE}=10V , I_E=0A , f=1MHz
Turn-on time		t_{on}	−	−	1	μs	I_C=4A , R_L=50Ω
Storage time		t_{stg}	−	−	2.5	μs	I_{B1}=−I_{B2}=0.4A
Fall time		t_f	−	−	1	μs	V_{CC}≒200V

∗ Measured using pulse current.

(96-188-C55)

High-frequency Amplifier Transistor, RF switching
2SC4997 / 2SC4998

●**Features**
1) High f_T. (f_T=240MHz)

●**Absolute maximum ratings (Ta=25°C)**

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	15	V
Collector-emitter voltage		V_{CEO}	10	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	0.1	A
Collector power dissipation	2SC4997	P_C	0.15	W
	2SC4998		0.2	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

●**Packaging specifications and h_{FE}**

Type	2SC4997	2SC4998
Package	EMT3	UMT3
h_{FE}	560~2700	560~2700
Marking	CB	CB
Code	TL	T106
Basic ordering unit (pieces)	3000	3000

●**Electrical characteristics (Ta=25°C)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	10	—	—	V	I_C=1mA
Collector-emitter breakdown voltage	BV_{CEO}	15	—	—	V	I_C=10μA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=10μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=12V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.15	V	I_C/I_B=10mA/1mA
DC current transfer ratio	h_{FE}	560	1600	2700	—	V_{CE}=2V , I_C=5mA
Transition frequency	f_T	—	240	—	MHz	V_{CE}=5V , I_E=10mA , f=200MHz
Output capacitance	Cob	—	1.4	3	pF	V_{CB}=10V , I_E=0A , f=1MHz

(SPEC-C131)

High-frequency Amplifier Transistor (25V, 300MHz)
2SC4618 / 2SC4098 / 2SC2413K / 2SC2058S

●**Features**
1) Low collector capacitance. (Cob : Typ.1. 3pF)
2) Low rbb, high gain, and excellent noise characteristics.

●**Absolute maximum ratings (Ta=25°C)**

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	40	V
Collector-emitter voltage		V_{CEO}	25	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	50	mA
Collector power dissipation	2SC4618	P_C	0.15	W
	2SC4098, 2SC2413K		0.2	
	2SC2058S		0.3	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

●**Packaging specifications and h_{FE}**

Type	2SC4618	2SC4098	2SC2413K	2SC2058S
Package	EMT3	UMT3	SMT3	SPT
h_{FE}	NPQ	NPQ	NPQ	P
Marking	A*	A*	A*	—
Code	EL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

* Denotes h_{FE}

●**Electrical characteristics (Ta=25°C)**

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	40	—	—	V	I_C=50μA
Collector-emitter breakdown voltage		BV_{CEO}	25	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current		I_{CBO}	—	—	0.5	μA	V_{CB}=24V
Emitter cutoff current		I_{EBO}	—	—	0.5	μA	V_{EB}=3V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	0.1	0.3	V	I_C/I_B=10mA/1mA
DC current transfer ratio	2SC4618,2SC4098,2SC2413K	h_{FE}	56	—	270	—	V_{CE}=6V , I_C=1mA
	2SC2058S		82	—	180		
Transition frequency		f_T	150	300	—	MHz	V_{CE}=6V , I_E=−1mA , f=100MHz
Output capacitance		Cob	—	1.3	2.2	pF	V_{CB}=6V , I_E=0A , f=1MHz

(96-161-C26)

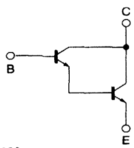
Medium Power Transistor (60V, 1A)

2SD1834

●Features

1) Darlington connection for high DC current gain. (Typ. 15000 at V_{CE}/I_C=3V/0.5A)
2) High input impedance.

●Circuit schematic



B : Base
C : Collector
E : Emitter

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	60	V	
Collector-emitter voltage	V_{CES}	60	V	＊2
Emitter-base voltage	V_{EBO}	7	V	
Collector current	I_C	1	A (DC)	
		2	A (Pulse)	＊1
Collector power dissipation	P_C	0.5	W	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

＊1 Sigle pulse Pw=100ms
＊2 R_{BE}=0Ω

●Packaging specifications and h_{FE}

Type	2SD1834
Package	MPT3
h_{FE}	2k~
Marking	DE＊
Code	T100
Basic ordering unit (pieces)	1000

＊Denotes h_{FE}

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	60	—	—	V	I_C=100μA , R_{BE}=0Ω
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	1	μA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	—	—	1	μA	V_{EB}=6V
DC current transfer ratio	h_{FE}	2000	—	—	—	V_{CE}/I_C=3V/500mA ＊
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.9	1.5	V	I_C/I_B=500mA/500μA
Output capacitance	Cob	—	7	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

＊Measured using pulse current.

(94S-340-D64)

Muting Transistor

2SD1468S / 2SD1865

●Features

1) Low $V_{CE(sat)}$. (Typ. 0.006V at I_C/I_B=1/0.1mA)
2) Optimal for low voltage, high current drives.
3) High DC current gain and high current.

●Packaging specifications and h_{FE}

Type	2SD1468S	2SD1865
Package	SPT	ATV
h_{FE}	QRS	QR
Code	TP	TV2
Basic ordering unit (pieces)	5000	2500

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	30	V
Collector-emitter voltage		V_{CEO}	15	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	1	A
Collector power dissipation	2SD1468S	P_C	0.3	W
	2SD1865		0.6	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	30	—	—	V	I_C=50μA
Collector-emitter breakdown voltage		BV_{CEO}	15	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current		I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current		I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	0.08	0.4	V	I_C/I_B=0.5A/50mA
DC current transfer ratio	2SD1468S	h_{FE}	120	—	560	—	V_{CE}/I_C=3V/0.1A
	2SD1865		120	—	390	—	
Transition frequency		f_T	50	150	—	MHz	V_{CE}=5V , I_E=−50mA , f=100MHz
Output capacitance		Cob	—	15	30	pF	V_{CB}=10V , I_E=0A , f=1MHz

(94L-767-D65)

Power Transistor (−80V, −4A)
2SB1644

●Features
1) Low $V_{CE(sat)}$. (Typ. −0.5V at I_C/I_B = −3/−0.3A)
2) Excellent DC current gain characteristics.

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CEO}	−80	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−4	A (DC)
		−6	A (Pulse) *
Collector power dissipation	Pc	30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SB1644
Package	PSD3
h_{FE}	EF
Code	T100
Basic ordering unit (pieces)	1000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−80	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−60	−	−	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−80V
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.5	V	I_C/I_B=−3A/−0.3A *
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	−1.5	V	I_C/I_B=−3A/−0.3A *
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=−5V/−1A
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V, I_E=0.5A, f=5MHz *
Output capacitance	Cob	−	100	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

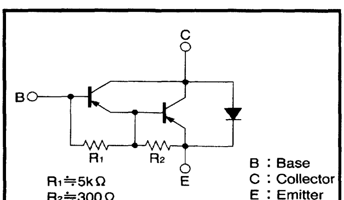
* Measured using pulse current.

(SPEC-B14UP)

Power Transistor (−80V, −10A)
2SB1551

●Features
1) Darlington connection for high DC current gain.
2) Built-in resistor between base and emitter.
3) Built-in damper diode.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CEO}	−80	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−10	A (DC)
	I_{CP}	−20	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Single pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SB1551
Package	TO-220FP
h_{FE}	1k~20k
Code	−
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−80	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−80	−	−	V	I_C=−5mA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−80V
Emitter cutoff current	I_{EBO}	−	−	−3	mA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−1	−1.5	V	I_C/I_B=−3A/−6mA *1
DC current transfer ratio	h_{FE}	1000	−	20000	−	V_{CE}/I_C=−3V/−5A
Transition frequency	f_T	−	12	−	MHz	V_{CE}=−5V, I_E=0.5A, f=10MHz *2
Output capacitance	Cob	−	90	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(941-453-B415)

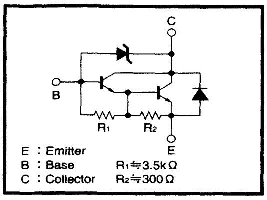
Medium Power Transistor (Motor or Relay drive)

2SD2170

●Features

1) Built-in zener diode between collector and base.
2) Zener diode has low dispersion.
3) Strong protection against reverse power surges due to low loads.
4) Darlington connection for high DC current gain.
5) Built-in resistor between base and emitter.
6) Built-in damper diode.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	90^{+20}_{-10}	V
Collector-emitter voltage	V_{CES}	90^{+20}_{-10}	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	2	A (DC)
		3	A (Pulse) ＊1
Collector power dissipation	P_C	2	W ＊2
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

＊1 Single pulse Pw=10ms , Duty=1/2
＊2 On 40 x 40 x 0.7 mm ceramic board.

●Packaging specifications and h_{FE}

Type	2SD2170
Package	MPT3
h_{FE}	1k~10k
Marking	DM
Code	T100
Basic ordering unit (pieces)	1000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	80	—	110	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	80	—	110	V	I_C=1mA
Collector cutoff current	I_{CBO}	—	—	10	μA	V_{CB}=70V
Emitter cutoff current	I_{EBO}	—	—	3	mA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1.5	V	I_C/I_B=1A/1mA ＊1
DC current transfer ratio	h_{FE}	1000	—	10000	—	V_{CE}=2V , I_C=1A ＊1
Transition frequency	f_T	—	80	—	MHz	V_{CE}=5V , I_E=−0.1A , f=30MHz ＊2
Output capacitance	C_{ob}	—	25	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

＊1 Measured using pulse current. ＊2 Transition frequency of mounted transistor.

(96-241-D405)

Power Transistor (60V, 4A)

2SC4574

●Features

1) Built-in zener diode between collector and base.
2) Strong protection against reverse power surges due to low loads.
3) Built-in resistor between base and emitter.
4) Built-in damper diode.

●Absolute maximum ratings (Ta=25℃)

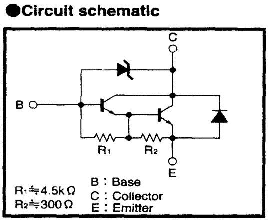
Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	60±10	V
Collector-emitter voltage	V_{CEO}	60±10	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	4	A (DC)
		6	A (Pulse) ＊
Collector power dissipation	P_C	5	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

＊ Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SC4574
Package	TO-220FP
h_{FE}	2k~20k
Code	—
Basic ordering unit (pieces)	500

●Circuit schematic



●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	60	70	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	60	70	V	I_C=5mA
Collector cutoff current	I_{CBO}	—	—	10	μA	V_{CB}=40V
Emitter cutoff current	I_{EBO}	—	—	3	mA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	1	1.5	V	I_C/I_B=1.5A/6mA ＊1
DC current transfer ratio	h_{FE}	2000	—	10000	—	V_{CE}/I_C=5V/1.5A ＊1
Transition frequency	f_T	—	80	—	MHz	V_{CE}=5V , I_E=−0.2A , f=30MHz ＊2
Output capacitance	C_{ob}	—	30	—	pF	V_{CB}=10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	—	0.4	—	μs	I_C=1.5A , R_L=14Ω
Storage time	t_{stg}	—	1.5	—	μs	I_{B1}=−I_{B2}=6mA
Fall time	t_f	—	0.4	—	μs	V_{CC}≃20V

＊1 Measured using pulse current. ＊2 Transition frequency of mounted transistor.

(94L-686-D406)

Power Transistor (31±4V, 2A)

2SD2167

●Features

1) Built-in zener diode between collector and base.
2) Zener diode has low voltage dispersion.
3) Strong protection against reverse power surges due to low loads.
4) P_C=2 W (On 40×40×0.7mm ceramic board)

●Packaging specifications and h_{FE}

Type	2SD2167
Package	MPT3
h_{FE}	NPQ
Marking	DL*
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	31±4	V	
Collector-emitter voltage	V_{CEO}	31±4	V	
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	2	A (DC)	
		3	A (Pulse)	*1
Collector power dissipation	P_C	0.5	W	
		2	W	*2
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

*1 Pw=20ms , duty=1/2
*2 On 40 x 40 x 0.7 mm ceramic board.

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	27	—	35	V	I_C=50 μA	
Collector-emitter breakdown voltage	BV_{CEO}	27	—	35	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA	
Collector cutoff current	I_{CBO}	—	—	1	μA	V_{CB}=20V	
Emitter cutoff current	I_{EBO}	—	—	1	μA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1	V	I_C/I_B=2A/0.2A	*
		—	0.25	0.5	V	I_C/I_B=1A/50mA	*
DC current transfer ratio	h_{FE}	56	—	270	—	V_{CE}/I_C=3V/0.5A	
Transition frequency	f_T	—	100	—	MHz	V_{CE}=3V , I_E=−0.5A , f=30MHz	*
Output capacitance	Cob	—	25	—	pF	V_{CB}=10V , I_E=0A , f=1MHz	

* Measured using pulse current.

(92S-358–D310)

Power Transistor (60V, 3A)

2SD2394 / 2SD2576

●Features

1) Low $V_{CE(sat)}$ (Typ. 0.3V at I_C/I_B=2/0.2A)
2) Excellent DC current gain characteristics.
3) Wide SOA (safe operating area).

●Packaging specifications and h_{FE}

Type	2SD2394	2SD2576
Package	TO-220FN	TO-220FN
h_{FE}	EF	F
Code	−	−
Basic ordering unit (pieces)	500	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	80	V	
Collector-emitter voltage	V_{CEO}	60	V	
Emitter-base voltage	V_{EBO}	7	V	
Collector current	I_C	3	A (DC)	
	I_{CP}	6	A (Pulse)	*
Collector power dissipation	P_C	2	W	
		25	W (Tc=25℃)	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* Sigle pulse Pw=100ms

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage		BV_{CBO}	80	—	—	V	I_C=50 μA	
Collector-emitter breakdown voltage		BV_{CEO}	60	—	—	V	I_C=1mA	
Emitter-base breakdown voltage		BV_{EBO}	7	—	—	V	I_E=50 μA	
Collector cutoff current		I_{CBO}	—	—	10	μA	V_{CB}=60V	
Emitter cutoff current		I_{EBO}	—	—	10	μA	V_{EB}=7V	
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	1	V	I_C/I_B=2A/0.2A	
		$V_{CE(sat)}$	—	—	0.8	V		
Base-emitter saturation voltage		$V_{CE(sat)}$	—	—	1.5	V	I_C/I_B=2A/0.2A	*
DC current transfer ratio	2SD2394	h_{FE}	100	—	320	—	V_{CE}/I_C=5V/0.5A	
	2SD2576		160	—	320	—		
Transition frequency		f_T	—	8	—	MHz	V_{CE}=5V , I_E=−0.5A , f=5MHz	*
Output capacitance		Cob	—	35	—	pF	V_{CB}=10V , I_E=0A , f=1MHz	

*1 Measured using pulse current.

(94L-1098-D348)

Power Transistor (120V, 7A)
2SD1957

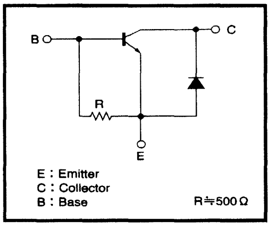
●Features
1) High DC current gain. (160~500)
2) Low $V_{CE(sat)}$. (Typ. 0.2V at I_C/I_B=3/0.3A)
3) P_C=30W. (T_C=25℃)
4) Wide SOA (safe operating area).
5) Built-in damper diode.

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	120	V
Collector-emitter voltage	V_{CEO}	120	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	7	A (DC)
		12	A (Pulse) *
Diode current	I_D	7	A
Collector power dissipation	P_C	2	W
		30	W (T_C=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Circuit schematic



●Packaging specifications and h_{FE}

Type	2SD1957
Package	TO-220FP
h_{FE}	FG
Code	–
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	120	–	–	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	120	–	–	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	5	–	–	V	I_E=30mA	
Collector cutoff current	I_{CBO}	–	–	10	μA	V_{CB}=100V	
Emitter cutoff current	I_{EBO}	–	–	20	mA	V_{EB}=4V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	–	0.2	1	V	I_C/I_B=3A/0.3A	*
Base-emitter saturation voltage	$V_{BE(sat)}$	–	0.9	1.5	V	I_C/I_B=3A/0.3A	*
DC current transfer ratio	h_{FE}	160	–	500	–	V_{CE}/I_C=5V/1A	
Transition frequency	f_T	–	40	–	MHz	V_{CE}=5V, I_E=−0.5A, f=10MHz	*
Output capacitance	Cob	–	100	–	pF	V_{CB}=10V, I_E=0A, f=1MHz	
Diode forward current	V_{ECF}	–	–	3	V	I_D=7A	*

* Measured using pulse current.

(94L-919-D301)

Power Transistor (60V, 3A)
2SD2061

●Features
1) Low $V_{CE(sat)}$. (Typ. 0.3V at I_C/I_B=2/0.2A)
2) Excellent DC current gain characteristics.
3) P_C=30W. (T_C=25℃)
4) Wide SOA (safe operating area).

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CEO}	60	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	3	A (DC)
		6	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (T_C=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Packaging specifications and h_{FE}

Type	2SD2061
Package	TO-220FP
h_{FE}	EF
Code	–
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	80	–	–	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	60	–	–	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	5	–	–	V	I_E=50μA	
Collector cutoff current	I_{CBO}	–	–	10	μA	V_{CB}=60V	
Emitter cutoff current	I_{EBO}	–	–	10	μA	V_{EB}=4V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	–	–	1		I_C/I_B=2A/0.2A	*
Base-emitter saturation voltage	$V_{BE(sat)}$	–	–	1.5		I_C/I_B=2A/0.2A	*
DC current transfer ratio	h_{FE}	100	–	320	–	V_{CE}/I_C=5V/0.5A	
Transition frequency	f_T	–	8	–		V_{CE}=5V, I_E=−0.5A, f=5MHz	*
Output capacitance	Cob	–	70	–	pF	V_{CB}=10V, I_E=0A, f=1MHz	

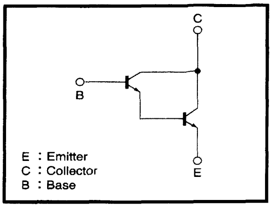
* Measured using pulse current.

(94L-1016-D304)

High-gain Amplifier Transistor (32V, 12V)
2SD2142K / 2SC2062S

●Features
1) Darlington connection for a high h_{FE}.
(Min. 5000 at V_{CE}/I_C=3V/0.1A)
2) High input impedance.

●Internal schematic diagram



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	40	V
Collector-emitter voltage		V_{CEO}	32	V
Emitter-base voltage		V_{EBO}	12	V
Collector current		I_C	0.3	A
Collector power dissipation	2SD2142K	P_C	0.2	W
	2SC2062S		0.3	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Packaging specifications and h_{FE}

Type	2SD2142K	2SC2062S
Package	SMT3	SPT
h_{FE}	5k~	C
Code	T146	TP
Basic ordering unit (pieces)	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	40	—	—	V	I_C=100μA
Collector-emitter breakdown voltage		BV_{CEO}	32	—	—	V	I_C=10mA
Emitter-base breakdown voltage		BV_{EBO}	12	—	—	V	I_E=100μA
Collector cutoff current		I_{CBO}	—	—	0.1	μA	V_{CB}=30V
Emitter cutoff current		I_{EBO}	—	—	0.1	μA	V_{EB}=12V
DC current transfer ratio	2SD2142K	h_{FE}	5000	—	—	—	V_{CE}/I_C=3V/0.1A
	2SC2062S		10000	—	—	—	
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	1.4	V	I_C/I_B=200mA/0.2mA
Transition frequency		f_T	—	200	—	MHz	V_{CE}=5V , I_E=−10mA , f=100MHz *
Output capacitance		Cob	—	2.5	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

* Transition frequency of mounted transistor.

(94L-570-D25)

Low Vce (sat) Transistor (Strobes and DC-DC converters)
2SD2470

●Features
1) Low $V_{CE(sat)}$. (Typ. 0.25V at I_C/I_B=3/0.1A)
2) I_C=5A is possible.

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	15	V
Collector-emitter voltage	V_{CEO}	10	V
Emitter-base voltage	V_{EBO}	10	V
Collector current	I_C	5	A (DC)
	I_{CP}	8	A (Pulse) *
Collector power dissipation	P_C	0.4	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Single pulse=10ms

●Packaging specifications and h_{FE}

Type	2SD2470
Package	SPT
h_{FE}	270~820
Code	TP
Basic ordering unit (pieces)	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CEO}	10	—	—	V	I_C=1mA
Collector-emitter breakdown voltage	BV_{CBO}	15	—	—	V	I_C=50μA
Emitter-base breakdown voltage	BV_{EBO}	10	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=10V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=8V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.25	0.5	V	I_C/I_B=3/0.1A
DC current transfer ratio	h_{FE}	270	—	820	—	V_{CE}=2V , I_C=2A
Transition frequency	f_T	—	170	—	MHz	V_{CE}=6V , I_E=0.05A , f=100MHz
Output capacitance	Cob	—	30	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

(SPEC-D230)

Power Transistor (100V, 5A)
2SD1897

●**Features**
1) Low $V_{CE(sat)}$. (Typ. −0.3V at I_C/I_B=3/0.3A)
2) Excellent h_{FE} current characteristics.
3) Pc=30 W. (Tc=25℃)

●**Packaging specifications and h_{FE}**

Type	2SD1897
Package	TO-220FP
h_{FE}	E
Code	—
Basic ordering unit (pieces)	500

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	100	V
Collector-emitter voltage	V_{CEO}	100	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	5	A (DC)
		10	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Simgle pulse Pw=100ms

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	100	—	—	V	I_C=50 μA	
Collector-emitter breakdown voltage	BV_{CEO}	100	—	—	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA	
Collector cutoff current	I_{CBO}	—	—	10	μA	V_{CB}=100V	
Emitter cutoff current	I_{EBO}	—	—	10	μA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.3	1.0	V	I_C/I_B=3A/0.3A	*
Base-emitter saturation voltage	$V_{CE(sat)}$	—	—	1.5	V	I_C/I_B=3A/0.3A	*
DC current transfer ratio	h_{FE}	100	—	200	—	V_{CE}/I_C=5V/1A	
Transition frequency	f_T	—	8	—	MHz	V_{CE}=5V , I_E=−0.5A , f=5MHz	*
Output capacitance	Cob	—	100	—	pF	V_{CB}=10V , I_E=0A , f=1MHz	

* Measured using pulse current.

(96-768-D91)

Muting Transistor
2SD1757K

●**Features**
1) Low $V_{CE(sat)}$. (Typ. 8mV at I_C/I_B=10/1mA)
2) Optimal for muting.

●**Packaging specifications and h_{FE}**

Type	2SD1757K
Package	SMT3
h_{FE}	QRS
Marking	* AA
Code	T146
Basic ordering unit (pieces)	3000

* Denotes h_{FE}

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	30	V
Collector-emitter voltage	V_{CEO}	15	V
Emitter-base voltage	V_{EBO}	6.5	V
Collector current	I_C	0.5	A
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	15	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6.5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.1	0.4	V	I_C/I_B=500mA/50mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}/I_C=3V/100mA
Transition frequency	f_T	—	150	—	MHz	V_{CE}=5V , I_E=−50mA , f=100MHz
Output capacitance	Cob	—	15	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

(92S-314-D95)

Medium Power Transistor (50V, 0.5A)

2SD1949 / 2SD1484K / 2SC1741AS

●Features

1) High current. (I_C=0.5A)
2) Low $V_{CE(sat)}$. (Typ. 0.1V at I_C/I_B=150/15mA)

●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	0.5	A
Collector power dissipation	2SD1949,2SD1484K	P_C	0.2	W
	2SC1741AS		0.3	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

●Packaging specifications and h_{FE}

Type	2SD1949	2SD1484K	2SC1741AS
Package	UMT3	SMT3	SPT
h_{FE}	QR	QR	QR
Marking	Y*	Y*	—
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

* Denotes h_{FE}

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=100μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=100μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=30V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}/I_C=3V/0.1A
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=150mA/15mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=5V , I_E=−20mA , f=100MHz
Output capacitance	Cob	—	6.5	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

(96-678-D15)

Power Transistor (80V, 0.3A)

2SC3359S

●Features

1) High breakdown voltage. (V_{CEO}=80V)
2) Low $V_{CE(sat)}$. (Typ. 0.2V at I_C/I_B=0.3/0.03A)

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CEO}	80	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	0.3	A
Collector power dissipation	P_C	0.3	W
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

●Packaging specifications and h_{FE}

Type	2SC3359S
Package	SPT
h_{FE}	QR
Code	TP
Basic ordering unit (pieces)	5000

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	80	—	—	V	I_C=1mA
Collector-base breakdown voltage	BV_{CBO}	80	—	—	V	I_C=50μA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=80V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.2	0.5	V	I_C/I_B=0.3/0.03A
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=3V , I_C=0.1A
Transition frequency	f_T	50	150	—	MHz	V_{CE}=5V , I_E=0.01A , f=100MHz
Output capacitance	Cob	—	5	8	pF	V_{CB}=10V , I_E=0A , f=1MHz

(SPEC-D16)

Power Transistor (−60V, −3A)
2SB1370

●**Features**
1) Low $V_{CE(sat)}$. (Typ. −0.3V at I_C/I_B=−2/−0.2A)
2) Excellent DC current gain characteristics.
3) P_C = 2W (Ta=25℃) / 30W (Tc=25℃)
4) Wide SOA (safe operating area).

●**Packaging specifications and h_{FE}**

Type	2SB1370
Package	TO-220FN
h_{FE}	EF
Code	−
Basic ordering unit (pieces)	500

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−60	V
Collector-emitter voltage	V_{CEO}	−60	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−3	A (DC)
	I_{CP}	−6	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−60	−	−	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current	I_{CBO}	−	−	−10	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	−	−	−10	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−1.5		I_C/I_B=−2A/−0.2A *
Base-emitter saturation voltage	$V_{BE(sat)}$	−	−	−1.5		I_C/I_B=−2A/−0.2A *
DC current transfer ratio	h_{FE}	100	−	320	−	V_{CE}/I_C=−5V/−0.5A
Transition frequency	f_T	−	15	−		V_{CE}=−5V, I_E=0.5A, f=5MHz *
Output capacitance	Cob	−	80	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

* Measured using pulse current.

(94L-411-B303)

Power Transistor (−60V, −3A)
2SB1655/2SB1565

●**Features**
1) Low $V_{CE(sat)}$. (Typ. −0.3V at I_C/I_B=−2/−0.2A)
2) Excellent DC current gain characteristics.
3) Wide SOA (safe operating area).

●**Packaging specifications and h_{FE}**

Type	2SB1655	2SB1565
Package	TO-220FN	TO-220FN
h_{FE}	E	EF
Code	−	−
Basic ordering unit (pieces)	500	500

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−80	V
Collector-emitter voltage	V_{CEO}	−60	V
Emitter-base voltage	V_{EBO}	−7	V
Collector current	I_C	−3	A (DC)
	I_{CP}	−6	A (Pulse) *
Collector power dissipation	P_C	2	W
		25	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●**Electrical characteristics** (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−80	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage		BV_{CEO}	−60	−	−	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−7	−	−	V	I_E=−50μA
Collector cutoff current		I_{CBO}	−	−	−10	μA	V_{CB}=−60V
Emitter cutoff current		I_{EBO}	−	−	−10	μA	V_{EB}=−7V
Collector-emitter saturation voltage	2SB1655	$V_{CE(sat)}$	−	−	−1	V	I_C/I_B=−2A/−0.2A *
	2SB1565		−	−	−1.5	V	
Base-emitter saturation voltage		$V_{BE(sat)}$	−	−	−1.5	V	I_C/I_B=−2A/−0.2A *
DC current transfer ratio	2SB1655	h_{FE}	100	−	200	−	V_{CE}/I_C=−5V/−0.5A
	2SB1565		100	−	320	−	
Transition frequency		f_T	−	15	−	MHz	V_{CE}=−5V, I_E=0.5A, f=5MHz *
Output capacitance		Cob	−	50	−	pF	V_{CB}=−10V, I_E=0A, f=1MHz

* Measured using pulse current.

(94L-456-B349)

Bi-polar transistors

High-frequency Amplifier Transistor, RF switches (−10V, −0.1A)
2SA1885

●Features
1) High transition frequency. (Typ. 650MHz)

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−15	V
Collector-emitter voltage	V_{CEO}	−10	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−0.1	A
Collector power dissipation	P_C	0.15	W
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

●Package, mark, and packaging specifications

Type	2SA1885
Package	EMT3
h_{FE}	QRS
Marking	CA
Code	TL
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	−10	—	—	V	I_C=−1mA
Collector-base breakdown voltage	BV_{CBO}	−15	—	—	V	I_C=−10μA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−10μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−12V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.15	V	I_C/I_B=−10/−1mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=−5V , I_C=−100mA
Transition frequency	f_T	300	650	—	MHz	V_{CE}=−5V , I_E=−10mA , f=200MHz
Output capacitance	Cob	—	1.2	3	pF	V_{CB}=−10V , I_E=0A , f=1MHz

(SPEC-A128)

High-voltage Switching Transistor (Telephone power supply)
2SA1812 / 2SA1727 / 2SA1776

●Features
1) High breakdown voltage. (V_{CEO}=−400V)
2) Low $V_{CE(sat)}$. (Typ.−0.3V at I_C/I_B=−100/−10mA)
3) Fast switching. (tf : Typ. 1μs at I_C=−100mA)
4) Wide SOA (safe operating area).

●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−400	V
Collector-emitter voltage		V_{CEO}	−400	V
Emitter-base voltage		V_{EBO}	−7	V
Collector current		I_C	−0.5	A (DC)
			−1.0	A (Pulse) *1
Collector power dissipation	2SA1812	P_C	0.5	W
			2	*2
	2SA1727		1	W(Tc=25°C)
			10	
	2SA1776		1	W *3
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

*1 Single pulse *2 On 40×40×0.7mm ceramic board.
*3 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Packaging specifications and h_{FE}

Type	2SA1812	2SA1727	2SA1776
Package	MPT3	CPT3	ATV
h_{FE}	PQ	PQ	PQ
Marking	AJ *	−	−
Code	T100	TL	TV2
Basic ordering unit (pieces)	3000	3000	2500

* Denotes h_{FE}

●Electrical characteristics (Ta=25°C)

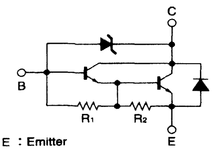
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−400	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−400	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−7	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−1	μA	V_{CB}=−400V
Emitter cutoff current	I_{EBO}	—	—	−1	μA	V_{EB}=−6V
DC current transfer ratio	h_{FE}	82	150	270	—	V_{CE}=−5V , I_C=−50mA
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−1	V	I_C/I_B=−100mA/−10mA
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	−1.2	V	I_C/I_B=−100mA/−10mA
Transition frequency	f_T	—	12	—	MHz	V_{CB}=−5V , I_E=50mA , f=5MHz
Output capacitance	Cob	—	18	—	pF	V_{CE}=−10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	—	0.6	—	μs	I_C=−100mA , R_L=1.5kΩ I_{B1}=−I_{B2}=−10mA V_{CC}≒−150V
Storage time	t_{stg}	—	2.7	—	μs	
Fall time	t_f	—	1	—	μs	

(96-609-A313)

Medium Power Transistor (Motor relay or Solenoid drive)
2SD2212 / 2SD2143 / 2SD1866 / 2SD1764

●Features
1) Built-in zener diode between collector and base.
2) Strong protection against reverse surges due to low loads.
3) Built-in resistor between base and emitter.
4) Built-in damper diode.

●Circuit schematic



E : Emitter
B : Base R1≒3.5kΩ
C : Collector R2≒300Ω

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	60±10	V
Collector-emitter voltage		V_{CES}	60±10	V
Emitter-base voltage		V_{EBO}	6	V
Collector current		I_C	2	A (DC)
			3	A (Pulse) ∗1
Collector power dissipation	2SD2212	P_C	2	W ∗2
	2SD2143		10	W(Tc=25℃)
	2SD1866		1	W ∗3
	2SD1764		20	W(Tc=25℃)
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 Sigle pulse Pw=100ms ∗2 On 40×40×0.7mm ceramic board.
∗3 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Packaging specifications and h_{FE}

Type	2SD2212	2SD2143	2SD1866	2SD1764
Package	MPT3	CPT3	ATV	TO-220FP
h_{FE}	1k~10k	1k~10k	1k~10k	1k~10k
Code	T100	TL	TV2	−
Basic ordering unit (pieces)	1000	2500	2500	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	50	—	70	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	50	—	70	V	I_C=5mA	
Collector cutoff current	I_{CBO}	—	—	1.0	μA	V_{CB}=40V	
Emitter cutoff current	I_{EBO}	—	—	3	mA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1.5	V	I_C/I_B=1A/1mA	∗
DC current transfer ratio	h_{FE}	1000	—	10000	—	V_{CE}=2V , I_C=1A	
Output capacitance	Cob	—	25	—	pF	V_{CB}=10V , I_E=0A , f=1MHz	

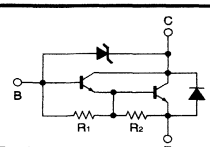
∗ Measured using pulse current.

(96-762-D84)

Medium Power Transistor (Motor relay or Solenoid drive)
2SD1856

●Features
1) Built-in zener diode between collector and base.
2) Strong protection against reverse surges due to low loads.
3) Built-in resistor between base and emitter.
4) Built-in damper diode.

●Circuit schematic



E : Emitter
B : Base R1≒3.5kΩ
C : Collector R2≒300Ω

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	60±10	V
Collector-emitter voltage	V_{CEO}	60±10	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	5	A (DC)
		10	A (Pulse) ∗
Collector power dissipation	P_C	2	W
		25	W (Tc=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

∗ Sigle pulse Pw=10ms

●Packaging specifications and h_{FE}

Type	2SD1856
Package	TO-220FP
h_{FE}	2k~30k
Code	—
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	50	—	70	V	I_C=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	50	—	70	V	I_C=5mA	
Collector cutoff current	I_{CBO}	—	—	10	μA	V_{CB}=40V	
Emitter cutoff current	I_{EBO}	—	—	3	mA	V_{EB}=5V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1.5	V	I_C/I_B=2A/2mA	∗
DC current transfer ratio	h_{FE}	2000	—	30000	—	V_{CE}/I_C=3V/2A	∗
Output capacitance	Cob	—	75	—	pF	V_{CB}=10V , I_E=0A , f=1MHz	

∗ Measured using pulse current.

(94L-885-D87)

Medium Power Transistor (25V, 1.2A)

2SD2537 / 2SD2171S

●Features

1) High DC current gain.
2) High emitter-base voltage. (V_{CBO}=12V Min.)
3) Low $V_{CE(sat)}$. (Max. 0.3V at I_C/I_B=500/10mA)

●Packaging specifications and h_{FE}

Type	2SD2537	2SD2171S
Package	MPT3	SPT
h_{FE}	VW	V
Marking	DV*	—
Code	T100	TP
Basic ordering unit (pieces)	1000	5000

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	30	V
Collector-emitter voltage	V_{CEO}	25	V
Emitter-base voltage	V_{EBO}	12	V
Collector current	I_C	1.2	A (DC)
		2	A (Pulse) *1
Collector power dissipation	P_C	2	W *2
		0.3	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

*1 Single pulse Pw=100ms *2 On 40 x 40 x 0.7 mm ceramic board.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	30	—	—	V	I_C=10μA
Collector-emitter breakdown voltage		BV_{CEO}	25	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	12	—	—	V	I_E=10μA
Collector cutoff current		I_{CBO}	—	—	0.3	μA	V_{CB}=30V
Emitter cutoff current		I_{EBO}	—	—	0.3	μA	V_{EB}=12V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=500mA/10mA *
DC current transfer ratio	2SD2537	h_{FE}	820	—	2700	—	V_{CE}/I_C=5V/0.5A
	2SD2171S		820	—	1800	—	
Transition frequency		f_T	—	200	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz *
Output capacitance		Cob	—	20	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

* Measured using pulse current.

(94L-1061-D212)

General Purpose Transistor (50V, 0.15A)

2SD2351 / 2SD2226K / 2SD2227S

●Features

1) High DC current gain.
2) High emitter-base voltage. (V_{CBO}=12V Min.)
3) Low $V_{CE(sat)}$. (Typ. 0.3V at I_C/I_B=50/5mA)

●Packaging specifications and h_{FE}

Type	2SD2351	2SD2226K	2SD2227S
Package	UMT3	SMT3	SPT
h_{FE}	VW	VW	W
Marking	BJ*	BJ*	—
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	60	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	12	V
Collector current		I_C	0.15	A (DC)
			0.2	A (Pulse) *
Collector power dissipation	2SD2351, 2SD2226K	P_C	0.2	W
	2SD2227S		0.3	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	60	—	—	V	I_C=10μA
Collector-emitter breakdown voltage		BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage		BV_{EBO}	12	—	—	V	I_E=10μA
Collector cutoff current		I_{CBO}	—	—	0.3	μA	V_{CB}=50V
Emitter cutoff current		I_{EBO}	—	—	0.3	μA	V_{EB}=12V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=50mA/5mA *
DC current transfer ratio	2SD2351, 2SD2226K	h_{FE}	560	—	2700	—	V_{CE}/I_C=5V/1mA *
	2SD2227S		1200	—	2700	—	V_{CE}/I_C=5V/1mA *
Transition frequency		f_T	—	250	—	MHz	V_{CE}=5V, I_E=−10mA, f=100MHz *
Output capacitance		Cob	—	3.5	—	pF	V_{CB}=5V, I_E=0A, f=1MHz

* Measured using pulse current.

(94S-374-D215)

Low Frequency Transistor (60V, 3A)

2SD2396

●Features

1) Low $V_{CE(sat)}$. (Typ. 0.3V at I_C/I_B=2/0.05A)
2) High DC current gain. (Typ. 1000 at V_{CE}/I_C=4V/0.5A)
3) P_C =30W. (T_C=25℃)
4) Wide SOA (safe operating area).

●Packaging specifications and h_{FE}

Type	2SD2396
Package	TO-220FN
h_{FE}	HJK
Code	—
Basic ordering unit (pieces)	500

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	80	V
Collector-emitter voltage	V_{CEO}	60	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	3	A (DC)
	I_{CP}	6	A (Pulse) *
Collector power dissipation	P_C	2	W
		30	W (T_C=25℃)
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* Sigle pulse Pw=100ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	80	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	60	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	100	μA	V_{CB}=80V
Emitter cutoff current	I_{EBO}	—	—	100	μA	V_{EB}=6V
DC current transfer ratio	h_{FE}	400	—	2000	—	V_{CE}=4V , IC=0.5A *
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.3	0.8	V	I_C/I_B=2A/0.05A *
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	1.5	V	I_C/I_B=2A/0.05A *
Transition frequency	f_T	—	40	—	MHz	V_{CE}=5V , I_E=−0.2A , f=10MHz *
Output capacitance	Cob	—	55	—	pF	V_{CB}=10V , I_E=0A , f=1MHz

* Measured using pulse current.

(96-819-D351)

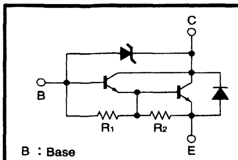
Power Transistor (90±10V, 3A)

2SC5060

●Features

1) Built-in zener diode between collector and base.
2) Zener diode has low voltage dispersion.
3) Strong protection against reverse power surges due to low loads.
4) Darlington connection for high DC current gain.
5) Built-in resistor between base and emitter.
6) Built-in damper diode.

●Circuit schematic



B : Base
C : Collector R_1≒3kΩ
E : Emitter R_2≒1kΩ

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	90±10	V
Collector-emitter voltage	V_{CEO}	90±10	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	1	A (DC)
	I_{CP}	2	A (Pulse) *1
Collector power dissipation	P_C	1	W *2
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

*1 Sigle pulse Pw=10ms
*2 Printed circuit board: 1.7 mm thick, collector copper plating at least 1 cm^2.

●Packaging specifications and h_{FE}

Type	2SC5060
Package	ATV
h_{FE}	M
Code	TV2
Basic ordering unit (pieces)	500

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	80	—	100	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	80	—	100	V	I_C=1mA
Collector cutoff current	I_{CBO}	—	—	10	μA	V_{CB}=70V
Emitter cutoff current	I_{EBO}	—	—	3	mA	V_{EB}=5V
DC current transfer ratio	h_{FE}	1000	—	2500	—	V_{CE}=3V , I_C=0.5A *1
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1.5	V	I_C/I_B=500mA/1mA
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	2	V	I_C/I_B=500mA/1mA *1
Transition frequency	f_T	—	80	—	MHz	V_{CB}=5V , I_E=−0.1A , f=30MHz *2
Output capacitance	Cob	—	20	—	pF	V_{CE}=10V , I_E=0A , f=1MHz
Turn-on time	t_{on}	—	0.2	—	μs	I_C=0.8A , R_L=50Ω
Storage time	t_{stg}	—	5	—	μs	I_{B1}=−I_{B2}=8mA
Fall time	t_f	—	0.6	—	μs	V_{CC}≒40V

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

(96-733-D416)

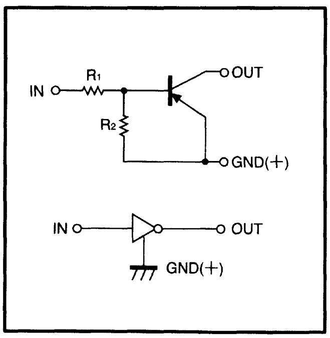
Digital transistors (built-in resistors)

DTA113ZE/DTA113ZUA/DTA113ZKA/DTA113ZSA

●Features

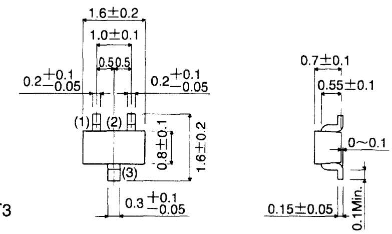
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Equivalent circuit



●External dimensions (Units: mm)

DTA113ZE

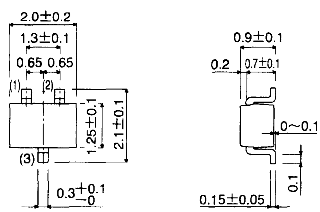


ROHM : EMT3

(1) GND
(2) IN
(3) OUT

Addreviated symbol : E11

DTA113ZUA



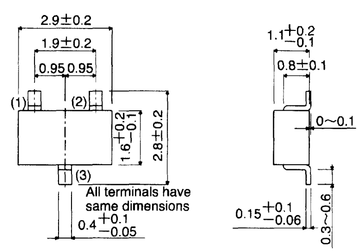
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 111

(1) GND
(2) IN
(3) OUT

DTA113ZKA



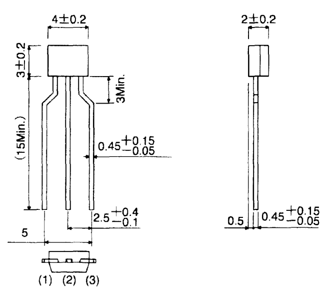
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

(1) GND
(2) IN
(3) OUT

Addreviated symbol : E11

DTA113ZSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(94S-504A113Z)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA113Z□) E	UA	KA	SA	Unit
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−10				V
		5				
Output current	I_O	−100				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	—	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−7.2	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	33	—	—	—	V_O=−5V,I_O=−5mA
Input resistance	R_1	0.7	1	1.3	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA113ZE		○	—	—	—
DTA113ZUA		—	○	—	—
DTA113ZKA		—	—	○	—
DTA113ZSA		—	—	—	○

Digital transistors

● Electrical characteristic curves

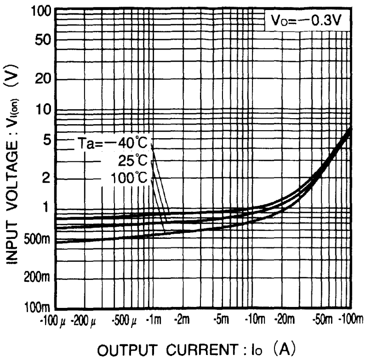


Fig.1 Input voltage vs. output current (ON characteristics)

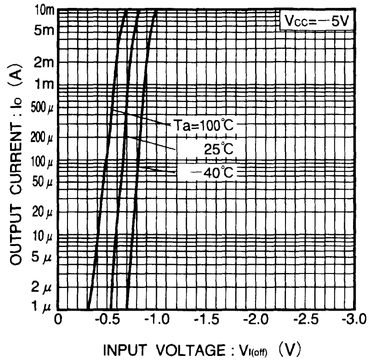


Fig.2 Output current vs. input voltage (OFF characteristics)

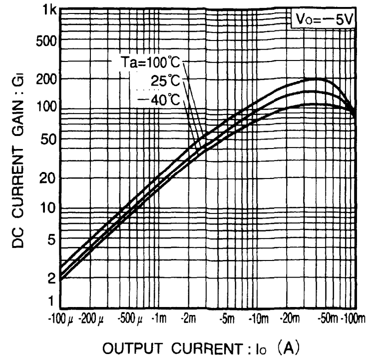


Fig.3 DC current gain vs. output current

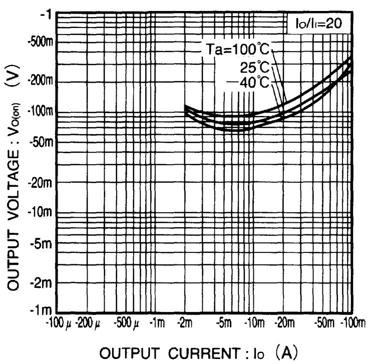


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTA114EE/DTA114EUA/DTA114EKA/DTA114ESA

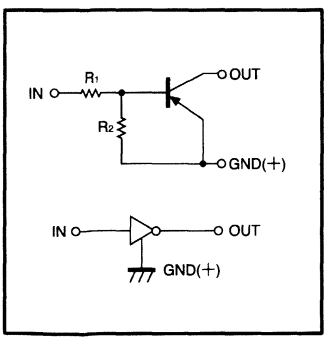
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

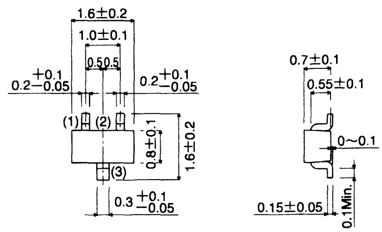
PNP digital transistor
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)

DTA114EE

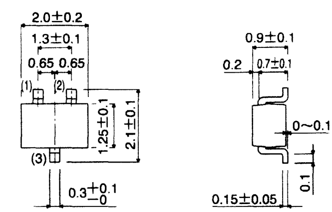


ROHM : EMT3

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 14

DTA114EUA



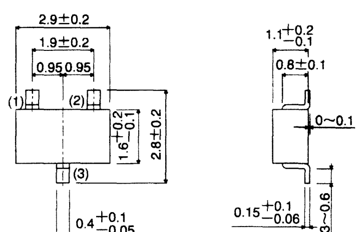
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 14

DTA114EKA



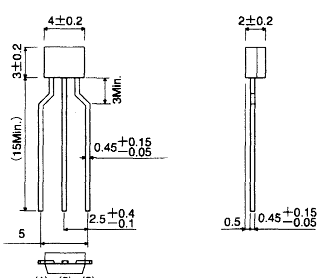
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 14

DTA114ESA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-250-A114E)

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTA114E□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−40				V
		10				
Output current	I_O	−50				mA
	I_C(Max.)	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				°C
Storage temperature	Tstg	−55~150				°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−10mA
Output voltage	$V_{O(on)}$	—	—	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−0.88	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=−5V, I_O=−5mA
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	3000	3000	5000
DTA114EE		○	—	—	—	—
DTA114EUA		—	○	—	—	—
DTA114EKA		—	—	○	—	—
DTA114ECA		—	—	—	○	—
DTA114ESA		—	—	—	—	○

● Electrical characteristic curves

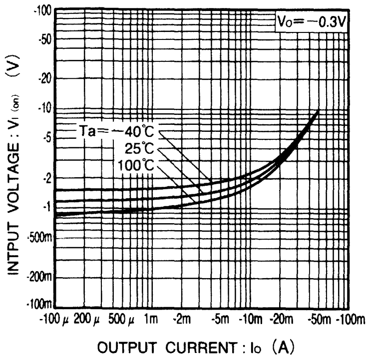


Fig.1 Input voltage vs. output current (ON characteristics)

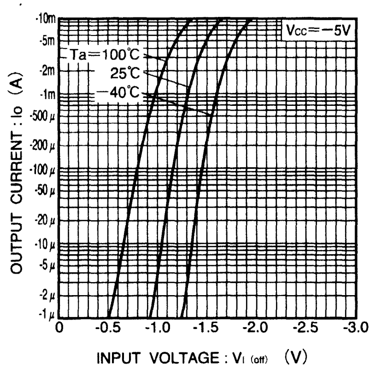


Fig.2 Output current vs. input voltage (OFF characteristics)

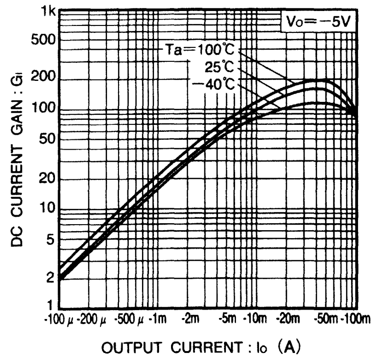


Fig.3 DC current gain vs. output current

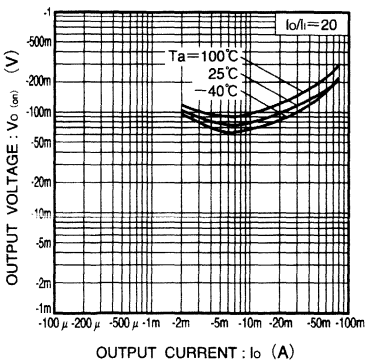


Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)

DTA114TE/DTA114TUA/DTA114TKA/DTA114TSA

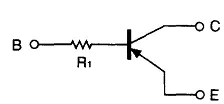
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

PNP digital transistor
(Built-in resistor type)

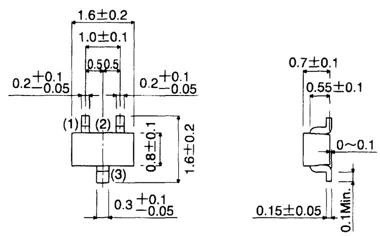
●Equivalent circuit



B : Base
C : Collector
E : Emitter

●External dimensions (Units: mm)

DTA114TE

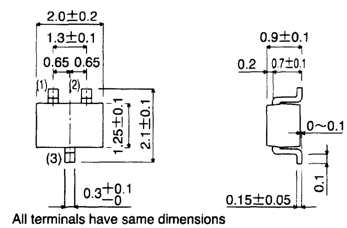


ROHM : EMT3

(1) Emitter
(2) Base
(3) Collector

Addreviated symbol : 94

DTA114TUA



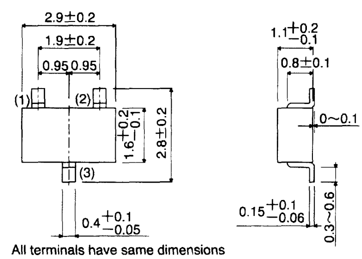
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 94

(1) Emitter
(2) Base
(3) Collector

DTA114TKA



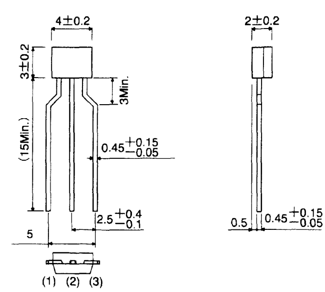
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 94

(1) Emitter
(2) Base
(3) Collector

DTA114TSA



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

(96-253-A114T)

ROHM

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTA114T□)				Unit
		E	UA	KA	SA	
Collector-base voltage	V_{CBO}	−50				V
Collector-emitter voltage	V_{CEO}	−50				V
Emitter-base voltage	V_{EBO}	−5				V
Collector current	I_C	−100				mA
Collector power dissipation	P_C	150	200		300	mW
Junction temperature	Tj	150				°C
Storage temperature	Tstg	−55~150				°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−10mA/−1mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=−5V, I_C=−1mA
Input resistance	R_1	7	10	13	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA114TE		○	—	—	—
DTA114TUA		—	○	—	—
DTA114TKA		—	—	○	—
DTA114TSA		—	—	—	○

● Electrical characteristic curves

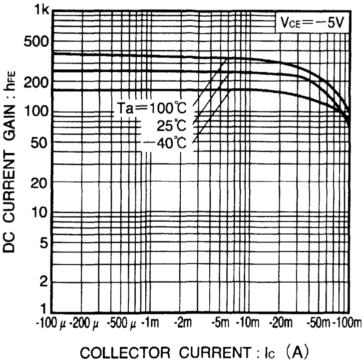


Fig.1 DC current gain vs. collector current

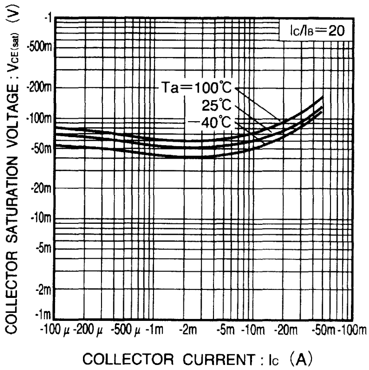


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital transistors (built-in resistors)
DTA114YE/DTA114YUA/DTA114YKA/DTA114YSA

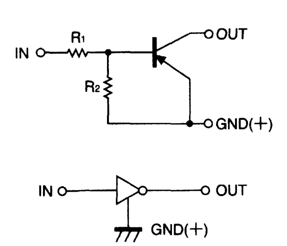
● Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

● Structure

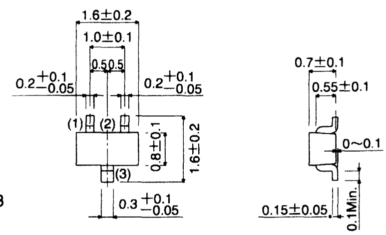
PNP digital transistor
(Built-in resistor type)

● Equivalent circuit



● External dimensions (Units: mm)

DTA114YE

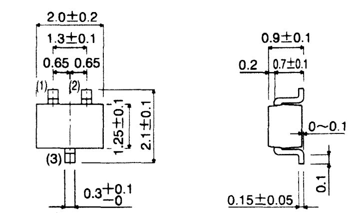


ROHM : EMT3

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 54

DTA114YUA



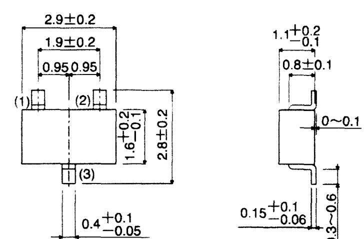
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 54

DTA114YKA



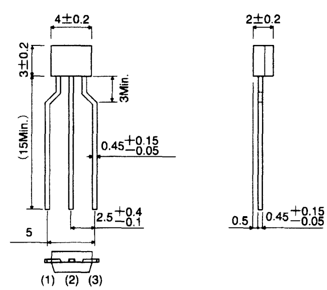
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 54

DTA114YSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-256-A114Y)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA114Y□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	−50				V
Input voltage	V_I	−40				V
		6				
Output current	I_O	−70				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−1.4	—	—		V_O=−0.3V, I_O=−1mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−5mA/−0.25mA
Input current	I_I	—	—	−0.88	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=−5V, I_O=−5mA
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	3.7	4.7	5.7	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA114YE		○	—	—	—
DTA114YUA		—	○	—	—
DTA114YKA		—	—	○	—
DTA114YSA		—	—	—	○

● Electrical characteristic curves

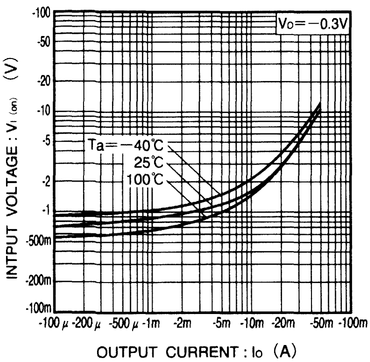


Fig.1 Input voltage vs. output current (ON characteristics)

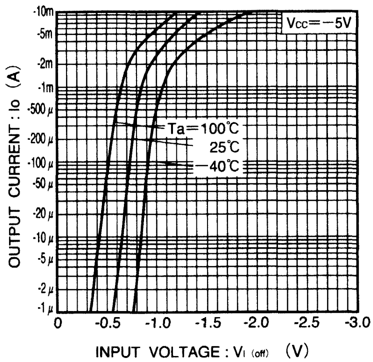


Fig.2 Output current vs. input voltage (OFF characteristics)

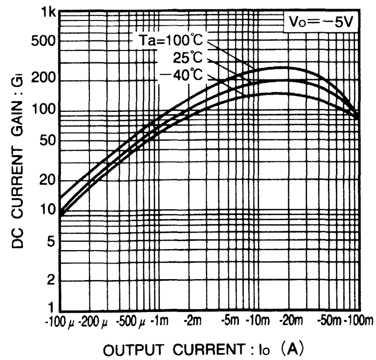


Fig.3 DC current gain vs. output current

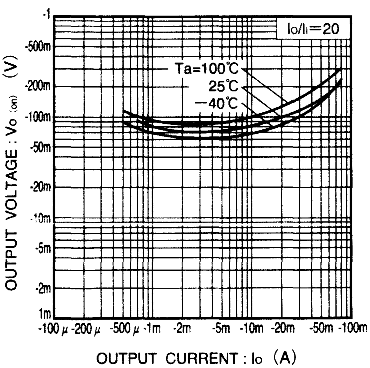
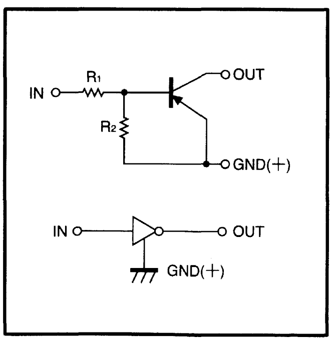


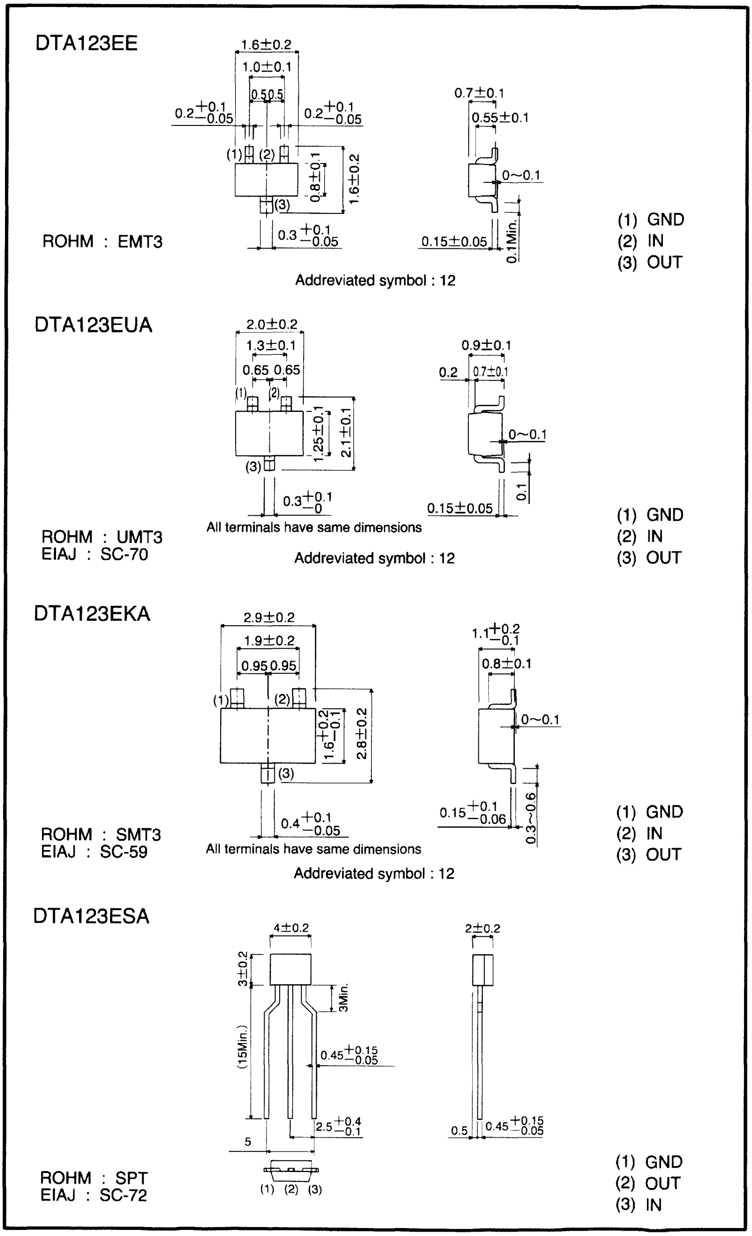
Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)
DTA123EE/DTA123EUA/DTA123EKA/DTA123ESA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Equivalent circuit


●External dimensions (Units: mm)


(96-265-A123E)

ROHM

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA123E□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−12				V
		10				
Output current	I_O	−100				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−3.8	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	20	—	—	—	V_O=−5V, I_O=−20mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA123EE		○	—	—	—
DTA123EUA		—	○	—	—
DTA123EKA		—	—	○	—
DTA123ESA		—	—	—	○

●Electrical characteristic curves

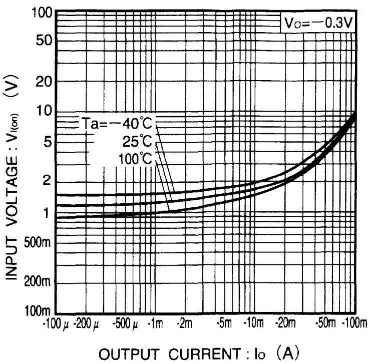


Fig.1 Input voltage vs. output current (ON characteristics)

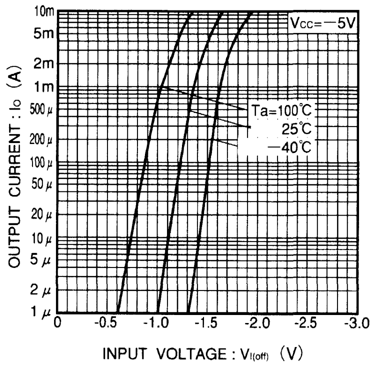


Fig.2 Output current vs. input voltage (OFF characteristics)

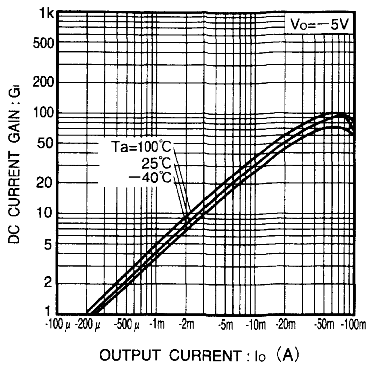


Fig.3 DC current gain vs. output current

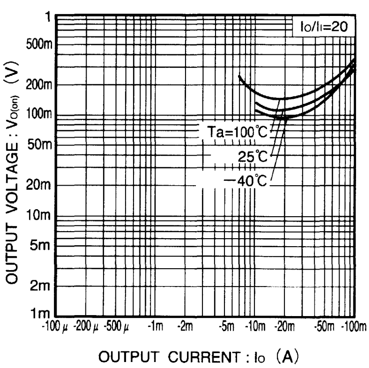


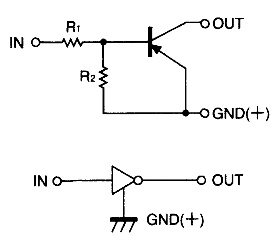
Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTA123JE/DTA123JUA/DTA123JKA/DTA123JSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

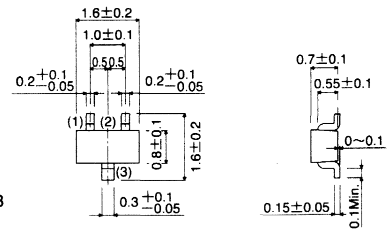
●Structure
PNP digital transistor
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)

DTA123JE

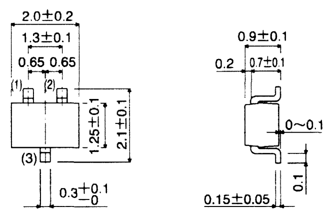


ROHM : EMT3

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 132

DTA123JUA



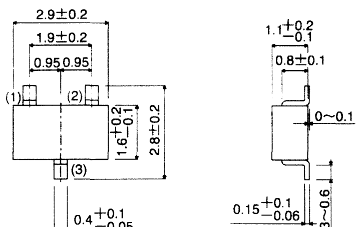
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 132

DTA123JKA



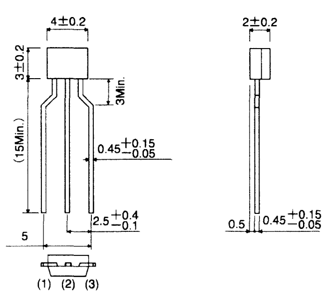
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

(1) GND
(2) IN
(3) OUT

Addreviated symbol : E32

DTA123JSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-262-A123J)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA123J□) E	UA	KA	SA	Unit
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−12				V
		5				
Output current	I_O	−100				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−1.1	—	—		V_O=−0.3V, I_O=−5mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−5mA/−0.25mA
Input current	I_I	—	—	−3.6	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	80	—	—	—	V_O=−5V, I_O=−10mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	17	21	26	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA123JE		○	—	—	—
DTA123JUA		—	○	—	—
DTA123JKA		—	—	○	—
DTA123JSA		—	—	—	○

● Electrical characteristic curves

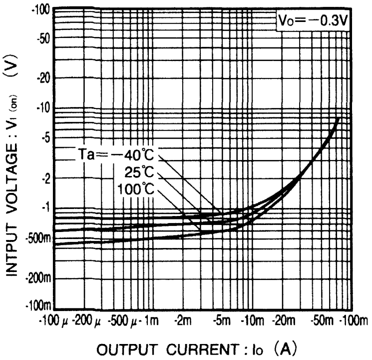


Fig.1 Input voltage vs. output current (ON characteristics)

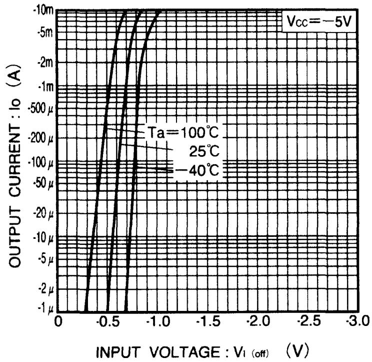


Fig.2 Output current vs. input voltage (OFF characteristics)

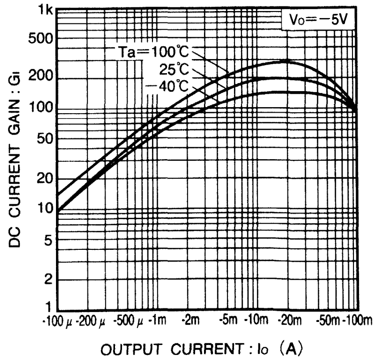


Fig.3 DC current gain vs. output current

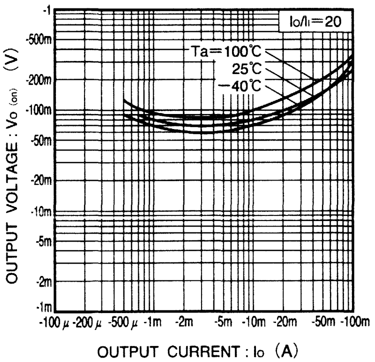


Fig.4 Output voltage vs. output current

Digital transistors

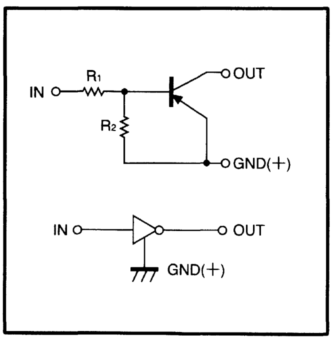
Digital transistors (built-in resistors)

DTA123YE/DTA123YUA/DTA123YKA/DTA123YSA

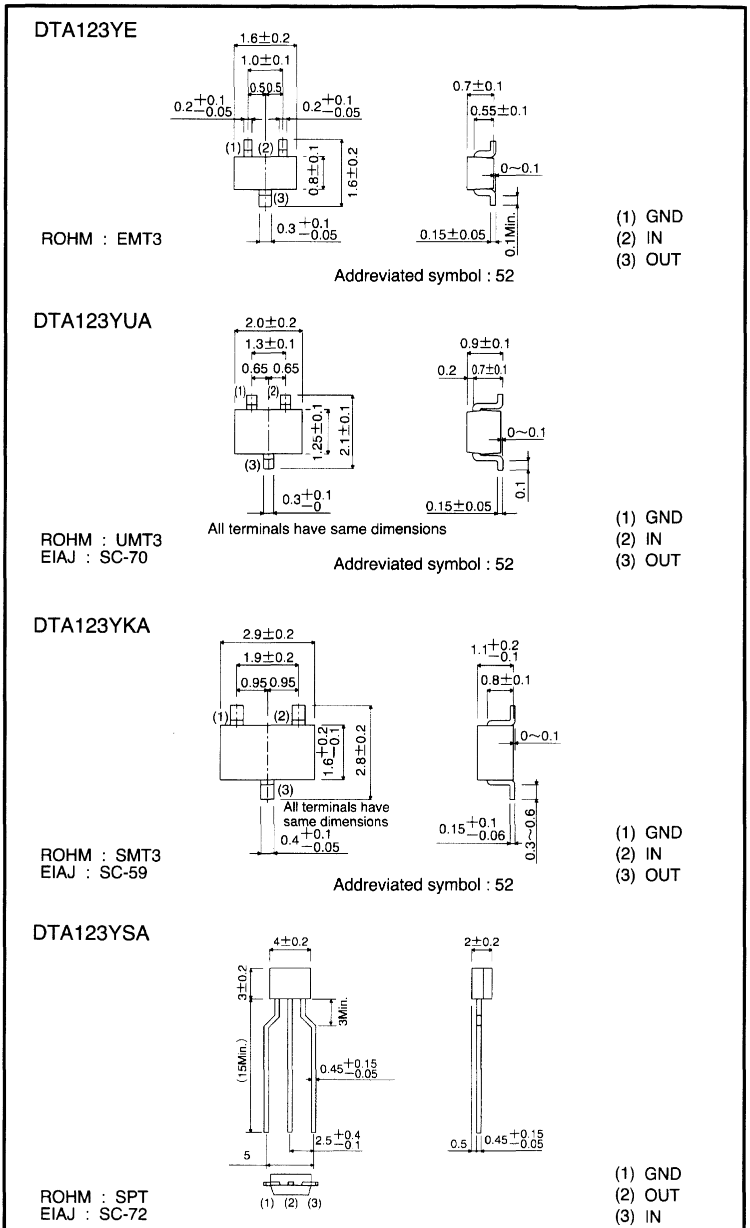
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Equivalent circuit



●External dimensions (Units: mm)



(96S-537-A123Y)

ROHM

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits(DTA123Y□) E	UA	KA	SA	Unit
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−12				V
		5				
Output current	I_O	−100				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	—	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−3.8	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	33	—	—	—	V_O=−5V, I_O=−10mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	3.6	4.5	5.5	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA123YE		○	—	—	—
DTA123YUA		—	○	—	—
DTA123YKA		—	—	○	—
DTA123YSA		—	—	—	○

Digital transistors

● Electrical characteristic curves

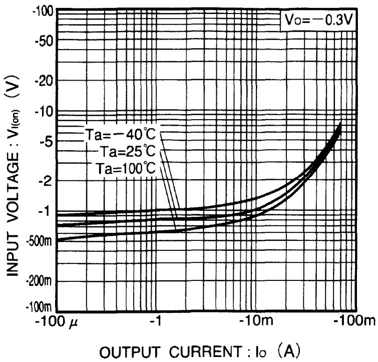


Fig.1 Input voltage vs. output current (ON characteristics)

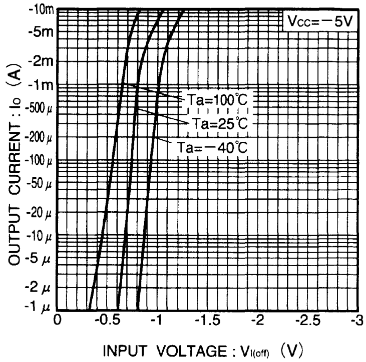


Fig.2 Output current vs. input voltage (OFF characteristics)

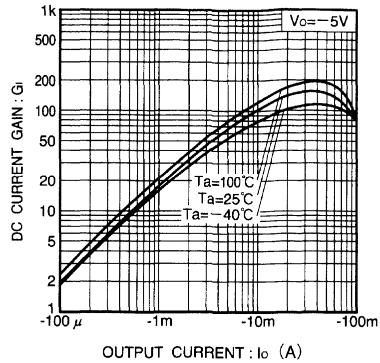


Fig.3 DC current gain vs. output current

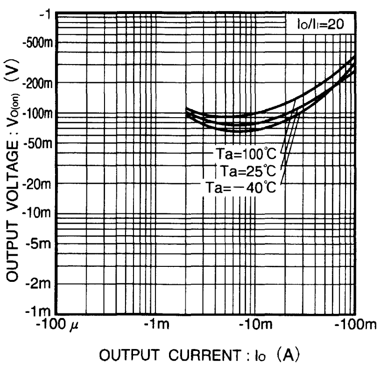


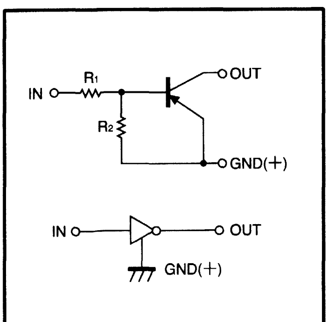
Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTA124EE/DTA124EUA/DTA124EKA/ DTA124ECA/DTA124ESA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

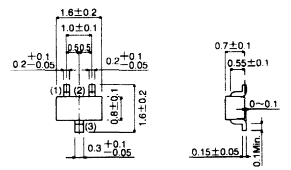
●Structure
PNP digital transistor
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)

DTA124EE

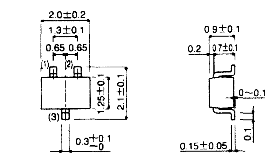


ROHM : EMT3

Addreviated symbol : 15

(1) GND
(2) IN
(3) OUT

DTA124EUA



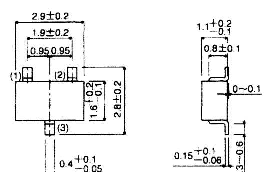
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 15

(1) GND
(2) IN
(3) OUT

DTA124EKA



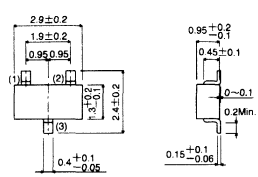
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 15

(1) GND
(2) IN
(3) OUT

DTA124ECA



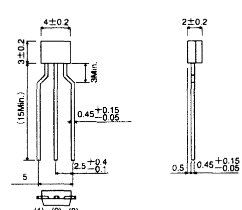
All terminals have same dimensions

ROHM : SST3

Addreviated symbol : 15

(1) GND
(2) IN
(3) OUT

DTA124ESA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-265-A124E)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA124E□)					Unit
		E	UA	KA	CA	SA	
Supply voltage	V_{CC}	−50					V
Input voltage	V_{IN}	40					V
		−10					
Output current	I_O	−30					mA
	$I_{C(Max.)}$	−100					
Power dissipation	Pd	150	200			300	mW
Junction temperature	Tj	150					℃
Storage temperature	Tstg	−55~150					℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−3	—	—		V_O=−0.2V, I_O=−5mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−0.36	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=−5V, I_O=−5mA
Input resistance	R_1	15.4	22	28.6	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type		EMT3	UMT3	SMT3	SST3	SPT
	Package	EMT3	UMT3	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	3000	3000	5000
DTA124EE		○	—	—	—	—
DTA124EUA		—	○	—	—	—
DTA124EKA		—	—	○	—	—
DTA124ECA		—	—	—	○	—
DTA124ESA		—	—	—	—	○

●Electrical characteristic curves

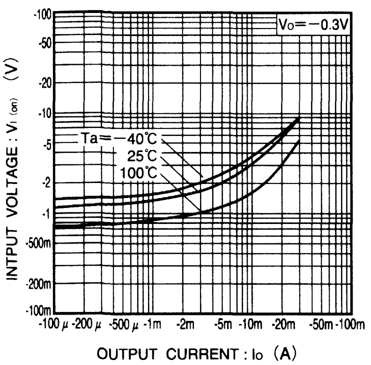


Fig.1 Input voltage vs. output current (ON characteristics)

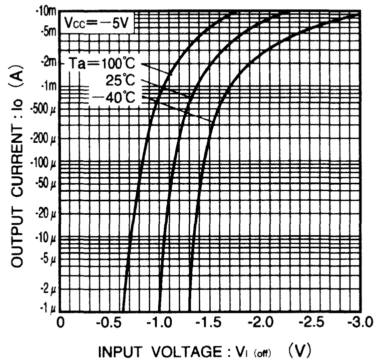


Fig.2 Output current vs. input voltage (OFF characteristics)

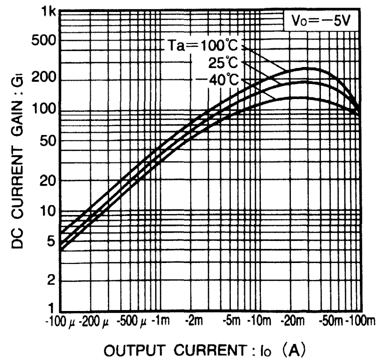


Fig.3 DC current gain vs. output current

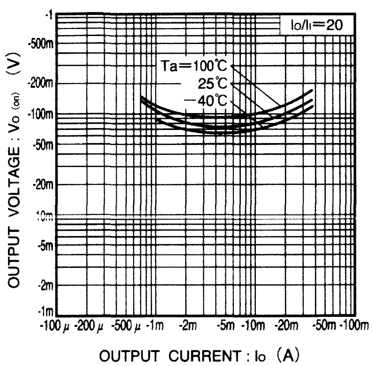


Fig.4 Output voltage vs. output current

Digital transistors

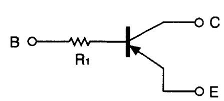
Digital transistors (built-in resistors)

DTA124TE/DTA124TUA/DTA124TKA/DTA124TSA

●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

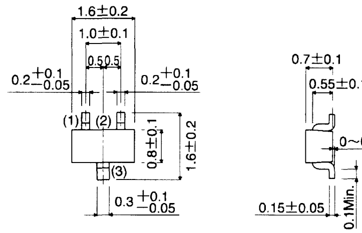
●Equivalent circuit



B : Base
C : Collector
E : Emitter

●External dimensions (Units: mm)

DTA124TE

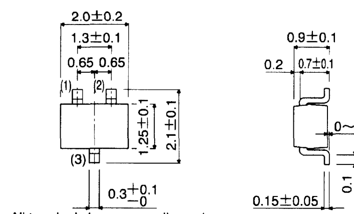


ROHM : EMT3

(1) Emitter
(2) Base
(3) Collector

Addreviated symbol : 95

DTA124TUA



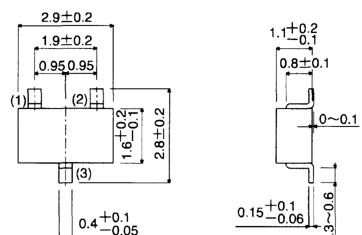
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

Addreviated symbol : 95

DTA124TKA



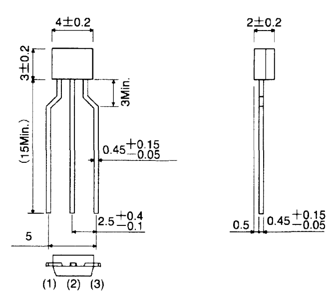
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

Addreviated symbol : 95

DTA124TSA



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

(94S-546-A124T)

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTA124T□) E	UA	KA	SA	Unit
Collector-base voltage	V_{CBO}	−50				V
Collector-emitter voltage	V_{CEO}	−50				V
Emitter-base voltage	V_{EBO}	−5				V
Collector current	I_C	−100				mA
Collector power dissipation	P_C	150	200		300	mW
Junction temperature	Tj	150				°C
Storage temperature	Tstg	−55~150				°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−5mA/−0.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=−5V, I_C=−1mA
Input resistance	R_1	15.4	22	28.6	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA124TE		○	—	—	—
DTA124TUA		—	○	—	—
DTA124TKA		—	—	○	—
DTA124TSA		—	—	—	○

Digital transistors

●Electrical characteristic curves

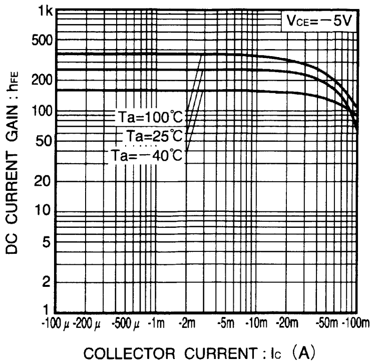


Fig.1 DC current gain vs. collector current

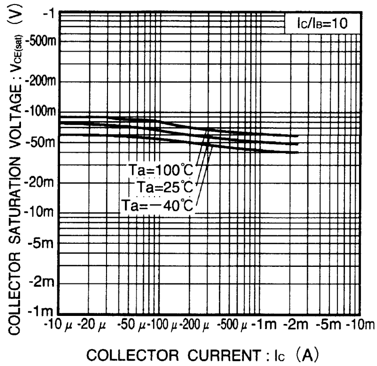
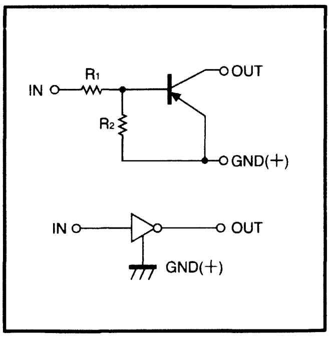


Fig.2 Collector-emitter saturation voltage vs. collector current

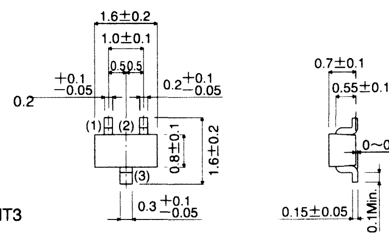
Digital transistors (built-in resistors)
DTA124XE/DTA124XUA/DTA124XKA/DTA124XSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Equivalent circuit


●External dimensions (Units: mm)

DTA124XE

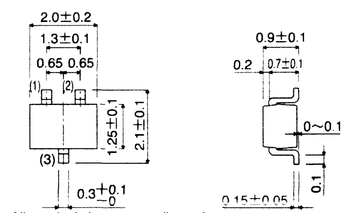


ROHM : EMT3

Addreviated symbol : 35

(1) GND
(2) IN
(3) OUT

DTA124XUA



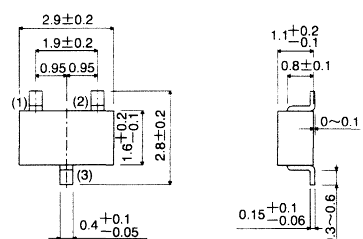
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 35

(1) GND
(2) IN
(3) OUT

DTA124XKA



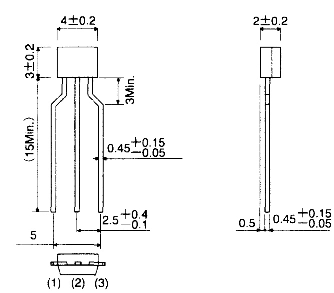
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 35

(1) GND
(2) IN
(3) OUT

DTA124XSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(94S-549-A124X)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA124X□) E	UA	KA	SA	Unit
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−40				V
		10				
Output current	I_O	−50				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.4	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−2.5	—	—		V_O=−0.3V, I_O=−2mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−10mA, I_I=−0.5mA
Input current	I_I	—	—	−0.36	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=−5V, I_O=−5mA
Input resistance	R_1	15.4	22	28.6	kΩ	—
Resistance ratio	R_2/R_1	1.7	2.1	2.6	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type \ Package	EMT3	UMT3	SMT3	SPT
Package style	Taping	Taping	Taping	Taping
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000
DTA124XE	○	—	—	—
DTA124XUA	—	○	—	—
DTA124XKA	—	—	○	—
DTA124XSA	—	—	—	○

● Electrical characteristic curves

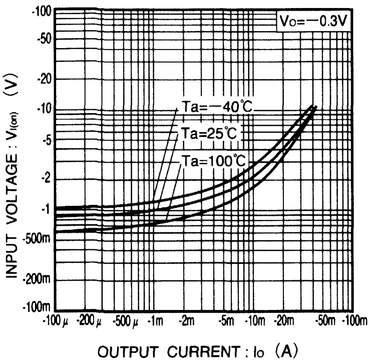


Fig.1 Input voltage vs. output current (ON characteristics)

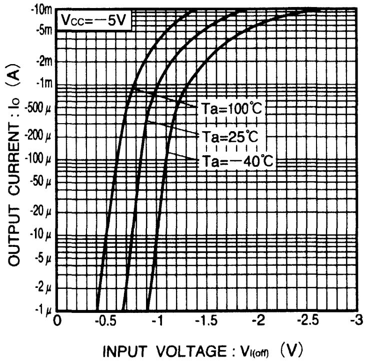


Fig.2 Output current vs. input voltage (OFF characteristics)

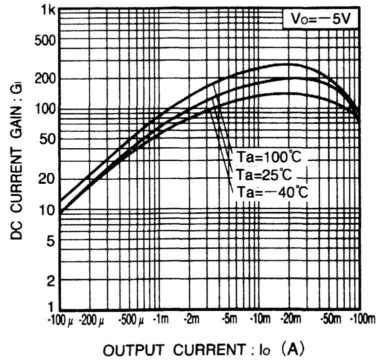


Fig.3 DC current gain vs. output current

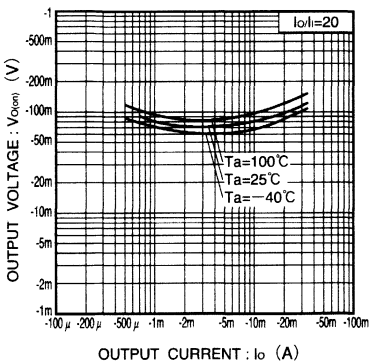


Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)

DTA143EE/DTA143EUA/DTA143EKA/ DTA143ECA/DTA143ESA

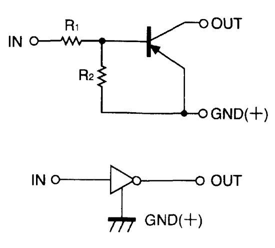
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

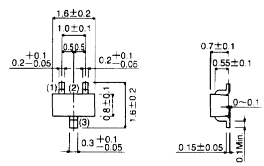
PNP digital transistor
(with built-in resistors)

●Equivalent circuit



●External dimensions (Units: mm)

DTA143EE

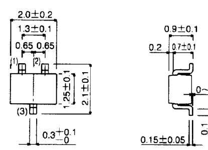


ROHM : EMT3

Addreviated symbol : 13

(1) GND
(2) IN
(3) OUT

DTA143EUA



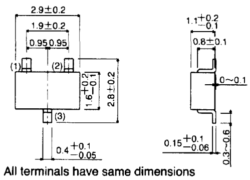
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 13

(1) GND
(2) IN
(3) OUT

DTA143EKA



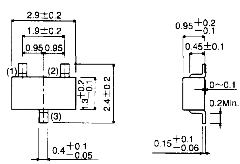
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 13

(1) GND
(2) IN
(3) OUT

DTA143ECA



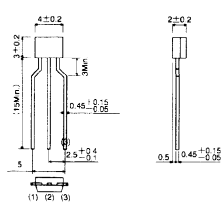
All terminals have same dimensions

ROHM : SST3

Addreviated symbol : 13

(1) GND
(2) IN
(3) OUT

DTA143ESA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-268-A143E)

ROHM

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA143E□)					Unit
		E	UA	KA	CA	SA	
Supply voltage	V_{CC}	−50					V
Input voltage	V_{IN}	−30					V
		10					
Output current	I_O	−100					mA
	$I_{C(Max.)}$	−100					
Power dissipation	Pd	150	200			300	mW
Junction temperature	Tj	150					℃
Storage temperature	Tstg	−55~150					℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−1.8	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	20	—	—	—	V_O=−5V, I_O=−10mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type		EMT3	UMT3	SMT3	SST3	SPT
	Package	EMT3	UMT3	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	3000	3000	5000
DTA143EE		○	—	—	—	—
DTA143EUA		—	○	—	—	—
DTA143EKA		—	—	○	—	—
DTA143ECA		—	—	—	○	—
DTA143ESA		—	—	—	—	○

● Electrical characteristic curves

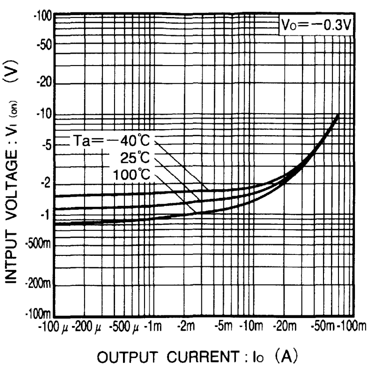


Fig.1 Input voltage vs. output current (ON characteristics)

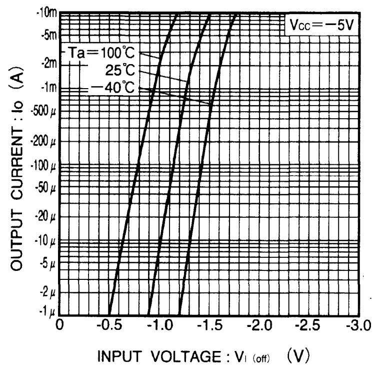


Fig.2 Output current vs. input voltage (OFF characteristics)

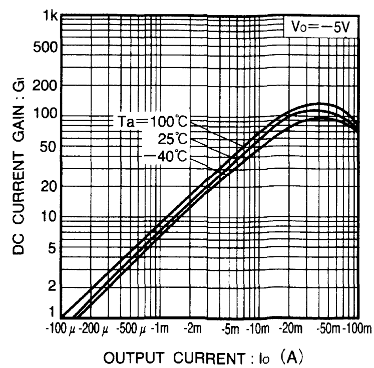


Fig.3 DC current gain vs. output current

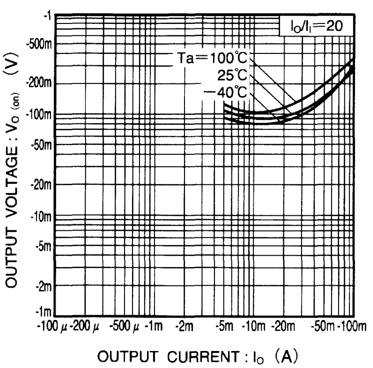


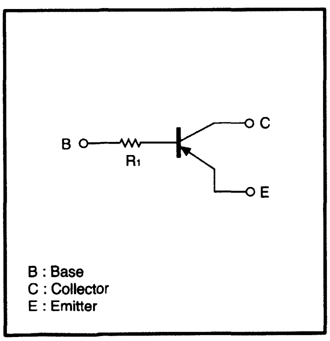
Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTA143TE/DTA143TUA/DTA143TKA/DTA143TSA

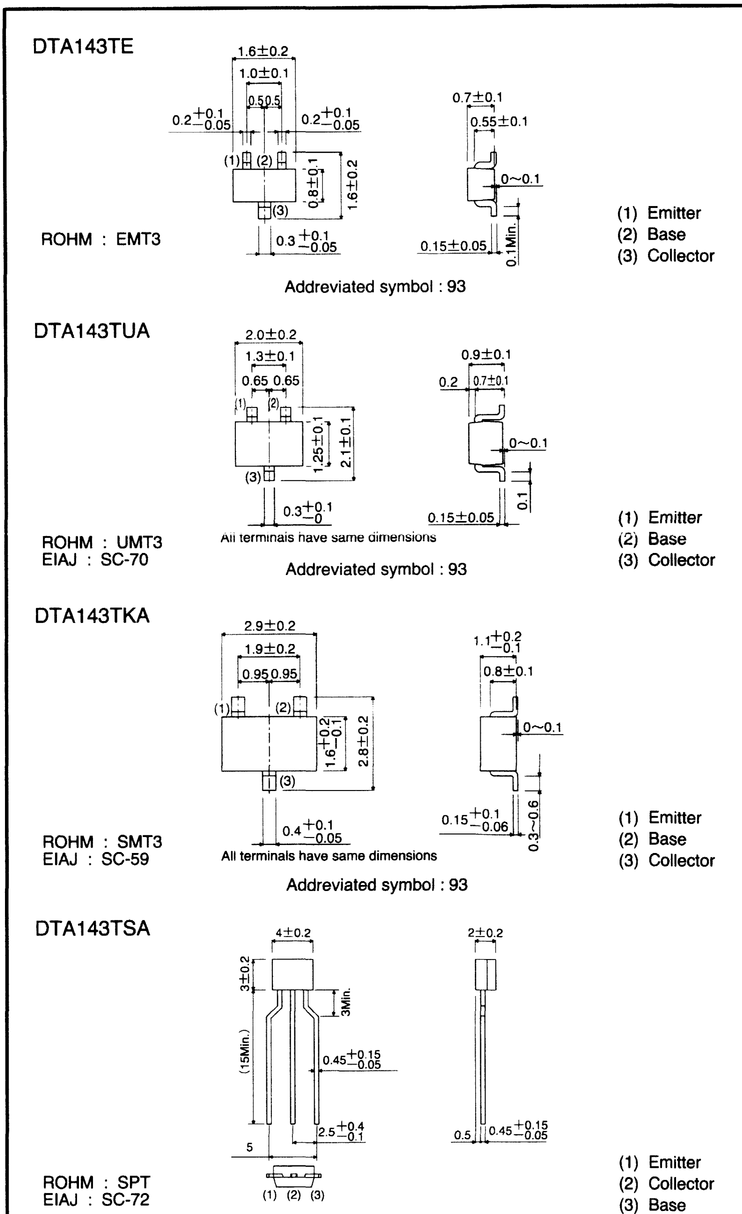
●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
PNP digital transistor
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)



(96-271-A143T)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA143T□)				Unit
		E	UA	KA	SA	
Collector-base voltage	V_{CBO}	−50				V
Collector-emitter voltage	V_{CEO}	−50				V
Emitter-base voltage	V_{EBO}	−5				V
Collector current	I_C	−100				mA
Collector power dissipation	P_C	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−5mA/−0.25mA
DC current transfer ratio	h_{FE}	100	250	600	—	I_C=−1mA, V_{CE}=−5V
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA143TE		○	—	—	—
DTA143TUA		—	○	—	—
DTA143TKA		—	—	○	—
DTA143TSA		—	—	—	○

● Electrical characteristic curves

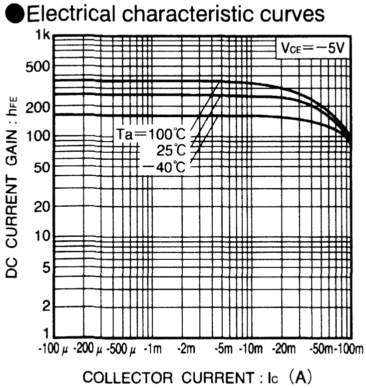


Fig.1 DC current gain vs. collector current

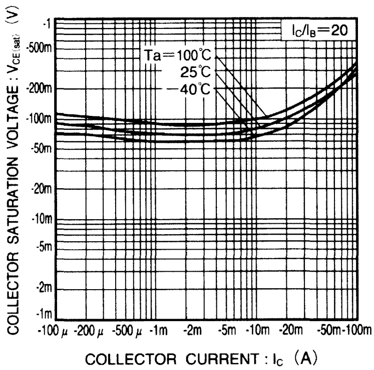


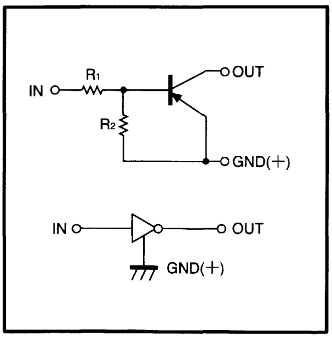
Fig.2 Collector-emitter saturation voltage vs. collector current

Digital transistors

Digital transistors (built-in resistors)
DTA143XE/DTA143XUA/DTA143XKA/DTA143XSA

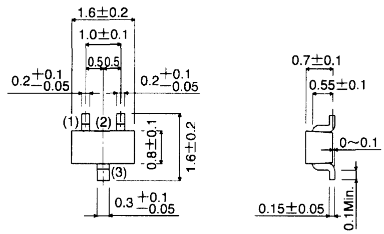
● Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on / off conditions need to be set for operation, making device design easy.

● Equivalent circuit



● External dimensions (Units: mm)

DTA143XE

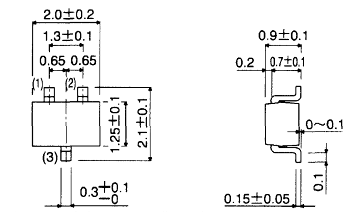


ROHM : EMT3

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 33

DTA143XUA



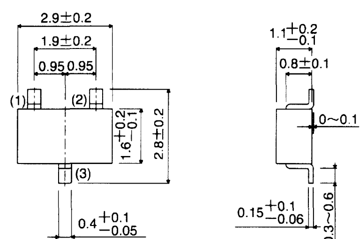
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 33

DTA143XKA



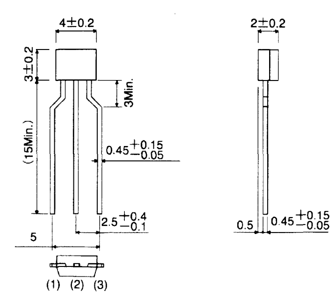
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 33

DTA143XSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(94S-564-A143X)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA143X□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	−50				V
Input voltage	V_I	−20				V
		7				
Output current	I_O	−100				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−2.5	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−1.8	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=−5V, I_O=−10mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	1.7	2.1	2.6	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA143XE		○	—	—	—
DTA143XUA		—	○	—	—
DTA143XKA		—	—	○	—
DTA143XSA		—	—	—	○

Digital transistors

●Electrical characteristic curves

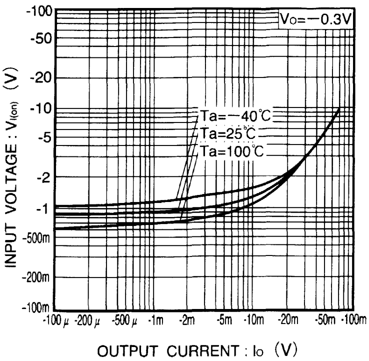


Fig.1 Input voltage vs. output current (ON characteristics)

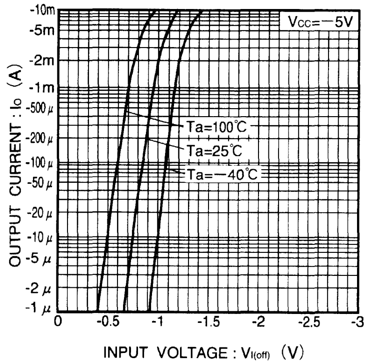


Fig.2 Output current vs. input voltage (OFF characteristics)

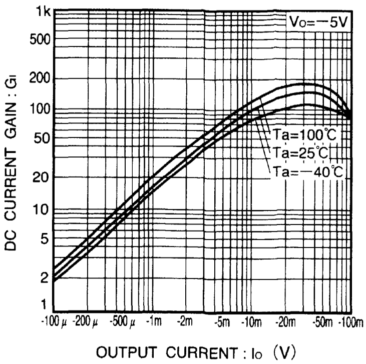


Fig.3 DC current gain vs. output current

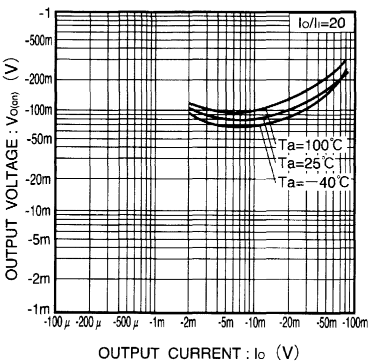


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTA143ZE/DTA143ZUA/DTA143ZKA/DTA143ZSA

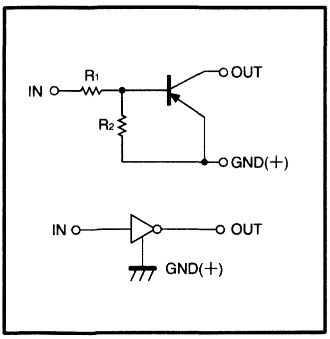
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

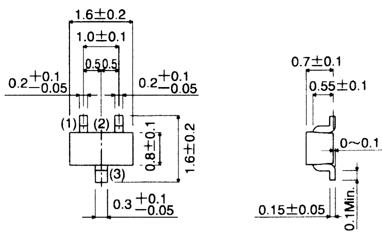
PNP digital transistor
(with built-in resistors)

●Equivalent circuit



●External dimensions (Units: mm)

DTA143ZE

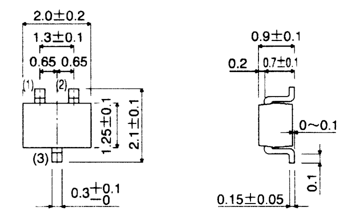


ROHM : EMT3

Addreviated symbol : E13

(1) GND
(2) IN
(3) OUT

DTA143ZUA



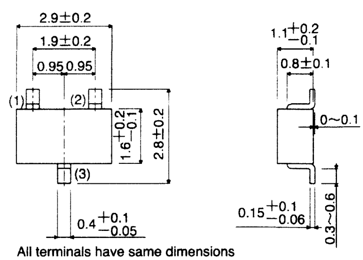
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : 113

(1) GND
(2) IN
(3) OUT

DTA143ZKA



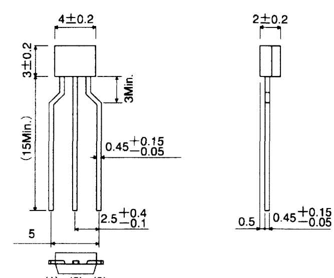
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : E13

(1) GND
(2) IN
(3) OUT

DTA143ZSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-274-143Z)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTA143Z□) E	UA	KA	SA	Unit
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−30				V
		5				
Output current	I_O	−100				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−1.3	—	—		V_O=−0.3V, I_O=−5mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−5mA/−0.25mA
Input current	I_I	—	—	−1.8	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	80	—	—	—	V_O=−5V, I_O=−10mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz＊

＊ Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA143ZE		○	—	—	—
DTA143ZUA		—	○	—	—
DTA143ZKA		—	—	○	—
DTA143ZSA		—	—	—	○

● Electrical characteristic curves

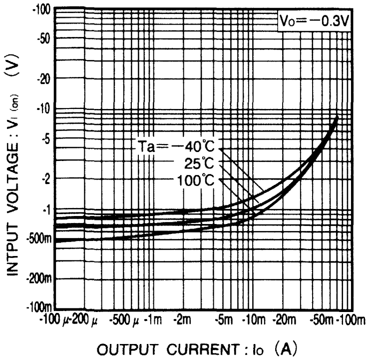


Fig.1 Input voltage vs. output current (ON characteristics)

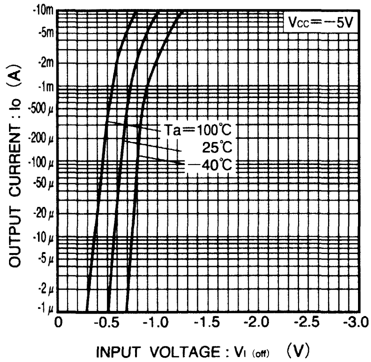


Fig.2 Output current vs. input voltage (OFF characteristics)

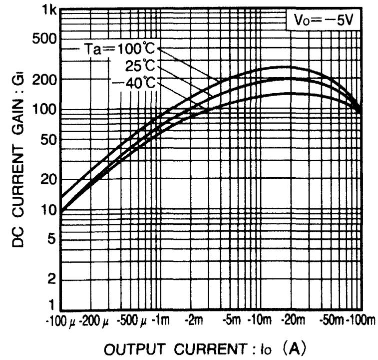


Fig.3 DC current gain vs. output current

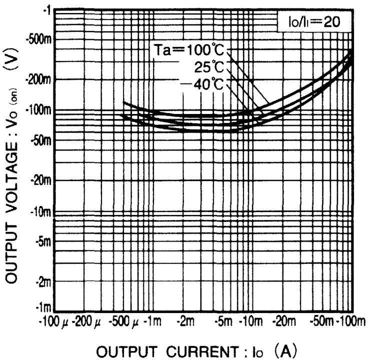


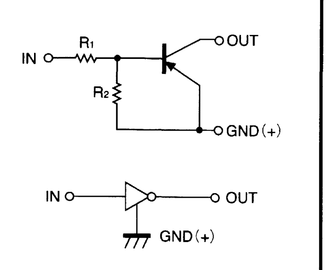
Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)
DTA144EE/DTA144EUA/DTA144EKA/DTA144ESA

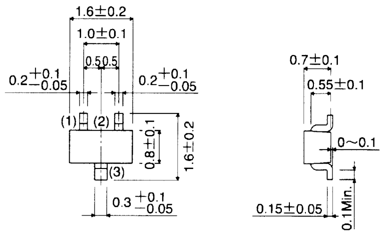
●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
PNP digital transistor
(Built-in resistor type)

●Equivalent circuit


●External dimensions (Units: mm)

DTA144EE

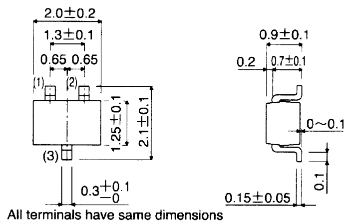


ROHM : EMT3

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 16

DTA144EUA



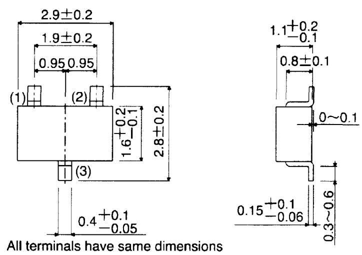
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 16

DTA144EKA



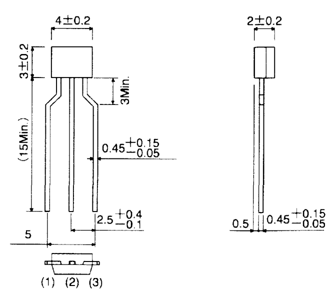
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

(1) GND
(2) IN
(3) OUT

Addreviated symbol : 16

DTA144ESA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-277-A144E)

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTA144E□) E	UA	KA	SA	Unit
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−40				V
		10				
Output current	I_O	−30				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				°C
Storage temperature	Tstg	−55~150				°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−3.0	—	—		V_O=−0.3V, I_O=−2mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−0.18	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=−5V, I_O=−5mA
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type		EMT3	UMT3	SMT3	SPT
	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTA144EE		○	—	—	—
DTA144EUA		—	○	—	—
DTA144EKA		—	—	○	—
DTA144ESA		—	—	—	○

Digital transistors

●Electrical characteristic curves

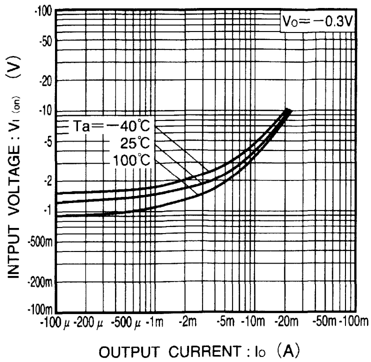


Fig.1 Input voltage vs. output current (ON characteristics)

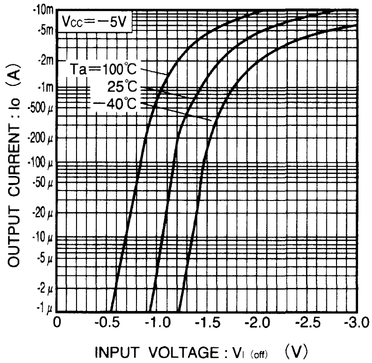


Fig.2 Output current vs. input voltage (OFF characteristics)

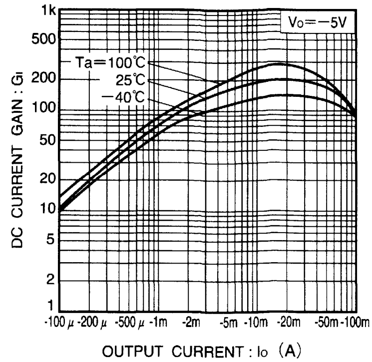


Fig.3 DC current gain vs. output current

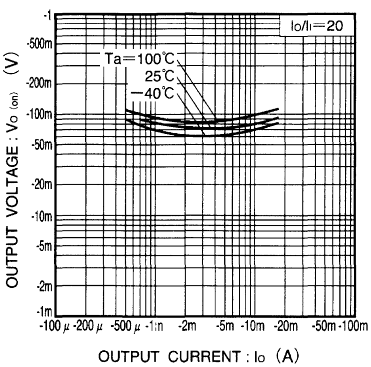


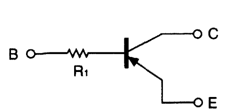
Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTA144TE/DTA144TUA/DTA144TKA/ DTA144TCA/DTA144TSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
PNP digital transistor
(Built-in resistor type)

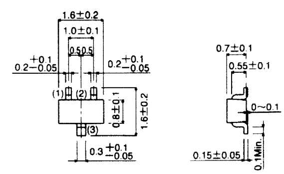
●Equivalent circuit



B : Base
C : Collector
E : Emitter

●External dimensions (Units: mm)

DTA144TE

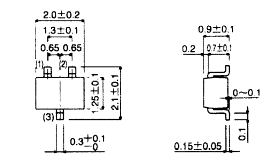


ROHM : EMT3

Addreviated symbol : 96

(1) Emitter
(2) Base
(3) Collector

DTA144TUA



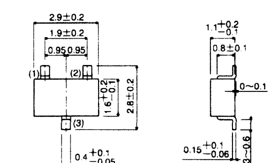
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 96

(1) Emitter
(2) Base
(3) Collector

DTA144TKA



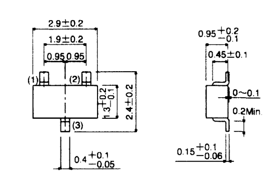
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 96

(1) Emitter
(2) Base
(3) Collector

DTA144TCA



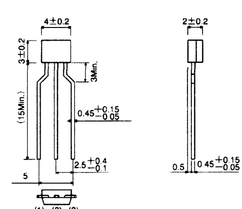
All terminals have same dimensions

ROHM : SST3

Addreviated symbol : 96

(1) Emitter
(2) Base
(3) Collector

DTA144TSA



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

(96-283-A144T)

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTA144E□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	−50				V
Input voltage	V_{IN}	−40				V
		10				
Output current	I_O	−30				mA
	$I_{C(Max.)}$	−100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				°C
Storage temperature	Tstg	−55~150				°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−5mA/−0.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=−5V, I_C=−1mA
Input resistance	R_1	32.9	47	61.1	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	3000	3000	5000
DTA144TE		○	—	—	—	—
DTA144TUA		—	○	—	—	—
DTA144TKA		—	—	○	—	—
DTA144TCA		—	—	—	○	—
DTA144TSA		—	—	—	—	○

●Electrical characteristic curves

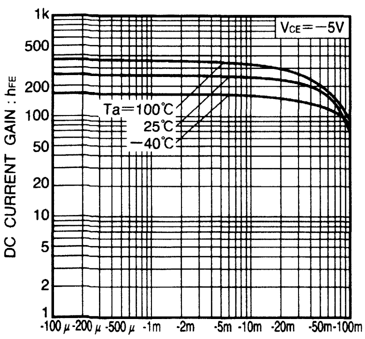


Fig.1 DC current gain vs.collector current

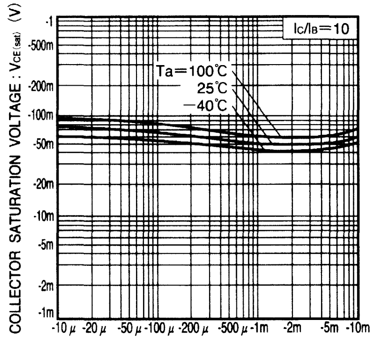


Fig.2 Collector-emitter saturation voltage vs.collector current

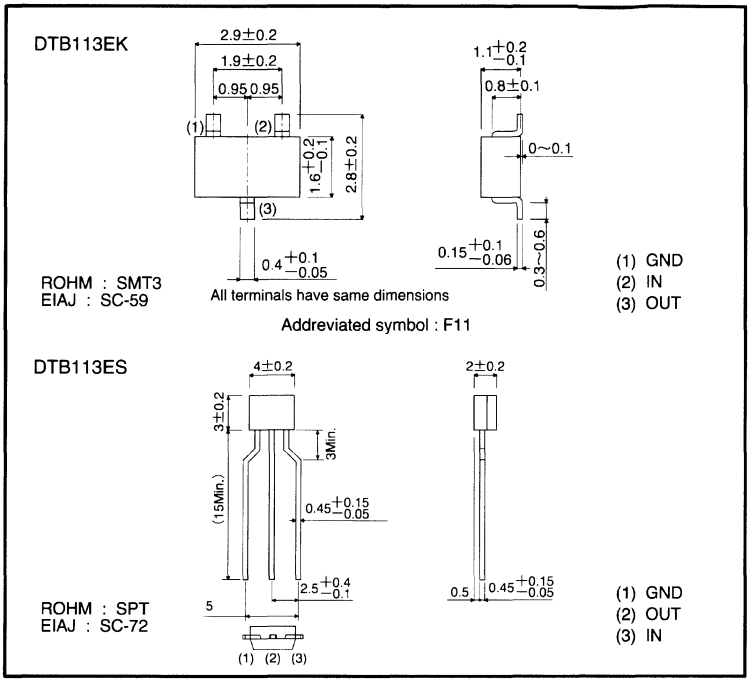
Digital transistors

Digital transistors (built-in resistors)
DTB113EK/DTB113ES

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
PNP digital transistor
(Built-in resistor type)

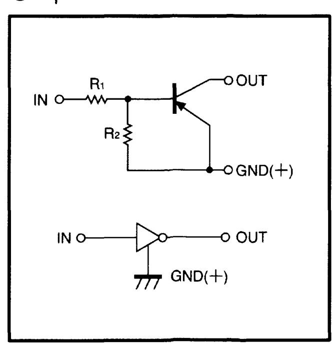
●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTB113E□) K	Limits(DTB113E□) S	Unit
Supply voltage	V_{CC}	−50		V
Input voltage	V_{IN}	−10		V
		10		
Output current	I_C	−500		mA
Power dissipation	Pd	200	300	mW
Junction temperature	Tj	150		°C
Storage temperature	Tstg	−55~150		°C

●Equivalent circuit



(96-286-B113E)

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3	—	—	V	V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	—	−0.3	V	I_O/I_I=−50mA/−2.5mA
Input current	I_I	—	—	−7.2	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	33	—	—	—	V_O=−5V, I_O=−50mA
Input resistance	R_1	0.7	1	1.3	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
	Basic ordering unit (pieces)	3000	5000
DTB113EK		○	—
DTB113ES		—	○

●Electrical characteristic curves

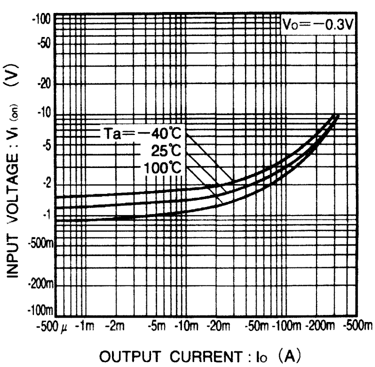


Fig.1 Input voltage vs. output current (ON characteristics)

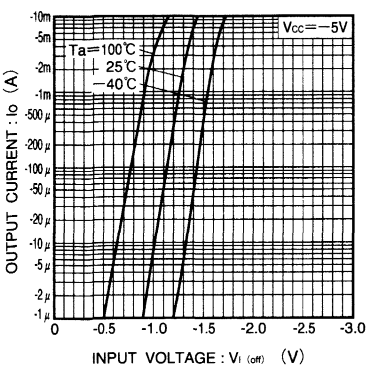


Fig.2 Output current vs. input voltage (OFF characteristics)

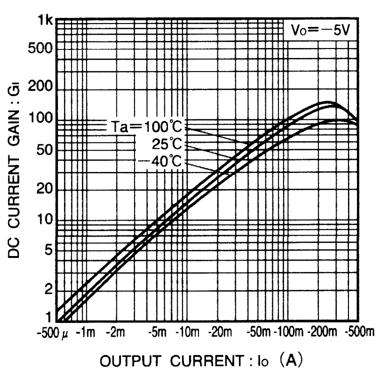


Fig.3 DC current gain vs. output current

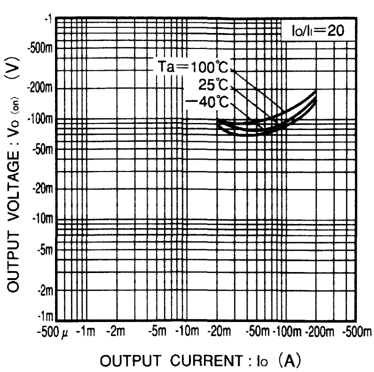


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTB113ZK/DTB113ZS

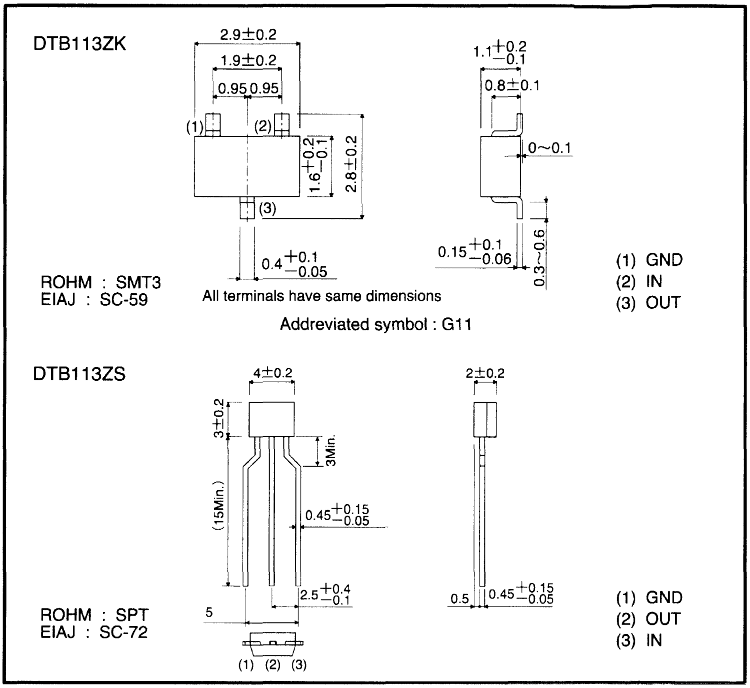
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

PNP digital transistor
(Built-in resistor type)

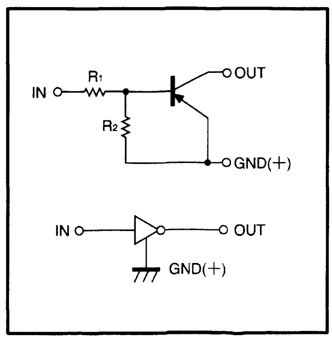
●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTB113Z□)		Unit
		K	S	
Supply voltage	V_{CC}	−50		V
Input voltage	V_{IN}	−10		V
		5		
Output current	I_C	−500		mA
Power dissipation	Pd	200	300	mW
Junction temperature	Tj	150		°C
Storage temperature	Tstg	−55~150		°C

●Equivalent circuit



(96-288-B113Z)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=100 μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	—	−0.3	V	I_O/I_I=−50mA/−2.5mA
Input current	I_I	—	—	−7.2	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=−5V, I_O=−50mA
Input resistance	R_1	0.7	1	1.3	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Transistors / Type	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
	Basic ordering unit (pieces)	3000	5000
DTB113ZK		○	—
DTB113ZS		—	○

●Electrical characteristic curves

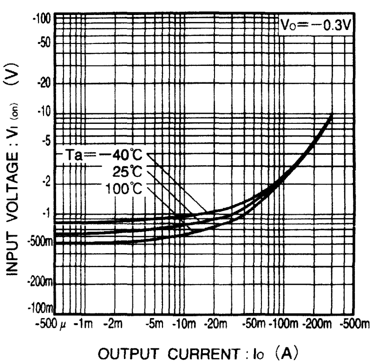


Fig.1 Input voltage vs. output current (ON characteristics)

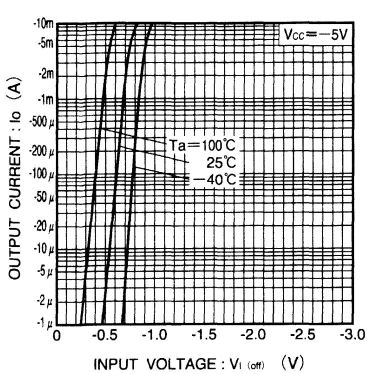


Fig.2 Output current vs. input voltage (OFF characteristics)

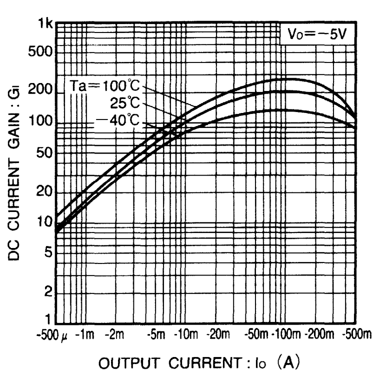


Fig.3 DC current gain vs. output current

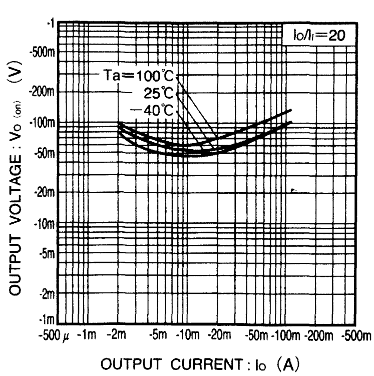


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTB114EK/DTB114ES

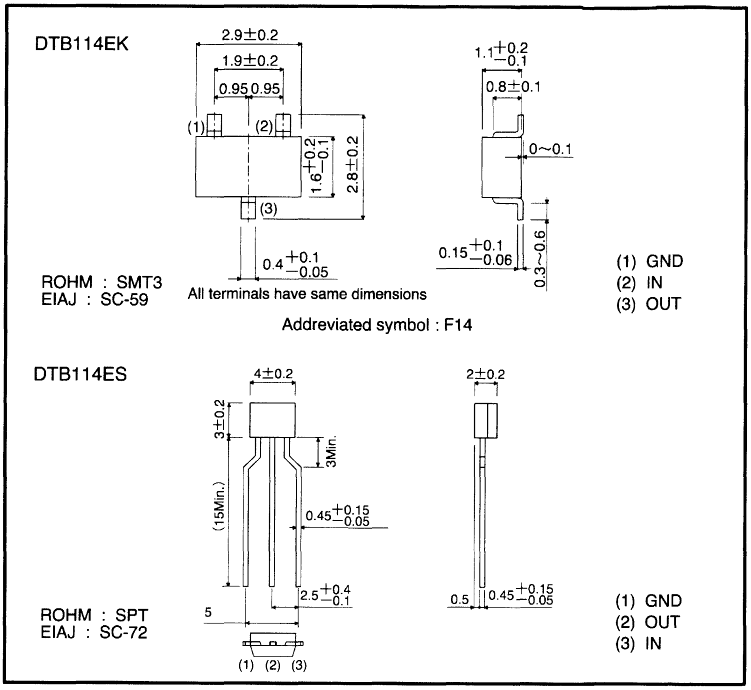
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

PNP digital transistor
(Built-in resistor type)

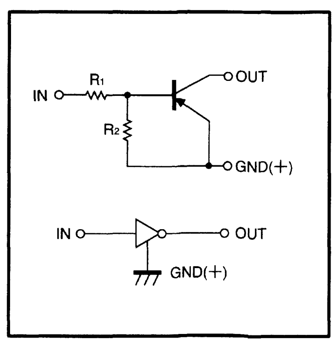
●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTB114E□) K	Limits(DTB114E□) S	Unit
Supply voltage	V_{CC}	−50		V
Input voltage	V_{IN}	−40		V
		10		
Output current	I_C	−500		mA
Power dissipation	Pd	200	300	mW
Junction temperature	Tj	150		°C
Storage temperature	Tstg	−55~150		°C

●Equivalent circuit



(96-290-B114E)

ROHM

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=100 μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−10mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−50mA/−2.5mA
Input current	I_I	—	—	−0.88	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=−5V, I_O=−50mA
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
Type	Basic ordering unit (pieces)	3000	5000
DTB114EK		○	—
DTB114ES		—	○

●Electrical characteristic curves

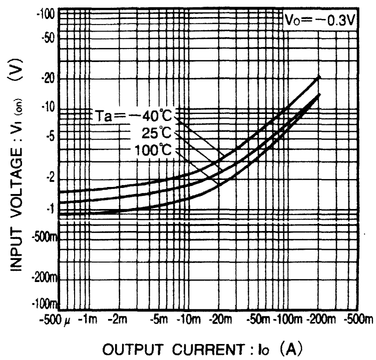


Fig.1 Input voltage vs. output current (ON characteristics)

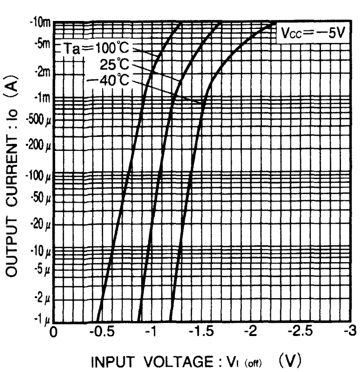


Fig.2 Output current vs. input voltage (OFF characteristics)

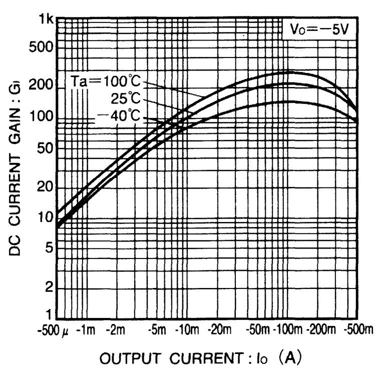


Fig.3 DC current gain vs. output current

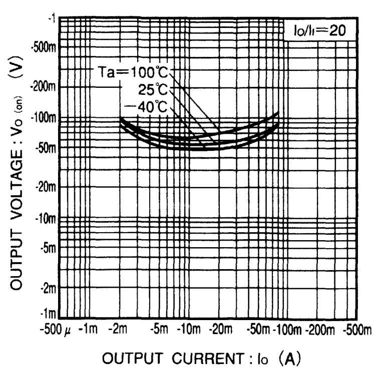


Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)
DTB123EK/DTB123ES

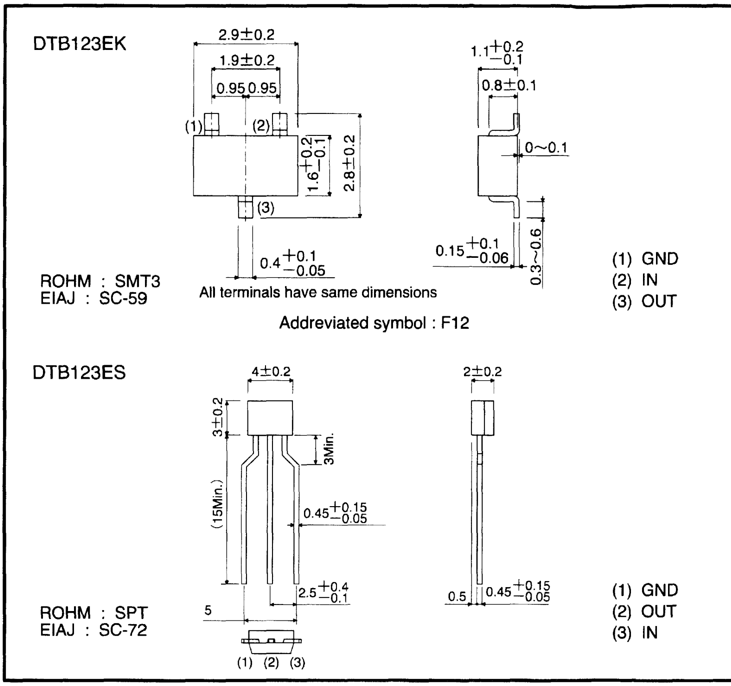
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

PNP digital transistor
(Built-in resistor type)

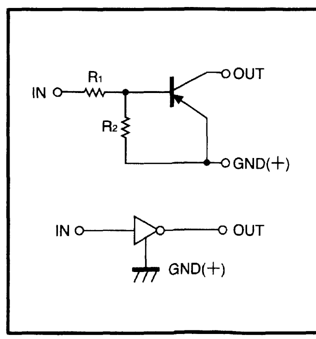
●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTB123E□) K	Limits(DTB123E□) S	Unit
Supply voltage	V_{CC}	−50		V
Input voltage	V_{IN}	−12		V
		−10		
Output current	I_C	−500		mA
Power dissipation	Pd	200	300	mW
Junction temperature	Tj	150		°C
Storage temperature	Tstg	−55~150		°C

●Equivalent circuit



(96-298-B123E)

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	—	−0.3	V	I_O/I_I=−50mA/−2.5mA
Input current	I_I	—	—	−3.8	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	39	—	—	—	V_O=−5V, I_O=−50mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

● Packaging specifications

Type		SMT3	SPT
	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
	Basic ordering unit (pieces)	3000	5000
DTB123EK		○	—
DTB123ES		—	○

● Electrical characteristic curves

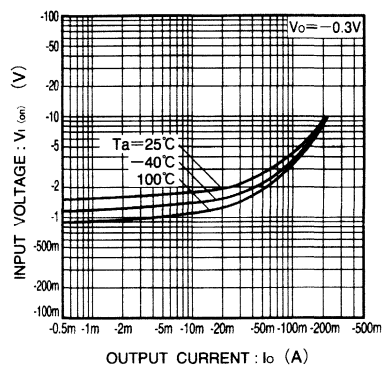


Fig.1 Input voltage vs. output current (ON characteristics)

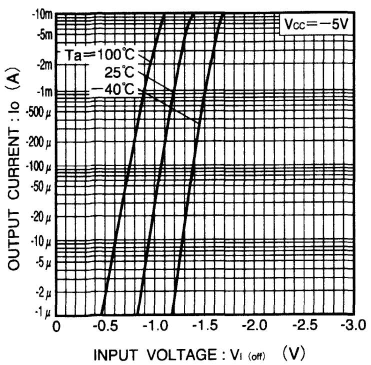


Fig.2 Output current vs. input voltage (OFF characteristics)

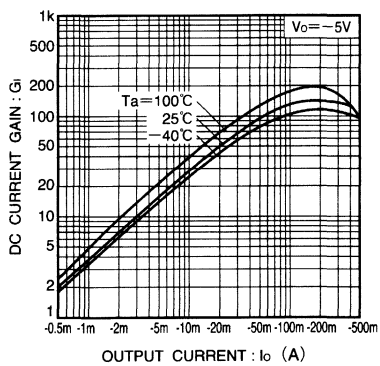


Fig.3 DC current gain vs. output current

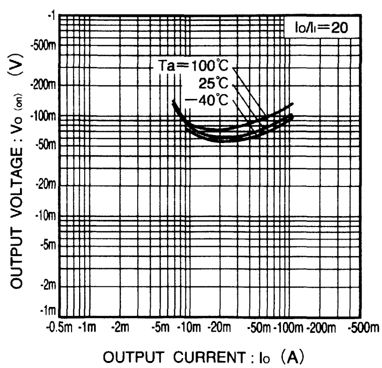


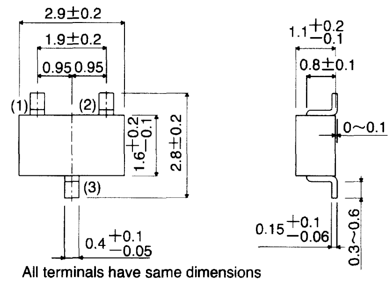
Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)
DTB123TK

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●External dimensions (Units: mm)



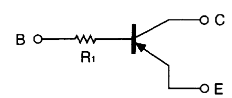
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : F92

(1) Emitter
(2) Base
(3) Collector

●Equivalent circuit



B : Base
C : Collector
E : Emitter

●Structure
PNP digital transistor
(Built-in resistor type)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−40	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−500	mA
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

(96-300-B123T)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−40	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−50mA/−2.5mA
DC current gain	h_{FE}	100	250	600	—	V_{CE}=−5V, I_C=−50mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=50mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	SMT3
	Package style	Taping
	Code	T146
	Basic ordering unit (pieces)	3000
DTB123TK		○

Digital transistors

●Electrical characteristic curves

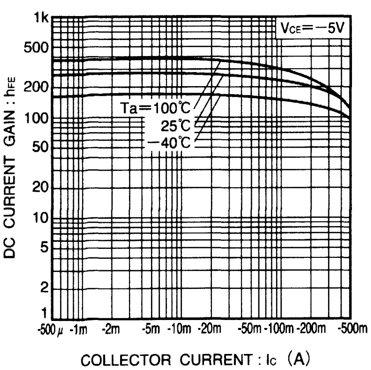


Fig.1 DC current gain vs. collector current

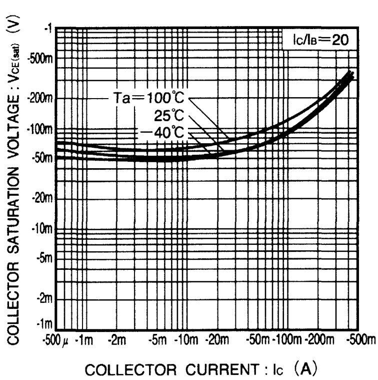


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital transistors (built-in resistors)

DTB123YK/DTB123YC/DTB123YS

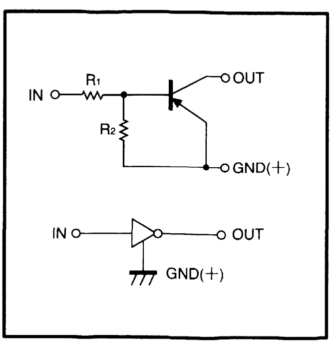
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

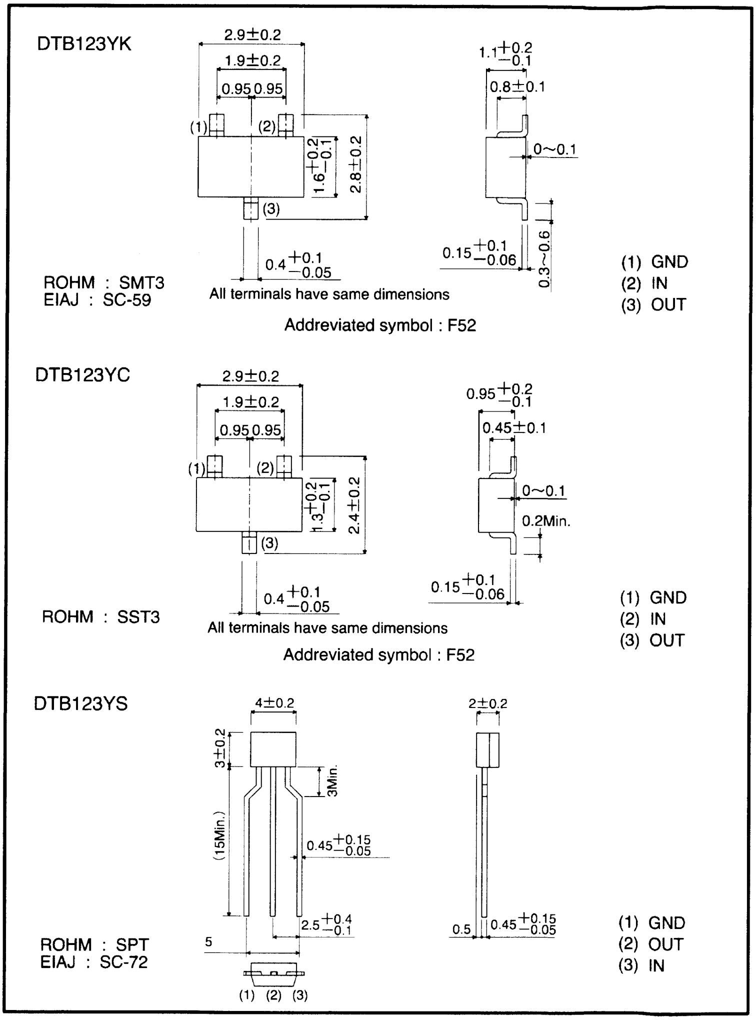
●Structure

PNP digital transistor
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)



(96-302-B123Y)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTB123Y□) K	C	S	Unit
Supply voltage	V_{CC}	−50			V
Input voltage	V_{IN}	−12			V
		5			
Output current	I_C	−500			mA
Power dissipation	Pd	200		300	mW
Junction temperature	Tj	150			℃
Storage temperature	Tstg	−55~150			℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−2	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−50mA/−2.5mA
Input current	I_I	—	—	−3.6	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=−5V, I_O=−50mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	3.6	4.5	5.5	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping
	Code	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	5000
DTB123YK		○	—	—
DTB123YC		—	○	—
DTB123YS		—	—	○

Digital transistors

● Electrical characteristic curves

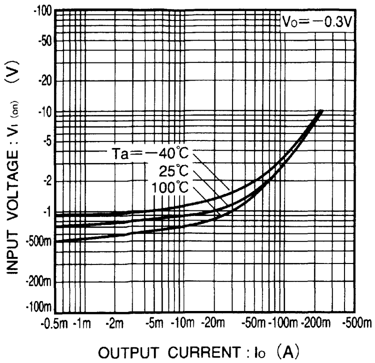


Fig.1 Input voltage vs. output current (ON characteristics)

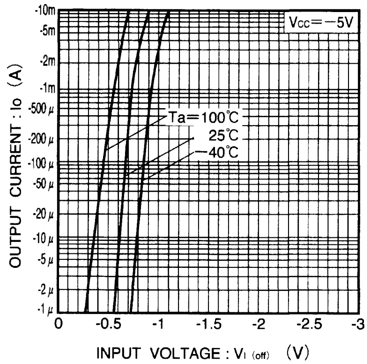


Fig.2 Output current vs. input voltage (OFF characteristics)

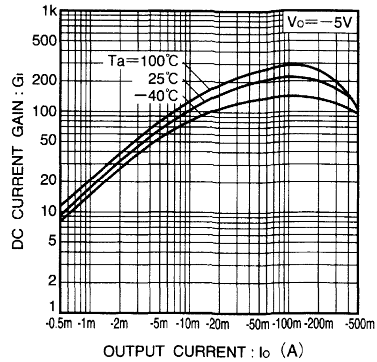


Fig.3 DC current gain vs. output current

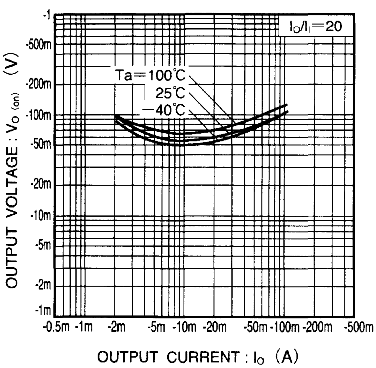


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTB143EK/DTB143EC/DTB143ES

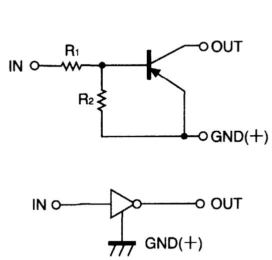
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

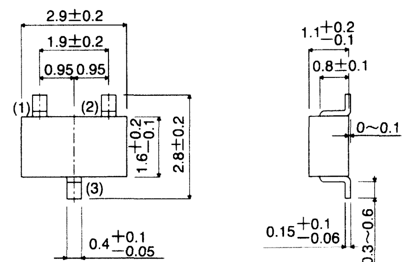
PNP digital transistor
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)

DTB143EK



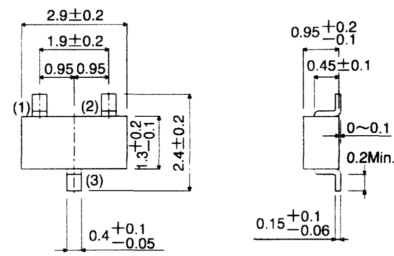
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : F13

(1) GND
(2) IN
(3) OUT

DTB143EC



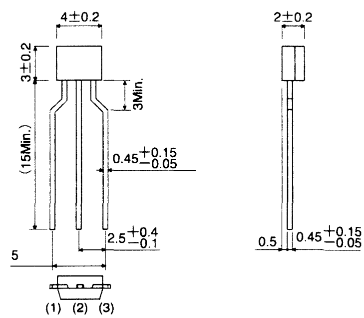
ROHM : SST3

All terminals have same dimensions

Addreviated symbol : F13

(1) GND
(2) IN
(3) OUT

DTB143ES



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

Digital transistors

(96-304-B143E)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTB143E□)			Unit
		K	C	S	
Supply voltage	V_{CC}	−50			V
Input voltage	V_{IN}	−30			V
		10			
Output current	I_C	−500			mA
Power dissipation	Pd	200		300	mW
Junction temperature	Tj	150			℃
Storage temperature	Tstg	−55~150			℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	—	−0.3	V	I_O/I_I=−50mA/−2.5mA
Input current	I_I	—	—	−1.8	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	47	—	—	—	V_O=−5V, I_O=−50mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping
	Code	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	5000
DTB143EK		○	—	—
DTB143EC		—	○	—
DTB143ES		—	—	○

● Electrical characteristic curves

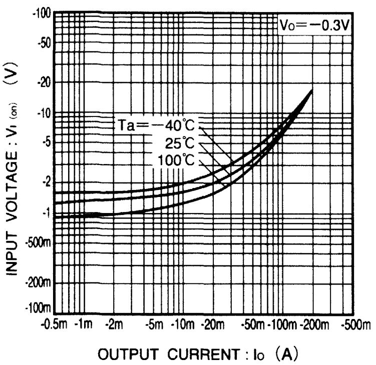


Fig.1 Input voltage vs. output current (ON characteristics)

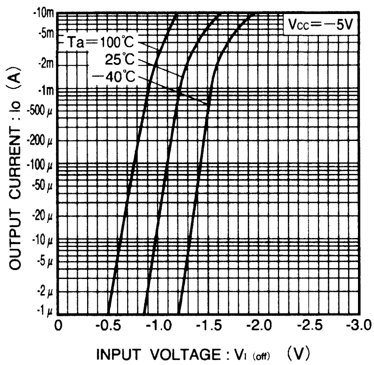


Fig.2 Output current vs. input voltage (OFF characteristics)

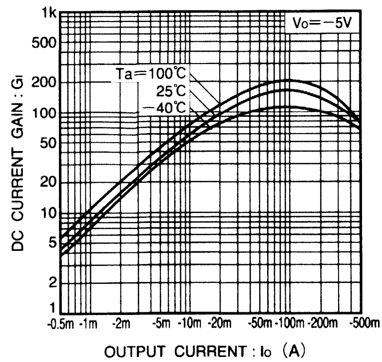


Fig.3 DC current gain vs. output current

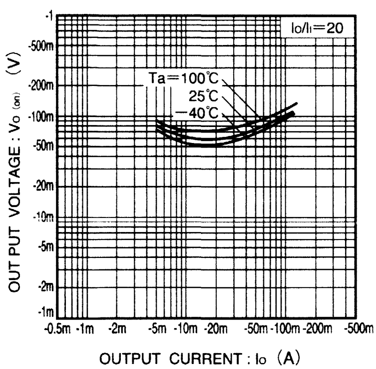


Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)

DTB143TK/DTB143TS

●Features

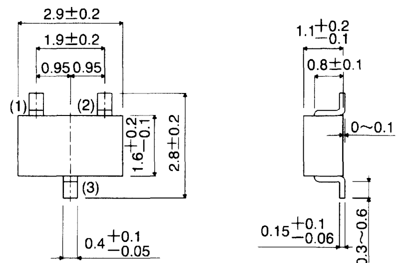
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

PNP digital transistor
(Built-in resistor type)

●External dimensions (Units: mm)

DTB143TK



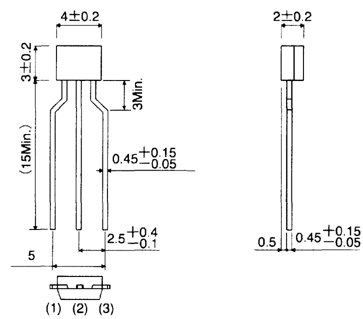
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : F93

(1) Emitter
(2) Base
(3) Collector

DTB143TS



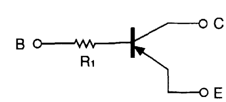
ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTB143T□) K	Limits(DTB143T□) S	Unit
Collector-base voltage	V_{CBO}	−50		V
Collector-emitter voltage	V_{CEO}	−40		V
Emitter-base voltage	V_{EBO}	−5		V
Collector current	I_C	−500		mA
Collector power dissipation	P_C	200	300	mW
Junction temperature	Tj	150		℃
Storage temperature	Tstg	−55~150		℃

●Equivalent circuit



B : Base
C : Collector
E : Emitter

(96-306-B143T)

ROHM

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−40	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−50mA/−2.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=−5V, I_C=−50mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=50mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
Type	Basic ordering unit (pieces)	3000	5000
DTB143TK		○	—
DTB143TS		—	○

Digital transistors

●Electrical characteristic curves

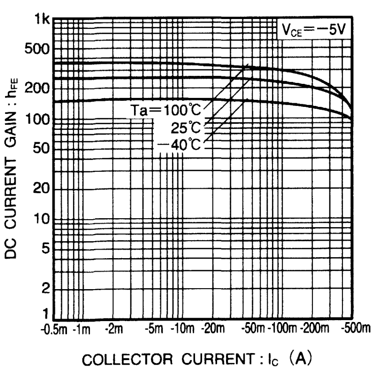


Fig.1 DC current gain vs. collector current

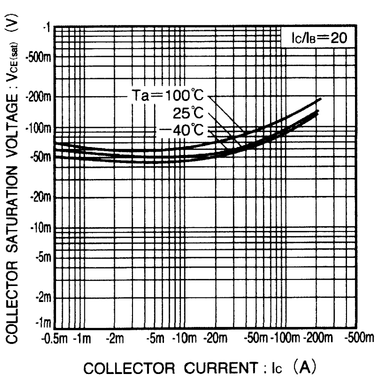


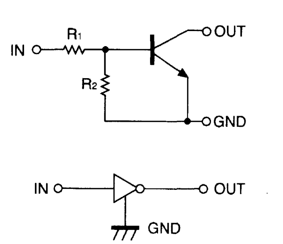
Fig.2 Collector-emitter saturation voltage vs. collector current

Digital transistors (built-in resistors)
DTC113ZUA / DTC113ZKA / DTC113ZSA

● Features

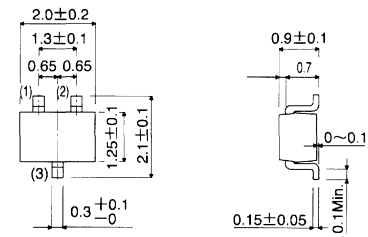
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

● Equivalent circuit



● External dimensions (Units: mm)

DTC113ZUA



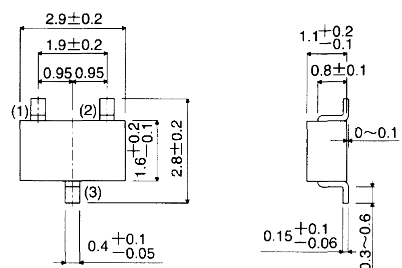
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 121

(1) GND
(2) IN
(3) OUT

DTC113ZKA



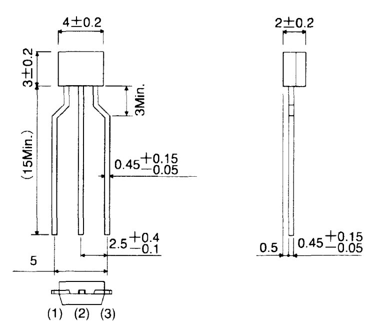
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : Z21

(1) GND
(2) IN
(3) OUT

DTC113ZSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96S-623-C113Z)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC113Z□) UA	KA	SA	Unit
Supply voltage	V_{CC}	50			V
Input voltage	V_{IN}	10			V
		−5			
Output current	I_O	100			mA
	$I_{C(Max.)}$	100			
Power dissipation	Pd	200		300	mW
Junction temperature	Tj	150			℃
Storage temperature	Tstg	−55~150			℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V, I_O=100μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	7.2	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	33	—	—	—	V_O=5V, I_O=5mA
Input resistance	R_1	0.7	1	1.3	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC113ZUA		—	○	—	—
DTC113ZKA		—	—	○	—
DTC113ZSA		—	—	—	○

●Electrical characteristic curves

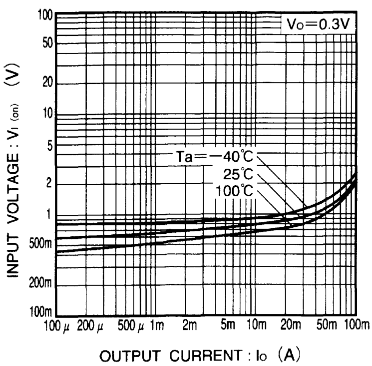


Fig.1 Input voltage vs. output current (ON characteristics)

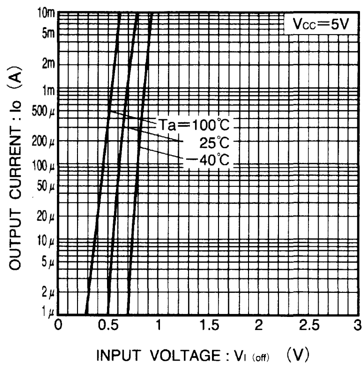


Fig.2 Output current vs. input voltage (OFF characteristics)

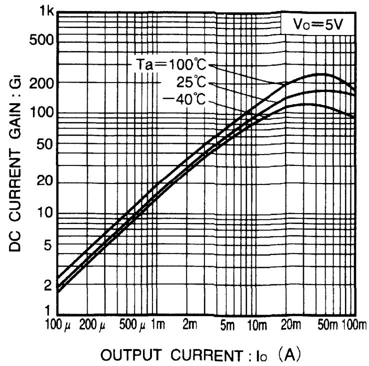


Fig.3 DC current gain vs. output current

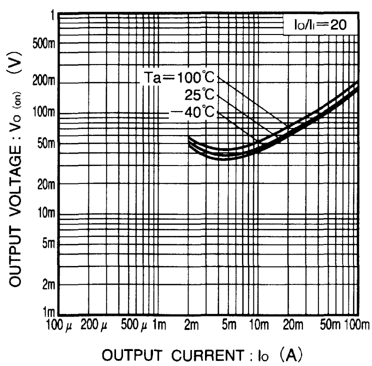


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTC114EE / DTC114EUA / DTC114EKA DTC114ECA / DTC114ESA

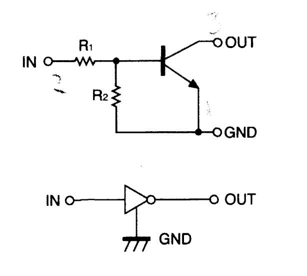
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

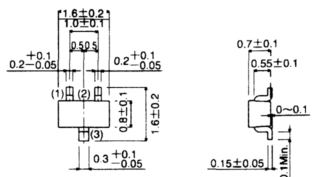
NPN digital transistor
(with built-in resistors)

●Equivalent circuit



●External dimensions (Units: mm)

DTC114EE

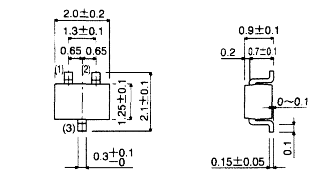


ROHM : EMT3

Addreviated symbol : 24

(1) GND
(2) IN
(3) OUT

DTC114EUA



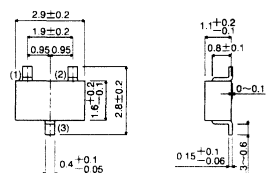
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : 24

(1) GND
(2) IN
(3) OUT

DTC114EKA



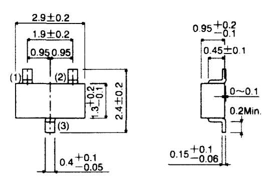
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : 24

(1) GND
(2) IN
(3) OUT

DTC114ECA



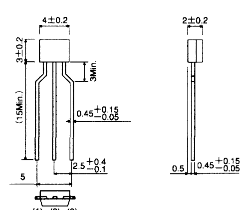
All terminals have same dimensions

ROHM : SST3

Addreviated symbol : 24

(1) GND
(2) IN
(3) OUT

DTC114ESA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

Digital transistors

(96-308-C114E)

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits(DTC114E□)					Unit
		E	UA	KA	CA	SA	
Supply voltage	V_{CC}	50					V
Input voltage	V_{IN}	40					V
		−10					
Output current	I_O	50					mA
	$I_{C(Max.)}$	100					
Power dissipation	Pd	150	200			300	mW
Junction temperature	Tj	150					°C
Storage temperature	Tstg	−55~150					°C

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=10mA
Output voltage	$V_{O(on)}$	—	—	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=5V, I_O=5mA
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	3000	3000	5000
DTC114EE		○	—	—	—	—
DTC114EUA		—	○	—	—	—
DTC114EKA		—	—	○	—	—
DTC114ECA		—	—	—	○	—
DTC114ESA		—	—	—	—	○

● Electrical characteristic curves

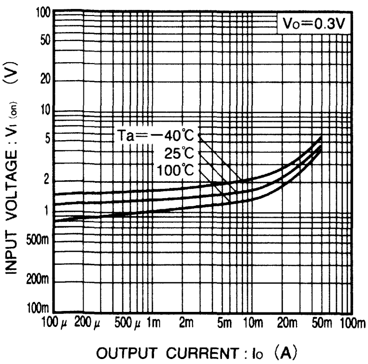


Fig.1 Input voltage vs. output current (ON characteristics)

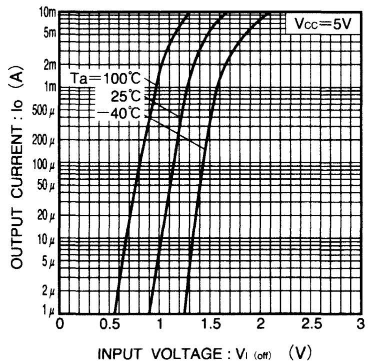


Fig.2 Output current vs. input voltage (OFF characteristics)

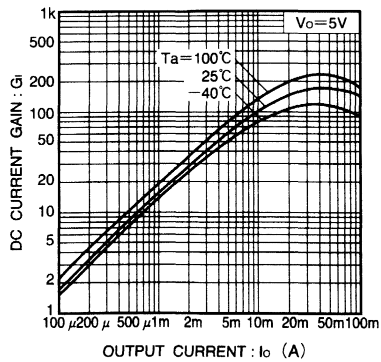


Fig.3 DC current gain vs. output current

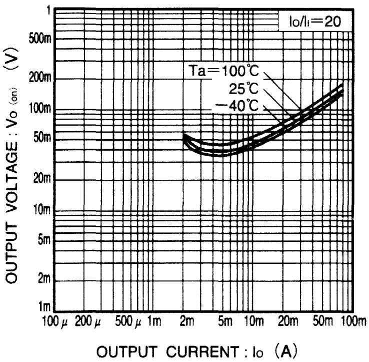


Fig.4 Output voltage vs. output current

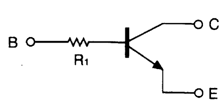
Digital transistors

Digital transistors (built-in resistors)
DTC114TE / DTC114TUA / DTC114TKA
DTC114TCA / DTC114TSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
NPN digital transistor
(Built-in resistor type)

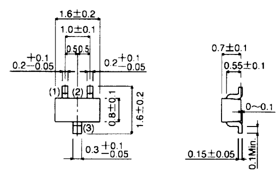
●Equivalent circuit



B : Base
C : Collector
E : Emitter

●External dimensions (Units: mm)

DTC114TE

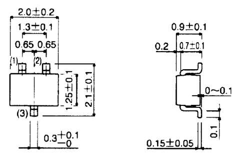


ROHM : EMT3

Addreviated symbol : 94

(1) Emitter
(2) Base
(3) Collector

DTC114TUA



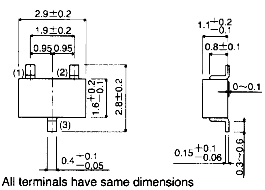
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 94

(1) Emitter
(2) Base
(3) Collector

DTC114TKA



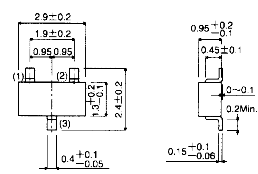
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 94

(1) Emitter
(2) Base
(3) Collector

DTC114TCA



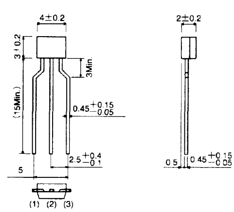
All terminals have same dimensions

ROHM : SST3

Addreviated symbol : 94

(1) Emitter
(2) Base
(3) Collector

DTC114TSA



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

(96-311-C114T)

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTC114T□)					Unit
		E	UA	KA	CA	SA	
Collector-base voltage	V_{CBO}	50					V
Collector-emitter voltage	V_{CEO}	50					V
Emitter-base voltage	V_{EBO}	5					V
Collector current	I_C	100					mA
Collector power dissipation	P_C	150	200			300	mW
Junction temperature	Tj	150					°C
Storage temperature	Tstg	−55~150					°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=10mA/1mA
DC current transfer ratio	h_{FE}	100	300	600	—	V_{CE}=5V, I_C=1mA
Input resistance	R_1	7	10	13	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	T116	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	3000	5000
DTC114TE		○	—	—	—	—
DTC114TUA		—	○	—	—	—
DTC114TKA		—	—	○	—	—
DTC114TCA		—	—	—	○	—
DTC114TSA		—	—	—	—	○

Digital transistors

●Electrical characteristic curves

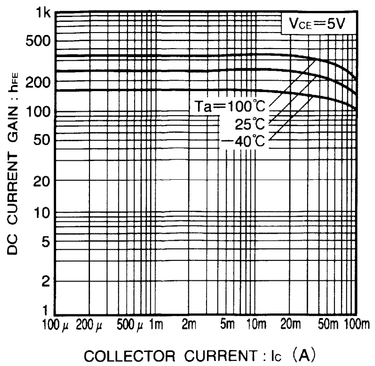


Fig.1 DC current gain vs. collector current

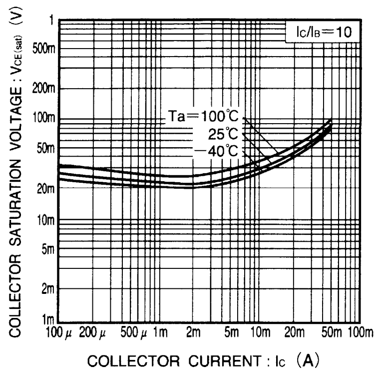


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital transistors (built-in resistors)

DTC114YE / DTC114YUA / DTC114YKA DTC114YSA

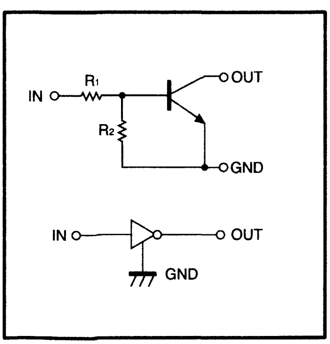
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

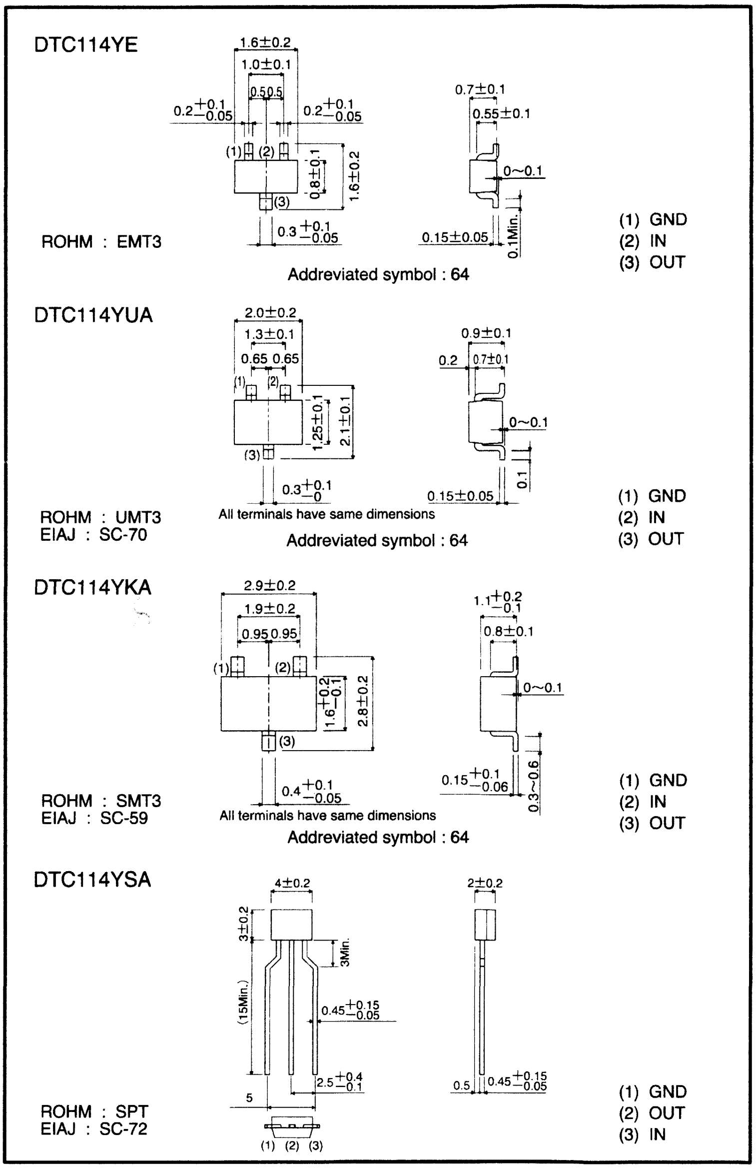
●Structure

NPN digital transistor
(Built-in resisto types)

●Equivalent circuit



●External dimensions (Units: mm)



(96-314-C114Y)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC114Y□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	50				V
Input voltage	V_{IN}	40				V
		−6				
Output current	I_O	70				mA
	$I_{C(Max.)}$	100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55～150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V, I_O=100μA
	$V_{I(on)}$	1.4	—	—		V_O=0.3V, I_O=1mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=5mA/0.25mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=5V, I_O=5mA
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	3.7	4.7	5.7	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC114YE		○	—	—	—
DTC114YUA		—	○	—	—
DTC114YKA		—	—	○	—
DTC114YSA		—	—	—	○

● Electrical characteristic curves

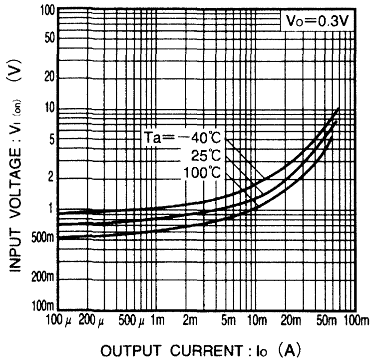


Fig.1 Input voltage vs. output current (ON characteristics)

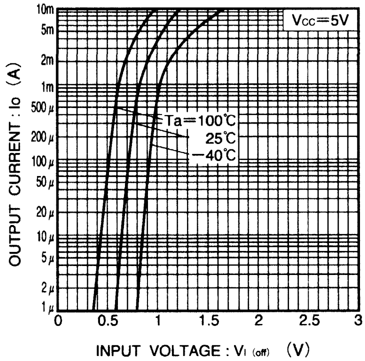


Fig.2 Output current vs. input voltage (OFF characteristics)

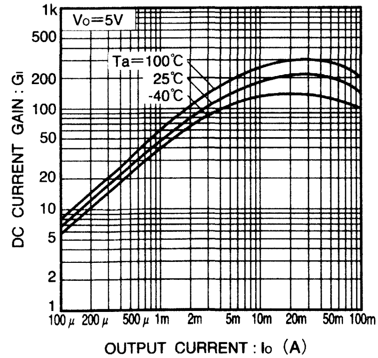


Fig.3 DC current gain vs. output current

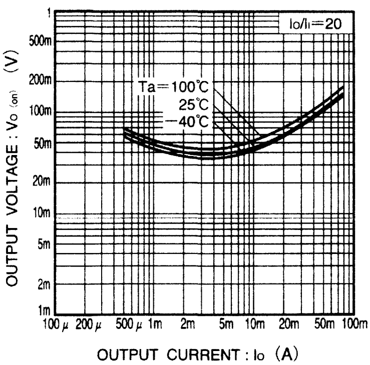


Fig.4 Output voltage vs. output current

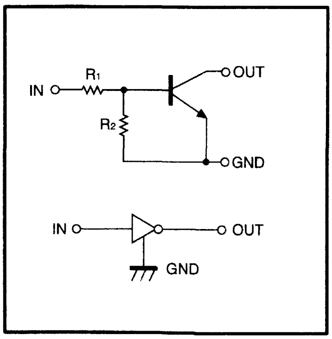
Digital transistors

Digital transistors (built-in resistors)
DTC123EE / DTC123EUA / DTC123EKA DTC123ESA

●Features

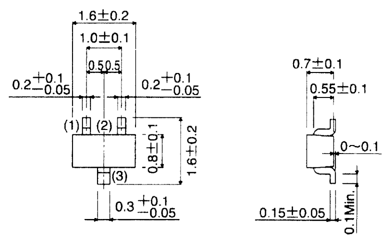
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Equivalent circuit



●External dimensions (Units: mm)

DTC123EE

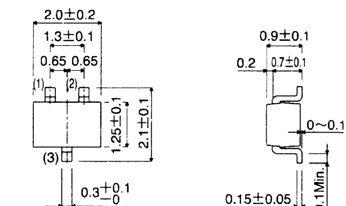


ROHM : EMT3

Addreviated symbol : 22

(1) GND
(2) IN
(3) OUT

DTC123EUA



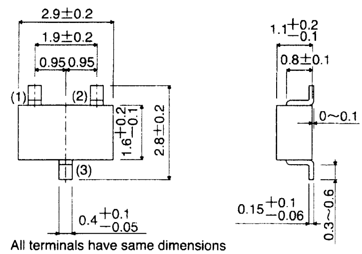
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : 22

(1) GND
(2) IN
(3) OUT

DTC123EKA



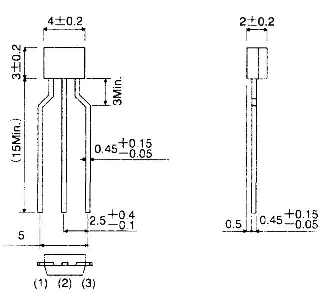
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : 22

(1) GND
(2) IN
(3) OUT

DTC123ESA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(94S-653-C123E)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC123E□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	50				V
Input voltage	V_{IN}	12				V
		−10				
Output current	I_O	100				mA
	$I_{C(Max.)}$	100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	3.8	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	20	—	—	—	V_O=5V, I_O=20mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC123EE		○	—	—	—
DTC123EUA		—	○	—	—
DTC123EKA		—	—	○	—
DTC123ESA		—	—	—	○

● Electrical characteristic curves

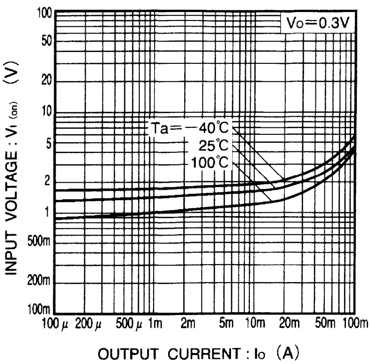


Fig.1 Input voltage vs. output current (ON characteristics)

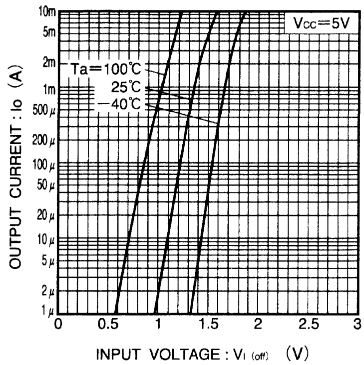


Fig.2 Output current vs. input voltage (OFF characteristics)

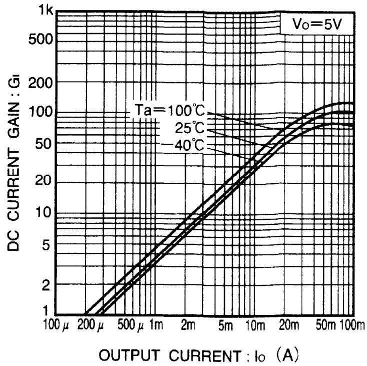


Fig.3 DC current gain vs. output current

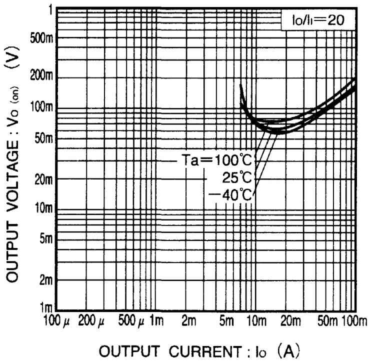


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTC123JE / DTC123JUA / DTC123JKA
DTC123JSA

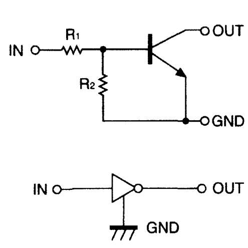
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

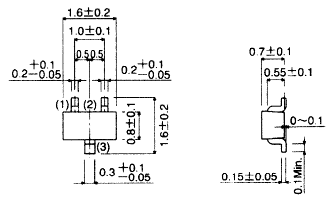
NPN digital transisto
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)

DTC123JE

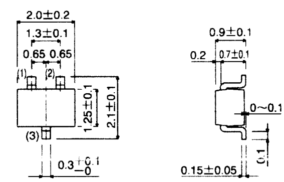


ROHM : EMT3

Addreviated symbol : E42

(1) GND
(2) IN
(3) OUT

DTC123JUA



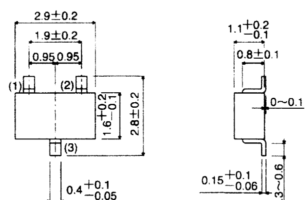
All terminals have same dimensions

ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : E42

(1) GND
(2) IN
(3) OUT

DTC123JKA



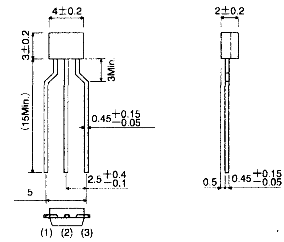
All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 142

(1) GND
(2) IN
(3) OUT

DTC123JSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-320-C123J)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC123J□) E	UA	KA	SA	Unit
Supply voltage	V_{CC}	50				V
Input voltage	V_{IN}	12				V
		−5				
Output current	I_O	100				mA
	$I_{C(Max.)}$	100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100μA
	$V_{I(on)}$	1.1	—	—		V_O=0.3V, I_O=5mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=5mA/0.25mA
Input current	I_I	—	—	3.6	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	80	—	—	—	V_O=5V, I_O=10mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	17	21	26	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC123JE		○	—	—	—
DTC123JUA		—	○	—	—
DTC123JKA		—	—	○	—
DTC123JSA		—	—	—	○

● Electrical characteristic curves

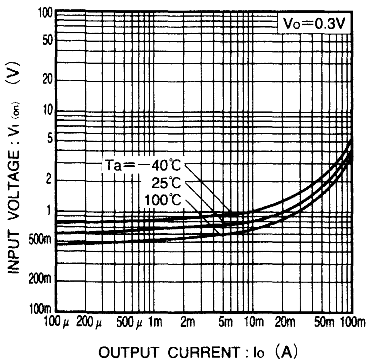


Fig.1 Input voltage vs. output current (ON characteristics)

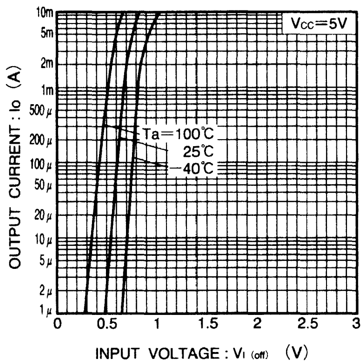


Fig.2 Output current vs. input voltage (OFF characteristics)

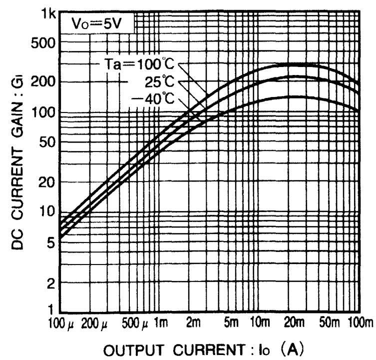


Fig.3 DC current gain vs. output current

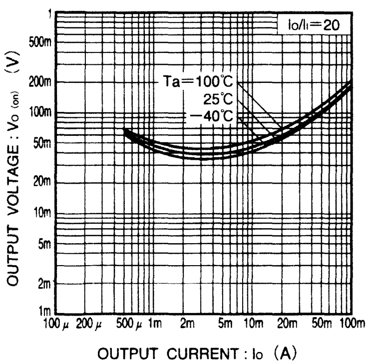


Fig.4 Output voltage vs. output current

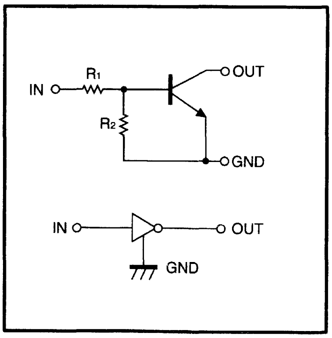
Digital transistors (built-in resistors)

DTC123YE / DTC123YUA / DTC123YKA
DTC123YSA

●Features

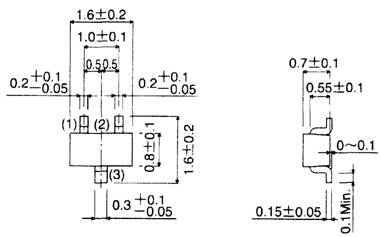
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Equivalent circuit



●External dimensions (Units: mm)

DTC123YE

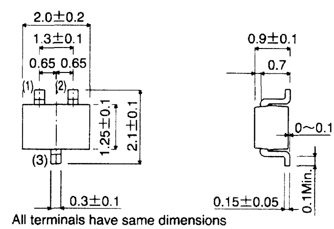


ROHM : EMT3

Addreviated symbol : 62

(1) GND
(2) IN
(3) OUT

DTC123YUA

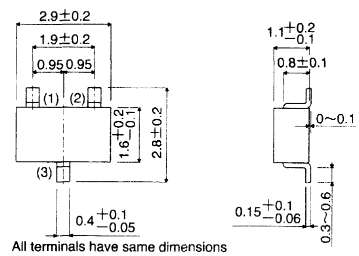


ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 62

(1) GND
(2) IN
(3) OUT

DTC123YKA

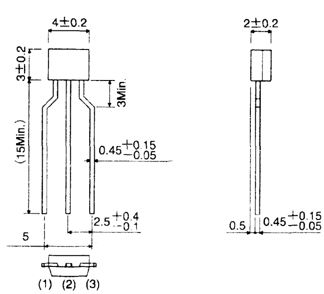


ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 62

(1) GND
(2) IN
(3) OUT

DTC123YSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-659-C123Y)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC123Y□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	50				V
Input voltage	V_{IN}	12				V
		−5				
Output current	I_O	100				mA
	$I_{C(Max.)}$	100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	3.8	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	33	—	—	—	V_O=5V, I_O=10mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	3.6	4.5	5.5	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC123YE		○	—	—	—
DTC123YUA		—	○	—	—
DTC123YKA		—	—	○	—
DTC123YSA		—	—	—	○

●Electrical characteristic curves

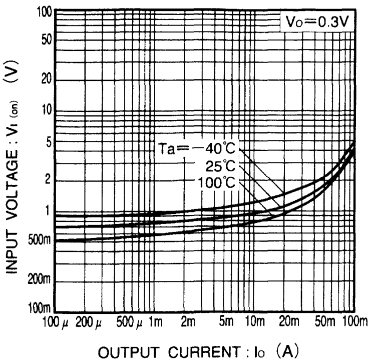


Fig.1 Input voltage vs. output current (ON characteristics)

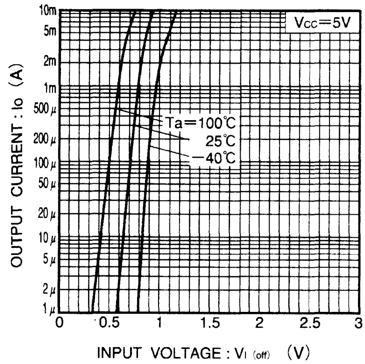


Fig.2 Output current vs. input voltage (OFF characteristics)

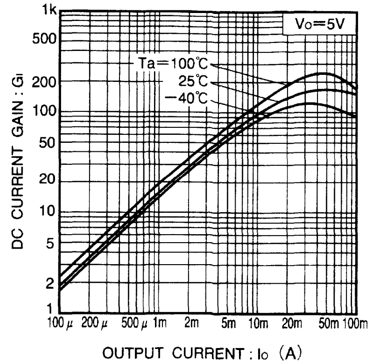


Fig.3 DC current gain vs. output current

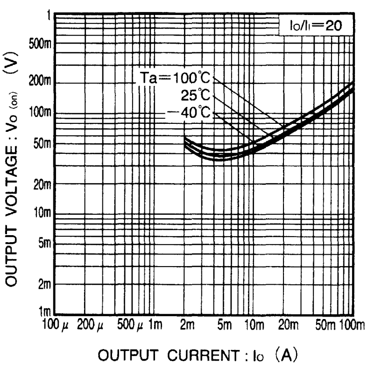


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTC124EE / DTC124EUA / DTC124EKA
DTC124ECA / DTC124ESA

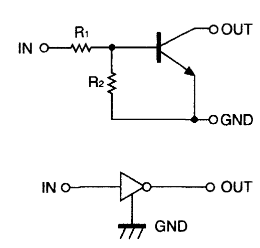
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

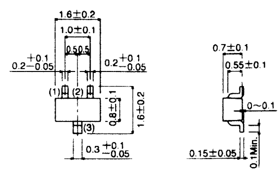
NPN digital transistor
(with built-in resistors)

●Equivalent circuit



●External dimensions (Units: mm)

DTC124EE

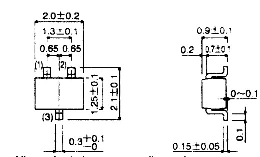


ROHM : EMT3

Addreviated symbol : 15

(1) GND
(2) IN
(3) OUT

DTC124EUA



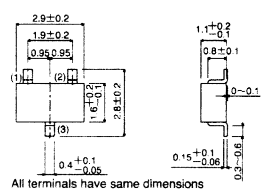
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : 15

(1) GND
(2) IN
(3) OUT

DTC124EKA



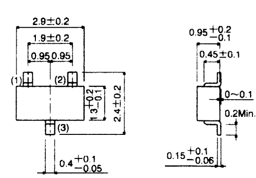
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : 15

(1) GND
(2) IN
(3) OUT

DTC124ECA



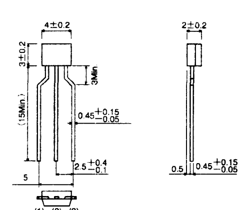
ROHM : SST3

All terminals have same dimensions

Addreviated symbol : 15

(1) GND
(2) IN
(3) OUT

DTC124ESA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-323-C124E)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC124E□)					Unit
		E	UA	KA	CA	SA	
Supply voltage	V_{CC}	50					V
Input voltage	V_{IN}	40					V
		−10					
Output current	I_O	30					mA
	$I_{C(Max.)}$	100					
Power dissipation	Pd	150	200			300	mW
Junction temperature	Tj	150					℃
Storage temperature	Tstg	−55～150					℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.2V, I_O=5mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.36	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=5V, I_O=5mA
Input resistance	R_1	15.4	22	28.6	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	3000	3000	5000
DTC124EE		○	—	—	—	—
DTC124EUA		—	○	—	—	—
DTC124EKA		—	—	○	—	—
DTC124ECA		—	—	—	○	—
DTC124ESA		—	—	—	—	○

● Electrical characteristic curves

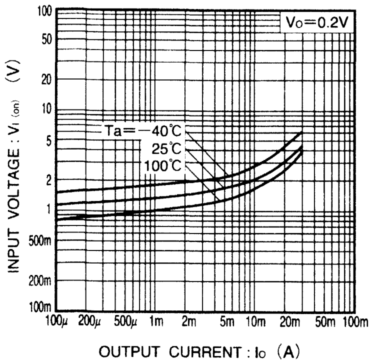


Fig.1 Input voltage vs. output current (ON characteristics)

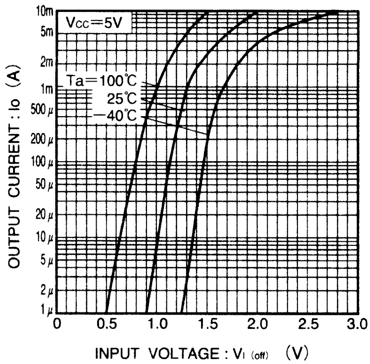


Fig.2 Output current vs. input voltage (OFF characteristics)

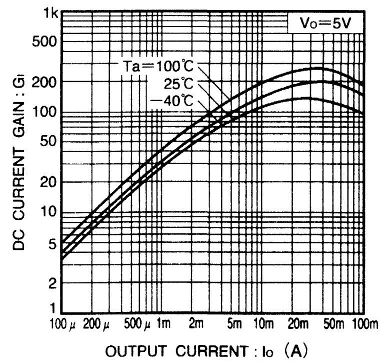


Fig.3 DC current gain vs. output current

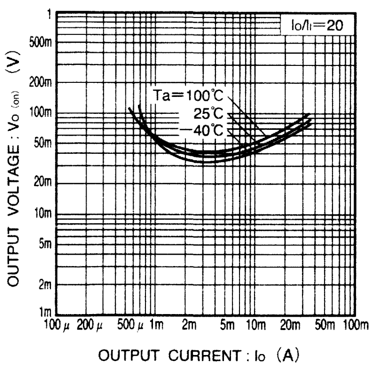


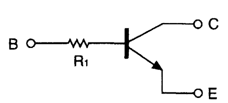
Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTC124TE / DTC124TUA / DTC124TKA
DTC124TSA

●Features

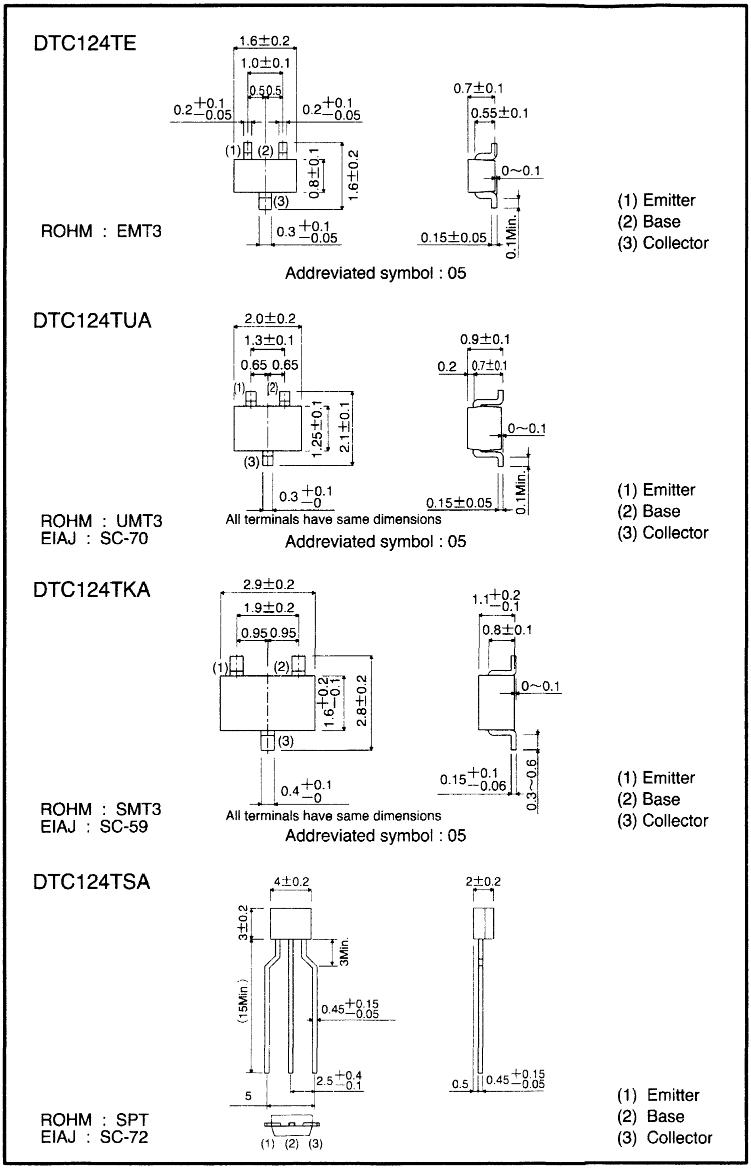
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Equivalent circuit



B : Base
C : Collector
E : Emitter

●External dimensions (Units: mm)



(96-326-C124T)

● Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC124T□) E	UA	KA	SA	Unit
Collector-base voltage	V_{CBO}	50				V
Collector-emitter voltage	V_{CEO}	50				V
Emitter-base voltage	V_{EBO}	5				V
Collector current	I_C	100				mA
Collector power dissipation	P_C	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

● Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=5mA/0.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=1mA
Input resistance	R_1	15.4	22	28.6	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

● Packaging specifications

	Package	EMT3	UMT3	SMT3	SST3
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC124TE		○	—	—	—
DTC124TUA		—	○	—	—
DTC124TKA		—	—	○	—
DTC124TSA		—	—	—	○

Digital transistors

●Electrical characteristic curves

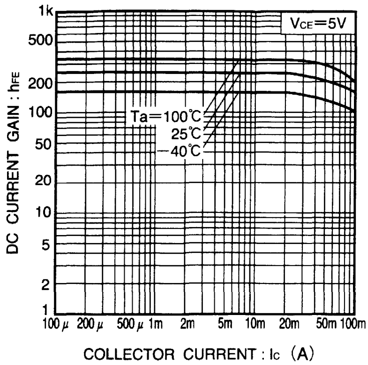


Fig.1 DC current gain vs. collector current

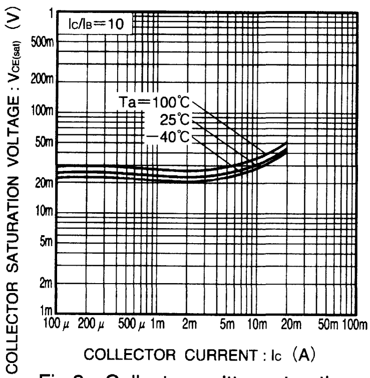


Fig.2 Collector-emitter saturation voltage vs. collector current

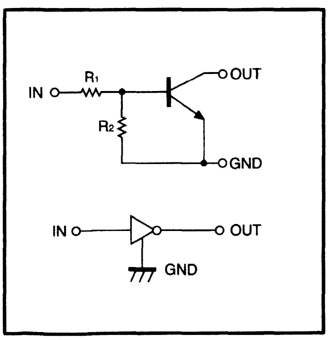
Digital transistors (built-in resistors)

DTC124XE / DTC124XUA / DTC124XKA DTC124XSA

●Features

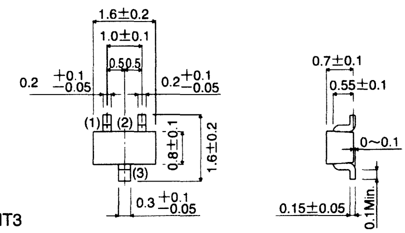
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Equivalent circuit



●External dimensions (Units: mm)

DTC124XE

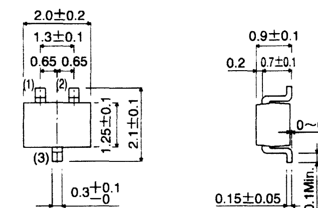


ROHM : EMT3

Addreviated symbol : 45

(1) GND
(2) IN
(3) OUT

DTC124XUA



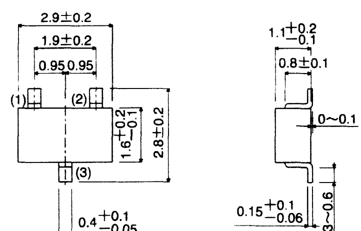
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : 45

(1) GND
(2) IN
(3) OUT

DTC124XKA



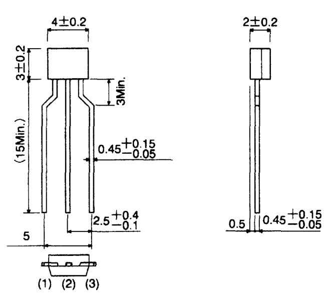
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : 45

(1) GND
(2) IN
(3) OUT

DTC124XSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(94S-671-C124X)

Digital transistors

● Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC124X□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	50				V
Input voltage	V_{IN}	40				V
		−10				
Output current	I_O	50				mA
	$I_{C(Max.)}$	100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

● Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.4	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	2.5	—	—		V_O=0.3V, I_O=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.36	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=5V, I_O=5mA
Input resistance	R_1	15.4	22	28.6	kΩ	—
Resistance ratio	R_2/R_1	1.7	2.1	2.6	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

● Packaging specifications

Type	Package	EMT3	UMT3	SMT3
	Package style	Taping	Taping	Taping
	Code	TL	T106	T146
	Basic ordering unit (pieces)	3000	3000	3000
DTC124XE		○	—	—
DTC124XUA		—	○	—
DTC124XKA		—	—	○
DTC124XSA		—	—	—

● Electrical characteristic curves

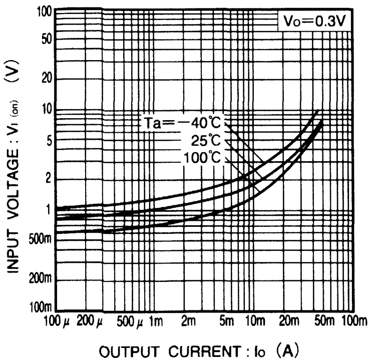


Fig.1 Input voltage vs. output current (ON characteristics)

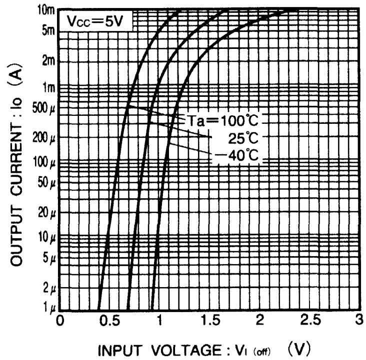


Fig.2 Output current vs. input voltage (OFF characteristics)

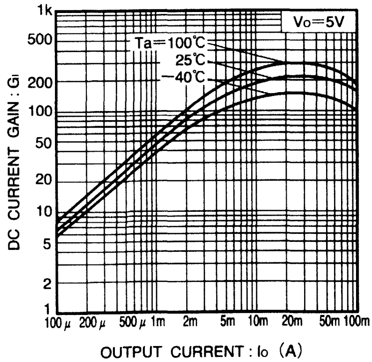


Fig.3 DC current gain vs. output current

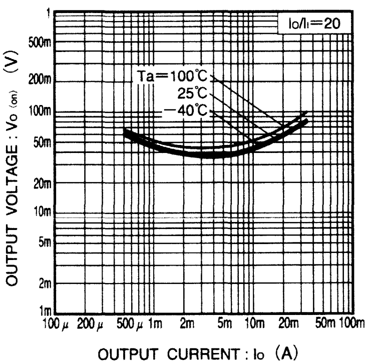


Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)

DTC143EE / DTC143EUA / DTC143EKA DTC143ESA

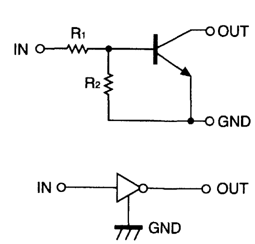
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

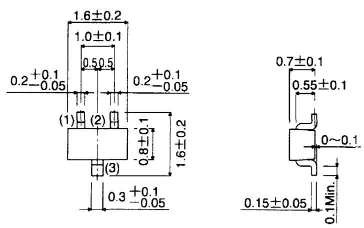
NPN digital transistor
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)

DTC143EE

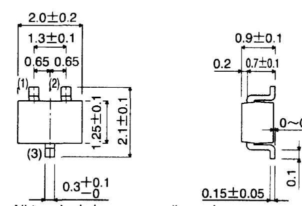


ROHM : EMT3

Addreviated symbol : 23

(1) GND
(2) IN
(3) OUT

DTC143EUA



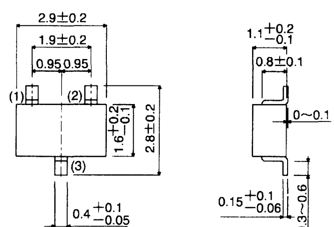
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : 23

(1) GND
(2) IN
(3) OUT

DTC143EKA



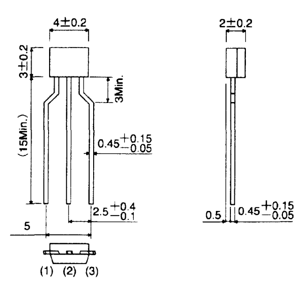
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : 23

(1) GND
(2) IN
(3) OUT

DTC143ESA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-328-C143E)

ROHM

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits (DTC143E□) E	UA	KA	SA	Unit
Supply voltage	V_{CC}	50				V
Input voltage	V_{IN}	30				V
		−10				
Output current	I_O	100				mA
	$I_{C(Max.)}$	100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55~150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	1.8	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	20	—	—	—	V_O=5V, I_O=10mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100Hz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC143EE		○	—	—	—
DTC143EUA		—	○	—	—
DTC143EKA		—	—	○	—
DTC143ESA		—	—	—	○

Digital transistors

●Electrical characteristic curves

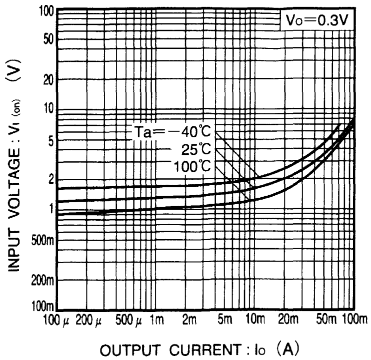


Fig.1 Input voltage vs. output current (ON characteristics)

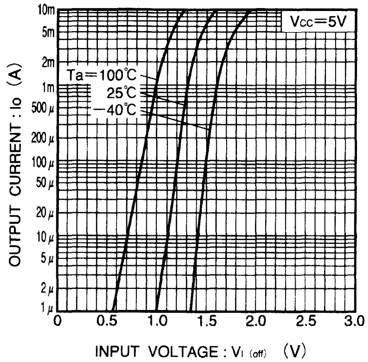


Fig.2 Output current vs. input voltage (OFF characteristics)

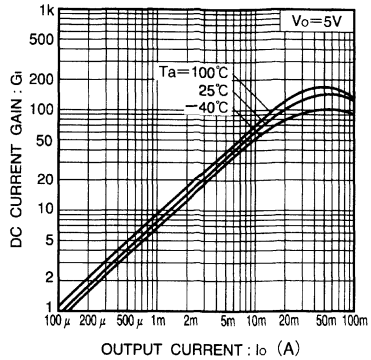


Fig.3 DC current gain vs. output current

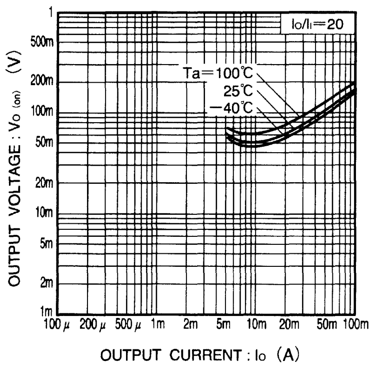


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTC143TE / DTC143TUA / DTC143TKA DTC143TSA

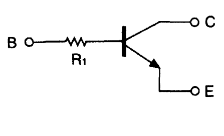
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

PNP digital transistor
(Built-in resistor type)

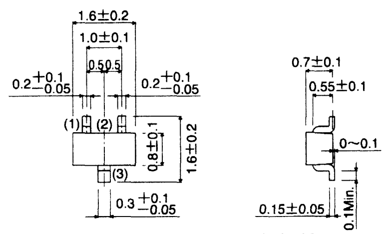
●Equivalent circuit



B : Base
C : Collector
E : Emitter

●External dimensions (Units: mm)

DTC143TE

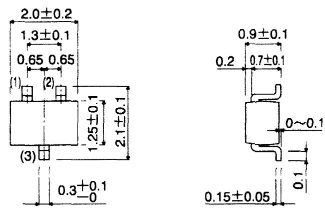


ROHM : EMT3

Addreviated symbol : 03

(1) Emitter
(2) Base
(3) Collector

DTC143TUA



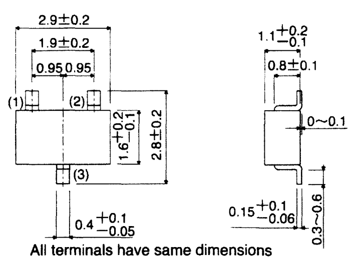
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : 03

(1) Emitter
(2) Base
(3) Collector

DTC143TKA



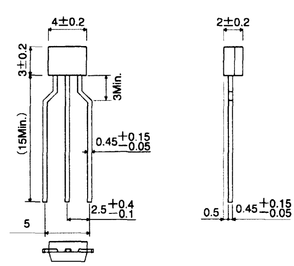
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : 03

(1) Emitter
(2) Base
(3) Collector

DTC143TSA



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

(96-331-C143T)

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits (DTC143T□) E	UA	KA	SA	Unit
Collector-base voltage	V_{CBO}	50				V
Collector-emitter voltage	V_{CEO}	50				V
Emitter-base voltage	V_{EBO}	5				V
Collector current	I_C	100				mA
Collector power dissipation	P_C	150	200		300	mW
Junction temperature	Tj	150				°C
Storage temperature	Tstg	−55~150				°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	−	−	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	−	−	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	−	−	V	I_E=50 μA
Collector cutoff current	I_{CBO}	−	−	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	−	−	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	0.3	V	I_C/I_B=5mA/0.25mA
DC current gain	h_{FE}	100	250	600	−	V_{CE}=5V, I_C=1mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	−
Transition frequency	f_T	−	250	−	MHz	V_{CE}=10V, I_E=−5mA, f=100Hz ∗

∗ Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC143TE		○	−	−	−
DTC143TUA		−	○	−	−
DTC143TKA		−	−	○	−
DTC143TSA		−	−	−	○

●Electrical characteristic curves

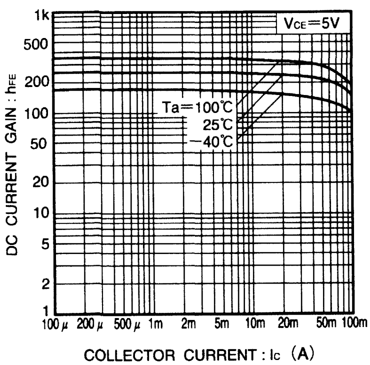


Fig.1 DC current gain vs. collector current

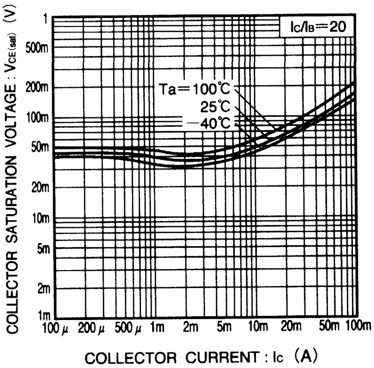


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital transistors

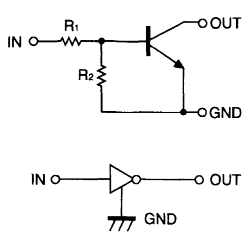
Digital transistors (built-in resistors)

DTC143XE / DTC143XUA / DTC143XKA DTC143XSA

●Features

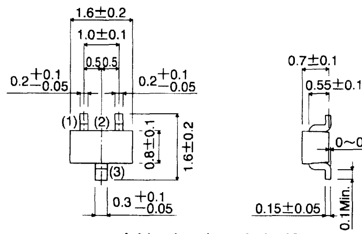
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on / off conditions need to be set for operation, making device design easy.

●Equivalent circuit



●External dimensions (Units: mm)

DTC143XE

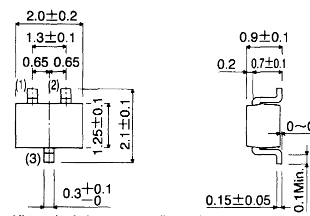


ROHM : EMT3

Addreviated symbol : 43

(1) GND
(2) IN
(3) OUT

DTC143XUA

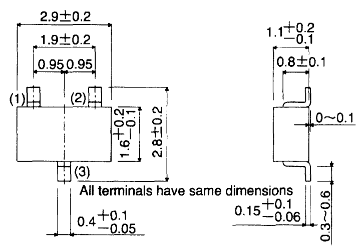


ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : 43

(1) GND
(2) IN
(3) OUT

DTC143XKA

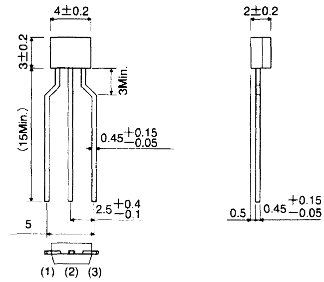


ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : 43

(1) GND
(2) IN
(3) OUT

DTC143XSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(94S-683-C143X)

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTC143X□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	50				V
Input voltage	V_{IN}	20				V
		−7				
Output current	I_O	100				mA
	$I_{C(Max.)}$	100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				°C
Storage temperature	Tstg	−55~150				°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V, I_O=100μA
	$V_{I(on)}$	2.5	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	1.8	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=5V, I_O=10mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	1.7	2.1	2.6	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC143XE		○	—	—	—
DTC143XUA		—	○	—	—
DTC143XKA		—	—	○	—
DTC143XSA		—	—	—	○

Digital transistors

●Electrical characteristic curves

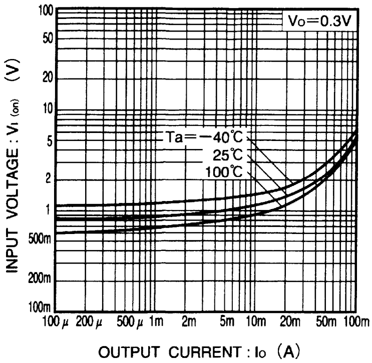


Fig.1 Input voltage vs. output current (ON characteristics)

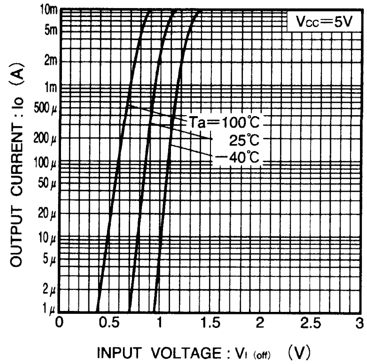


Fig.2 Output current vs. input voltage (OFF characteristics)

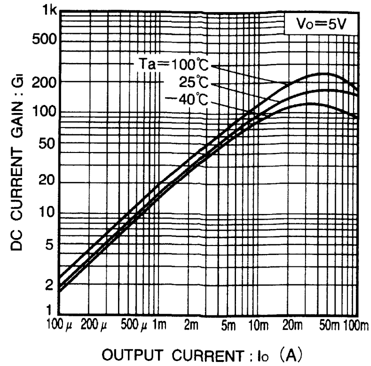


Fig.3 DC current gain vs. output current

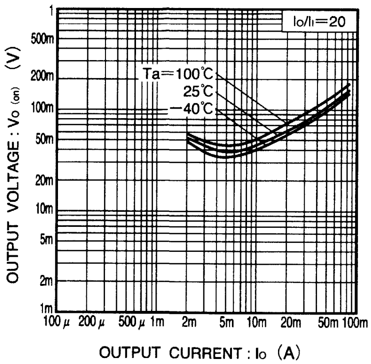


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTC143ZE / DTC143ZUA / DTC143ZKA
DTC143ZCA / DTC143ZSA

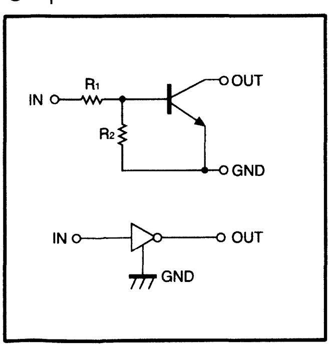
● Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

● Structure

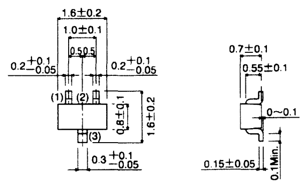
NPN digital transistor
(Built-in resistor type)

● Equivalent circuit



● External dimensions (Units: mm)

DTC143ZE

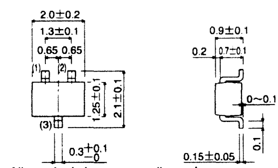


ROHM : EMT3

Addreviated symbol : E23

(1) GND
(2) IN
(3) OUT

DTC143ZUA



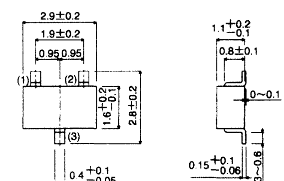
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : E23

(1) GND
(2) IN
(3) OUT

DTC143ZKA



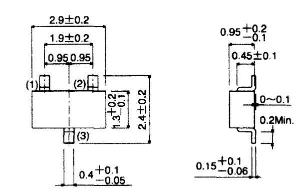
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : E23

(1) GND
(2) IN
(3) OUT

DTC143ZCA



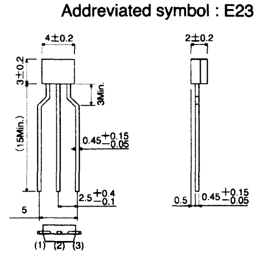
ROHM : SST

All terminals have same dimensions

Addreviated symbol : E23

(1) GND
(2) IN
(3) OUT

DTC143ZSA



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-334-C143Z)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits (DTC143Z□) E	UA	KA	CA	SA	Unit
Supply voltage	V_{CC}	50					V
Input voltage	V_{IN}	30					V
		−5					
Output current	I_O	100					mA
	$I_{C(Max.)}$	100					
Power dissipation	Pd	150	200			300	mW
Junction temperature	Tj	150					℃
Storage temperature	Tstg	−55~150					℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	1.3	—	—		V_O=0.3V, I_O=5mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=5mA/0.25mA
Input current	I_I	—	—	1.8	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	80	—	—	—	I_O=5V, I_O=10mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	T116	TP
	Basic ordering unit (pieces)	3000	3000	3000	3000	5000
DTC143ZE		○				
DTC143ZUA			○			
DTC143ZKA				○		
DTC143ZCA					○	
DTC143ZSA						○

● Electrical characteristic curves

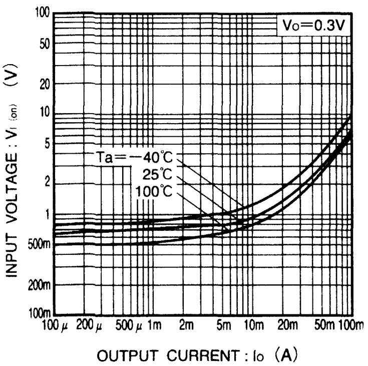


Fig.1 Input voltage vs. output current (ON characteristics)

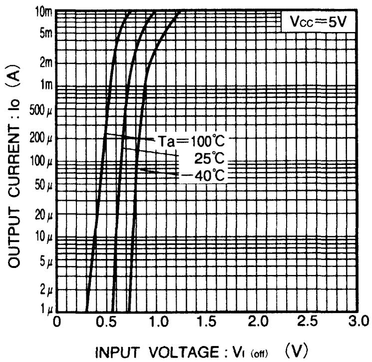


Fig.2 Output current vs. input voltage (OFF characteristics)

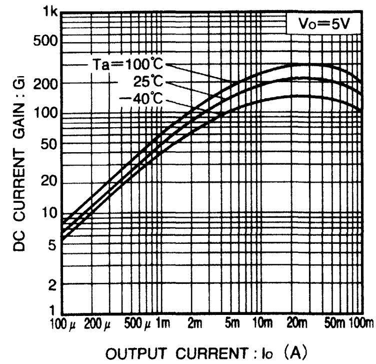


Fig.3 DC current gain vs. output current

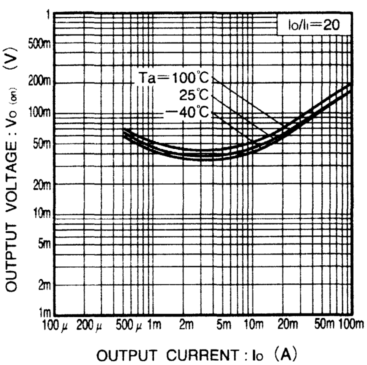


Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)

DTC144EE / DTC144EUA / DTC144EKA DTC144ESA

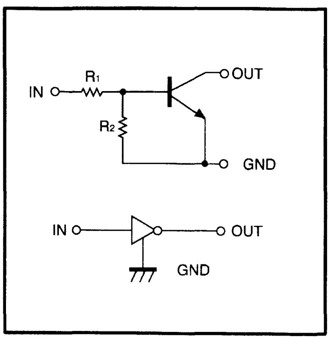
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

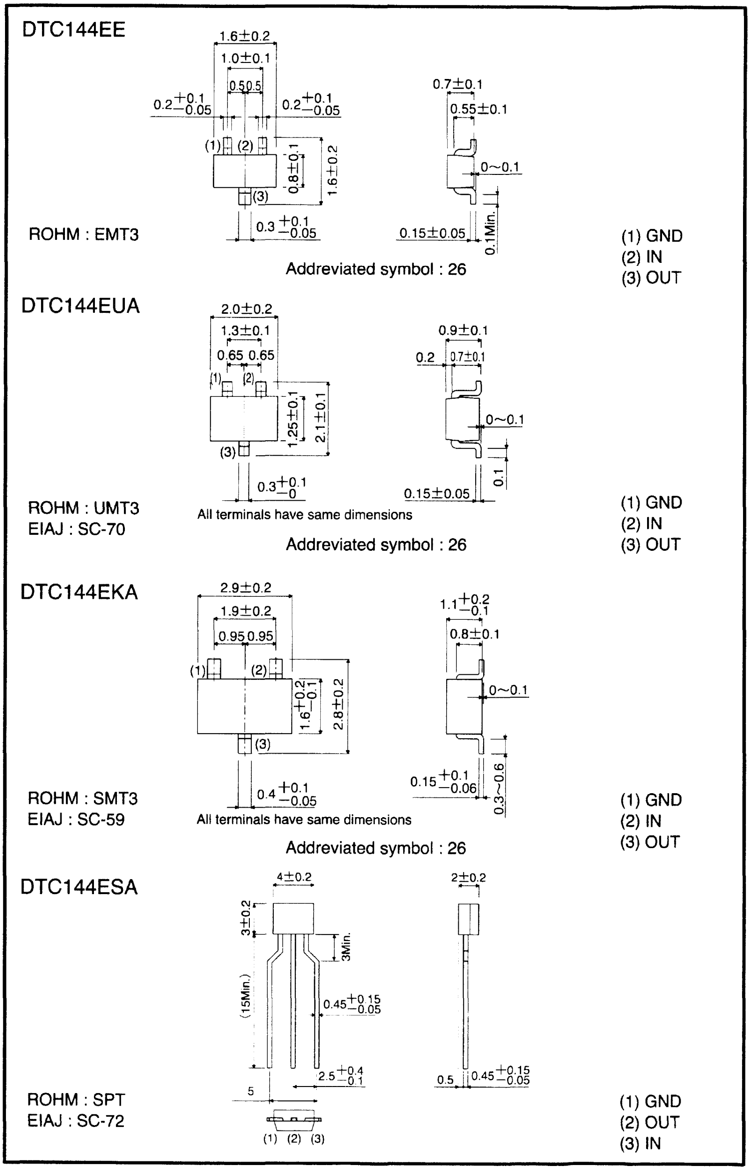
●Structure

PNP digital transistor
(Built-in resistors)

●Equivalent circuit



●External dimensions (Units: mm)



(96-337-C144E)

ROHM

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits (DTC144E□)				Unit
		E	UA	KA	SA	
Supply voltage	V_{CC}	50				V
Input voltage	V_{IN}	40				V
		−10				
Output current	I_O	30				mA
	$I_{C(Max.)}$	100				
Power dissipation	Pd	150	200		300	mW
Junction temperature	Tj	150				°C
Storage temperature	Tstg	−55~150				°C

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=2mA
Output voltage	$V_{O(on)}$	—	—	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.18	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=5V, I_O=5mA
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
Type	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC144EE		○			
DTC144EUA			○		
DTC144EKA				○	
DTC144ESA					○

Digital transistors

● Electrical characteristic curves

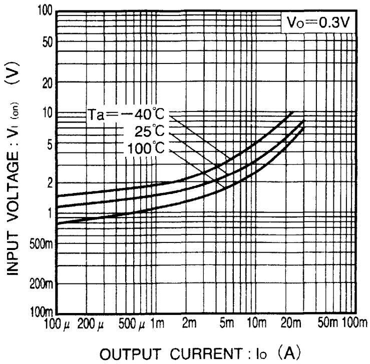


Fig.1 Input voltage vs. output current (ON characteristics)

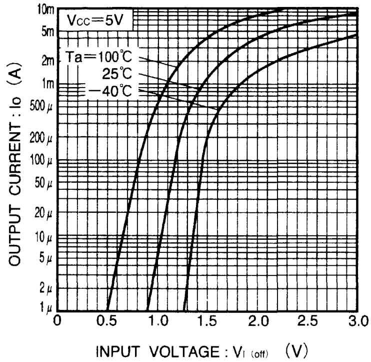


Fig.2 Output current vs. input voltage (OFF characteristics)

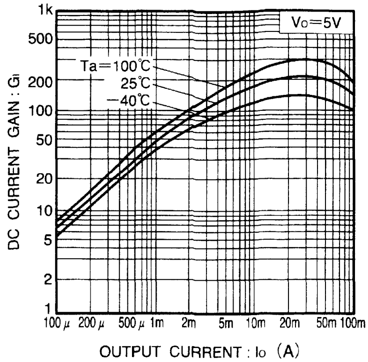


Fig.3 DC current gain vs. output current

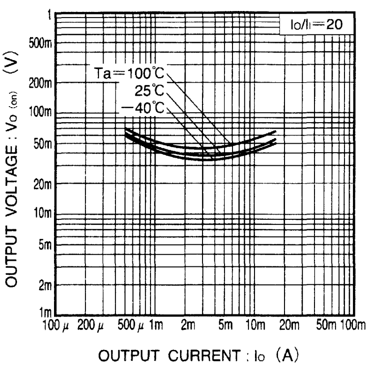


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)

DTC144TE / DTC144TUA / DTC144TKA
DTC144TSA

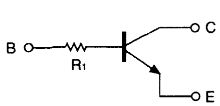
● Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

● Structure

NPN digital transistor
(Built-in resistor type)

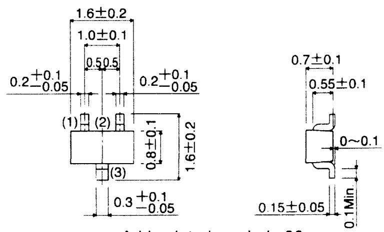
● Equivalent circuit



B : Base
C : Collector
E : Emitter

● External dimensions (Units: mm)

DTC144TE

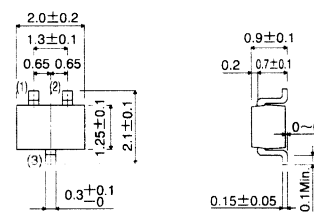


ROHM : EMT3

Addreviated symbol : 06

(1) Emitter
(2) Base
(3) Collector

DTC144TUA



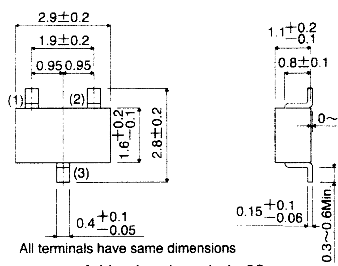
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : 06

(1) Emitter
(2) Base
(3) Collector

DTC144TKA



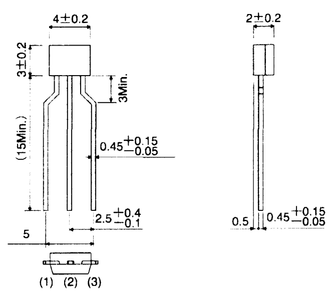
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : 06

(1) Emitter
(2) Base
(3) Collector

DTC144TSA



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC144T□) E	UA	KA	SA	Unit
Collector-base voltage	V_{CBO}	50				V
Collector-emitter voltage	V_{CEO}	50				V
Emitter-base voltage	V_{EBO}	5				V
Collector current	I_C	100				mA
Collector power dissipation	P_C	150	200		300	mW
Junction temperature	Tj	150				℃
Storage temperature	Tstg	−55～150				℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=5mA/0.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=1mA
Input resistance	R_1	32.9	47	61.1	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	EMT3	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping	Taping
	Code	TL	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	3000	5000
DTC144TE		○	—	—	—
DTC144TUA		—	○	—	—
DTC144TKA		—	—	○	—
DTC144TSA		—	—	—	○

● Electrical characteristic curves

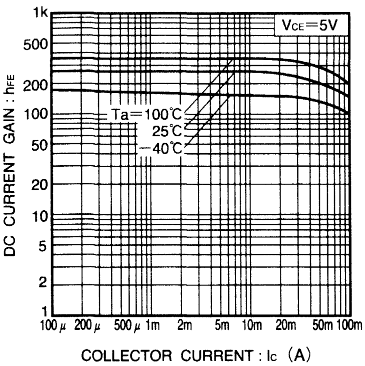


Fig.1 DC current gain vs. collector current

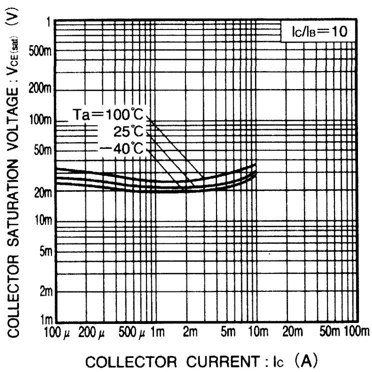


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital transistors

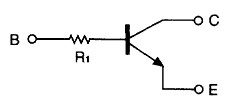
Digital transistors (built-in resistors)
DTC314TU / DTC314TK / DTC314TS

●Features
In addition to the features of regular digital transistors,

1) Low $V_{CE(sat)}$ makes these transistors optimal for muting circuits.
$V_{CE(sat)} = 40mV$ (Typ.)
($I_C/I_B = 50mA/2.5mA$)
2) They can be used at high current ($I_C = 600mA$).

●Structure
NPN digital transistor
(Built-in resistor type)

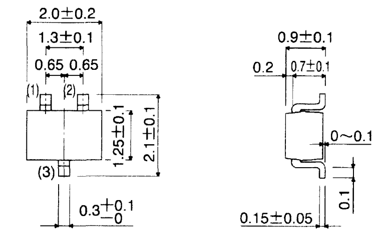
●Equivalent circuit



B : Base
C : Collector
E : Emitter

●External dimensions (Units: mm)

DTC314TU



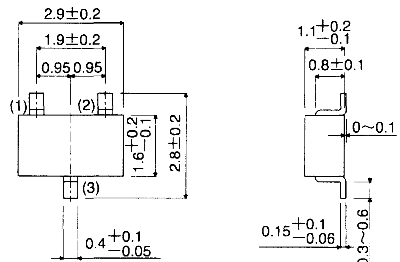
ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

Addreviated symbol : H04

(1) Emitter
(2) Base
(3) Collector

DTC314TK



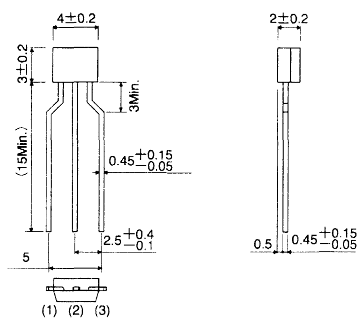
ROHM : SMT3
EIAJ : SC-59

All terminals have same dimensions

Addreviated symbol : H04

(1) Emitter
(2) Base
(3) Collector

DTC314TS



ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

(96-346-C314T)

ROHM

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC314T□) U	K	S	Unit
Collector-base voltage	V_{CBO}	30			V
Collector-emitter voltage	V_{CEO}	15			V
Emitter-base voltage	V_{EBO}	5			V
Collector current	I_C	600			mA
Collector power dissipation	P_C	200		300	mW
Junction temperature	Tj	150			℃
Storage temperature	Tstg	−55~150			℃

●Electrical characteristics (Ta = 25℃)

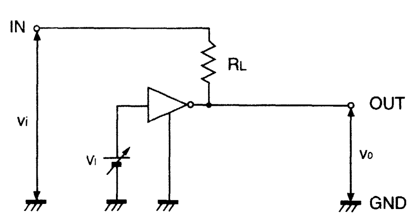
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	15	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	40	80	mV	I_C/I_B=50mA/2.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=50mA
Input resistance	R_1	7	10	13	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz *
Output "ON" resistance	Ron	—	1.5	—	Ω	V_I=7V, R_L=1kΩ, f=1kHz

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping
	Code	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	5000
DTC314TU		○	—	—
DTC314TK		—	○	—
DTC314TS		—	—	○

●Ron measurement circuit



$$Ron = \frac{V_O}{V_I - V_O} \times R_L$$

Fig.1 Output "ON" resistance (Ron) test circuit

● Electrical characteristic curves

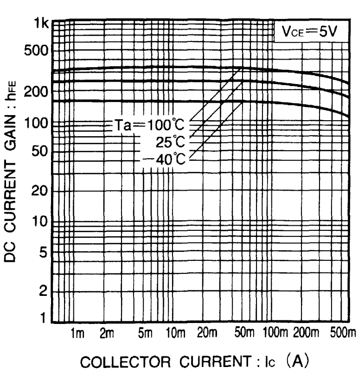


Fig.2 DC current gain vs. collector current

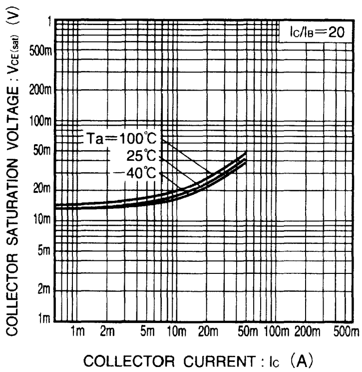


Fig.3 Collector-emitter saturation voltage vs. collector current

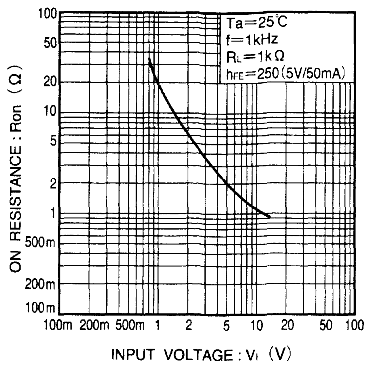


Fig.4 "ON" resistance vs. input voltage

Digital transistors (built-in resistors)

DTC363EU / DTC363EK / DTC363ES

●Features

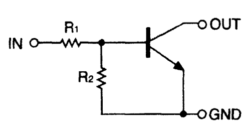
In addition to the features of regular digital transistors,

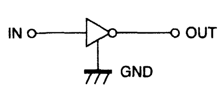
1) Low $V_{O(on)}$ makes these transistors optimal for muting circuits.
   $V_{O(on)}$ = 40mV (Typ.)
   (I_O/I_I = 50mA/2.5mA)
2) They can be used at high current (I_C = 600mA).

●Structure

NPN digital transistor
(Built-in resistor type)

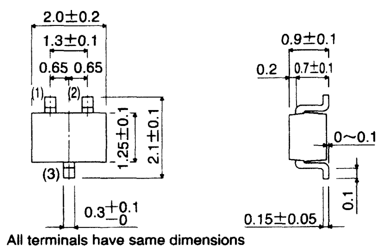
●Equivalent circuit





●External dimensions (Units: mm)

DTC363EU

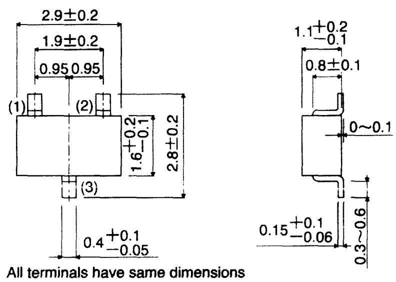


ROHM : UMT3
EIAJ : SC-70

Addreviated symbol : H27

(1) GND
(2) IN
(3) OUT

DTC363EK

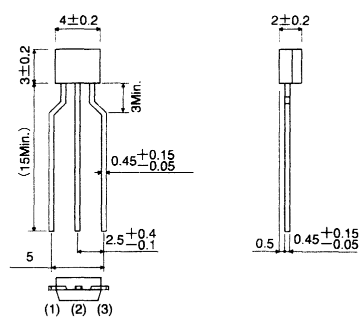


ROHM : SMT3
EIAJ : SC-59

Addreviated symbol : H27

(1) GND
(2) IN
(3) OUT

DTC363ES



ROHM : SPT
EIAJ : SC-72

(1) GND
(2) OUT
(3) IN

(96-350-C363E)

● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits(DTC363E□) U	K	S	Unit
Supply voltage	V_{CC}	20			V
Input voltage	V_{IN}	−10			V
		10			
Output current	I_C	600			mA
Power dissipation	Pd	200		300	mW
Junction temperature	Tj	150			°C
Storage temperature	Tstg	−55~150			°C

● Electrical characteristics (Ta = 25°C)

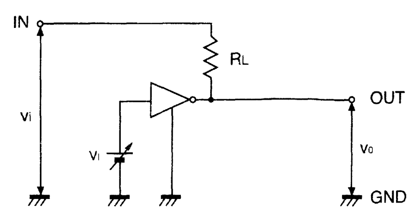
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	2	—	—		V_O=0.3V, I_O=10mA
Output voltage	$V_{O(on)}$	—	40	80	mV	I_O/I_I=50mA/2.5mA
Input current	I_I	—	—	1.3	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=15V, V_I=0V
DC current transfer ratio	G_I	70	—	—	—	V_O=5V, I_O=50mA
Input resistance	R_1	4.76	6.8	8.84	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz *
Output "ON" resistance	Ron	—	1.1	—	Ω	V_I=7V, R_L=1kΩ, f=1kHz

* Transition frequency of mounted transistor

● Packaging specifications

Type	Package	UMT3	SMT3	SPT
	Package style	Taping	Taping	Taping
	Code	T106	T146	TP
	Basic ordering unit (pieces)	3000	3000	5000
DTC363EU		○	—	—
DTC363EK		—	○	—
DTC363ES		—	—	○

● Ron measurement circuit



$$Ron = \frac{V_O}{V_I - V_O} \times R_L$$

Fig.1 Input "ON" resistance (Ron) test circuit

● Electrical characteristic curves

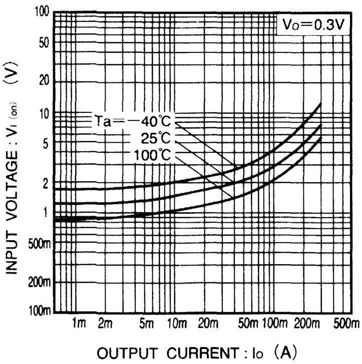


Fig.2 Input voltage vs. output current (ON characteristics)

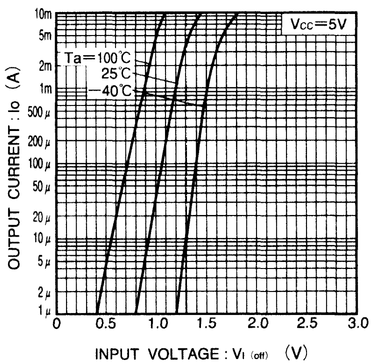


Fig.3 Output current vs. input voltage (OFF characteristics)

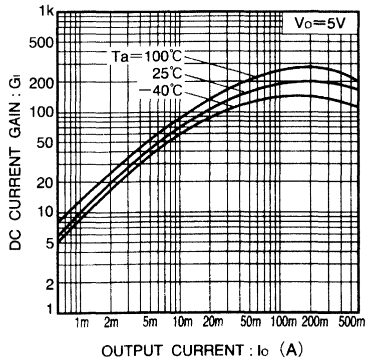


Fig.4 DC current gain vs. output current

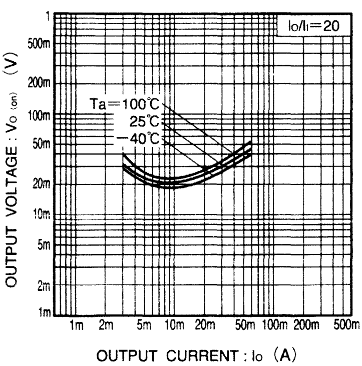


Fig.5 Output voltage vs. output current

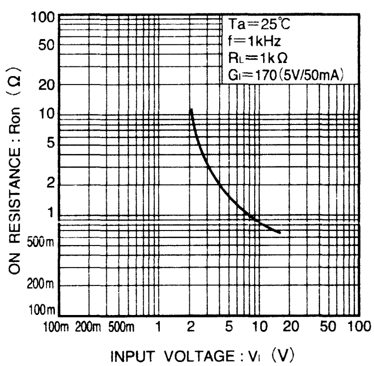


Fig.6 "ON" resistance vs. input voltage

Digital transistors

Digital transistors (built-in resistors)

DTC363TK / DTC363TS

●Features

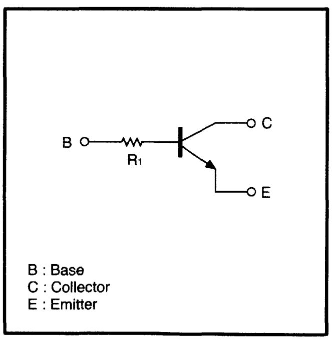
In addition to the features of regular digital transistors,

1) Low $V_{CE(sat)}$ makes these transistors optimal for muting circuits.
$V_{CE(sat)} = 40mV$ (Typ.)
$(I_C/I_B = 50mA/2.5mA)$
2) They can be used at high current ($I_C = 600mA$).

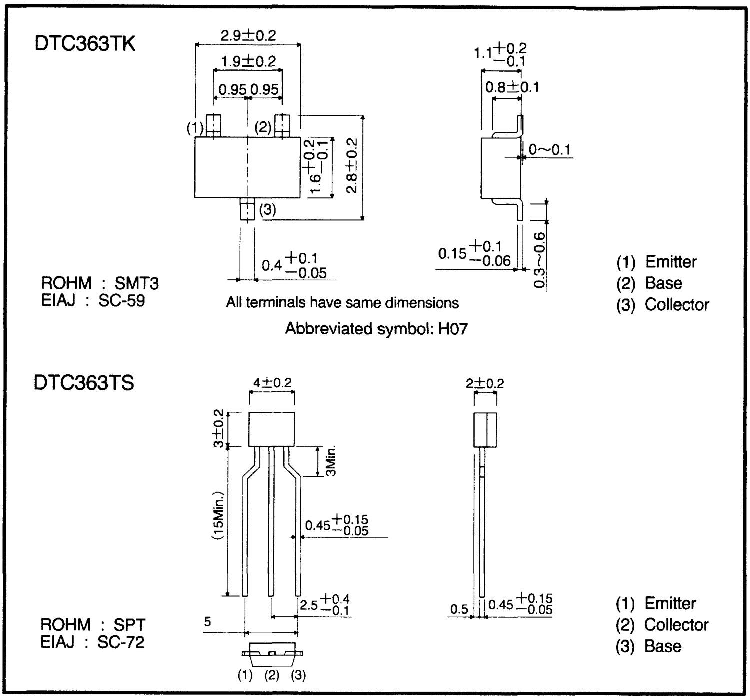
●Structure

NPN digital transistor
(Built-in resistor type)

●Equivalent circuit



●External dimensions (Units: mm)



● Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTC363T□) K	Limits(DTC363T□) S	Unit
Collector-base voltage	V_{CBO}	30		V
Collector-emitter voltage	V_{CEO}	15		V
Emitter-base voltage	V_{EBO}	5		V
Collector current	I_C	600		mA
Collector power dissipation	P_C	200	300	mW
Junction temperature	Tj	150		℃
Storage temperature	Tstg	−55~150		℃

● Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	15	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	40	80	mV	I_C/I_B=50mA/2.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=50mA
Input resistance	R_1	4.76	6.8	8.84	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz *
Output "ON" resistance	Ron	—	1.25	—	Ω	V_I=7V, R_L=1kΩ, f=1kHz

* Transition frequency of mounted transistor

● Packaging specifications

	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
Type	Basic ordering unit (pieces)	3000	5000
DTC363TK		○	—
DTC363TS		—	○

● Ron measurement circuit

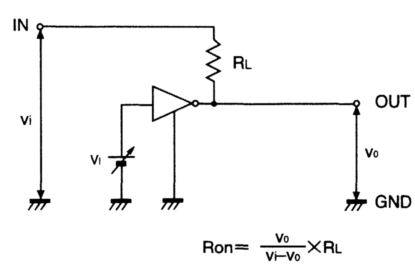


Fig.1 Input "on" resistance (Ron) measurement circuit

Digital transistors

● Electrical characteristic curves

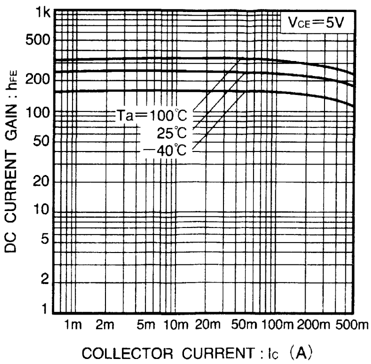


Fig.2 DC current gain vs. collector current

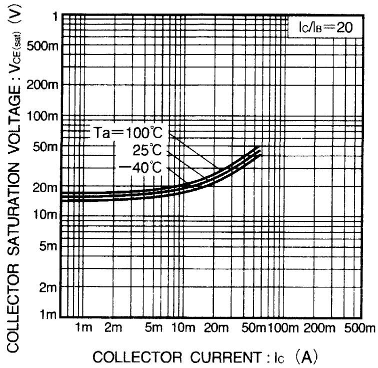


Fig.3 Collector-emitter saturation voltage vs. collector current

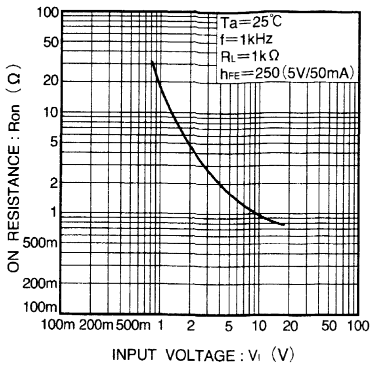


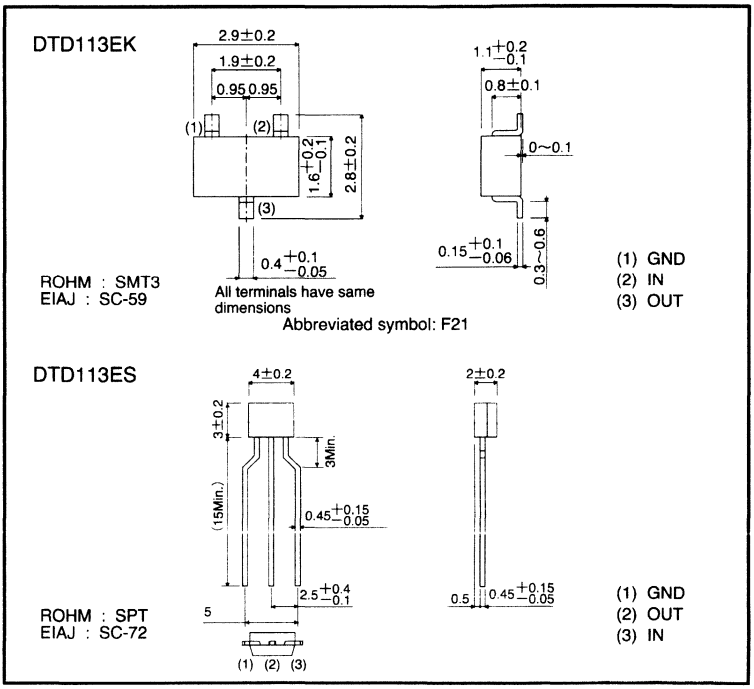
Fig.4 "ON" resistance vs. input voltage

Digital transistors (built-in resistors)
DTD113EK / DTD113ES

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
NPN digital transistor
(Built-in resistor type)

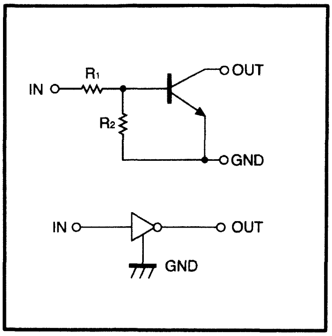
●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTD113E□) K	Limits(DTD113E□) S	Unit
Supply voltage	Vcc	50		V
Input voltage	VIN	10		V
		−10		
Output current	Ic	500		mA
Power dissipation	Pd	200	300	mW
Junction temperature	Tj	150		℃
Storage temperature	Tstg	−55~150		℃

●Equivalent circuit



●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=50mA/2.5mA
Input current	I_I	—	—	7.2	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	33	—	—	—	V_O=5V, I_O=50mA
Input resistance	R_1	0.7	1	1.3	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type			
	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
	Basic ordering unit (pieces)	3000	5000
DTD113EK		○	—
DTD113ES		—	○

●Electrical characteristic curves

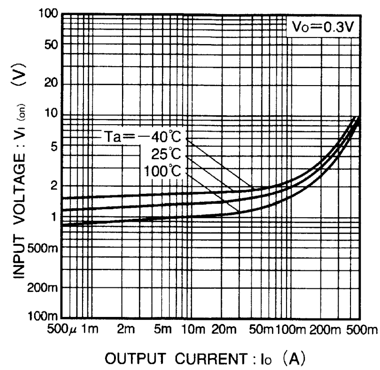


Fig.1 Input voltage vs. output current (ON characteristics)

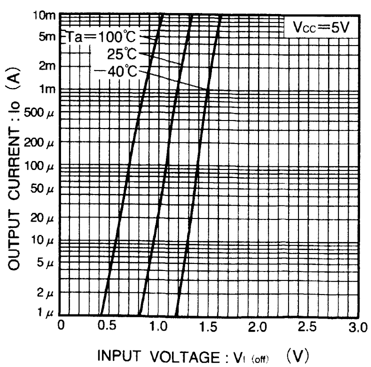


Fig.2 Output current vs. input voltage (OFF characteristics)

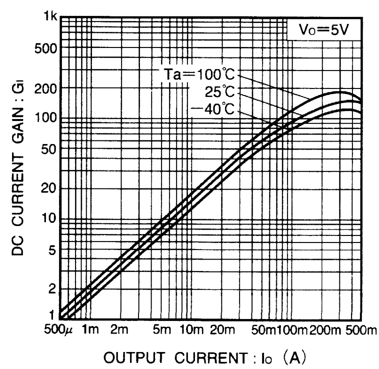


Fig.3 DC current gain vs. output current

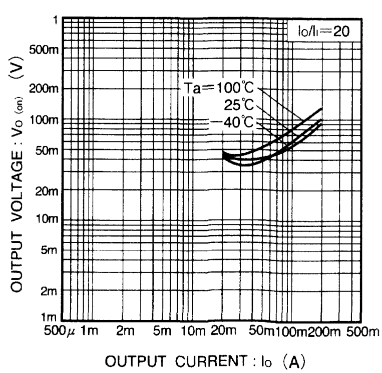


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTD113ZK / DTD113ZU / DTD113ZS

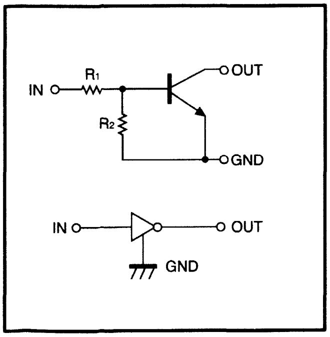
● Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

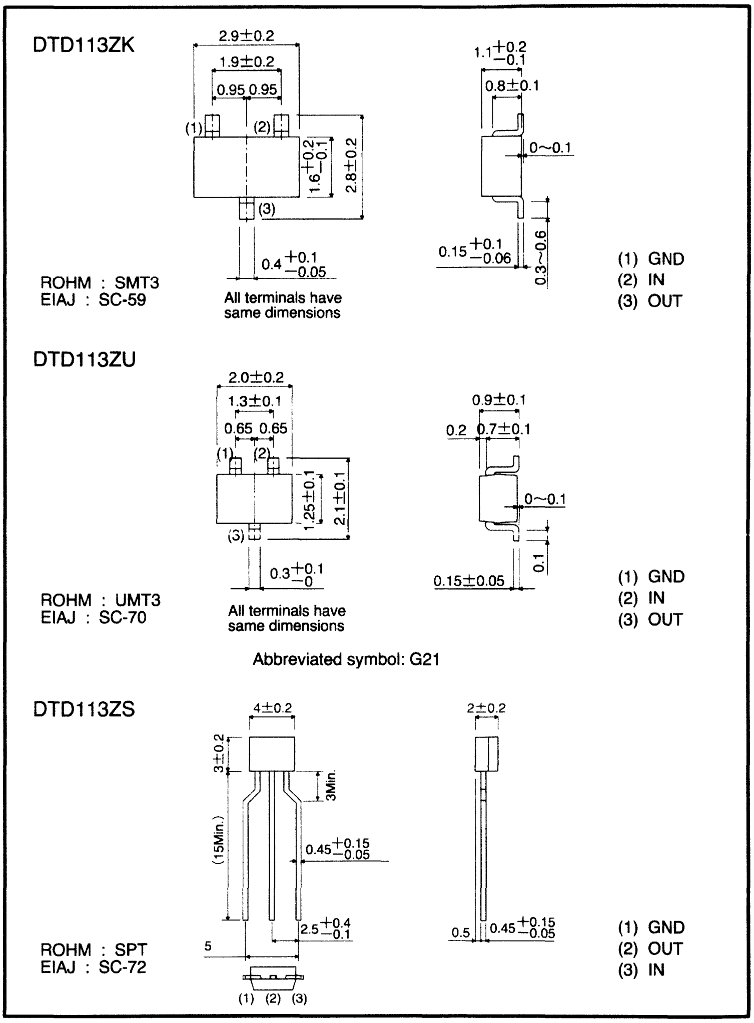
● Structure

NPN digital transistor
(Built-in resistor type)

● Equivalent circuit



● External dimensions (Units: mm)



(96-356-D113Z)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTD113Z□) U	K	S	Unit
Supply voltage	V_{CC}	50			V
Input voltage	V_{IN}	10			V
		−5			
Output current	I_C	500			mA
Power dissipation	Pd	200		300	mW
Junction temperature	Tj	150			℃
Storage temperature	Tstg	−55~150			℃

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=50mA/2.5mA
Input current	I_I	—	—	7.2	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=5V, I_O=50mA
Input resistance	R_1	0.7	1	1.3	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	SMT3	UMT3	SPT
	Package style	Taping	Taping	Taping
	Code	T146	T106	TP
Type	Basic ordering unit (pieces)	3000	3000	5000
DTD113ZK		○	—	—
DTD113ZU		—	○	—
DTD113ZS		—	—	○

● Electrical characteristic curves

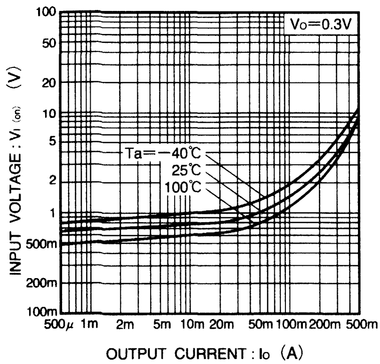


Fig.1 Input voltage vs. output current (ON characteristics)

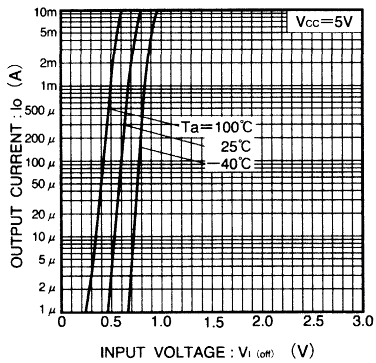


Fig.2 Output current vs. input voltage (OFF characteristics)

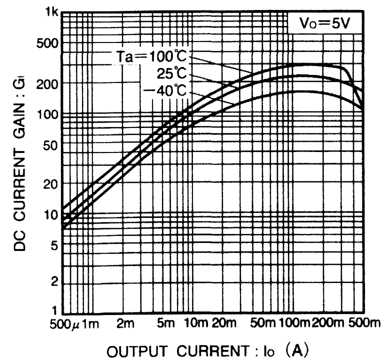


Fig. 3 DC current gain vs. output current

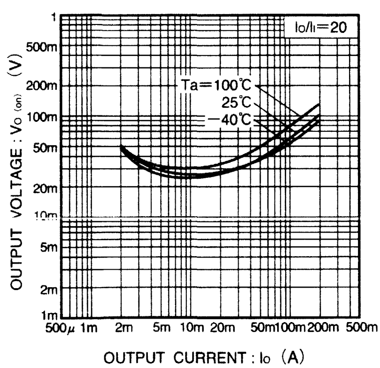


Fig.4 Output voltage vs. output current

Digital transistors

Digital transistors (built-in resistors)

DTD114EK / DTD114ES

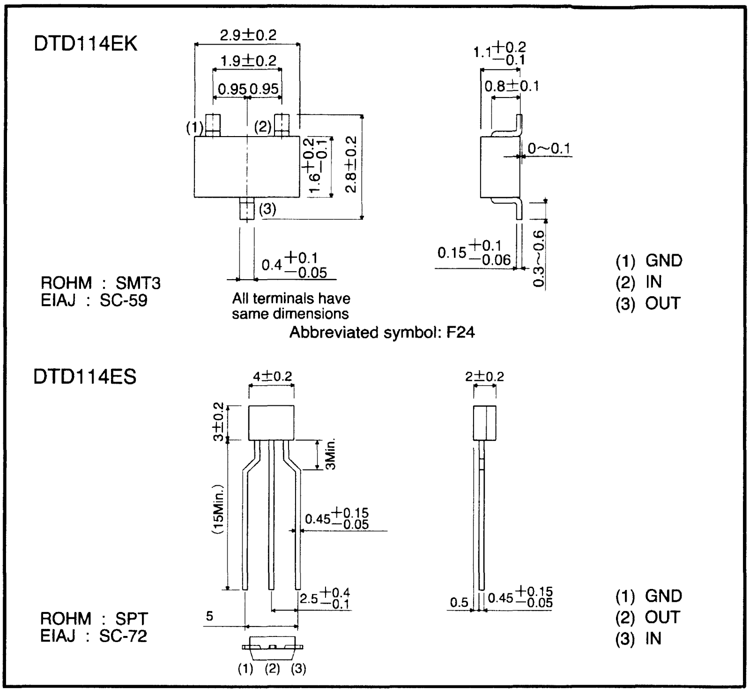
●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure

NPN digital transistor
(Built-in resistor type)

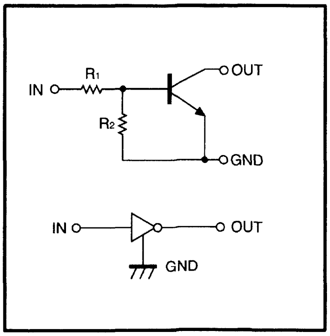
●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTD114E□) K	Limits(DTD114E□) S	Unit
Supply voltage	V_{CC}	50		V
Input voltage	V_{IN}	40		V
		−10		
Output current	I_C	500		mA
Power dissipation	Pd	200	300	mW
Junction temperature	Tj	150		℃
Storage temperature	Tstg	−55~150		℃

●Equivalent circuit



(96-354-D114E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=10mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=50mA/2.5mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=5V, I_O=50mA
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
	Basic ordering unit (pieces)	3000	5000
DTD114EK		○	—
DTD114ES		—	○

●Electrical characteristic curves

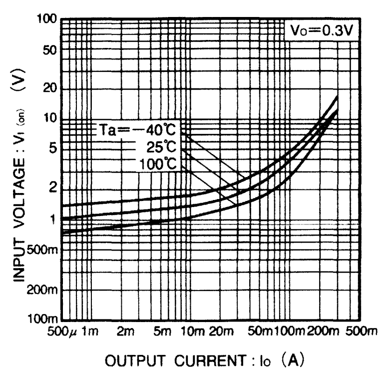


Fig.1 Input voltage vs. output current (ON characteristics)

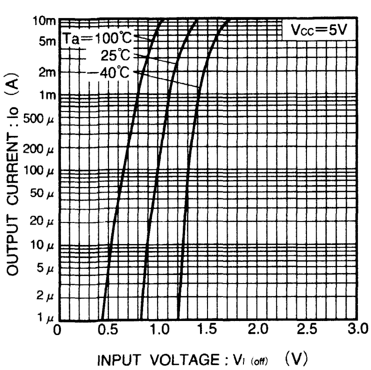


Fig.2 Output current vs. input voltage (OFF characteristics)

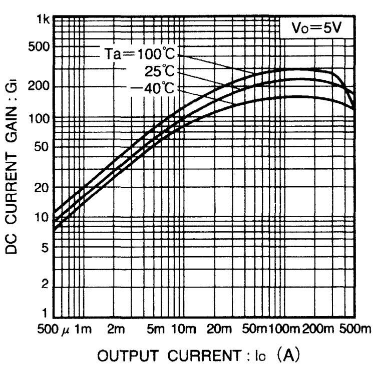


Fig.3 DC current gain vs. output current

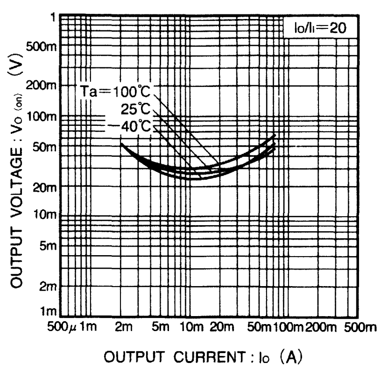


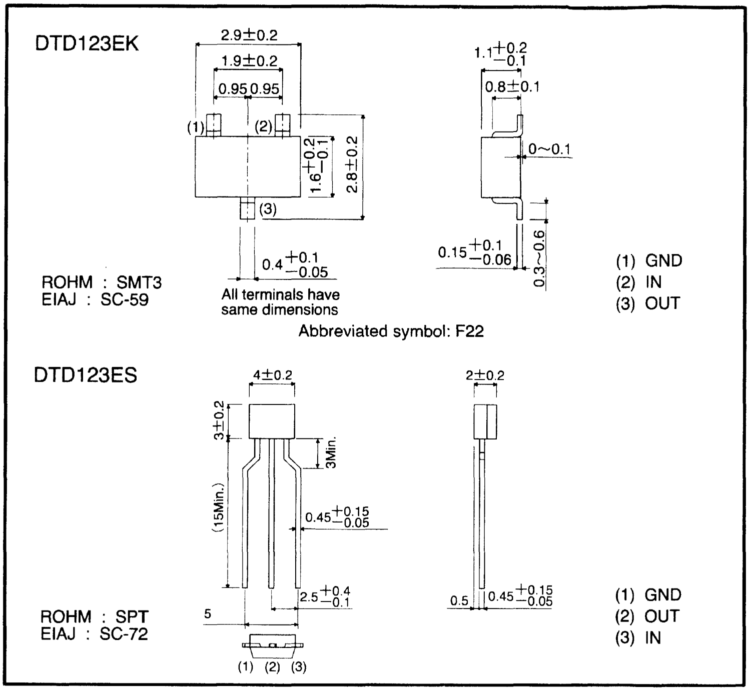
Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTD123EK / DTD123ES

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
NPN digital transistor
(Built-in resistor type)

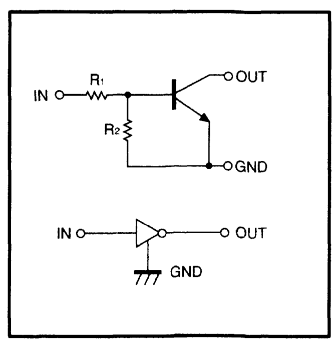
●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTD123E□) K	Limits(DTD123E□) S	Unit
Supply voltage	V_{CC}	50		V
Input voltage	V_{IN}	12		V
		−10		
Output current	I_C	500		mA
Power dissipation	Pd	200	300	mW
Junction temperature	Tj	150		℃
Storage temperature	Tstg	−55~150		℃

●Equivalent circuit



(96-366-D123E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=50mA/2.5mA
Input current	I_I	—	—	3.8	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	39	—	—	—	V_O=5V, I_O=50mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
Type	Basic ordering unit (pieces)	3000	5000
DTD123EK		○	—
DTD123ES		—	○

●Electrical characteristic curves

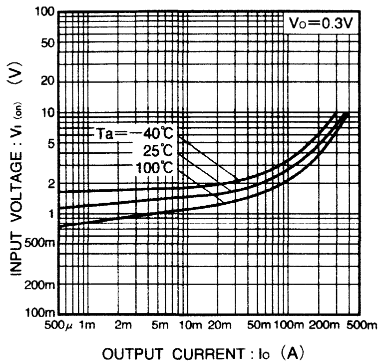


Fig.1 Input voltage vs. output current (ON characteristics)

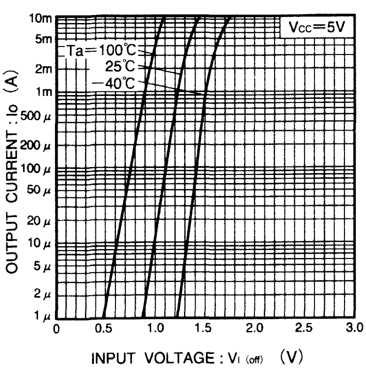


Fig.2 Output current vs. input voltage (OFF characteristics)

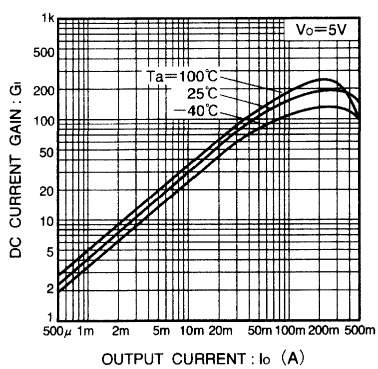


Fig.3 DC current gain vs. output current

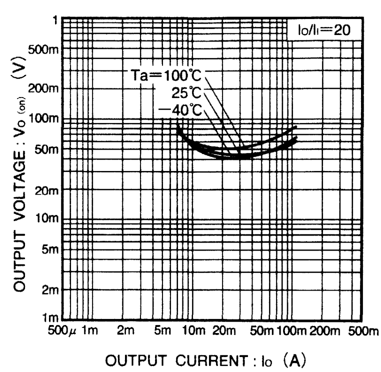


Fig.4 Output voltage vs. output current

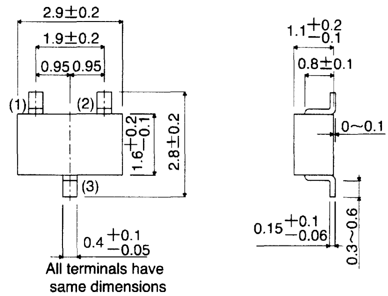
Digital transistors (built-in resistors)
DTD123TK / DTD123TS

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
NPN digital transistor
(Built-in resistor type)

●External dimensions (Units: mm)

DTD123TK

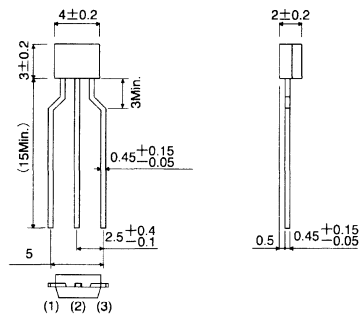


ROHM : SMT3
EIAJ : SC-59

Abbreviated symbol: F02

(1) Emitter
(2) Base
(3) Collector

DTD123TS



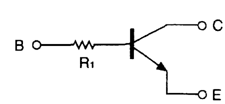
ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTD123T□) K	Limits(DTD123T□) S	Unit
Collector-base voltage	V_{CBO}	50		V
Collector-emitter voltage	V_{CEO}	40		V
Emitter-base voltage	V_{EBO}	5		V
Collector current	I_C	500		mA
Collector power dissipation	P_C	200	300	mW
Junction temperature	Tj	150		℃
Storage temperature	Tstg	−55~150		℃

●Equivalent circuit



B : Base
C : Collector
E : Emitter

(96-368-D123T)

ROHM

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	40	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=50m/2.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=50mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
	Basic ordering unit (pieces)	3000	5000
DTD123TK		○	—
DTD123TS		—	○

●Electrical characteristic curves

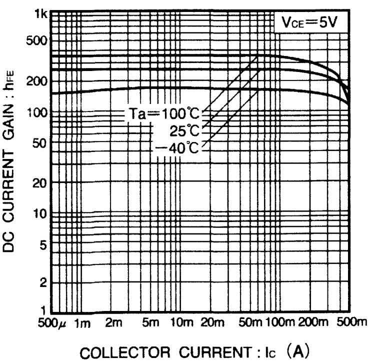


Fig.1 DC current gain vs. collector current

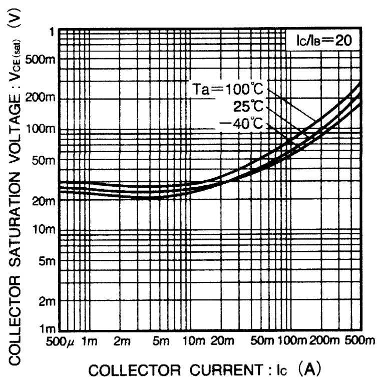


Fig.2 Collector-emitter saturation voltage vs. collector current

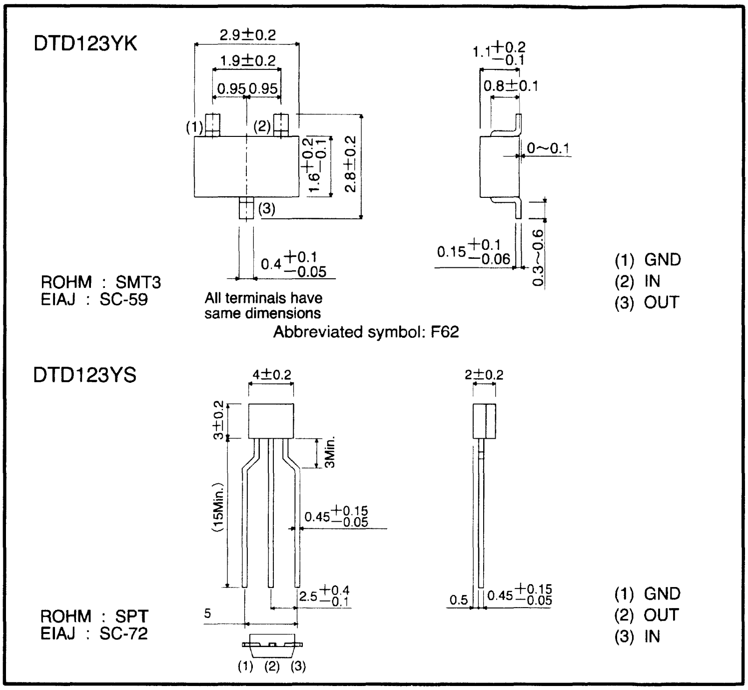
Digital transistors

Digital transistors (built-in resistors)
DTD123YK / DTD123YS

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
NPN digital transistor
(Built-in resistor type)

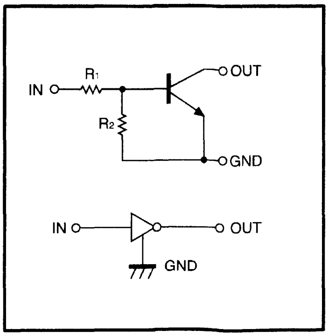
●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTD123Y□) K	Limits(DTD123Y□) S	Unit
Supply voltage	V_{CC}	50		V
Input voltage	V_{IN}	12		V
		−5		
Output current	I_C	500		mA
Power dissipation	Pd	200	300	mW
Junction temperature	Tj	150		℃
Storage temperature	Tstg	−55~150		℃

●Equivalent circuit



(96-370-D123Y)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	2	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=50mA/2.5mA
Input current	I_I	—	—	3.6	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current transfer ratio	G_I	56	—	—	—	V_O=5V, I_O=50mA
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	3.6	4.5	5.5	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type		SMT3	SPT
	Package	SMT3	SPT
	Package style	Taping	Taping
	Code	T146	TP
	Basic ordering unit (pieces)	3000	5000
DTD123YK		○	—
DTD123YS		—	○

●Electrical characteristic curves

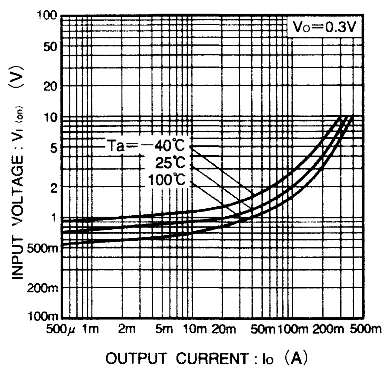


Fig.1 Input voltage vs. output current (ON characteristics)

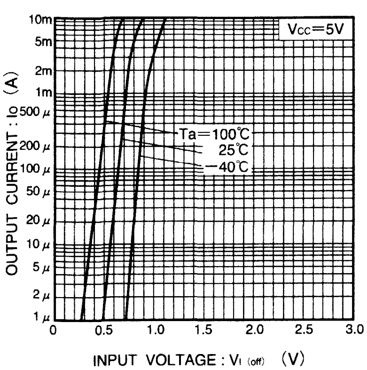


Fig.2 Output current vs. input voltage (OFF characteristics)

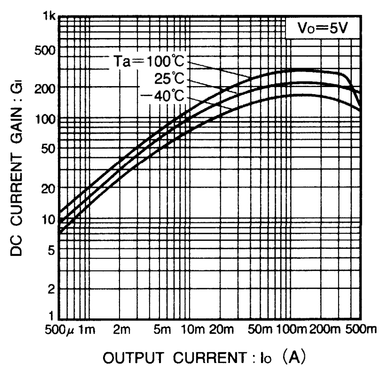


Fig. 3 DC current gain vs. output current

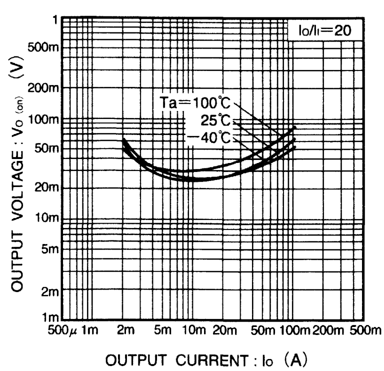


Fig.4 Output voltage vs. output current

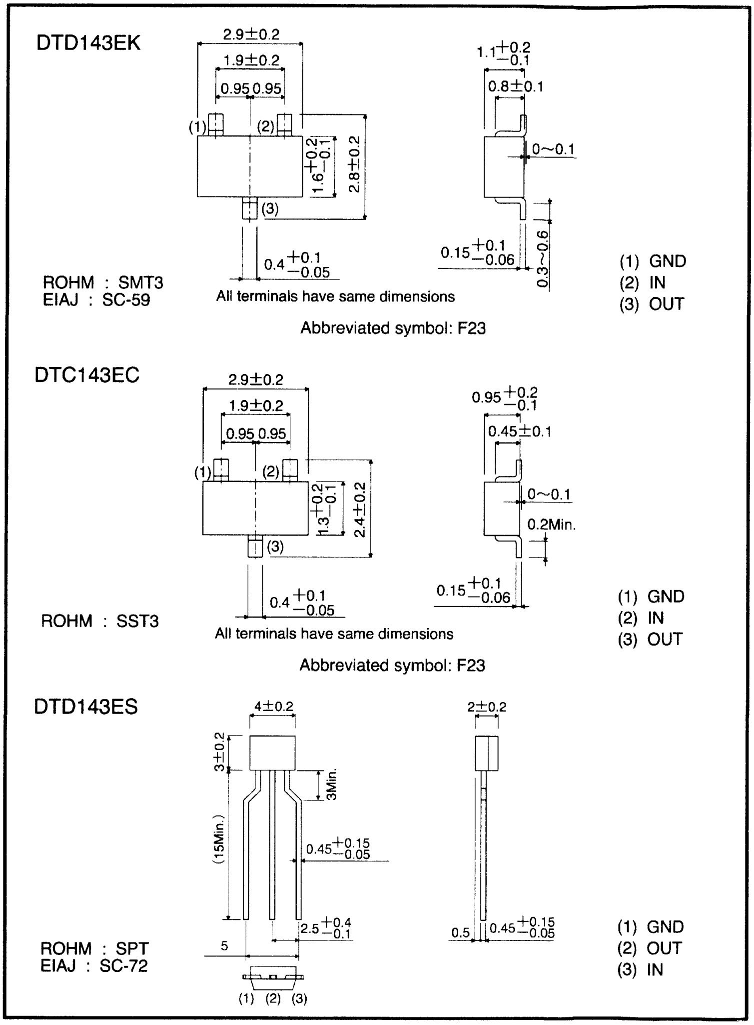
Digital transistors

Digital transistors (built-in resistors)
DTD143EK / DTD143ES / DTD143EC

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see the equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●Structure
NPN digital transistor
(Built-in resistor type)

●External dimensions (Units: mm)

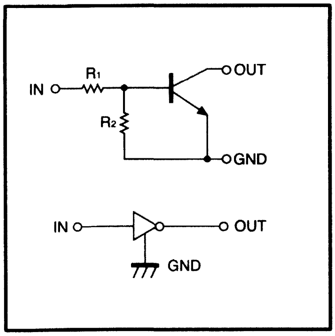


(96-372-D143E)

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits(DTD143E□) K	C	S	Unit
Supply voltage	V_{CC}	50			V
Input voltage	V_{IN}	30			V
		−10			V
Output current	I_C	500			mA
Power dissipation	Pd	200		300	mW
Junction temperature	Tj	150			℃
Storage temperature	Tstg	−55~150			℃

●Equivalent circuit



●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=50mA/2.5mA
Input current	I_I	—	—	1.8	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	47	—	—	—	V_O=5V, I_O=50mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	SMT3	SST3	SPT
	Package style	Taping	Taping	Taping
	Code	T146	T116	TP
Type	Basic ordering unit (pieces)	3000	3000	5000
DTD143EK		○	—	—
DTD143EC		—	—	○
DTD143ES		—	○	—

● Electrical characteristic curves

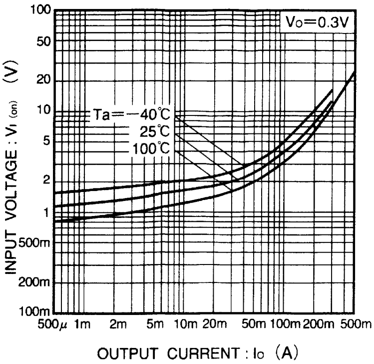


Fig.1 Input voltage vs. output current (ON characteristics)

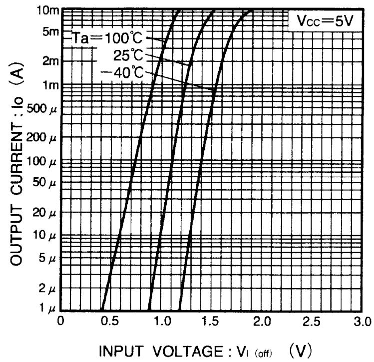


Fig.2 Output current vs. input voltage (OFF characteristics)

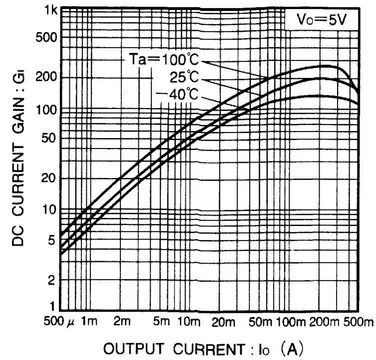


Fig.3 DC current gain vs. output current

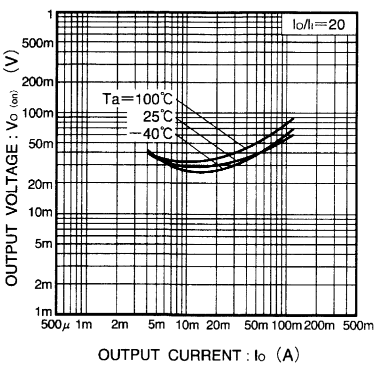
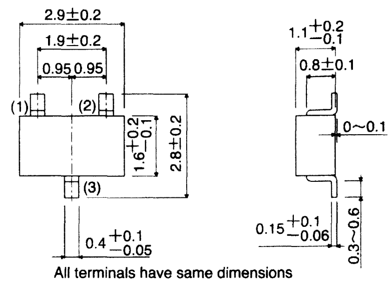


Fig.4 Output voltage vs. output current

Digital transistors (built-in resistors)
DTD143TK

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
3) Only the on/off conditions need to be set for operation, making device design easy.

●External dimensions (Units: mm)



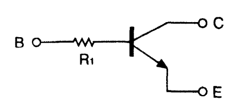
ROHM : SMT3
EIAJ : SC-59

Abbreviated symbol: F03

(1) Emitter
(2) Base
(3) Collector

●Structure
NPN digital transistor
(Built-in resistor type)

●Equivalent circuit



B : Base
C : Collector
E : Emitter

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	40	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	500	mA
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

Digital transistors

(96-374-D143T)

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	$I_C=50\mu A$
Collector-emitter breakdown voltage	BV_{CEO}	40	—	—	V	$I_C=1mA$
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	$I_E=50\mu A$
Collector cutoff current	I_{CBO}	—	—	0.5	μA	$V_{CB}=50V$
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	$V_{EB}=4V$
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	$I_C/I_B=50mA/2.5mA$
DC current transfer ratio	h_{FE}	100	250	600	—	$V_{CE}=5V$, $I_C=50mA$
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Transition frequency	f_T	—	200	—	MHz	$V_{CE}=10V$, $I_E=-50mA$, $f=100MHz$ *

* Transition frequency of mounted transistor

●Packaging specifications

	Package	SMT3
	Package style	Taping
	Code	T146
Type	Basic ordering unit (pieces)	3000
DTD143TK		○

●Electrical characteristic curves

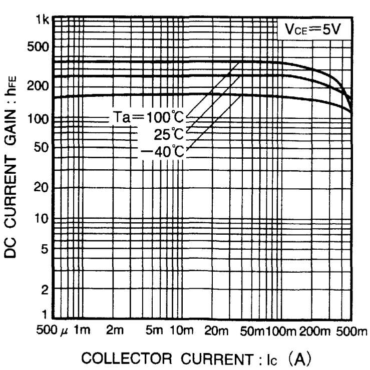


Fig.1 DC current gain vs. collector current

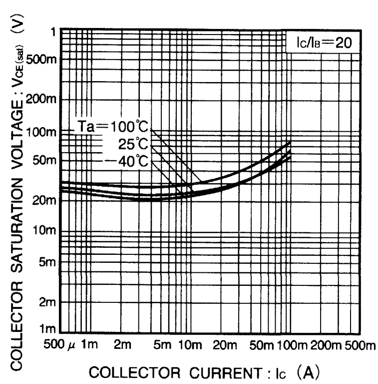


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital transistor (built-in resistors) Driver (60V,1A)

DTDG14GP

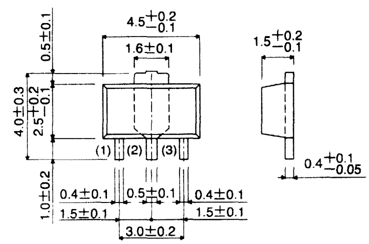
●Features

1) High h_{FE}.
   h_{FE} = 750 (Typ.) (V_{CE}/I_C = 2V/0.5A)
2) Low $V_{CE(sat)}$.
   (I_C/I_B = 500mA/5mA)
3) Built-in zener diode for strong protection against reverse surges due to low loads.

●Structure

NPN digital transistor
(Built-in resistor type)

●External dimensions (Units: mm)



ROHM : MPT3
EIAJ : SC-62

Abbreviated symbol: E01

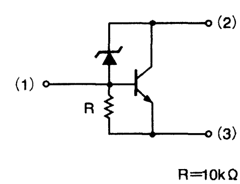
(1) Base
(2) Collector
(3) Emitter

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	60±10	V
Collector-emitter voltage	V_{CEO}	60±10	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	1	A
	I_{CP}	2	A(Pulse) ∗1
Collector power dissipation	P_C	0.5	W
		2	W ∗2
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

∗1 Pw≦10ms, Duty cycle≦1/2
∗2 On 40 x 40 x 0.7 mm ceramic board.

●Equivalent circuit



R=10kΩ

(1) : Base
(2) : Collector
(3) : Emitter

(96-376-DG14GP)

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	70	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	70	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=720 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=40V
Emitter cutoff current	I_{EBO}	300	—	580	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=500mA/5mA
DC current transfer ratio	h_{FE}	300	—	—	—	V_{CE}=2V, I_C=500mA
Emitter-base resistance	R	7	10	13	kΩ	—
Transition frequency	f_T	—	80	—	MHz	V_{CE}=5V, I_E=−0.1A, f=30MHz *

* Transition frequency of mounted transistor

●Packaging specifications

Type		
	Package	MPT3
	Package style	Taping
	Code	T100
	Basic ordering unit (pieces)	1000
DTDG14GP		○

●Electrical characteristic curves

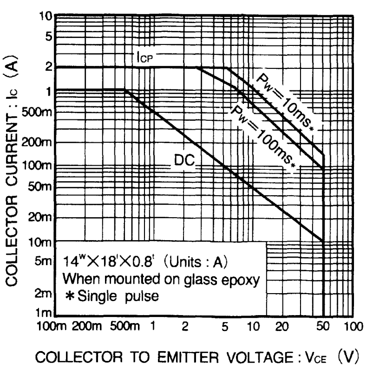


Fig.1 Safe operating area

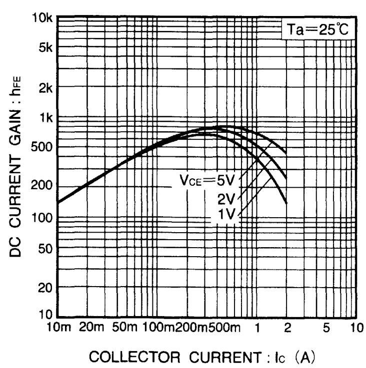


Fig.2 DC current gain vs. collector current

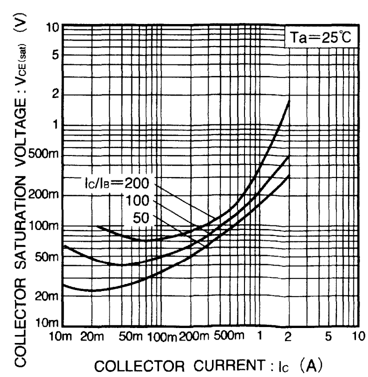


Fig.3 Collector-emitter saturation voltage vs. collector current

Digital transistor (built-in resistors) Driver (60V, 2A)

DTDS14GP

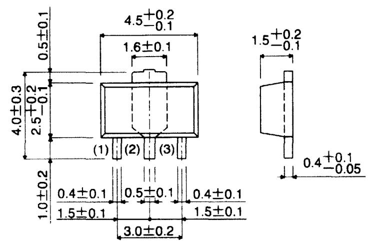
●Features

1) High h_{FE}.
   h_{FE} = 1500 (Typ.) (V_{CE} / I_C = 5V / 1A)
2) Low $V_{CE(sat)}$.
   $V_{CE(sat)}$ = 0.16V (Typ.)
   (I_C / I_B = 1A / 10mA)
3) Built-in zener diode for strong protection against reverse surges due to low loads.

●Structure

NPN digital transistor
(Built-in resistor type)

●External dimensions (Units: mm)

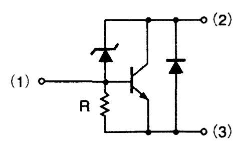


ROHM : MPT3
EIAJ : SC-62

Abbreviated symbol: S01

(1) Base
(2) Collector
(3) Emitter

●Equivalent circuit



R=10kΩ

(1) : Base
(2) : Collector
(3) : Emitter

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	60±10	V
Collector-emitter voltage	V_{CEO}	60±10	V
Emitter-base voltage	V_{EBO}	10	V
Collector curren	I_C	2	A
	I_{CP}	4	A(Pulse) ∗1
Base current	I_B	0.03	A
Collector power dissipation	P_C	0.5	W
		2	W ∗2
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

∗1 Pw≦10ms, Duty≦1/2
∗2 On 40 x 40 x 0.7 mm ceramic board.

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	70	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	70	V	I_C=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=40V
Emitter cutoff current	I_{EBO}	0.77	—	1.43	mA	V_{EB}=10V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=1A/10mA
DC current transfer ratio	h_{FE}	700	—	—	—	V_{CE}=5V, I_C=200mA ＊1
		1000	—	—	—	V_{CE}=5V, I_C=1A ＊1
		500	—	—	—	V_{CE}=5V, I_C=2A ＊1
Transition frequency	f_T	—	300	—	MHz	V_{CE}=5V, I_E=−0.5A, f=100MHz ＊2
Emitter-base resistance	R	7	10	13	kΩ	—
Diode forward voltage	V_F	—	—	1.5	V	I_F=1.0A

＊1 Measured using pulse current.

＊2 Transition frequency of mounted transistor.

●Packaging specifications

Type	Package	MPT3
	Package style	Taping
	Code	T100
	Basic ordering unit (pieces)	1000
DTDS14GP		○

●Electrical characteristic curves

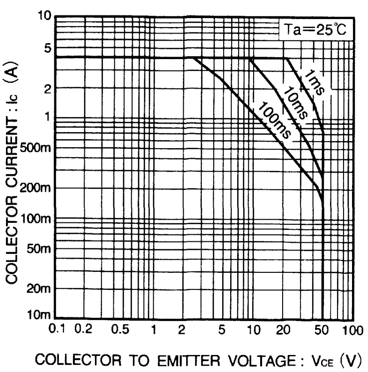


Fig.1 Safe operating area

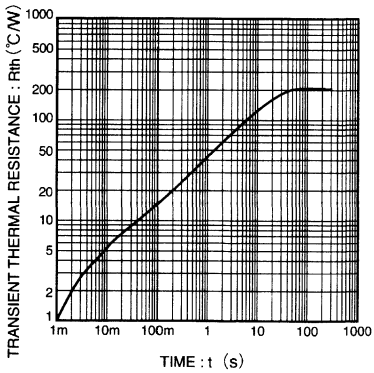


Fig.2 Transient thermal resistance

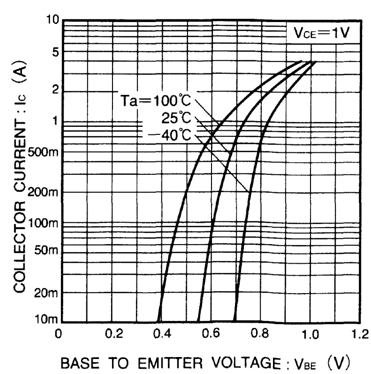


Fig.3 Grounded emitter propagation characteristics

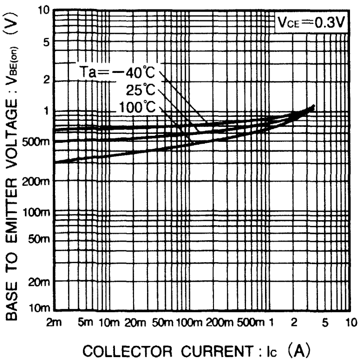


Fig.4 Grounded emitter propagation characteristics

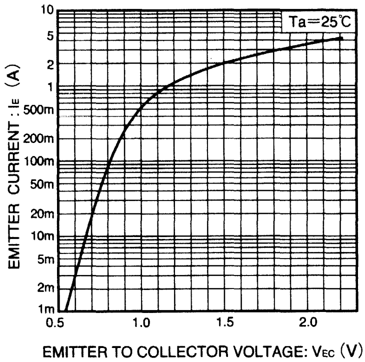


Fig.5 Emitter-collector diode forward characteristics

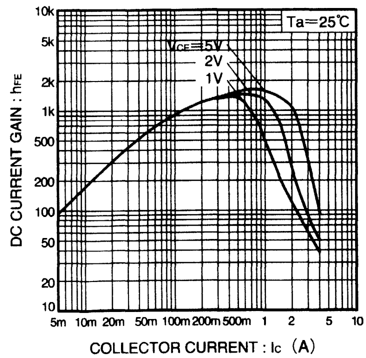


Fig.6 DC current gain vs. collector current (I)

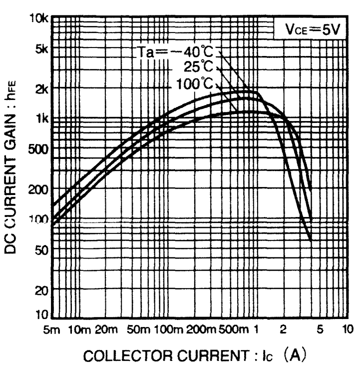


Fig.7 DC current gain vs. collecto rcurrent (II)

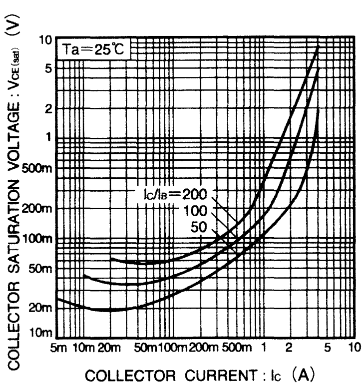


Fig.8 Collector-emitter saturation voltage vs. collector current (I)

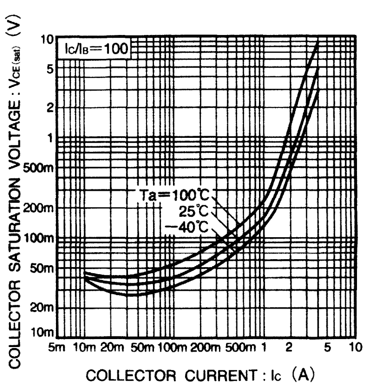


Fig.9 Collector-emitter saturation voltage vs. collector current (II)

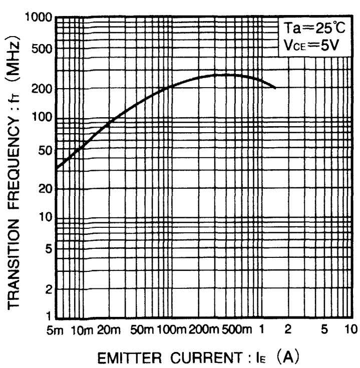


Fig.10 Gain bandwidth product vs. emitter current

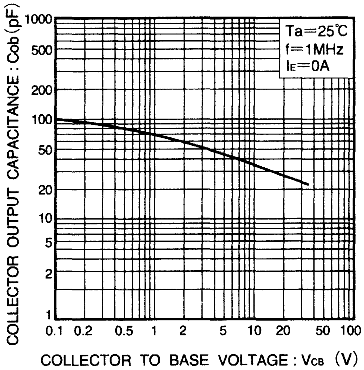


Fig.11 Collector output capacitance vs. collector-base voltage

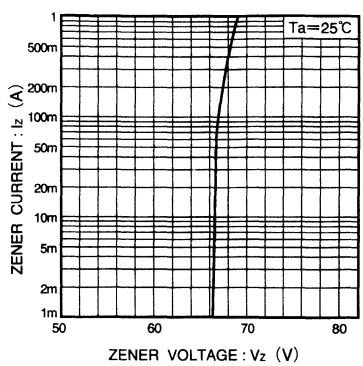


Fig.12 Zener characteristics

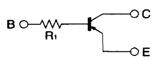
Digital transistors

Digital transistor (built-in resistors)
DTA113TKA

●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



E : Emitter
C : Collector
B : Base

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−5~10	V
Collector current	I_C	−100	mA
Collector Power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTA113TKA
Package	SMT3
Marking	91
Code	T146
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−10mA/−1mA
DC current transfer ratio	h_{FE}	100	250	600	—	I_C=−1mA , V_{CE}=−5V
Input resistance	R_1	0.7	1	1.3	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CB}=−10V , I_E=5mA , f=100MHz *

* Transition frequency of mounted transistor.

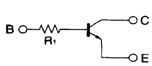
(SPEC-A113T)

Digital transistor (built-in resistors)
DTC123TKA

●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



E : Emitter
C : Collector
B : Base

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	100	mA
Collector Power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC123TKA
Package	SMT3
Marking	02
Code	T146
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=5mA/0.25mA
DC current transfer ratio	h_{FE}	100	250	600	—	I_C=1mA , V_{CE}=5V
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CB}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

(SPEC-C123T)

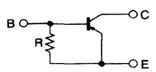
Digital transistors (built-in resistors)

DTA114GE / DTA114GUA / DTA114GKA / DTA114GSA

●Features

1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●Circuit schematic



E : Emitter
C : Collector
B : Base

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−50	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−100	mA
Collector Power dissipation	DTA114GE	Pc	150	mW
	DTA114GUA / DTA114GKA		200	
	DTA114GSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTA114GE	DTA114GUA	DTA114GKA	DTA114GSA
Package	EMT3	UMT3	SMT3	SPT
Marking	K14	K14	K14	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−720μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	−300	—	−580	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C=−10mA , I_B=−0.5mA
DC current transfer ratio	h_{FE}	30	—	—	—	I_C=−5mA , V_{CE}=−5V
Emitter-base resistance	R	7	10	13	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-510-A114G)

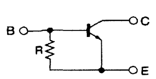
Digital transistors (built-in resistors)

DTC114GUA / DTC114GKA / DTC114GSA

●Features

1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●Circuit schematic



E : Emitter
C : Collector
B : Base

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector Power dissipation	DTC114GUA / DTC114GKA	Pc	200	mW
	DTC114GSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC114GUA	DTC114GKA	DTC114GSA
Package	UMT3	SMT3	SPT
Marking	K24	K24	—
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=720μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	300	—	580	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C=10mA , I_B=0.5mA
DC current transfer ratio	h_{FE}	300	—	—	—	I_C=5mA , V_{CE}=5V
Emitter-base resistance	R	7	10	13	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-629-C114G)

Digital transistors

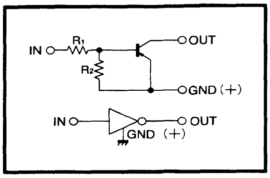
Digital transistors (built-in resistors)

DTA114WE / DTA114WUA / DTA114WKA / DTA114WSA

●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_I	−30	V
			10	
Output current		I_O	−100	mA
		I_{CMax}	−100	
Power dissipation	DTA114WE	Pd	150	mW
	DTA114WUA / DTA114WKA		200	
	DTA114WSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55∼150	℃

●Package, marking, and packaging specifications

Type	DTA114WE	DTA114WUA	DTA114WKA	DTA114WSA
Package	EMT3	UMT3	SMT3	SPT
Marking	74	74	74	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.8	V	V_{CC}=−50V , I_O=−100 μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V , I_O=−2mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−10mA , I_I=−0.5mA
Input current	I_I	—	—	−0.88	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V , V_I=0V
DC current gain	G_I	24	—	—	—	I_O=−10mA , V_O=−5V
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.37	0.47	0.57	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-516-A114W)

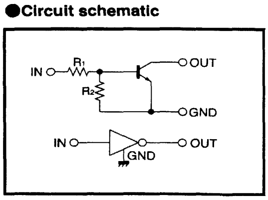
Digital transistors (built-in resistors)

DTC114WE / DTC114WUA / DTC114WKA / DTC114WSA

●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_I	30	V
			−10	
Output current		I_O	100	mA
		I_{CMax}	100	
Power dissipation	DTC114WE	Pd	150	mW
	DTC114WUA / DTC114WKA		200	
	DTC114WSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55∼150	℃

●Package, marking, and packaging specifications

Type	DTC114WE	DTC114WUA	DTC114WKA	DTC114WSA
Package	EMT3	UMT3	SMT3	SPT
Marking	84	84	84	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.8	V	V_{CC}=5V , I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V , I_O=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=10mA , I_I=0.5mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V , V_I=0V
DC current gain	G_I	24	—	—	—	I_O=10mA , V_O=5V
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.37	0.47	0.57	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-635-C114W)

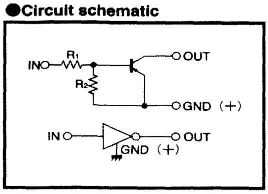
Digital transistors (built-in resistors)

DTA115EE / DTA115EUA / DTA115EKA / DTA115ESA

●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		Vcc	−50	V
Input voltage		V_I	−40	V
			10	
Output current		I_O	−20	mA
		I_{CMax}	−100	
Power dissipation	DTA115EE	Pd	150	mW
	DTA115EUA / DTA115EKA		200	
	DTA115ESA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTA115EE	DTA115EUA	DTA115EKA	DTA115ESA
Package	EMT3	UMT3	SMT3	SPT
Marking	19	19	19	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V , I_O=−100 μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V , I_O=−1mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−5mA , I_I=−0.25mA
Input current	I_I	—	—	−0.15	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V , V_I=0V
DC current gain	G_I	82	—	—	—	I_O=−5mA , V_O=−5V
Input resistance	R_1	70	100	130	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-522-A115E)

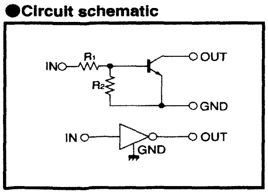
Digital transistors (built-in resistors)

DTC115EE / DTC115EUA / DTC115EKA / DTC115ESA

●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		Vcc	50	V
Input voltage		V_I	40	V
			−10	
Output current		I_O	20	mA
		I_{CMax}	100	
Power dissipation	DTC115EE	Pd	150	mW
	DTC115EUA / DTC115EKA		200	
	DTC115ESA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC115EE	DTC115EUA	DTC115EKA	DTC115ESA
Package	EMT3	UMT3	SMT3	SPT
Marking	69	69	69	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V , I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V , I_O=1mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=5mA , I_I=0.25mA
Input current	I_I	—	—	0.15	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V , V_I=0V
DC current gain	G_I	82	—	—	—	I_O=5mA , V_O=5V
Input resistance	R_1	70	100	130	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-644-C115E)

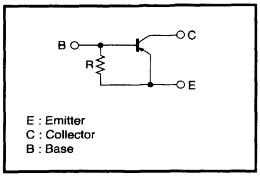
Digital transistors (built-in resistors)

DTA115GUA / DTA115GKA

●Features

1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−100	mA
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTA115GUA	DTA115GKA
Package	UMT3	SMT3
Marking	K19	K19
Code	T106	T146
Basic ordering unit (pieces)	3000	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−72 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	−30	—	−58	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C=−10mA , I_B=−0.5mA
DC current transfer ratio	h_{FE}	82	—	—	—	I_C=−5mA , V_{CE}=−5V
Emitter-base resistance	R	70	100	130	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-525-A115G)

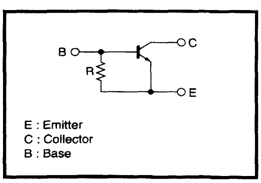
Digital transistors (built-in resistors)

DTC115GUA / DTC115GKA

●Features

1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	100	mA
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC115GUA	DTC115GKA
Package	UMT3	SMT3
Marking	K29	K29
Code	T106	T146
Basic ordering unit (pieces)	3000	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=72 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	30	—	58	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C=10mA , I_B=0.25mA
DC current transfer ratio	h_{FE}	82	—	—	—	I_C=5mA , V_{CE}=5V
Emitter-base resistance	R	70	100	130	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

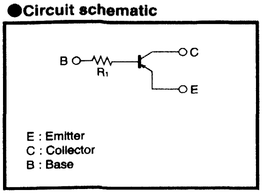
* Transition frequency of mounted transistor.

(94S-647-C115G)

Digital transistors (built-in resistors)
DTA115TE / DTA115TUA / DTA115TKA / DTA115TSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−50	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−100	mA
Collector power dissipation	DTA115TE	P_C	150	mW
	DTA115TUA / DTA115TKA		200	
	DTA115TSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTA115TE	DTA115TUA	DTA115TKA	DTA115TSA
Package	EMT3	UMT3	SMT3	SPT
Marking	99	99	99	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	$I_C=-50\mu A$
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	$I_C=-1mA$
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	$I_E=-50\mu A$
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	$V_{CB}=-50V$
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	$V_{EB}=-4V$
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	$I_C/I_B=-1mA/-0.1mA$
DC current transfer ratio	h_{FE}	100	250	600	—	$I_C=-1mA$, $V_{CE}=-5V$
Input resistance	R_1	70	100	130	kΩ	—
Transition frequency	f_T	—	250	—	MHz	$V_{CE}=-10V$, $I_E=5mA$, f=100MHz *

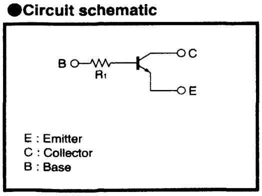
* Transition frequency of mounted transistor.

(96-259-A115T)

Digital transistors (built-in resistors)
DTC115TUA / DTC115TKA / DTC115TSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector power dissipation	DTC115TUA / DTC115TKA	P_C	200	mW
	DTC115TSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC115TUA	DTC115TKA	DTC115TSA
Package	UMT3	SMT3	SPT
Marking	09	09	—
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	$I_C=50\mu A$
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	$I_C=1mA$
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	$I_E=50\mu A$
Collector cutoff current	I_{CBO}	—	—	0.5	μA	$V_{CB}=50V$
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	$V_{EB}=4V$
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	$I_C/I_B=1mA/0.1mA$
DC current transfer ratio	h_{FE}	100	250	600	—	$I_C=1mA$, $V_{CE}=5V$
Input resistance	R_1	70	100	130	kΩ	—
Transition frequency	f_T	—	250	—	MHz	$V_{CE}=10V$, $I_E=-5mA$, f=100MHz *

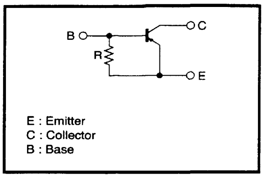
* Transition frequency of mounted transistor.

(96-317-C115T)

Digital transistors (built-in resistors)
DTA124GKA / DTA124GSA

●Features
1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−50	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−100	mA
Collector power dissipation	DTA124GKA	P_C	200	mW
	DTA124GSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTA124GKA	DTA124GSA
Package	SMT3	SPT
Marking	K15	—
Code	T146	TP
Basic ordering unit (pieces)	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−330 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	−140	—	−260	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C=−10mA , I_B=−0.5mA
DC current transfer ratio	h_{FE}	56	—	—	—	I_C=−5mA , V_{CE}=−5V
Emitter-base resistance	R	15.4	22	28.6	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

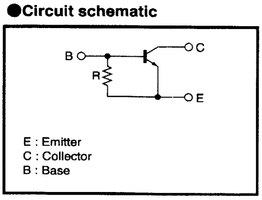
* Transition frequency of mounted transistor.

(94-543-A124G)

Digital transistors (built-in resistors)
DTC124GUA / DTC124GKA / DTC124GSA

●Features
1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector power dissipation	DTC124GUA/DTC124GKA	P_C	200	mW
	DTC124GSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC124GUA	DTC124GKA	DTC124GSA
Package	UMT3	SMT3	SPT
Marking	K25	K25	—
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=330 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	140	—	260	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C=10mA , I_B=0.5mA
DC current transfer ratio	h_{FE}	56	—	—	—	I_C=5mA , V_{CE}=5V
Emitter-base resistance	R	15.4	22	28.6	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

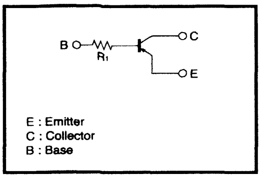
* Transition frequency of mounted transistor.

(94S-665-C124G)

Digital transistor (built-in resistors)
DTA125TUA / DTA125TKA / DTA125TSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−50	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−100	mA
Collector power dissipation	DTA125TUA / DTA125TKA	P_C	200	mW
	DTA125TSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTA125TUA	DTA125TKA	DTA125TSA
Package	UMT3	SMT3	SPT
Marking	9A	9A	−
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	−	−	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	−	−	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	−	−	V	I_E=−50μA
Collector cutoff current	I_{CBO}	−	−	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	−	−	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−0.3	V	I_C=−0.5mA , I_B=−0.05mA
DC current transfer ratio	h_{FE}	100	250	600	−	I_C=−1mA , V_{CE}=−5V
Input resistance	R_1	70	100	130	kΩ	−
Transition frequency	f_T	−	250	−	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

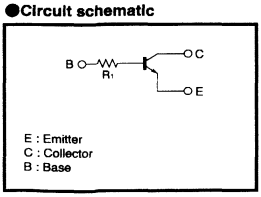
* Transition frequency of mounted transistor.

(94S-552-A125T)

Digital transistor (built-in resistors)
DTC125TUA / DTC125TKA / DTC125TSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector power dissipation	DTC125TUA / DTC125TKA	P_C	200	mW
	DTC125TSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC125TUA	DTC125TKA	DTC125TSA
Package	UMT3	SMT3	SPT
Marking	0A	0A	−
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	−	−	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	−	−	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	−	−	V	I_E=50μA
Collector cutoff current	I_{CBO}	−	−	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	−	−	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	0.3	V	I_C=0.5mA , I_B=0.05mA
DC current transfer ratio	h_{FE}	100	250	600	−	I_C=1mA , V_{CE}=5V
Input resistance	R_1	70	100	130	kΩ	−
Transition frequency	f_T	−	250	−	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

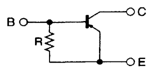
(94S-674-C125T)

Digital transistors (built-in resistors)
DTA144GUA / DTA144GKA

●**Features**

1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●**Circuit schematic**



E : Emitter
C : Collector
B : Base

●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−100	mA
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●**Package, marking, and packaging specifications**

Type	DTA144GUA	DTA144GKA
Package	UMT3	SMT3
Marking	K16	K16
Code	T106	T146
Basic ordering unit (pieces)	3000	3000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−160μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	−65	—	−130	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C=−10mA , I_B=−0.5mA
DC current transfer ratio	h_{FE}	68	—	—	—	I_C=−5mA , V_{CE}=−5V
Emitter-base resistance	R	32.9	47	61.1	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

* Transition frequency of mounted transistor.

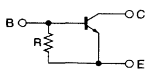
(94S-570-A144G)

Digital transistors (built-in resistors)
DTC144GE / DTC144GUA / DTC144GKA / DTC144GSA

●**Features**

1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●**Circuit schematic**



E : Emitter
C : Collector
B : Base

●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector Power dissipation	DTC144GE	P_C	150	mW
	DTC144GUA / DTC144GKA		200	
	DTC144GSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●**Package, marking, and packaging specifications**

Type	DTC144GE	DTC144GUA	DTC144GKA	DTC144GSA
Package	EMT3	UMT3	SMT3	SPT
Marking	K26	K26	K26	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=160μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	65	—	130	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C=10mA , I_B=0.5mA
DC current transfer ratio	h_{FE}	68	—	—	—	I_C=5mA , V_{CE}=5V
Emitter-base resistance	R	32.9	47	61.1	kΩ	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=5mA , f=100MHz *

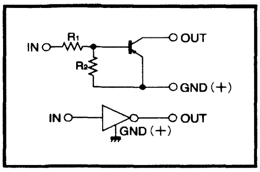
* Transition frequency of mounted transistor.

(94S-692-C144G)

Digital transistor (built-in resistors)
DTA144VUA / DTA144VKA / DTA144VSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_I	−40	V
			15	
Output current		I_O	−30	mA
		I_{CMax}	−10	
Power dissipation	DTA144VUA / DTA144VKA	Pd	200	mW
	DTA144VSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTA144VUA	DTA144VKA	DTA144VSA
Package	UMT3	SMT3	SPT
Marking	E56	E56	—
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−1	V	V_{CC}=−5V , I_O=−100 μA
	$V_{I(on)}$	−5	—	—		V_O=−0.3V , I_O=−2mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−10mA , I_I=−0.5mA
Input current	I_I	—	—	−0.16	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V , V_I=0V
DC current gain	G_I	33	—	—	—	I_O=−5mA , V_O=−5V
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.17	0.21	0.26	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

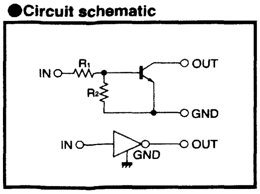
* Transition frequency of mounted transistor.

(94S-576-A144V)

Digital transistor (built-in resistors)
DTC144VUA / DTC144VKA / DTC144VSA

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_I	−15	V
			40	
Output current		I_O	30	mA
		I_{CMax}	100	
Power dissipation	DTC144VUA / DTC144VKA	Pd	200	mW
	DTC144VSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC144VUA	DTC144VKA	DTC144VSA
Package	UMT3	SMT3	SPT
Marking	E66	E66	—
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	1	V	V_{CC}=5V , I_O=100 μA
	$V_{I(on)}$	5	—	—		V_O=0.3V , I_O=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=10mA , I_I=0.5mA
Input current	I_I	—	—	0.16	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V , V_I=0V
DC current gain	G_I	33	—	—	—	I_O=5mA , V_O=5V
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.17	0.21	0.26	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-698-C144V)

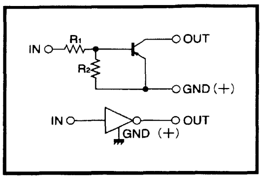
Digital transistors (built-in resistors)

DTA144WE / DTA144WUA / DTA144WKA / DTA144WSA

●**Features**

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●**Circuit schematic**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_I	−40	V
			10	
Output current		I_O	−30	mA
		I_{CMax}	−100	
Power dissipation	DTA144WE	Pd	150	mW
	DTA144WUA / DTA144WKA		200	
	DTA144WSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●**Package, marking, and packaging specifications**

Type	DTA144WE	DTA144WUA	DTA144WKA	DTA144WSA
Package	EMT3	UMT3	SMT3	SPT
Marking	76	76	76	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.8	V	V_{CC}=−5V , I_O=−100μA
	$V_{I(on)}$	−4	—	—		V_O=−0.3V , I_O=−2mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−10mA , I_I=−0.5mA
Input current	I_I	—	—	−0.16	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V , V_I=0V
DC current gain	G_I	56	—	—	—	I_O=−5mA , V_O=−5V
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.37	0.47	0.57	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-579-144W)

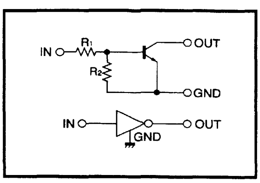
Digital transistors (built-in resistors)

DTC144WE / DTC144WUA / DTC144WKA / DTC144WSA

●**Features**

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●**Circuit schematic**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_I	40	V
			−10	
Output current		I_O	30	mA
		I_{CMax}	100	
Power dissipation	DTC144WE	Pd	150	mW
	DTC144WUA / DTC144WKA		200	
	DTC144WSA		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●**Package, marking, and packaging specifications**

Type	DTC144WE	DTC144WUA	DTC144WKA	DTC144WSA
Package	EMT3	UMT3	SMT3	SPT
Marking	86	86	86	—
Code	TL	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	3000	5000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.8	V	V_{CC}=5V , I_O=100μA
	$V_{I(on)}$	4	—	—		V_O=0.3V , I_O=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=10mA , I_I=0.5mA
Input current	I_I	—	—	0.16	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V , V_I=0V
DC current gain	G_I	56	—	—	—	I_O=5mA , V_O=5V
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.37	0.47	0.57	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

(94S-701-C144W)

Digital transistors (built-in resistors)

DTC323TU / DTC323TK / DTC323TS

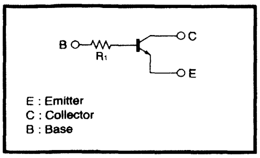
●Features

In addition to the features of regular digital transistors,

1) Low $V_{CE(sat)}$ makes these transistors ideal for muting circuits. (Typ. 0.04V at I_C/I_B=50/2.5mA)

2) They can be used at high current. ($I_{CMax.}$ =600mA)

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	30	V
Collector-emitter voltage		V_{CEO}	15	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	600	mA
Collector power dissipation	DTC323TU / DTC323TK	Pc	200	mW
	DTC323TS		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC323TU	DTC323TK	DTC323TS
Package	UMT3	SMT3	SPT
Marking	H02	H02	—
Code	T106	T146	TP
Basic ordering unit (pieces)	3000	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	15	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	40	80	mV	I_C/I_B=50mA/2.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	I_C=50mA , V_{CE}=5V
Input resistance	R_1	1.64	2.2	2.86	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V , I_E=−50mA , f=100MHz *
Output on resistance	Ron	—	0.65	—	Ω	V_I=7V , R_L=1kΩ , f=1kHz

* Transition frequency of mounted transistor.

(96-348-C323T)

Digital transistors (built-in resistors)

DTC343TK / DTC343TS

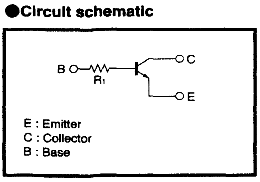
●Features

In addition to the features of regular digital transistors,

1) Low $V_{CE(sat)}$ makes these transistors ideal for muting circuits. (Typ. 0.04V at I_C/I_B=50/2.5mA)

2) They can be used at high current. ($I_{CMax.}$ =600mA)

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	30	V
Collector-emitter voltage		V_{CEO}	15	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	600	mA
Collector power dissipation	DTC343TK	Pc	200	mW
	DTC343TS		300	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTC343TK	DTC343TS
Package	SMT3	SPT
Marking	H03	—
Code	T146	TP
Basic ordering unit (pieces)	3000	5000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	15	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	40	80	mV	I_C=50mA , I_B=2.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	I_C=50mA , V_{CE}=5V
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V , I_E=−50mA , f=100MHz *
Output on resistance	Ron	—	0.95	—	Ω	V_I=7V , R=1kΩ , f=1kHz

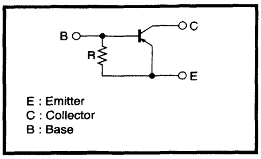
* Transition frequency of mounted transistor.

(94S-751-C343T)

Digital transistors (built-in resistors)
DTB114GK

●Features
1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−500	mA
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTB114GK
Package	SMT3
Marking	L14
Code	T146
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−720 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−30V
Emitter cutoff current	I_{EBO}	−300	—	−580	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−50mA/−2.5mA
DC current transfer ratio	h_{FE}	56	—	—	—	I_C=−100mA , V_{CE}=−5V
Emitter-base resistance	R	7	10	13	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

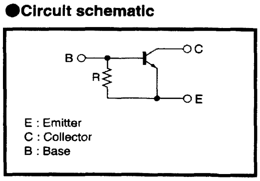
* Transition frequency of mounted transistor.

(96-292-B114G)

Digital transistors (built-in resistors)
DTD114GK

●Features
1) The built-in bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
2) Only the on/off conditions need to be set for operation, making device design easy.
3) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	500	mA
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTD114GK
Package	SMT3
Marking	L24
Code	T146
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=720 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	300	—	580	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=50mA/2.5mA
DC current transfer ratio	h_{FE}	56	—	—	—	I_C=100mA , V_{CE}=5V
Emitter-base resistance	R	7	10	13	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V , I_E=−50mA , f=100MHz *

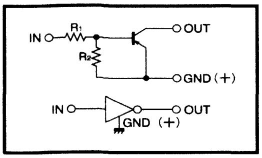
* Transition frequency of mounted transistor.

(96-360-D114G)

Digital transistor (built-in resistors)
DTB122JK

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	−50	V
Input voltage	V_I	−5	V
		5	
Output current	I_O	−500	mA
Power dissipation	Pd	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specification

Type	DTB122JK
Package	SMT3
Marking	G3C
Code	T146
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V , I_O=−100 μA
	$V_{I(on)}$	−2	—	—		V_O=−0.3V , I_O=−30mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−50mA/−2.5mA
Input current	I_I	—	—	−4.5	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−10	μA	V_{CC}=−30V , V_I=0V
DC current gain	G_I	47	—	—	—	I_O=−50mA , V_O=−5V
Input resistance	R_1	154	220	286	Ω	—
Resistance ratio	R_2/R_1	17.1	21.3	25.6	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=50mA , f=100MHz *

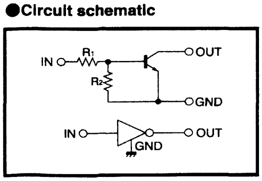
* Transition frequency of mounted transistor.

(96-296-B122J)

Digital transistor (built-in resistors)
DTD122JK

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	50	V
Input voltage	V_I	5	V
		−5	
Output current	I_O	500	mA
Power dissipation	Pd	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specification

Type	DTD122JK
Package	SMT3
Marking	G4C
Code	T146
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V , I_O=100 μA
	$V_{I(on)}$	2	—	—		V_O=0.3V , I_O=30mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=50mA/2.5mA
Input current	I_I	—	—	45	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V , V_I=0V
DC current gain	G_I	47	—	—	—	I_O=50mA , V_O=5V
Input resistance	R_1	154	220	286	Ω	—
Resistance ratio	R_2/R_1	17.1	21.3	25.6	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−50mA , f=100MHz *

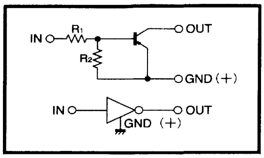
* Transition frequency of mounted transistor.

(96-364-D122J)

Digital transistors (built-in resistors)
DTB133HK / DTB133HS

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_I	−20	V
			6	
Output current		I_C	−500	mA
Power dissipation	DTB133HK	Pd	200	mW
	DTB133HS		300	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

●Package, marking, and packaging specifications

Type	DTB133HK	DTB133HS
Package	SMT3	SMT3
Marking	G98	—
Code	T146	TP
Basic ordering unit (pieces)	3000	5000

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V , I_O=−100μA
	$V_{I(on)}$	−2	—	—		V_O=−0.3V , I_O=−20mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−50mA , I_I=−2.5mA
Input current	I_I	—	—	−2.4	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V , V_I=0V
DC current gain	G_I	56	—	—	—	I_O=−50mA , V_O=−5V
Input resistance	R_1	2.31	3.3	4.29	kΩ	—
Resistance ratio	R_2/R_1	2.4	3	3.7	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

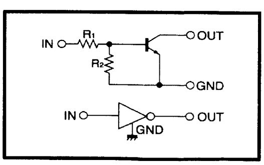
* Transition frequency of mounted transistor.

(94S-611-B133H)

Digital transistors (built-in resistors)
DTD133HK / DTD133HS

●Features
1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_I	20	V
			−6	
Output current		I_C	500	mA
Power dissipation	DTD133HK	Pd	200	mW
	DTD133HS		300	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

●Package, marking, and packaging specifications

Type	DTD133HK	DTD133HS
Package	SMT3	SMT3
Marking	G08	—
Code	T146	TP
Basic ordering unit (pieces)	3000	5000

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V , I_O=100μA
	$V_{I(on)}$	2	—	—		V_O=0.3V , I_O=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=50mA , I_I=2.5mA
Input current	I_I	—	—	2.4	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V , V_I=0V
DC current gain	G_I	56	—	—	—	I_O=50mA , V_O=5V
Input resistance	R_1	2.31	3.3	4.29	kΩ	—
Resistance ratio	R_2/R_1	2.4	3	3.7	—	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *

* Transition frequency of mounted transistor.

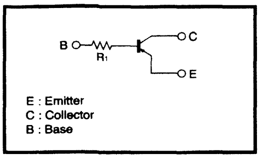
(94S-733-D133H)

Digital transistor (built-in resistors)
DTB114TK

●Features

1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors.
2) The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input, and parasitic effects are almost completely eliminated.
3) Only the on/off conditions need to be set for operation, making device design easy.
4) Higher mounting densities can be achieved.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−40	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−500	mA
Collector power dissipation	P_C	200	mW
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●Package, marking, and packaging specifications

Type	DTB114TK
Package	SMT3
Marking	E94
Code	T146
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−40	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−50mA/−2.5mA
DC current gain	h_{FE}	100	250	600	—	I_C=−50mA , V_{CE}=−5V
Input resistance	R_1	7	10	13	kΩ	—
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V , I_E=5mA , f=100MHz *

* Transition frequency of mounted transistor.

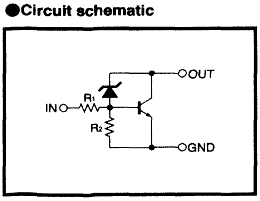
(96-294-B114T)

Digital transistor (built-in resistors), driver (60V, 1A)
DTDG23YP

●Features

1) High DC current gain. (Min. 300 at Vo/Io=2V/0.5A)
2) Low output voltage. (Typ. 0.4V at Io/Ii=500/50mA)
3) Built-in zener diode gives strong protection against reverse

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	60±10	V
Input voltage	V_{IN}	40	V
		−6	
Collector current	I_O	1	A
	$I_{C(Max.)}$	2	A (Pulse) *1
Power dissipation	Pd	1.5	W *2
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

*1 Pw≦10ms、Duty cycle≦2%　*2 On 40×40×0.7mm ceramic board.

●Package, marking, and packaging specifications

Type	DTDS23YP
Package	MPT3
Marking	E02
Code	T100
Basic ordering unit (pieces)	1000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V , I_O=100μA
	$V_{I(on)}$	2	—	—		V_O=0.4V , I_O=100mA
Output voltage	$V_{O(on)}$	—	—	0.4	V	I_O/I_I=500mA/5mA
Input current	I_I	—	—	3.6	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=40V , V_I=0V
DC current gain	G_I	300	—	—	—	V_O=2V , I_O=500mA
Transition frequency	f_T	—	80	—	MHz	V_{CE}=5V , I_E=−0.1A , f=30MHz *
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Emitter-base resistance	R_2	7	10	13	kΩ	—

* Transition frequency of mounted transistor.

(96-378-DS23YP)

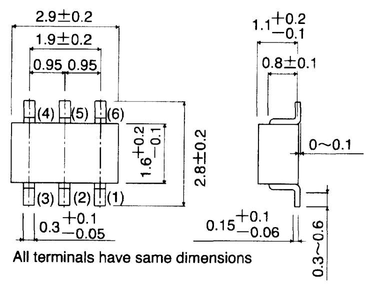
General Purpose Transistor (Isolated Dual Transistors)
IMT17

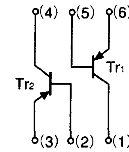
●Features
1) Two 2SA1036K chips in a SMT package.
2) Mounting possible with SMT3 automatic mounting machine.
3) Transistor elements are independent, eliminating interference.
4) High collector current.
   $I_C = -500mA$
5) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
PNP silicon transistor

The following characteristics apply to both Tr_1 and Tr_2 :

●External dimensions (Units: mm)





ROHM : SMT6
EIAJ : SC-74
Abbreviated symbol: T17

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−60	V	
Collector-emitter voltage	V_{CEO}	−50	V	
Emitter-base voltage	V_{EBO}	−5	V	
Collector current	I_C	500	mA	
Power dissipation	Pd	300(TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

*200 mW per element must not be exceeded.

(96-500-B11)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−100 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−100 μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−30V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.6	V	I_C/I_B=−500mA/−50mA
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=−3V, I_C=−100mA *
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V, I_E=20mA, f=100MHz
Output capacitance	Cob	—	7	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

* Measured using pulse current.

●Packaging specifications

	Package	Taping
	Code	T110
Type	Basic ordering unit (pieces)	3000
IMT17		○

●Electrical characteristic curves

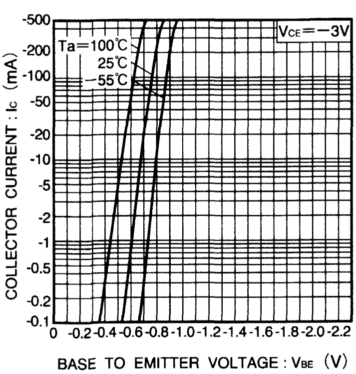


Fig.1 Grounded emitter propagation characteristics

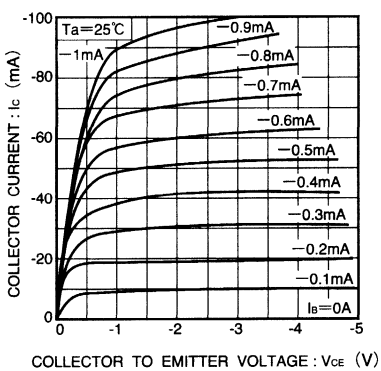


Fig.2 Grounded emitter outout characteristics (I)

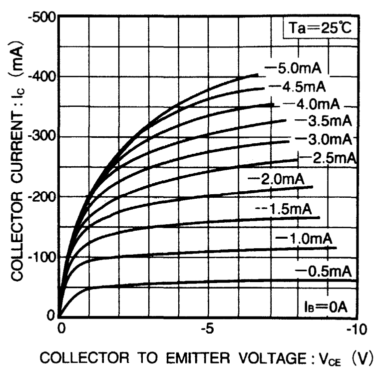


Fig.3 Grounded emitter output characteristics (II)

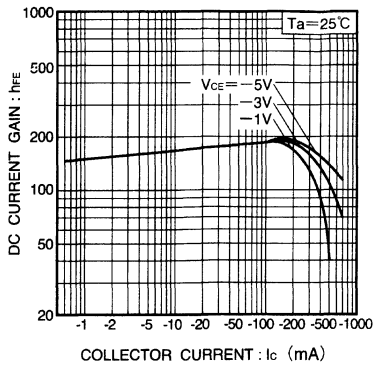


Fig.4 DC current gain vs. collector current (I)

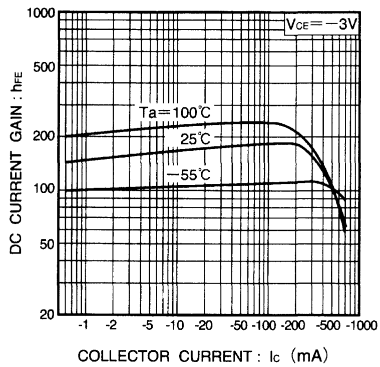


Fig.5 DC current gain vs. collector current (II)

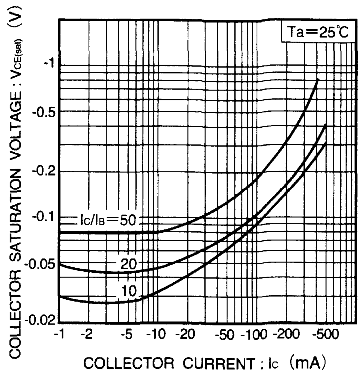


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

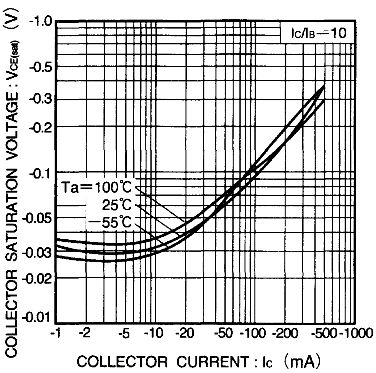


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

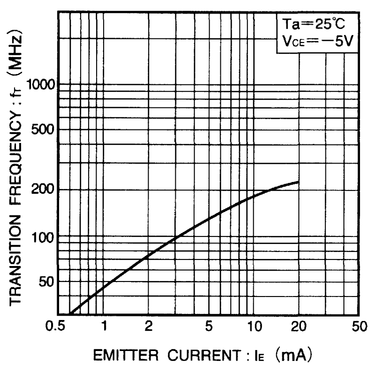


Fig.8 Gain bandwidth product vs. emitter current

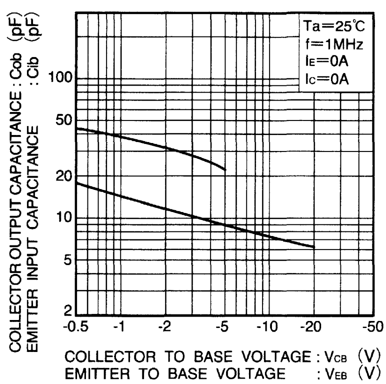


Fig.9 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

General Purpose Transistor (Isolated Dual Transistors)

IMX9

●Features

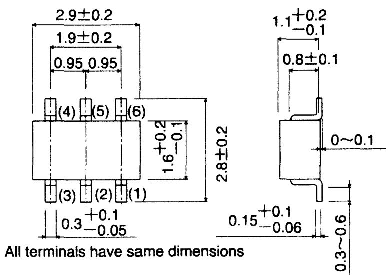
1) Two 2SD2114K chips in an SMT package.
2) Mounting possible with SMT3 automatic mounting machine.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

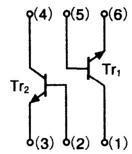
●Structure

Epitaxial planar type
NPN silicon transistor

The following characteristics apply to both Tr_1 and Tr_2.

●External dimensions (Units: mm)





ROHM : SMT6
EIAJ : SC-74

Abbreviated symbol: X9

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	25	V
Collector-emitter voltage	V_{CEO}	20	V
Emitter-base voltage	V_{EBO}	12	V
Collector current	I_C	500	mA
Power dissipation	Pd	300 (TOTAL)	mW *
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55~150	°C

* 200 mW per element must not be exceeded.

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	25	—	—	V	I_C=10μA
Collector-emitter breakdown voltage	BV_{CEO}	20	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	12	—	—	V	I_E=10μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=10V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.18	0.4	V	I_C/I_B=500mA/20mA
DC current transfer ratio	h_{FE}	560	—	2700	—	V_{CE}=3V, I_C=10mA
Transition frequency	f_T	—	350	—	MHz	V_{CE}=10V, I_E=−50mA, f=100MHz
Output capacitance	Cob	—	8	—	pF	V_{CB}=10V, I_E=0, f=1MHz
Output ON resistance	Ron	—	0.8	—	Ω	I_B=1mA, V_i=100mVrms, f=1kHz

●Packaging specifications

Type	Package	Taping
	Code	T110
	Basic ordering unit (pieces)	3000
IMX9		○

●Electrical characteristic curves

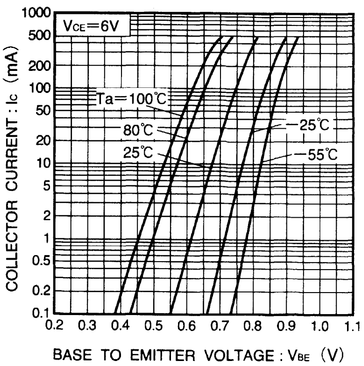


Fig.1 Grounded emitter propagation characteristics

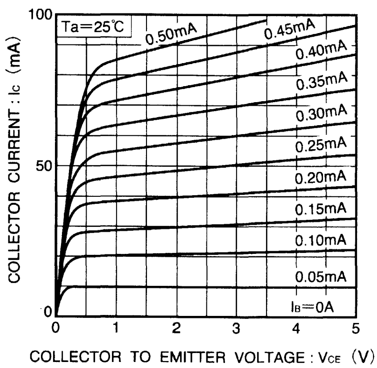


Fig.2 Grounded emitter output characteristics (I)

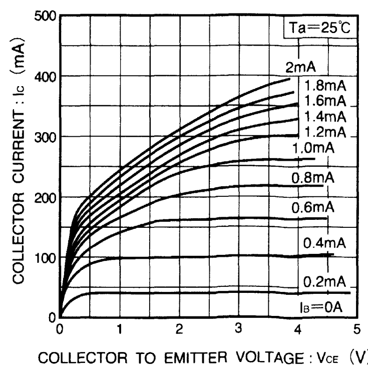


Fig.3 Grounded emitter output characteristics (II)

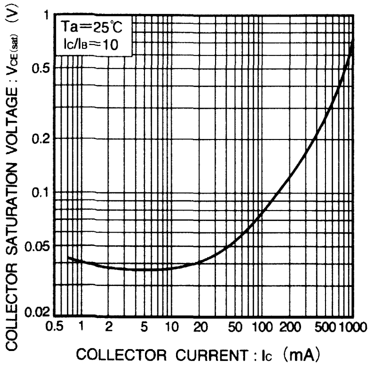


Fig.4 Collector-emitter saturation voltage vs. collector current

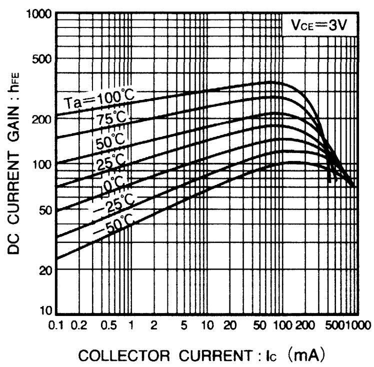


Fig.5 DC current gain vs. collector current

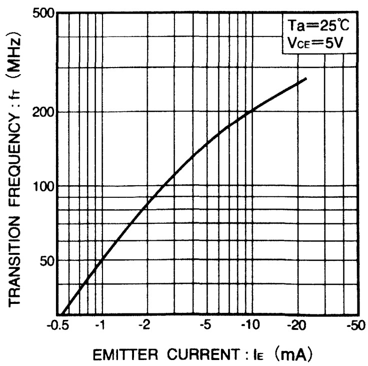


Fig.6 Gain bandwidth product vs. emitter current

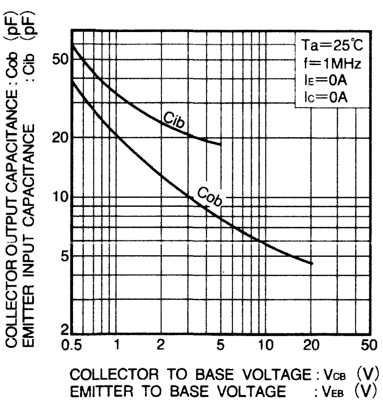


Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Dual transistors

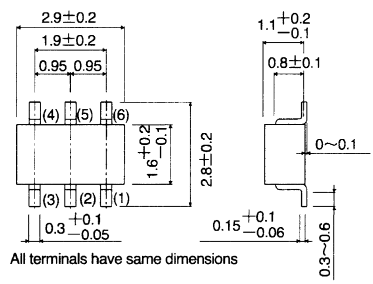
General Purpose Transistor (Isolated Dual Transistors)
IMX17

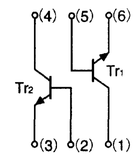
●Features
1) Two 2SD1484K chips in an SMT package.
2) Mounting possible with SMT3 automatic mounting machine.
3) Transistor elements are independent, eliminating interference.
4) High collector current.
   I_C = 500mA
5) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
NPN silicon transistor

The following characteristics apply to both Tr_1 and Tr_2.

●External dimensions (Units: mm)





ROHM : SMT6
EIAJ : SC-74

Abbreviated symbol: X17

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	60	V	
Collector-emitter voltage	V_{CEO}	50	V	
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	500	mA	
Power dissipation	Pd	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* 200 mW per element must not be exceeded.

(96-523-D15)

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=100 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=100 μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=30V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.6	V	I_C/I_B=500mA/50mA
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=3V, I_C=100mA *
Transition frequency	f_T	—	250	—	MHz	V_{CE}=5V, I_E=−20mA, f=100MHz
Output capacitance	Cob	—	7	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

* Measured using pulse current.

●Packaging specifications

	Package	Taping
	Code	T110
Type	Basic ordering unit (pieces)	3000
IMX17		○

●Electrical characteristic curves

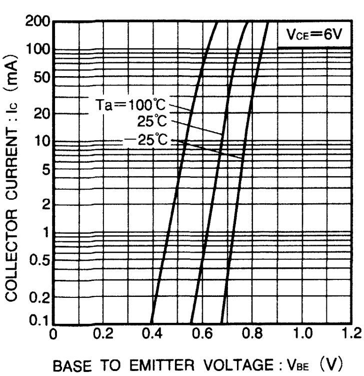


Fig.1 Grounded emitter propagation characteristics

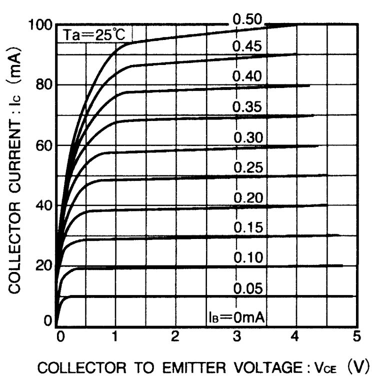


Fig.2 Grounded emitter output characteristics

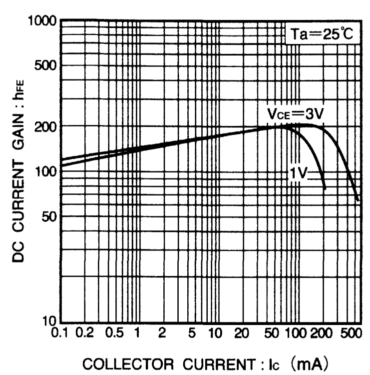


Fig.3 DC current gain vs. collector current (I)

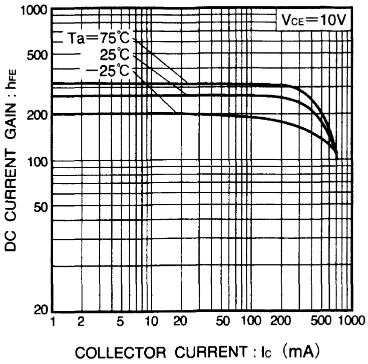


Fig.4 DC current gain vs. collector current (II)

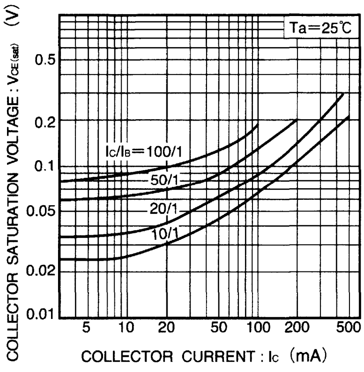


Fig.5 Collector-emitter saturation voltage vs. collector current

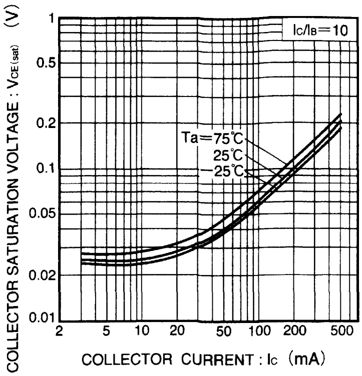


Fig.6 Collector-emitter saturation voltage vs. collector current

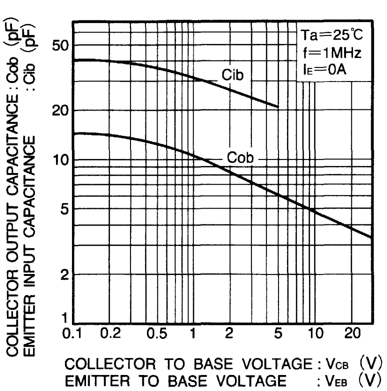


Fig.7 Input/output capacitance vs. voltage

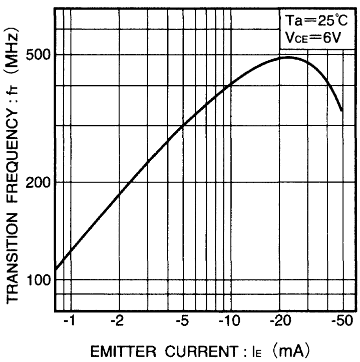


Fig.8 Gain bandwidth product vs. emitter current

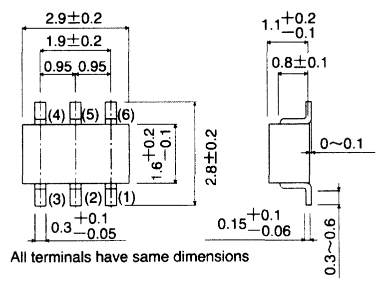
General Purpose Transistor (Isolated Dual Transistors)

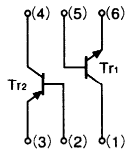
IMZ4

●Features

1) Both 2SA1036K chip and 2SC411K chip in a SMT package.
2) Mounting possible with SMT3 automatic mounting machine.
3) Transistor elements are independent, eliminating interference.
4) High collector current. Ic = 500mA
5) Mounting cost and area can be cut in half.

●External dimensions (Units: mm)





ROHM : SMT6
EIAJ : SC-74

Abbreviated symbol: Z4

●Structure

Epitaxial planar type
NPN / PNP silicon transistor

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits Tr1 (NPN)	Limits Tr2 (PNP)	Unit
Collector-base voltage	V_{CBO}	40	−40	V
Collector-emitter voltage	V_{CEO}	32	−32	V
Emitter-base voltage	V_{EBO}	5	−5	V
Collector current	I_C	500	−500	mA
Collector power dissipation	Pd	300 (TOTAL)		mW *
Junction temperature	Tj	150		℃
Storage temperature	Tstg	−55~150		℃

* 200 mW per element must not be exceeded.

(96-529-BD11)

●Electrical characteristics (Ta = 25°C)
Tr1 (NPN)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	40	—	—	V	I_C=100 μA
Collector-emitter breakdown voltage	BV_{CEO}	32	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=100 μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.6	V	I_C/I_B=500mA/50mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=3V, I_C=100mA *
Transition frequency	f_T	—	250	—	MHz	V_{CE}=5V, I_E=−20mA, f=100MHz
Output capacitance	Cob	—	6.5	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

* Measured using pulse current.

●Electrical characteristics (Ta = 25°C)
Tr2 (PNP)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−40	—	—	V	I_C=−100 μA
Collector-emitter breakdown voltage	BV_{CEO}	−32	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−100 μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−20V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.6	V	I_C/I_B=−300mA/−30mA
DC current transfer ratio	h_{FE}*	120	—	560	—	V_{CE}=−3V, I_C=−100mA
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−5V, I_E=20mA, f=100MHz
Output capacitance	Cob	—	7	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

* Measured using pulse current.

●Packaging specifications

	Package	Taping
	Code	T108
Type	Basic ordering unit (pieces)	3000
IMZ4		○

● Electrical characteristic curves

Tr1 (NPN)

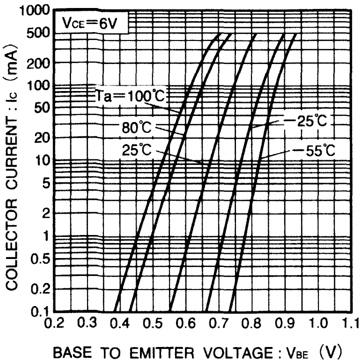


Fig.1 Grounded emitter propagation characteristics

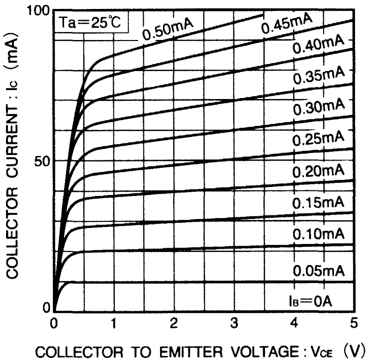


Fig.2 Grounded emitter output characteristics (I)

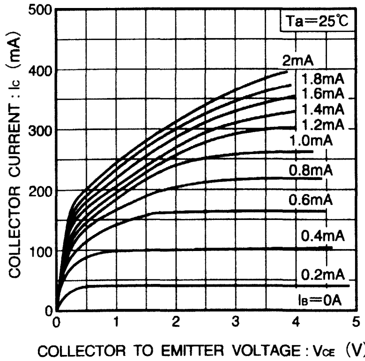


Fig.3 Grounded emitter output characteristics (II)

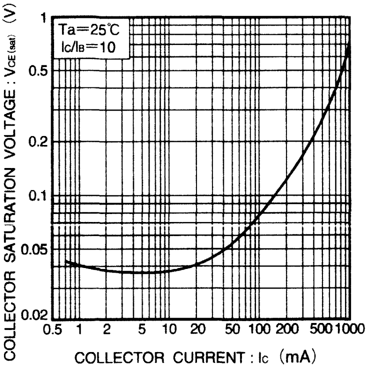


Fig.4 Collector-emitter saturation voltage vs. collector current

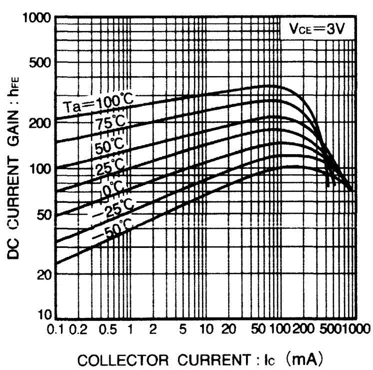


Fig.5 DC current gain vs. collector current

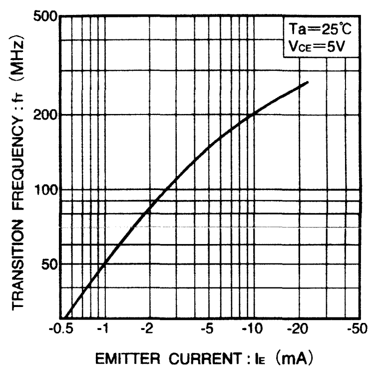


Fig.6 Gain bandwidth product vs. emitter current

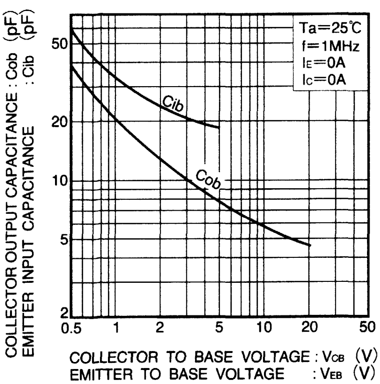


Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

●Electrical characteristic curves

Tr2 (PNP)

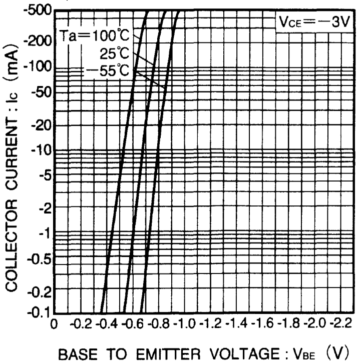


Fig.8 Grounded emitter propagation characteristics

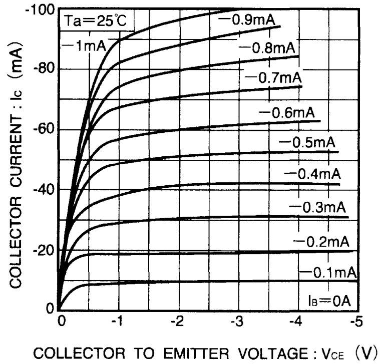


Fig.9 Grounded emitter output characteristics (I)

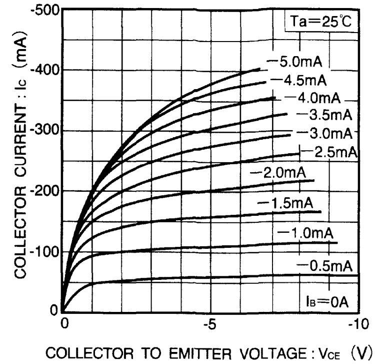


Fig.10 Grounded emitter output characteristics (II)

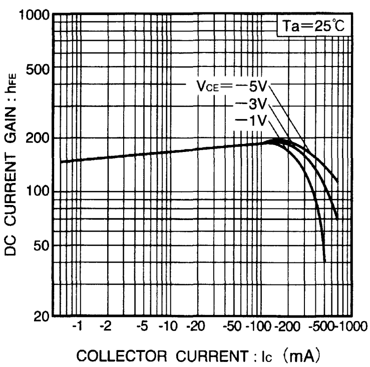


Fig.11 DC current gain vs. collector current (I)

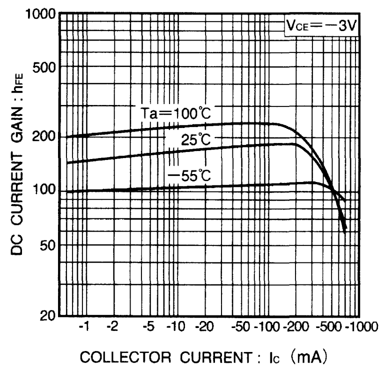


Fig.12 DC current gain vs. collector current (II)

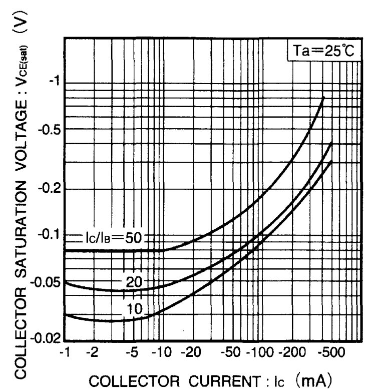


Fig.13 Collector-emitter saturation voltage vs. collector current (I)

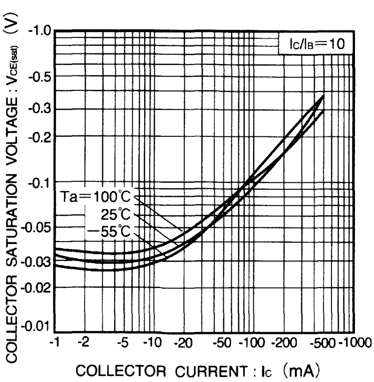


Fig.14 Collector-emitter saturation voltage vs. collector current (II)

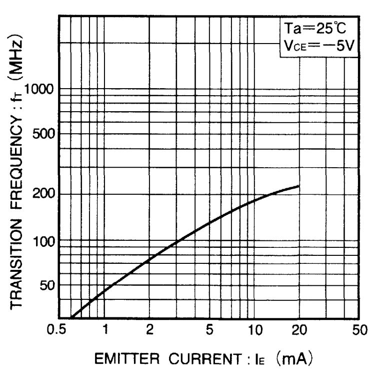


Fig.15 Gain bandwidth product vs. emitter current

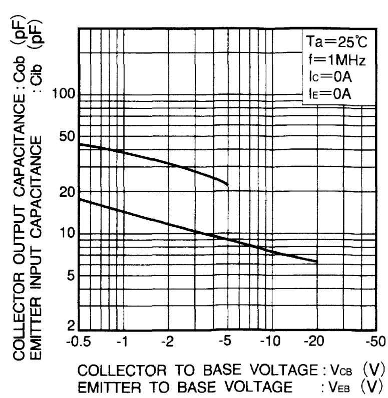


Fig.16 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

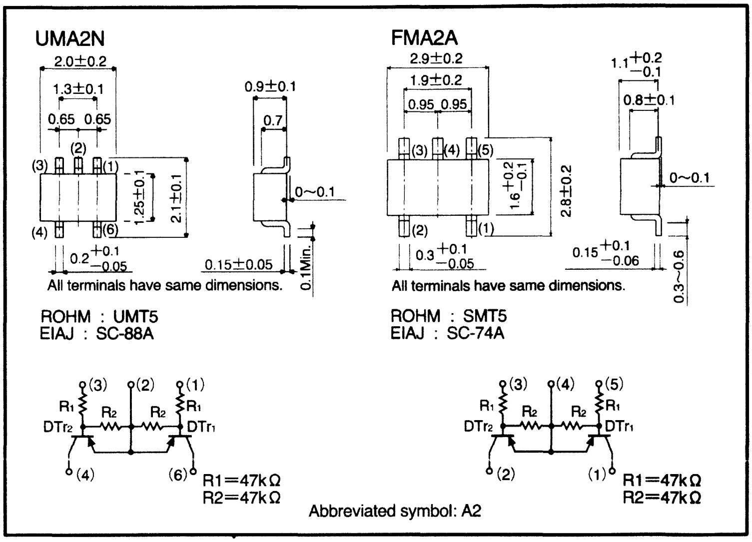
General Purpose Transistor (Common Emitter Dual Transistors)
UMA2N / FMA2A

●Features
1) Two DTA144E in UMT and SMT.
2) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●External dimensions (Units:mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_{IN}	−40	V
			10	
Output current		I_O	−30	mA
		$I_{C(Max.)}$	−100	
Power dissipation	UMA2N	Pd	150 (TOTAL)	mW *1
	FMA2A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(SPEC-A144E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I\ (off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I\ (on)}$	−3	—	—		V_O=−0.3V, I_O=−5mA
Output voltage	$V_{O\ (on)}$	—	−0.1	−0.3	V	I_O/I_I=−5mA/0.25mA
Input current	I_I	—	—	−0.18	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=−5V, I_O=−10mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHZ＊
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

＊Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMA2N		○	—
FMA2A		—	○

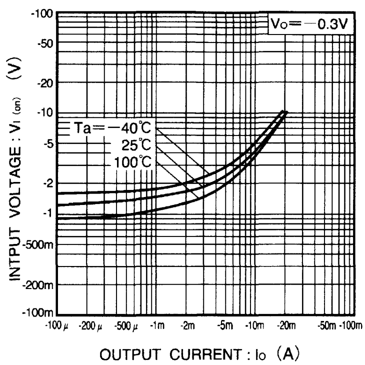


Fig.1 Input voltage vs. output current (ON characteristics)

●Electrical characteristic curves

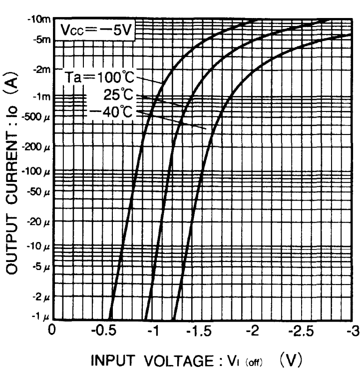


Fig.2 Output current vs. input voltage (OFF characteristics)

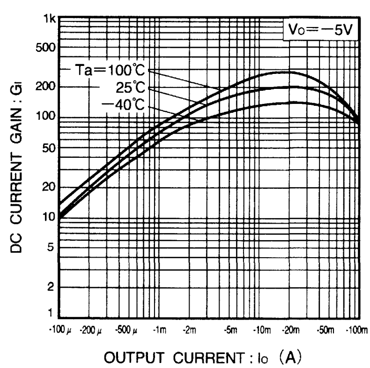


Fig.3 DC current gain vs. output current

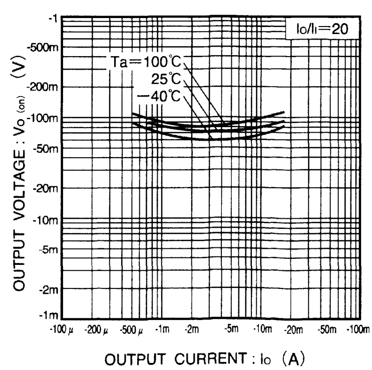


Fig.4 Output voltage vs. output current

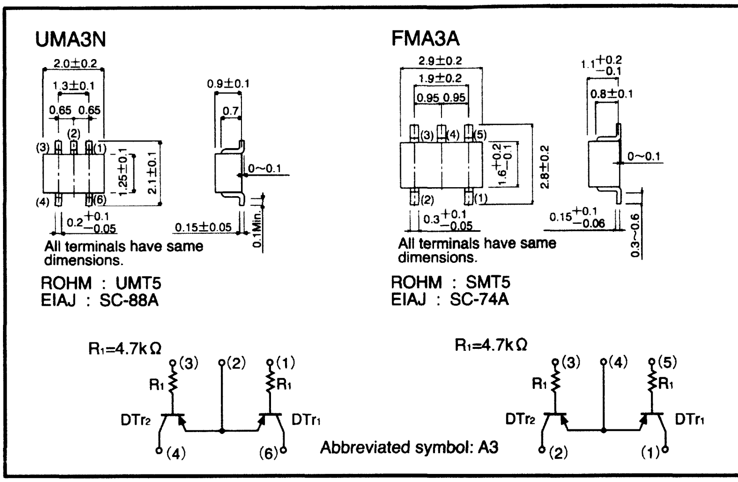
General Purpose Transistor (Common Emitter Dual Transistors)
UMA3N / FMA3A

●Features
1) Two DTA143T digital transistors in UMT and SMT packages.
2) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr1 and DTr2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	−50	V	
Collector-emitter voltage		V_{CEO}	−50	V	
Emitter-base voltage		V_{EBO}	−5	V	
Collector current		I_C	−100	mA	
Collector power dissipation	UMA3N	P_C	150 (TOTAL)	mW	∗1
	FMA3A		300 (TOTAL)		∗2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55～150	℃	

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base break down voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}/I_C=−5V/−1mA
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−5mA/−0.25mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10mA, I_E=5mA, f=100MHZ *
Input resistance	R_1	3.29	4.7	6.11	kΩ	—

* Transition frequency of mounted transistor

● Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMA3N		○	—
FMA3A		—	○

● Electrical characteristic curves

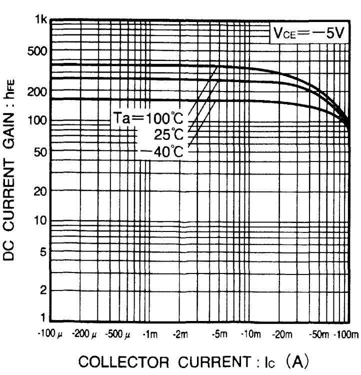


Fig.1 DC current gain vs. collector current

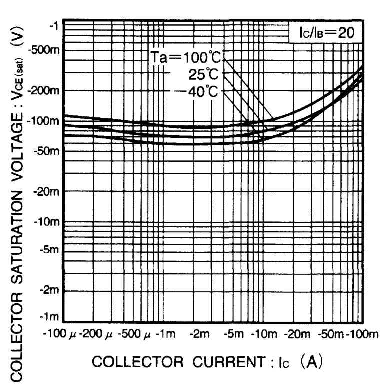


Fig.2 Collector-emitter saturation voltage vs. collector current

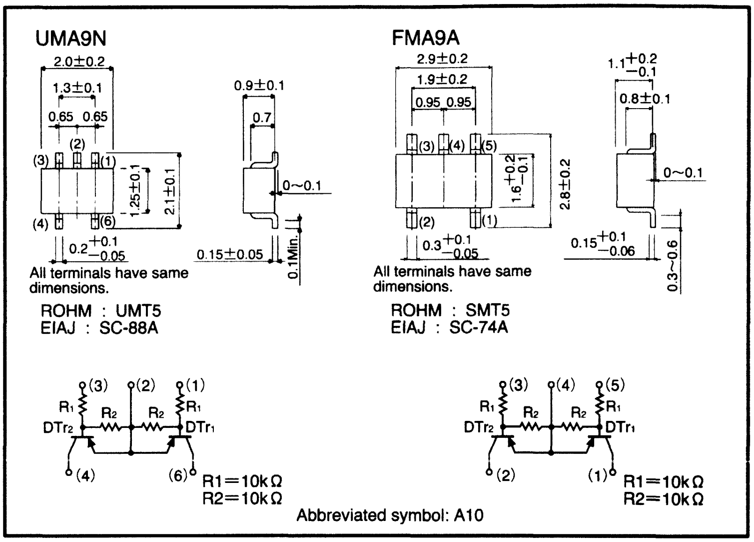
Digital transistor (Common Emitter Dual Transistors)
UMA9N/FMA9A

●Features
1) Two DTA114E in UMT and SMT packages.
2) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit	
Supply voltage		V_{CC}	−50	V	
Input voltage		V_{IN}	−40	V	
			10		
Output current		I_O	−50	mA	
		I_C (Max.)	−100		
Power dissipation	UMA9N	Pd	150 (TOTAL)	mW	∗1
	FMA9A		300 (TOTAL)		∗2
Junction temperature		Tj	150	°C	
Storage temperature		Tstg	−50~150	°C	

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

Dual transistors

(SPEC-A114E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	Vcc=−5V, Io=−100 μA
	$V_{I(on)}$	−3.0	—	—		Vo=−0.3V, Io=−20mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	Io/Ii=−10mA/−0.5mA
Input current	I_I	—	—	−0.88	mA	Vi=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	Vcc=−50V, Vi=0V
DC current gain	G_I	30	—	—	—	Io=−5mA, Vo=−5V
Transition frequency	f_T	—	250	—	MHz	VCE=−10mA, IE=5mA, f=100MHZ *
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMA9N		○	—
FMA9A		—	○

●Electrical characteristic curves

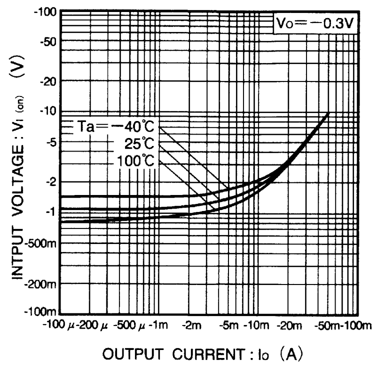


Fig.1 Input voltage vs. output current (ON characteristics)

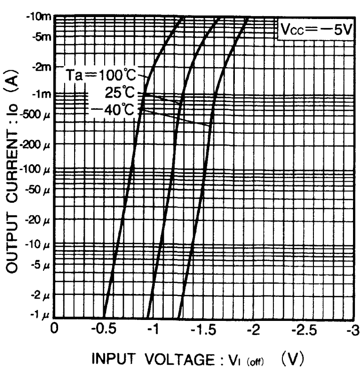


Fig.2 Output current vs. input voltage (OFF characteristics)

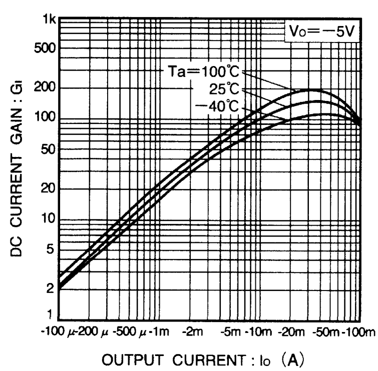


Fig.3 DC current gain vs. output current

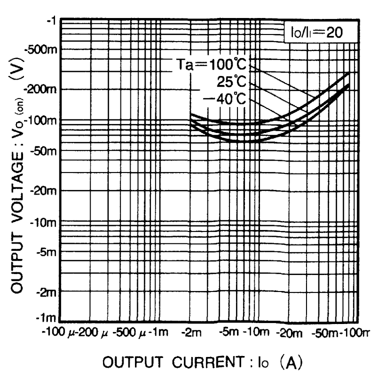


Fig.4 Output voltage vs. output current

General Purpose Transistor (Common Emitter Dual Transistors)

UMA11N/FMA11A

●Features

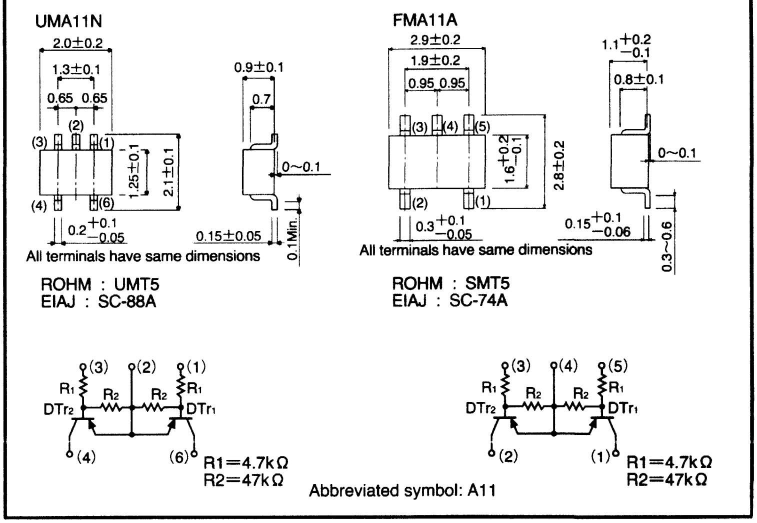
1) Two DTA143Z in UMT and SMT packages.
2) Mounting cost and area can be cut in half.

●Structure

Epitaxial planar type
PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr1 and DTr2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_{IN}	−30	V
			5	
Output current		I_O	−100	mA
		$I_{C(Max.)}$	−100	
Power dissipation	UMA11N	Pd	150 (TOTAL)	mW *1
	FMA11A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I\ (off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I\ (on)}$	−1.3	—	—		V_O=−0.3V, I_O=−5mA
Output voltage	$V_{O\ (on)}$	—	−0.1	−0.3	V	I_O/I_I=−5mA/−0.25mA
Input current	I_I	—	—	−1.8	mA	V_I=−5V
Output current	$I_{O\ (off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	80	—	—	—	V_O=−5V, I_O=−10mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unitt (pieces)	3000	3000
UMA11N		○	—
FMA11A		—	○

●Electrical characteristic curves

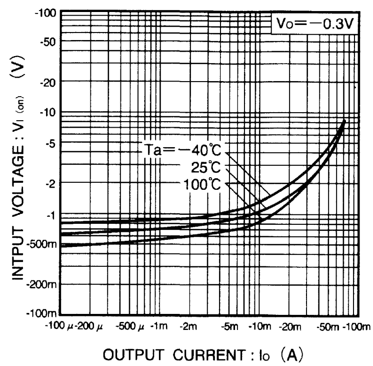


Fig.1 Input voltage vs. output current (ON characteristics)

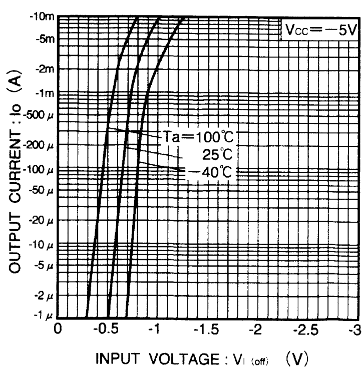


Fig.2 Output current vs. input voltage (OFF characteristics)

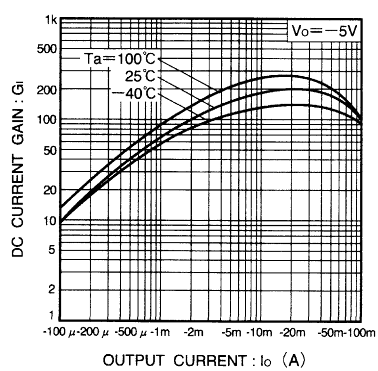


Fig.3 DC current gain vs. output current

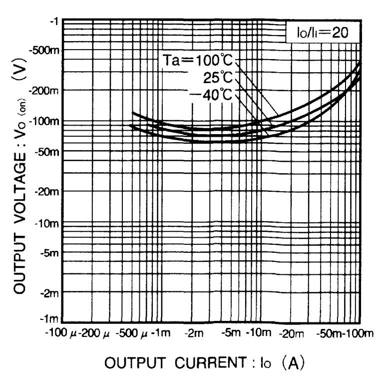


Fig.4 Output voltage vs. output current

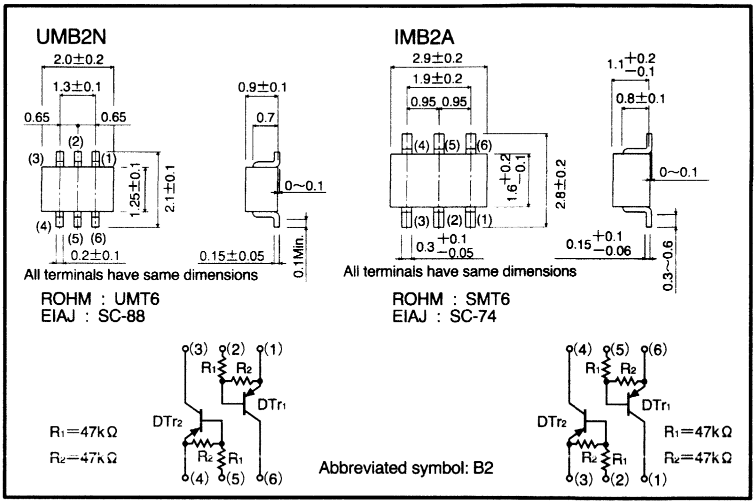
Digital Transistor (Isolated Dual Digital Transistors)
UMB2N / IMB2A

● Features
1) Two DTA144E in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.

● Structure
Epitaxial planar type
PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

● External dimensions (Units: mm)



● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_I	−40	V
			10	
Output current		I_O	−30	mA
		$I_{C(Max.)}$	−100	
Power dissipation	UMB2N	Pd	150 (TOTAL)	mW ∗1
	IMB2A		300 (TOTAL)	∗2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

Dual transistors

(96-444-A144E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3	—	—		V_O=−0.3V, I_O=−2mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−0.18	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=−5V, I_O=−5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10mA, I_E=5mA, f=100MHz *
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

*Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TN	T110
Type	Basic ordering unit (pieces)	3000	3000
UMB2N		○	—
IMB2A		—	○

●Electrical characteristic curves

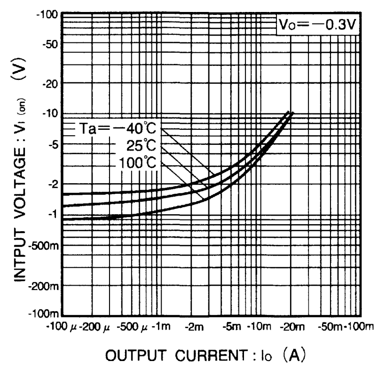


Fig.1 Input voltage vs. output current (ON characteristics)

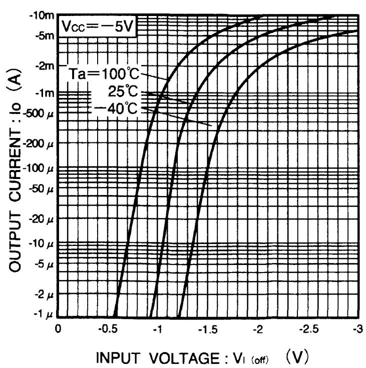


Fig.2 Output current vs. input voltage (OFF characteristics)

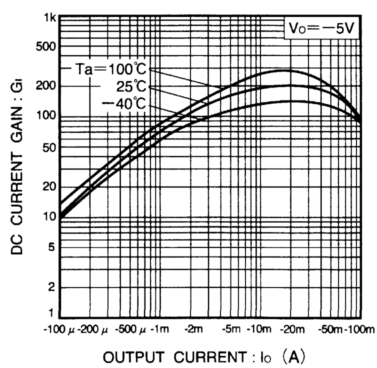


Fig.3 DC current gain vs. output current

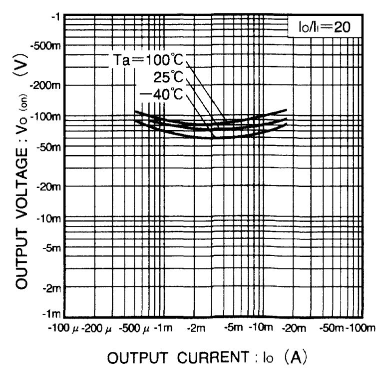


Fig.4 Output voltage vs. output current

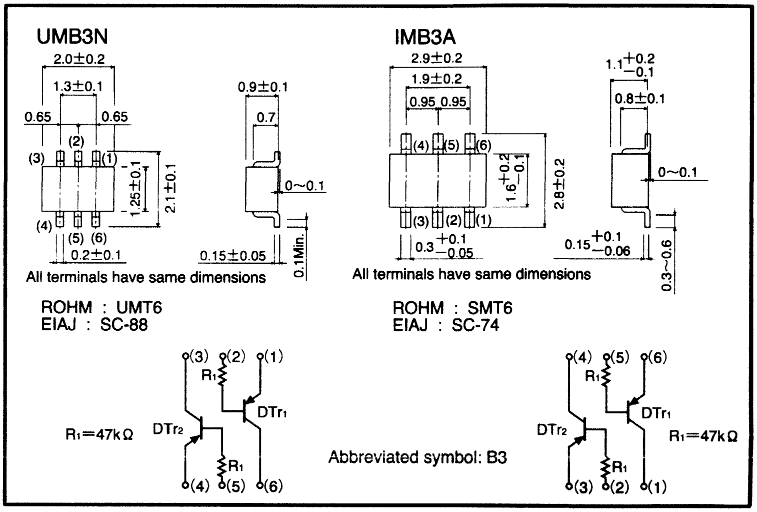
Digital Transistor (Isolated Dual Digital Transistors)

UMB3N / IMB3A

●Features

1) Two DTA143T in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.

●External dimensions (Units: mm)



●Structure

Epitaxial planar type
PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−50	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−100	mA
Collector power dissipation	UMB3N	P_C	150 (TOTAL)	mW ∗1
	IMB3A		300 (TOTAL)	mW ∗2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−5mA/−2.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=−5V, I_C=−1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	3.29	4.7	6.11	kΩ	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TN	T110
Type	Basic ordering unit (pieces)	3000	3000
UMB3N		○	—
IMB3N		—	○

●Electrical characteristic curves

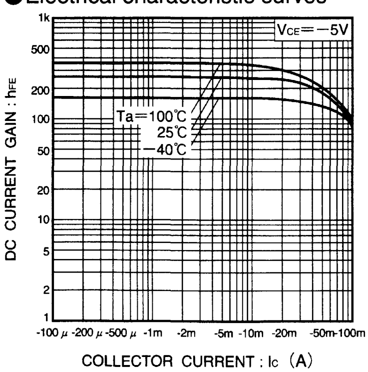


Fig.1 DC current gain vs. collector current

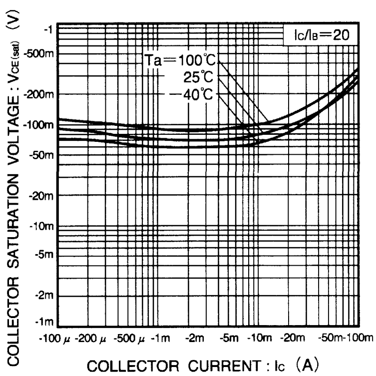


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital Transistor (Isolated Dual Digital Transistors)

UMB9N / IMB9A

●Features

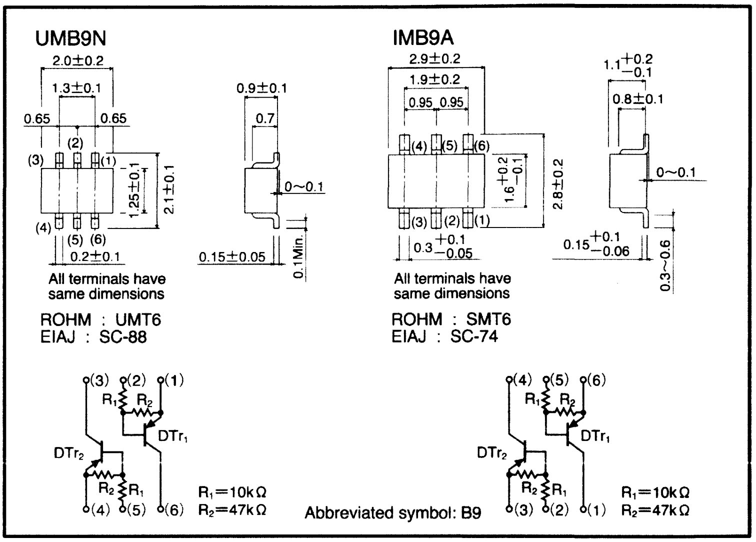
1) Two DTA114Y in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

●Structure

Epitaxial planar type
PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_I	−40	V
			6	
Output current		I_O	−70	mA
		$I_{C(Max.)}$	−100	
Power dissipation	UMB9N	Pd	150(TOTAL)	mW ∗1
	IMB9A		300(TOTAL)	∗2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-450-A114Y)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I\,(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I\,(on)}$	−1.4	—	—		V_O=−0.3V, I_O=−1mA
Output voltage	$V_{O\,(on)}$	—	−0.1	−0.3	V	I_O/I_I=−5mA/−0.25mA
Input current	I_I	—	—	−0.88	mA	V_I=−5V
Output current	$I_{O\,(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=−5V, I_O=−5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10mA, I_E=5mA, f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	3.7	4.7	5.7	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TN	T110
Type	Basic ordering unit (pieces)	3000	3000
UMB9N		○	—
IMB9A		—	○

●Electrical characteristic curves

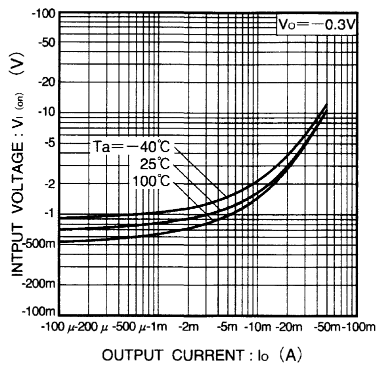


Fig.1 Input voltage vs. output current (ON characteristics)

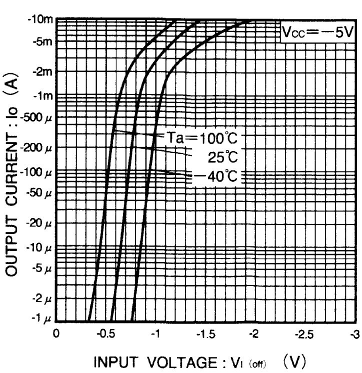


Fig.2 Output current vs. input voltage (OFF characteristics)

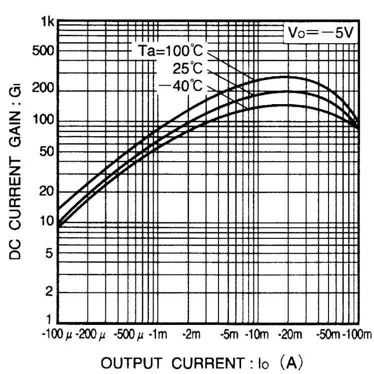


Fig.3 DC current gain vs. output current

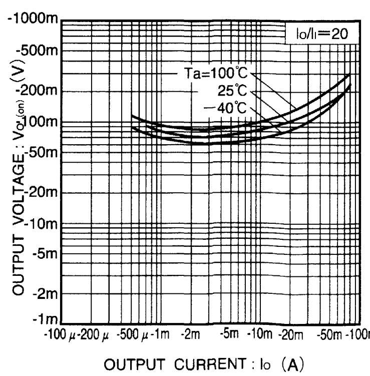


Fig.4 Output voltage vs. output current

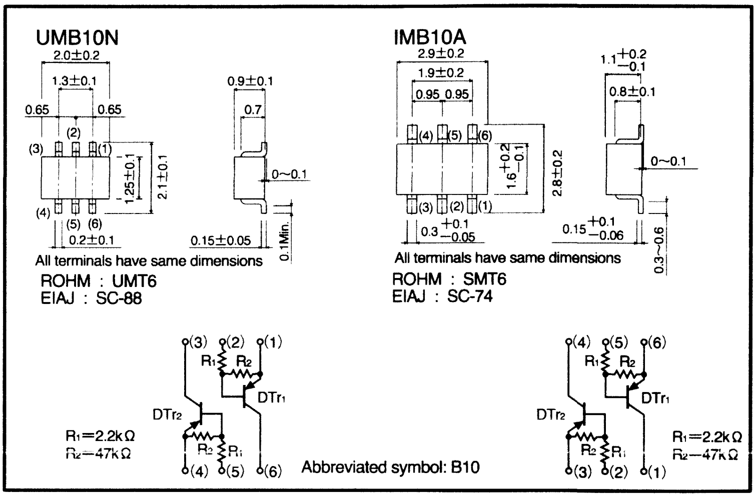
Digital Transistor (Isolated Dual Digital Transistors)

UMB10N / IMB10A

●Features

1) Two DTA123J in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

●External dimensions (Units: mm)



●Structure

Epitaxial planar type
PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_{IN}	−12	V
			5	
Output current		I_O	−100	mA
		$I_{C(Max.)}$	−100	
Power dissipation	UMB10N	Pd	150(TOTAL)	mW *1
	IMB10A		300(TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-262-A123J)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I\,(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I\,(on)}$	−1.1	—	—		V_O=−0.3V, I_O=−5mA
Output voltage	$V_{O\,(on)}$	—	−0.1	−0.3	V	I_O/I_I=−5mA/−0.25mA
Input current	I_I	—	—	−3.6	mA	V_I=−5V
Output current	$I_{O\,(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	80	—	—	—	V_O=−5V, I_O=−10mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10mA, I_E=5mA, f=100MHz *
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	17	21	26	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TN	T110
Type	Basic ordering unit (pieces)	3000	3000
UMB10N		○	—
IMB10A		—	○

●Electrical characteristic curves

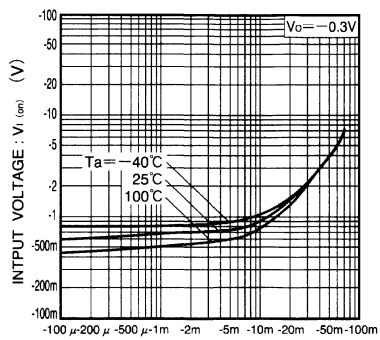


Fig.1 Input voltage vs. output current (ON characteristics)

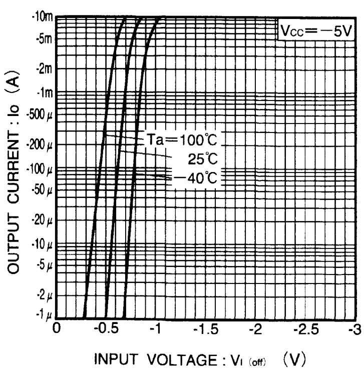


Fig.2 Output current vs. input voltage (OFF characteristics)

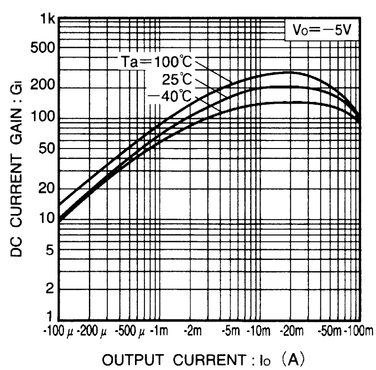


Fig.3 DC current gain vs. output current

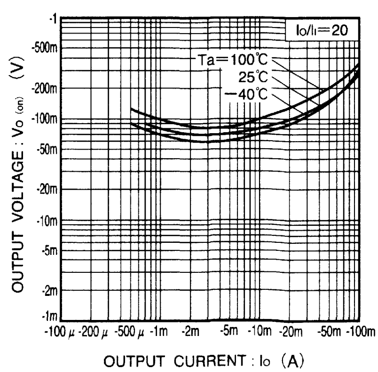


Fig.4 Output voltage vs. output current

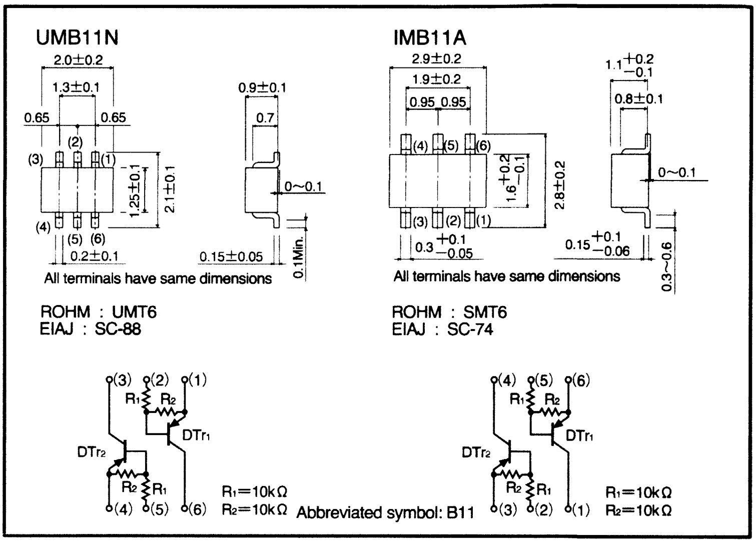
Digital Transistor (Dual Digital Transistors Isolated)
UMB11N / IMB11A

●Features
1) Two DTA114E in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
PNP silicon transistor
(Built-in transistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_{IN}	−40	V
			10	
Output current		I_O	−50	mA
		$I_{C(Max.)}$	−100	
Power dissipation	UMB11N	Pd	150 (TOTAL)	mW ∗1
	IMB11A		300 (TOTAL)	∗2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

Dual transistors

(96-454-A114E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3.0	—	—		V_O=−0.3V, I_O=−10mA
Output voltage	$V_{O(on)}$	—	0.1	−0.3	V	I_O/I_I=−10mA/−0.5mA
Input current	I_I	—	—	−0.88	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=−5V, I_O=−5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz*
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	Taping	
	Code	TN	T110
	Basic ordering unit (pieces)	3000	3000
UMB11N		○	—
IMB11A		—	○

●Electrical characteristic curves

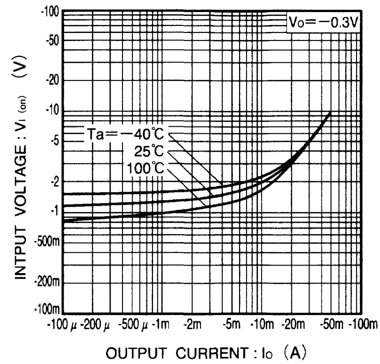


Fig.1 Input voltage vs. output current (ON characteristics)

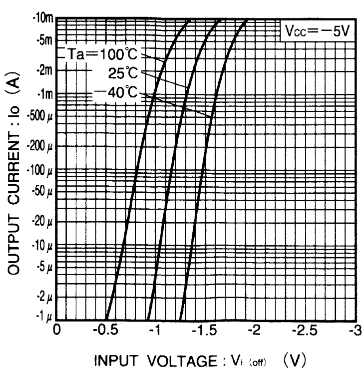


Fig.2 Output current vs. input voltage (OFF characteristics)

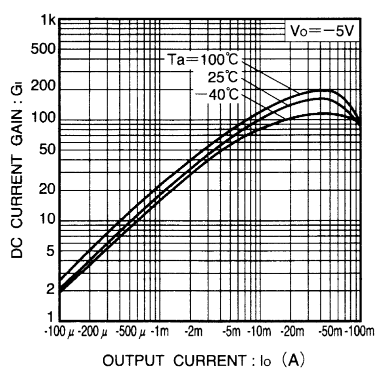


Fig.3 DC current gain vs. output current

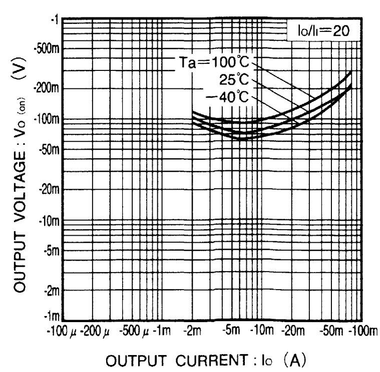


Fig.4 Output voltage vs. output current

Digital Transistor (Dual Digital Transistors for Power Management)

UMC2N / FMC2A

●Features

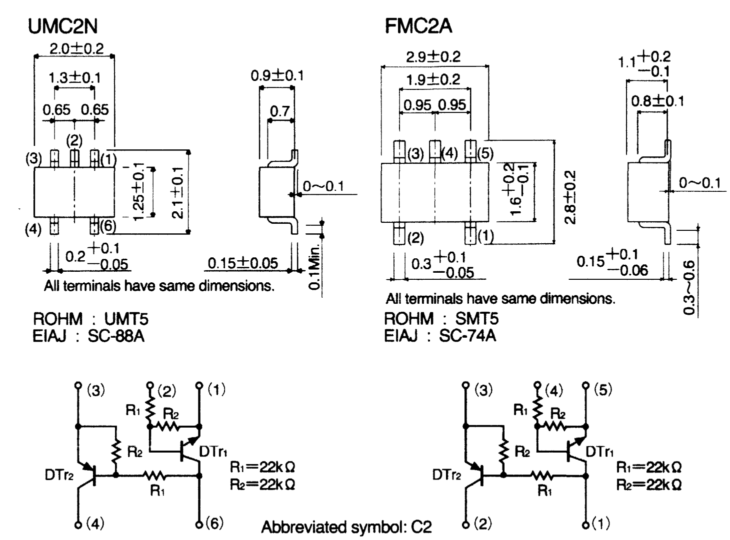
1) Both DTA124E and DTC124E in UMT and SMT packages.
2) Ideal for power switch circuits.
3) Mounting cost and area can be cut in half.

●Structure

Epitaxial planar type
NPN/PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both the DTr_1 and DTr_2, however, the "−" sign on DTr_2 values for the PNP type has been abbreviated.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit	
Supply voltage		V_{CC}	50	V	
Input current		V_{IN}	40	V	
			−10		
Output current		I_O	30	mA	
		$I_{C(Max.)}$	100		
Power dissipation	UMC2N	Pd	150 (TOTAL)	mW	∗1
	FMC2A		300 (TOTAL)		∗2
Junction temperature		Tj	150	°C	
Storage temperature		Tstg	−55~150	°C	

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-393-AC124E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100μA
	$V_{I(on)}$	3	—	—		V_O=0.2V, I_O=5mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.36	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	15.4	22	28.6	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMC2N		○	—
FMC2A		—	○

●Electrical characteristic curves

DTr1

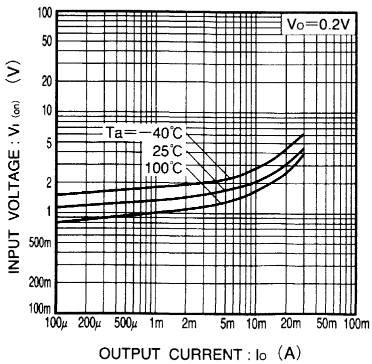


Fig.1 Input voltage vs. output current (ON characteristics)

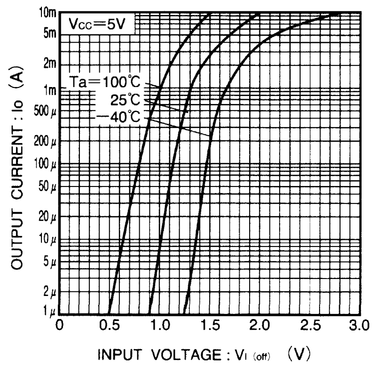


Fig.2 Output current vs. input voltage (OFF characteristics)

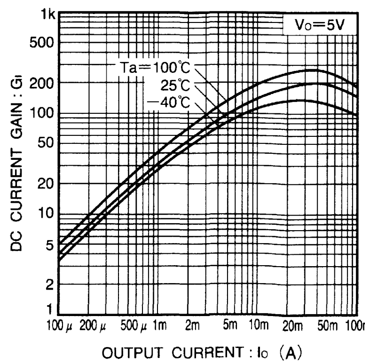


Fig.3 DC current gain vs. output current

DTr2

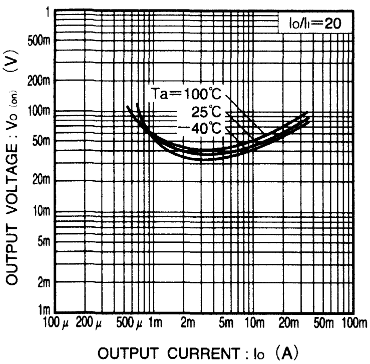


Fig.4 Output voltage vs. output current

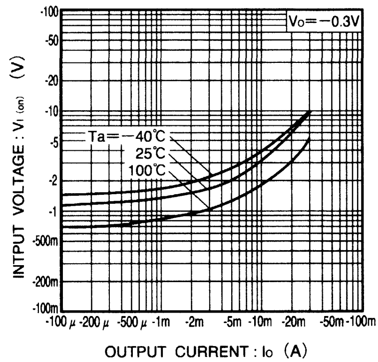


Fig.5 Input voltage vs. output current (ON characteristics)

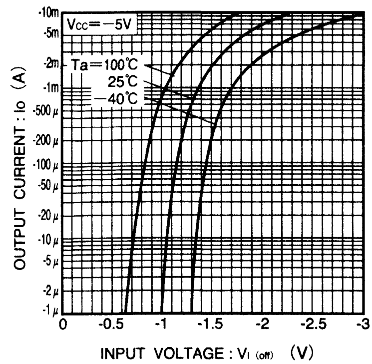


Fig.6 Output current vs. input voltage (OFF characteristics)

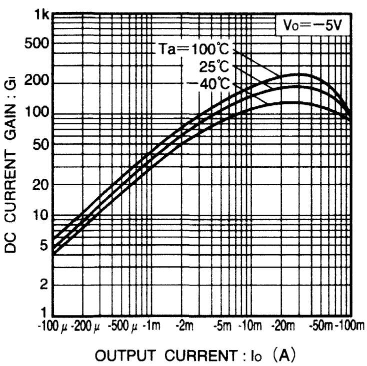


Fig.7 DC current gain vs. output current

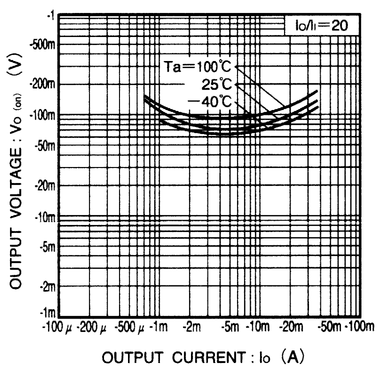


Fig.8 Output voltage vs. output current

Dual transistors

Digital Transistor (Dual Digital Transistors for Power Management)

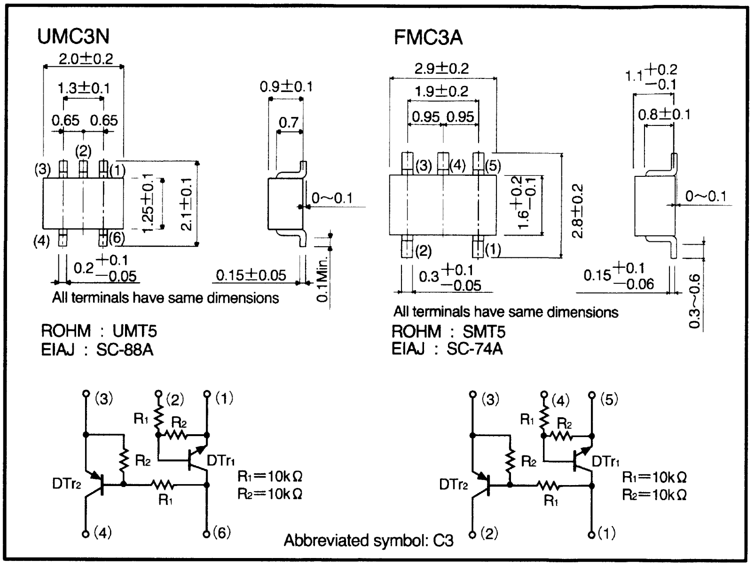
UMC3N / FMC3A

●Features
1) Two digital transistors, DTA114E and DTC114E, in the same size package as the UMT and SMT.
2) Ideal for power switch circuits.
3) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
NPN / PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.
The "−" symbol on PNP DTr_2 values has been abbreviated.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−10	
Output current		I_O	50	mA
		$I_{C(Max.)}$	100	
Power dissipation	UMC3N	Pd	150 (TOTAL)	mW *1
	FMC3A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-395-A/C114E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=10mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=10mA, I_I=0.5mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz*
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMC3N		○	—
FMC3A		—	○

Dual transistors

●Electrical characteristic curves

DTr1 (NPN)

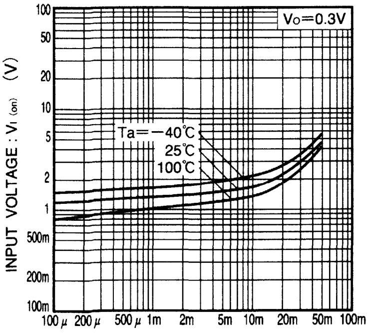


Fig.1 Input voltage vs. output current (ON characteristics)

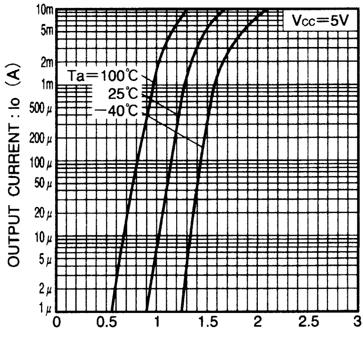


Fig.2 Output current vs. input voltage (OFF characteristics)

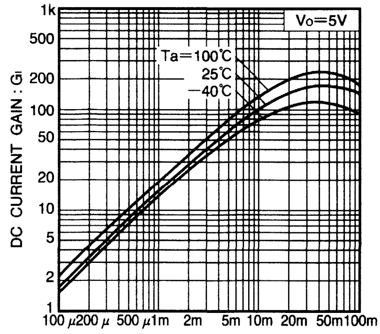


Fig.3 DC current gain vs. output current

●Electrical characteristic curves

DTr2 (PNP)

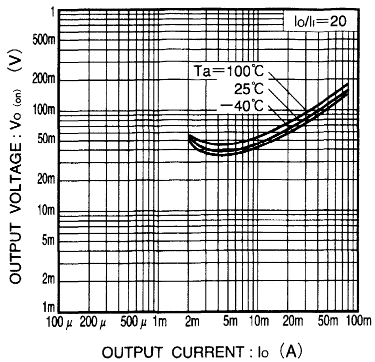


Fig.4 Output voltage vs. output current

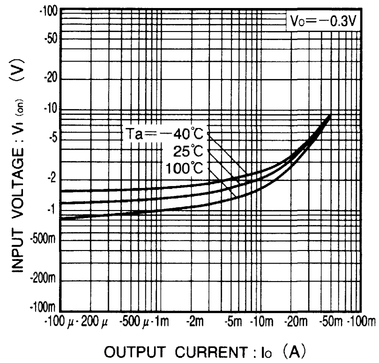


Fig.5 Input voltage vs. output current (ON characteristics)

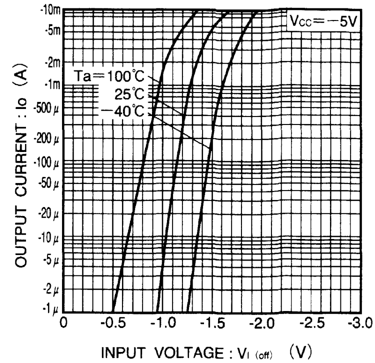


Fig.6 Output current vs. input voltage (OFF characteristics)

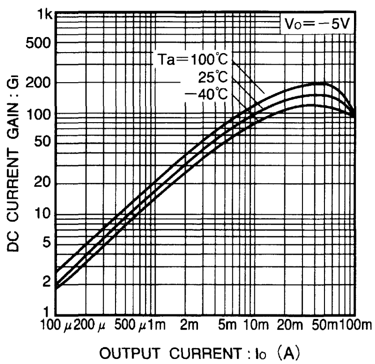


Fig.7 DC current gain vs. output current

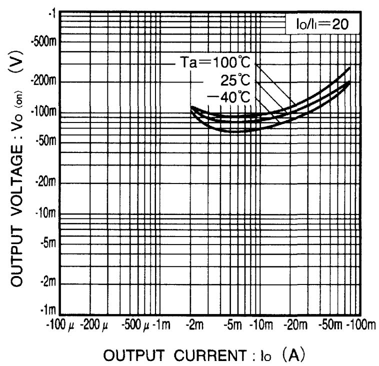


Fig.8 Output voltage vs. output current

Digital Transistor (Dual Digital Transistors for Power Management)

UMC4N / FMC4A

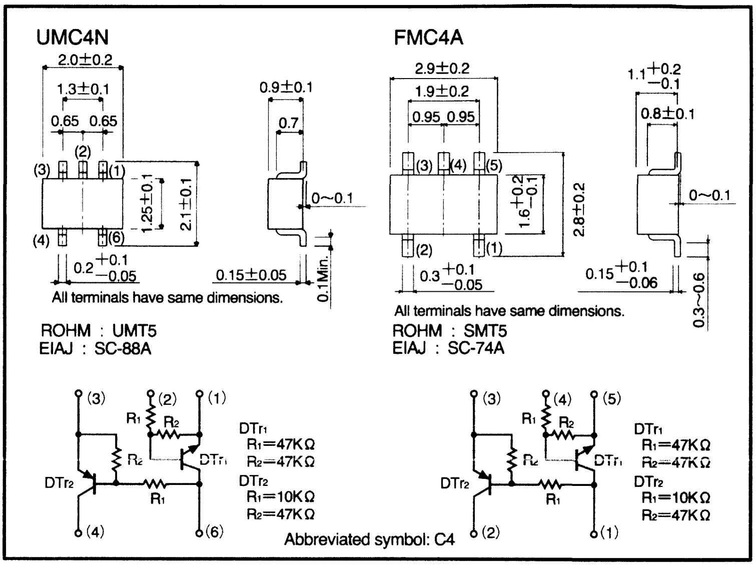
●Features

1) Two digital transistors, DTA114Y and DTC144E, in the same size package as the UMT and SMT.
2) Ideal for power switching circuits.
3) Mounting cost and area can be cut in half.

●Structure

Epitaxial planar type
NPN/PNP silicon transistor
(Built-in resistor type)

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits DTr1 (NPN)	Limits DTr2 (PNP)	Unit
Supply voltage		Vcc	50	−50	V
Input voltage		VIN	40	−40	V
			−10	6	
Output current		Io	30	−100	mA
		Ic (Max.)	100	−100	
Power dissipation	UMC4N	Pd	150 (TOTAL)		mW ∗1
	FMC4A		300 (TOTAL)		∗2
Junction temperature		Tj	150		℃
Storage temperature		Tstg	−55~150		℃

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-398-A114Y/C144E)

●Electrical characteristics, DTr_1 (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—	V	V_O=0.3V, I_O=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.18	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, VI=0V
DC current gain	G_I	68	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz＊
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

＊Transition frequency of mounted transistor

●Electrical characteristics, DTr_2 (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−1.4	—	—	V	V_O=−0.3V, I_O=−1mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−5mA /−0.25mA
Input current	I_I	—	—	−0.88	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=−5V, I_O=−5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz＊
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	3.7	4.7	5.7	—	—

＊Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMC4N		○	—
FMC4A		—	○

●Electrical characteristic curves

DTr1

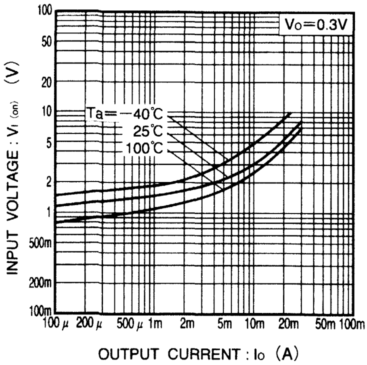


Fig.1 Input voltage vs. output current (ON characteristics)

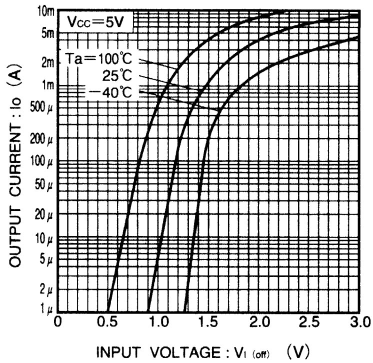


Fig.2 Output current vs. input voltage (OFF characteristics)

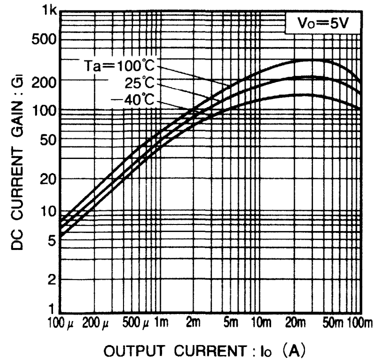


Fig.3 DC current gain vs. output current

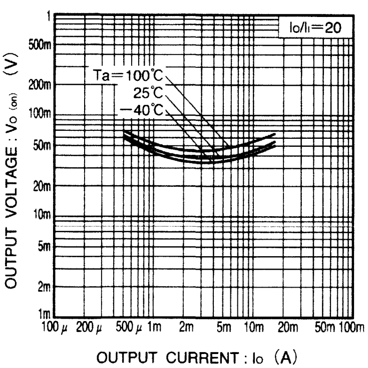


Fig.4 Output voltage vs. output current

DTr2

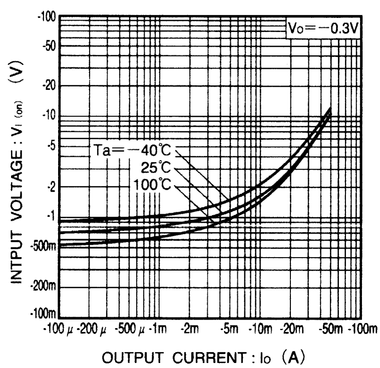


Fig.5 Input voltage vs. output current (ON characteristics)

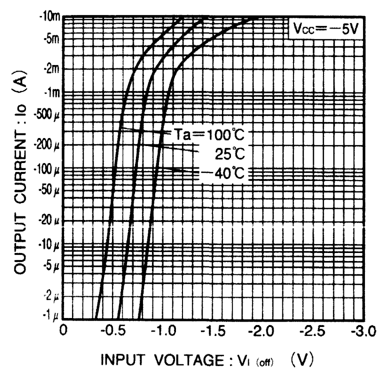


Fig.6 Output current vs. input voltage (OFF characteristics)

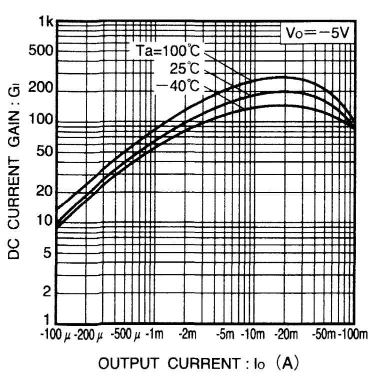


Fig.7 DC current gain vs. output current

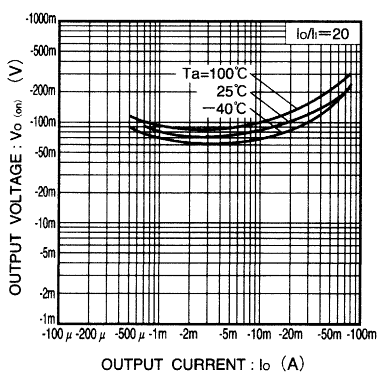


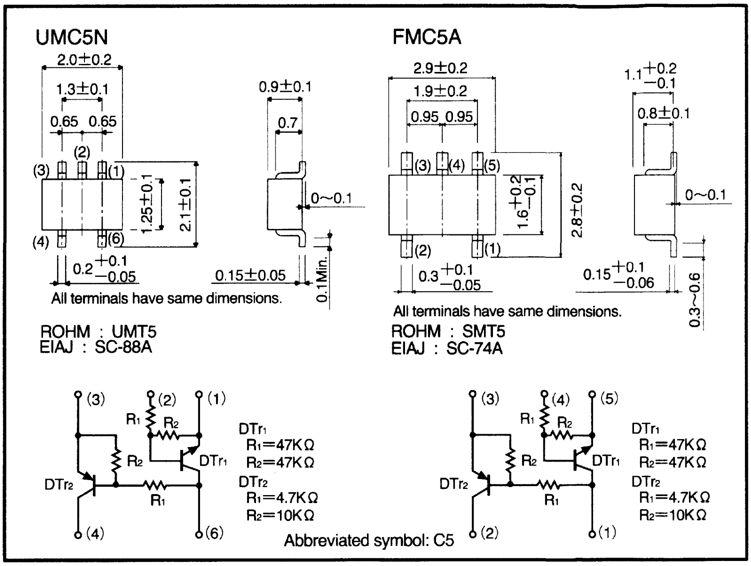
Fig.8 Output voltage vs. output current

Digital Transistor (Dual Digital Transistors for Power Management)
UMC5N / FMC5A

●Features
1) Two digital transistors, DTA143X and DTZ144E, in the same size package as the UMT and SMT.
2) Ideal for power switch circuits.
3) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
NPN / PNP silicon transistor
(Built-in resistor type)

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits		Unit
			DTr1 (NPN)	DTr2 (PNP)	
Supply voltage		V_{CC}	50	−50	V
Input voltage		V_{IN}	40	−20	V
			−10	7	
Output current		$I_{O(Max.)}$	30	−100	mA
		$I_{C(Max.)}$	100	−100	
Power dissipation	UMC5N	Pd	150 (TOTAL)		mW *1
	FMC5A		300 (TOTAL)		mW *2
Junction temperature		Tj	150		°C
Storange temperature		Tstg	−55~150		°C

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-402-A143X/C144E)

●Electrical characteristics, DTr1 (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=10mA, I_I=0.5mA
Input current	I_I	—	—	0.18	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Electrical characteristics, DTr2 (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100 μA
	$V_{I(on)}$	−2.5	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−10mA, I_I=−0.5mA
Input current	I_I	—	—	−1.8	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=−5V, I_O=−10mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10mA, I_E=5mA, f=100MHz *
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	1.7	2.1	2.6	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMC5N		○	—
FMC5A		—	○

● Electrical characteristic curves

DTr1 (NPN)

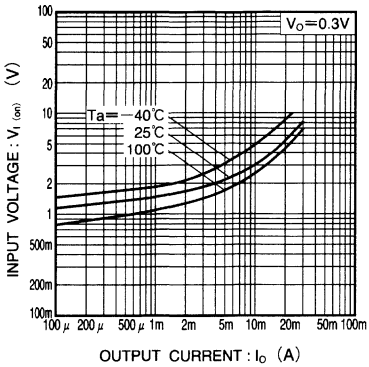


Fig.1 Input voltage vs. output current (ON characteristics)

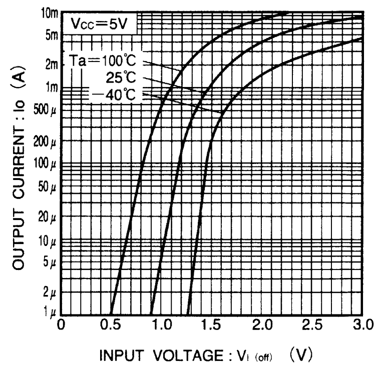


Fig.2 Output current vs. input voltage (OFF characteristics)

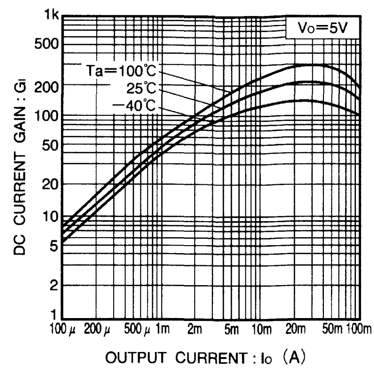


Fig.3 DC current gain vs. output current

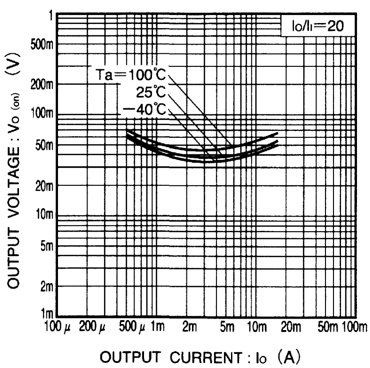


Fig.4 Output voltage vs. output current

DTr2 (PNP)

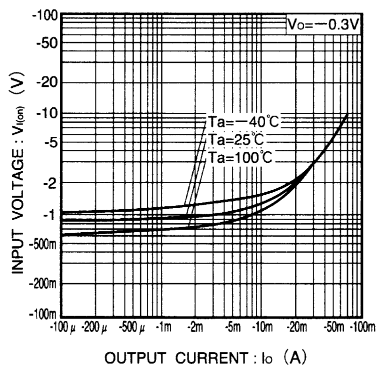


Fig.5 Input voltage vs. output current (ON characteristics)

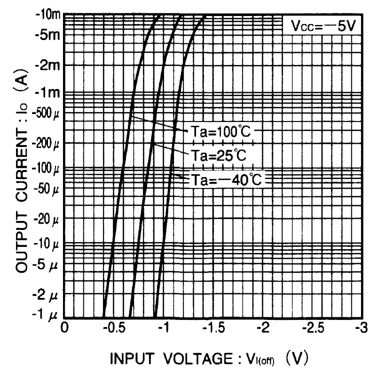


Fig.6 Output current vs. input voltage (OFF characteristics)

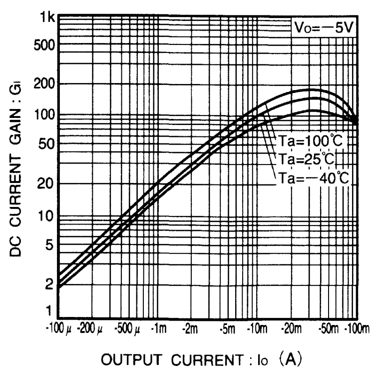


Fig.7 DC current gain vs. output current

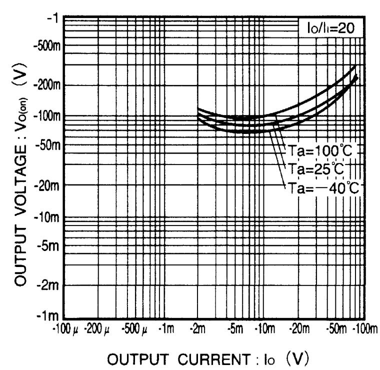


Fig.8 Output voltage vs. output current

Digital Transistor (Isolated Dual Digital Transistors)

UMD2N / IMD2A

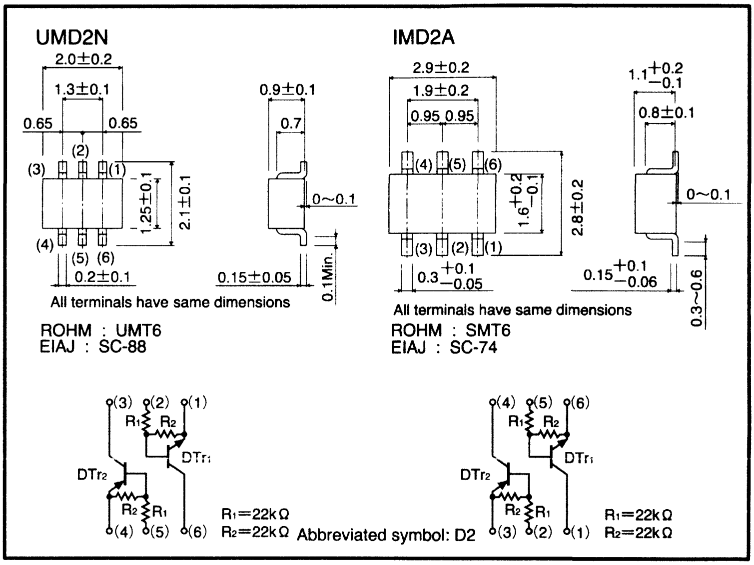
● Features

1) Two digital transistors, DTA124E and DTC124E, in the same size package as the UMT and SMT.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

● Structure

Epitaxial planar type
NPN/PNP silicon transistor
(Built-in resistor type)
The following characteristics apply to both the DTn1 and DTn2, however, the "−" sign on DTn2 values for the PNP type has been abbreviated.

● External dimensions (Units: mm)



● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−10	
Output current		I_O	30	mA
		$I_{C\,(Max.)}$	100	
Power dissipation	UMD2N	Pd	150 (TOTAL)	mW *1
	IMD2A		300 (TOTAL)	*2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-460-A/C124E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.2V, I_O=10mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.36	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	15.4	22	28.6	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Packag	Taping	
	Code	TR	T108
Type	Basic ordering unit (pieces)	3000	3000
UMD2N		○	—
IMD2A		—	○

●Electrical characteristic curves

DTr1 (NPN)

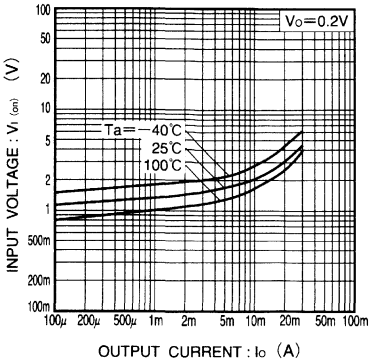


Fig.1 Input voltage vs. output current (ON characteristics)

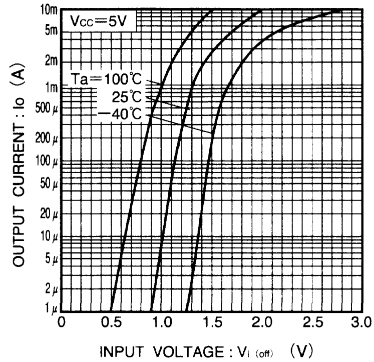


Fig.2 Output current vs. input voltage (OFF characteristics)

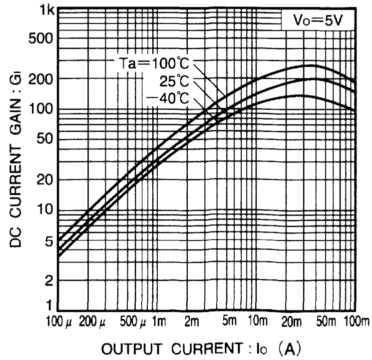


Fig.3 DC current gain vs. output current

DTr2 (PNP)

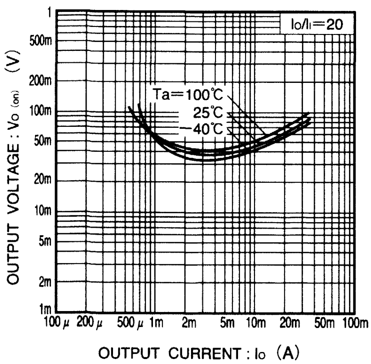


Fig.4 Output voltage vs. output current

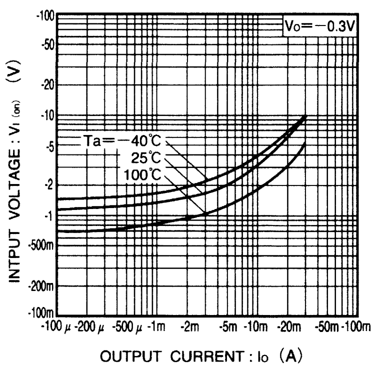


Fig.5 Input voltage vs. output current (ON characteristics)

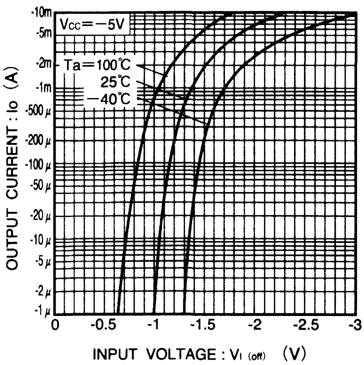


Fig.6 Output current vs. input voltage (OFF characteristics)

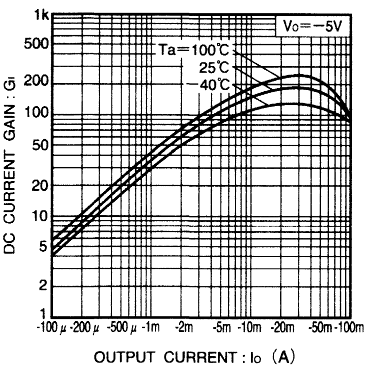


Fig.7 DC current gain vs. output current

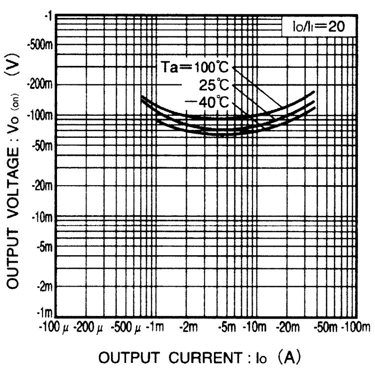


Fig.8 Output voltage vs. output current

Dual transistors

Digital Transistor (Isolated Dual Digital Transistors)

UMD3N / IMD3A

● Features

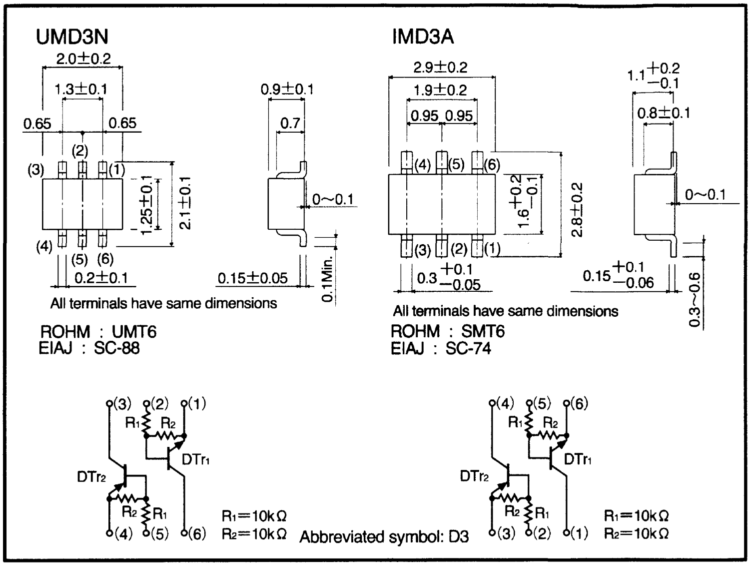
1) Two digital transistors, DTA114E and DTC114E, in the same size package as the UMT and SMT.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

● Structure

Epitaxial planar type
NPN / PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.
The "−" symbol on PNP DTr_2 values has been abbreviated.

● External dimensions (Units: mm)



● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	−10	V
			40	
Output current		I_O	50	mA
		$I_{C(Max.)}$	100	
Power dissipation	UMD3N	Pd	150 (TOTAL)	mW ∗1
	IMD3A		300 (TOTAL)	∗2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-463-A/C114E)

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=10mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=5V , I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T108
Type	Basic ordering unit (pieces)	3000	3000
UMD3N		○	—
IMD3A		—	○

●Electrical characteristic curves

DTr1 (NPN)

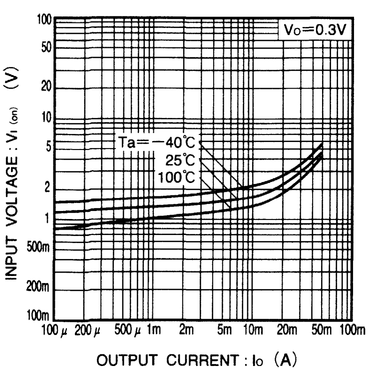


Fig.1 Input voltage vs. output current (ON characteristics)

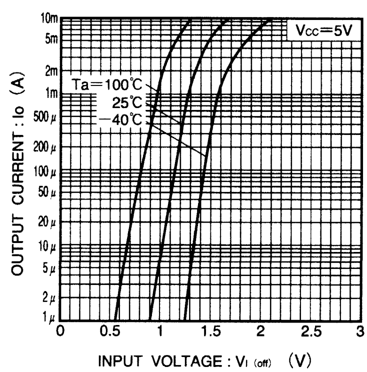


Fig.2 Output current vs. input voltage (OFF characteristics)

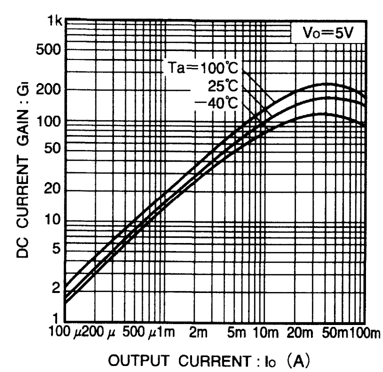


Fig.3 DC current gain vs. output current

DTr2 (PNP)

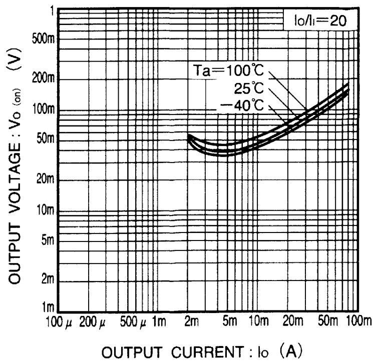


Fig.4 Output voltage vs. output current

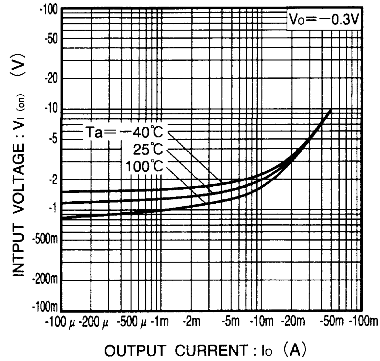


Fig.5 Input voltage vs. output current (ON characteristics)

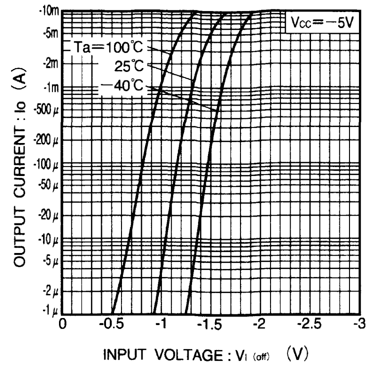


Fig.6 Output current vs. input voltage (OFF characteristics)

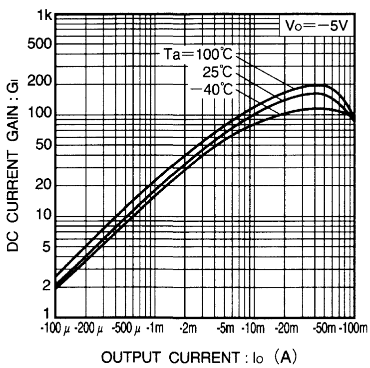


Fig.7 DC current gain vs. output current

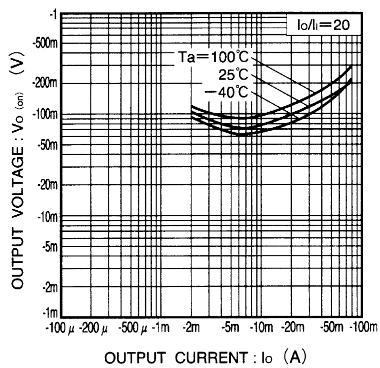


Fig.8 Output voltage vs. output current

Digital Transistor (Isolated Dual Digital Transistors)

UMD6N / IMD6A

●Features

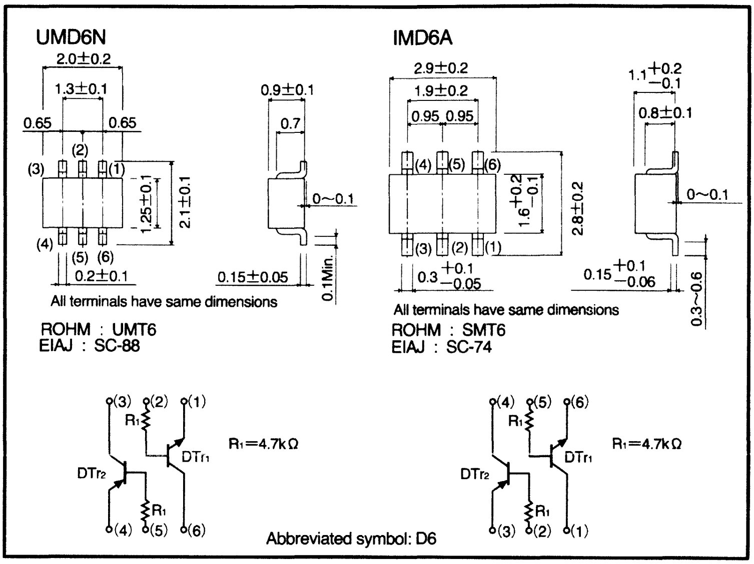
1) Two digital transistors, DTA143T and DTC143T, in the same size package as the UMT and SMT.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

●Structure

Epitaxial planar type
NPN/PNP silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.
The "−" symbol on PNP DTr_2 values has been abbreviated.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector power dissipation	UMD6N	P_C	150 (TOTAL)	mW ∗1
	IMD6A		300 (TOTAL)	∗2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=5mA/0.25mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	3.29	4.7	6.11	kΩ	—

* Transition frequency of mounted transistor

● Packaging specifications

Type	Package	Taping	
	Code	TR	T108
	Basic ordering unit (pieces)	3000	3000
UMD6N		○	—
IMD6A		—	○

● Electrical characteristic curves

DTr1 (NPN)

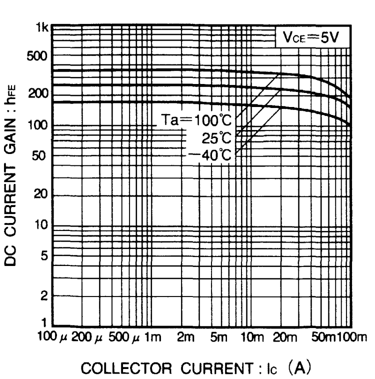


Fig.1 DC current gain vs. collector current

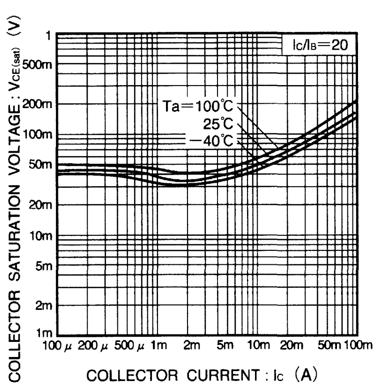


Fig.2 Collector-emitter saturation voltage vs. collector current

DTr2 (PNP)

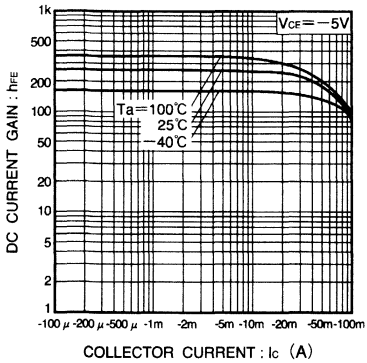


Fig.3 DC current gain vs. collector current

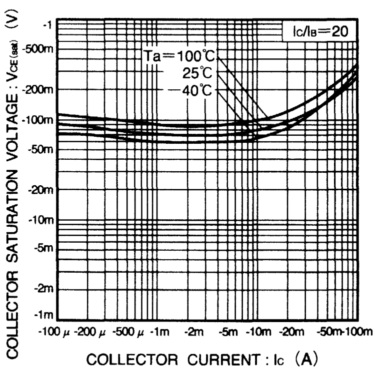


Fig.4 Collector-emitter saturation voltage vs. collector current

Dual transistors

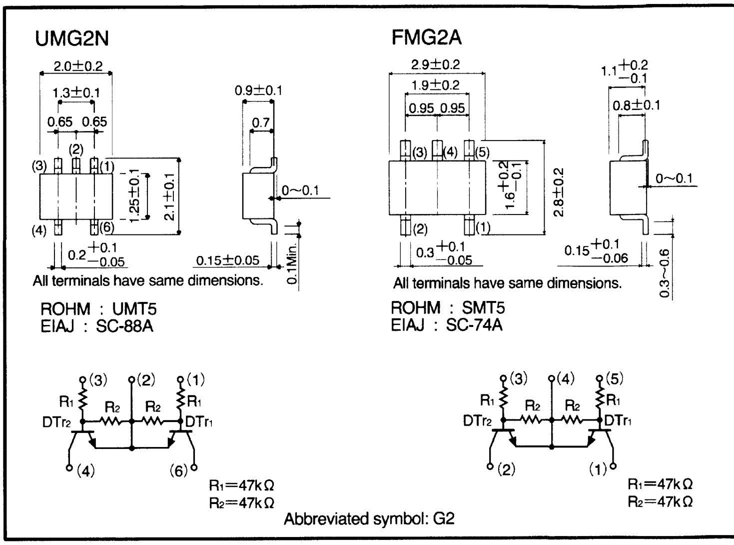
Digital Transistor (Common Emitter Dual Transistors)
UMG2N / FMG2A

●Features
1) Two DTC144E digital transistors in a UMT, SMT package.
2) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
NPN silicon transistor
(Built-in transistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−10	
Output current		I_O	30	mA
		$I_{C(Max.)}$	100	
Power dissipation	UMG2N	Pd	150 (TOTAL)	mW *1
	FMG2A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-409-C144E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I (off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I (on)}$	3	—	—		V_O=0.3V, I_O=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.18	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMG2N		○	—
FMG2A		—	○

●Electrical characteristic curves

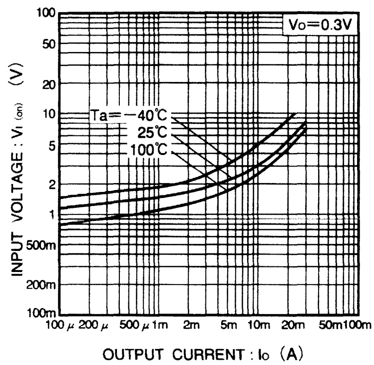


Fig.1 Input voltage vs. output current (on-characteristics)

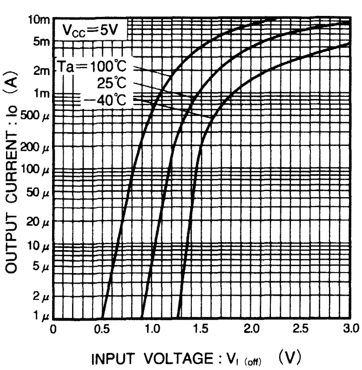


Fig.2 Output current vs. input voltage (off-characteristics)

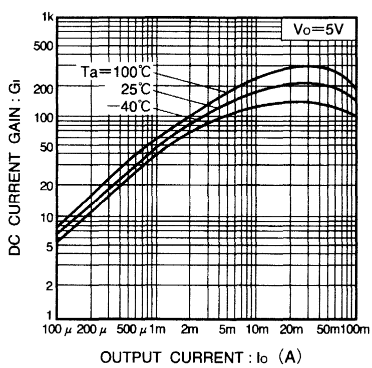


Fig.3 DC current gain vs. output current

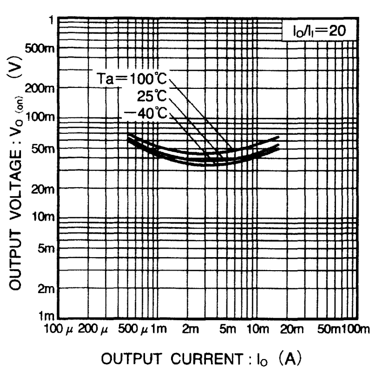


Fig.4 Output voltage vs. output current

Digital Transistor (Common Emitter Dual Transistors)

UMG3N / FMG3A

●Features

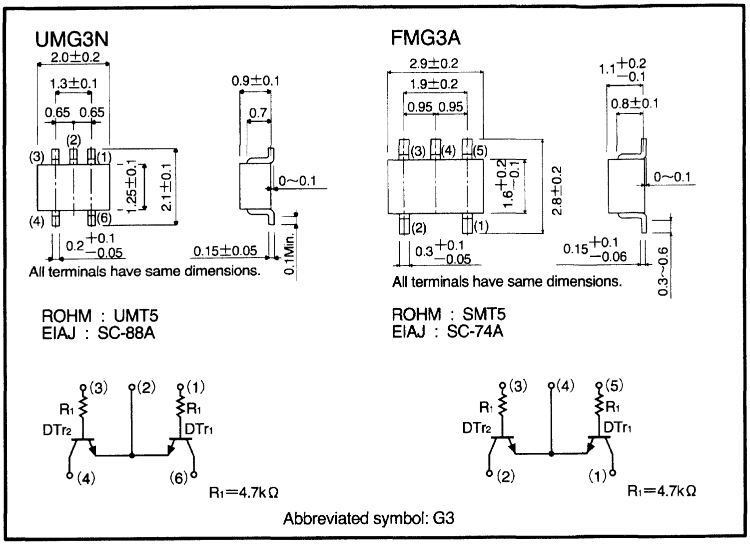
1) Two DTC143T digital transistors in a UMT, SMT package.
2) Mounting cost and area can be cut in half.

●Structure

Epitaxial planar type
NPN silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector power dissipation	UMG3N	P_C	150 (TOTAL)	mW *1
	FMG3A		300 (TOTAL)	*2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-411-C143T)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=10mA/1mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	3.29	4.7	6.11	kΩ	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMG3N		○	—
FMG3A		—	○

●Electrical characteristic curves

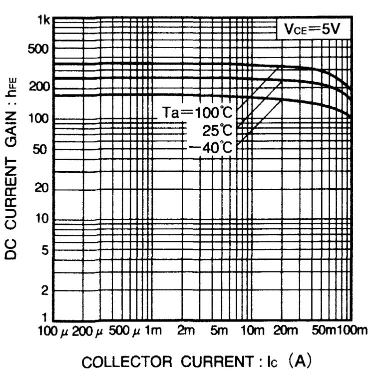


Fig.1 DC current gain vs. collector current

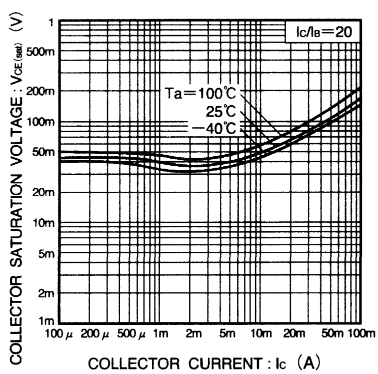


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital Transistor (Common Emitter Dual Transistors)

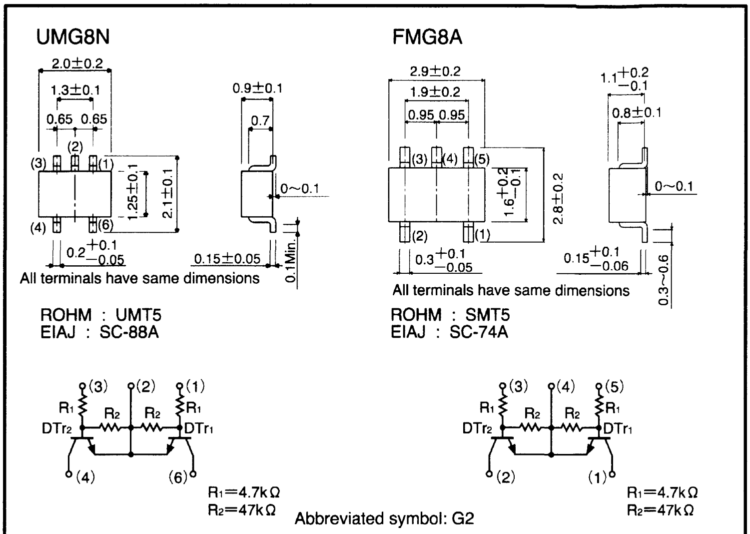
UMG8N / FMG8A

●Features
1) Two DTC143T digital transistors in a UMT, SMT package.
2) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
NPN silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	30	V
			−5	
Output current		I_O	100	mA
		$I_{C(Max.)}$	100	mA
Power dissipation	UMG8N	Pd	150 (TOTAL)	mW ∗1
	FMG8A		300 (TOTAL)	∗2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-413-C143Z)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	1.3	—	—		V_O=0.3V, I_O=5mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=5mA/0.25mA
Input current	I_I	—	—	1.8	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	80	—	—	—	V_O=5V, I_O=10mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	Taping	
	Code	TR	T148
	Basic ordering unit (pieces)	3000	3000
UMG8N		○	—
FMG8A		—	○

●Electrical characteristic curves

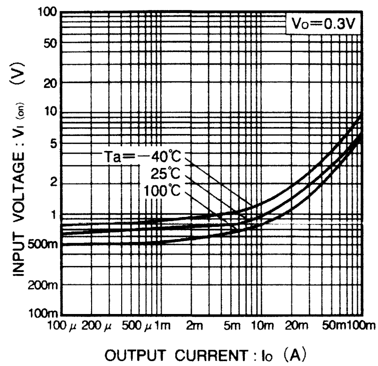


Fig.1 Input voltage vs. output current (ON characteristics)

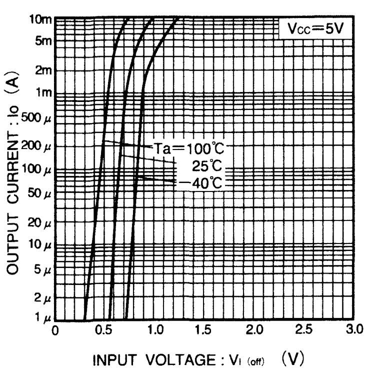


Fig.2 Output current vs. input voltage (OFF characteristics)

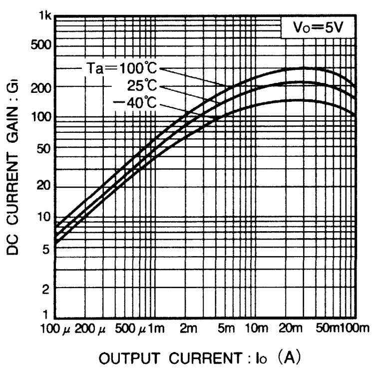


Fig.3 DC current gain vs. output current

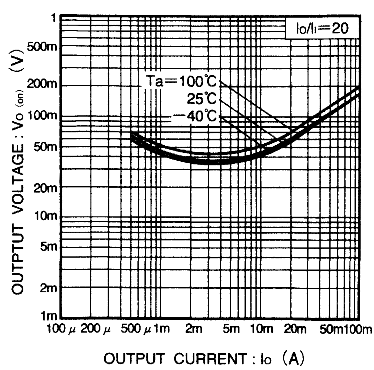


Fig.4 Output voltage vs. output current

Dual transistors

Digital Transistor (Common Emitter Dual Transistors)

UMG9N/FMG9A

● Features

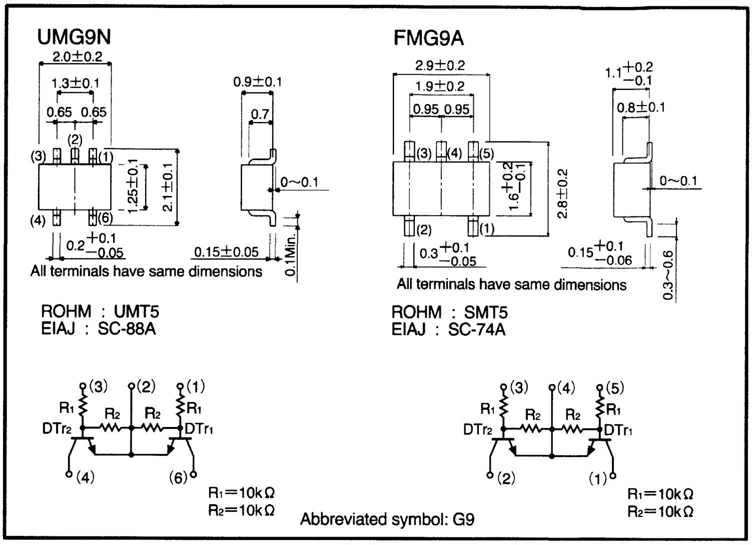
1) Two DTC114E digital transistors in a UMT, SMT package.
2) Mounting cost and area can be cut in half.

● Structure

Epitaxial planar type
NPN silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

● External dimensions (Units: mm)



● Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−10	
Output current		I_O	50	mA
		$I_{C (Max.)}$	100	
Power dissipation	UMG9N	Pd	150 (TOTAL)	mW *1
	FMG9A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-415-C114E)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I\,(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I\,(on)}$	3	—	—		V_O=0.3V, I_O=10mA
Output voltage	$V_{O\,(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O\,(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1.0	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMG9N		○	—
FMG9A		—	○

●Electrical characteristic curves

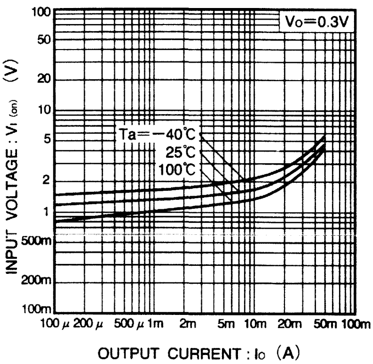


Fig.1 Input voltage vs. output current (ON characteristics)

Dual transistors

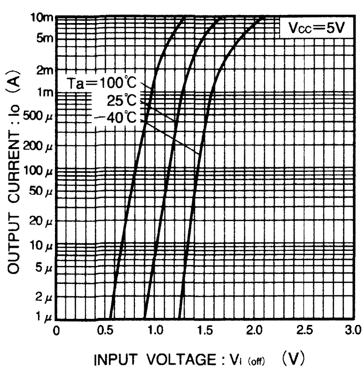


Fig.2 Output current vs. input voltage (OFF characteristics)

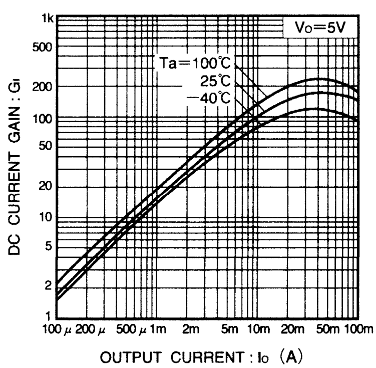


Fig.3 DC current gain vs. output current

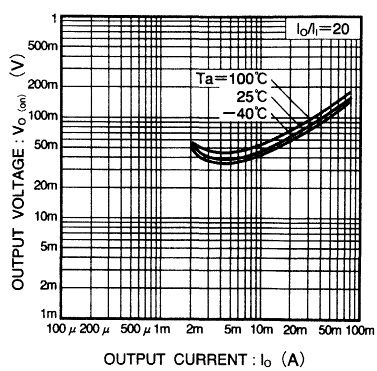


Fig.4 Output voltage vs. output current

Digital Transistor (Isolated Dual Digital Transistors)

UMH2N / IMH2A

● Features

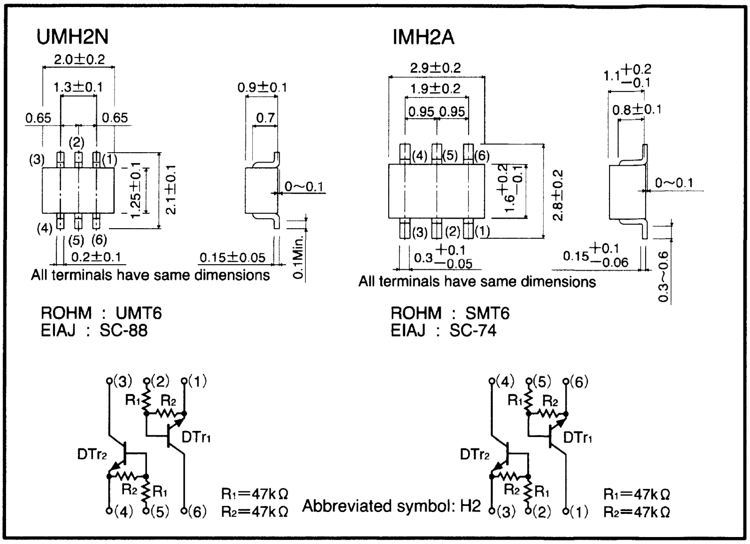
1) Two DTC144E in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

● Structure

Epitaxial planar type
NPN silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

● External dimensions (Units: mm)



● Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−10	
Output current		I_O	30	mA
		$I_{C(Max.)}$	100	
Power dissipation	UMH2N	Pd	150 (TOTAL)	mW ∗1
	IMH2A		300 (TOTAL)	∗2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(SPEC-C144E)

ROHM

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	3	—	—		V_O=0.3V, I_O=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.18	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	Taping	
	Code	TN	T110
	Basic ordering unit (pieces)	3000	3000
UMH2N		○	—
IMH2A		—	○

●Electrical characteristic curves

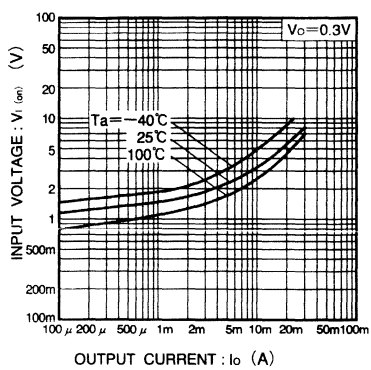


Fig.1 Input voltage vs. output current (ON characteristics)

Dual transistors

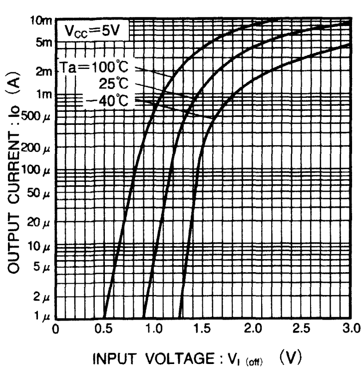


Fig.2 Output current vs. input voltage (OFF characteristics)

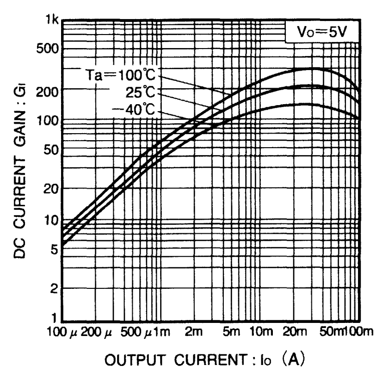


Fig.3 DC current gain vs. output current

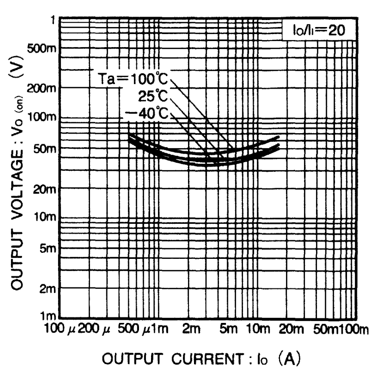


Fig.4 Output voltage vs. output current

Digital Transistor (Isolated Dual Digital Transistors)

UMH3N / IMH3A

●Features

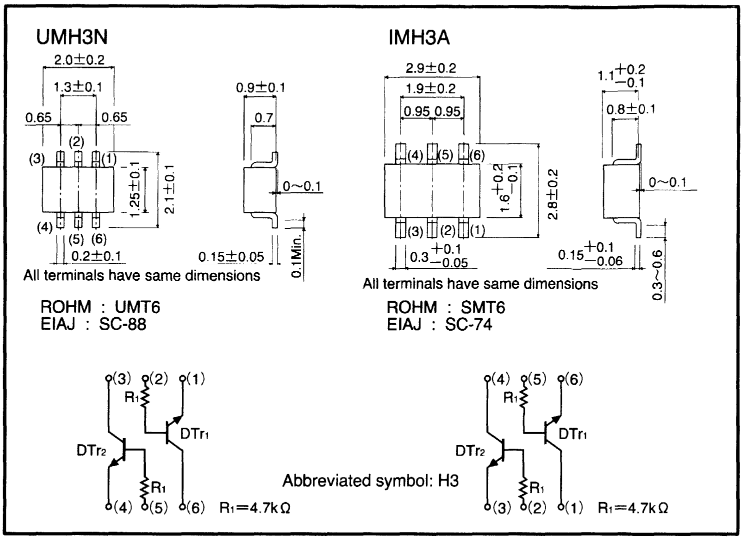
1) Two DTAK13T in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.

●Structure

Epitaxial planar type
NPN silicon transistor

The following characteristics apply to both DTr_1 and DTr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector power dissipation	UMH3N	P_C	150 (TOTAL)	mW ∗1
	IMH3A		300 (TOTAL)	mW ∗2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-480-C143T)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltag	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=5mA/0.25mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	3.29	4.7	6.11	kΩ	—

* Transition frequency of mounted transistor

●Packaging specifications

Type	Package	Taping	
	Code	TN	T110
	Basic ordering unit (pieces)	3000	3000
UMH3N		○	—
IMH3A		—	○

Dual transistors

●Electrical characteristic curves

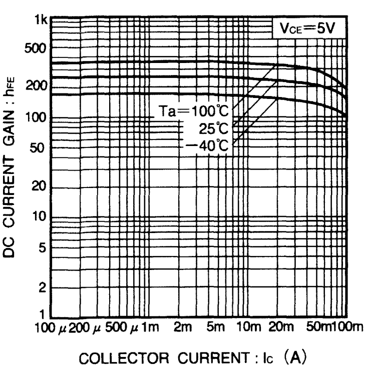


Fig.1 DC current gain vs. collector current

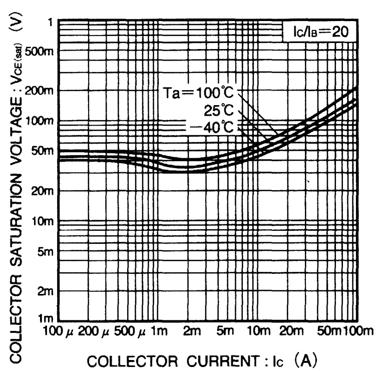


Fig.2 Collector-emitter saturation voltage vs. collector current

Digital Transistor (Isolated Dual Digital Transistors)

UMH9N / IMH9A

●Features

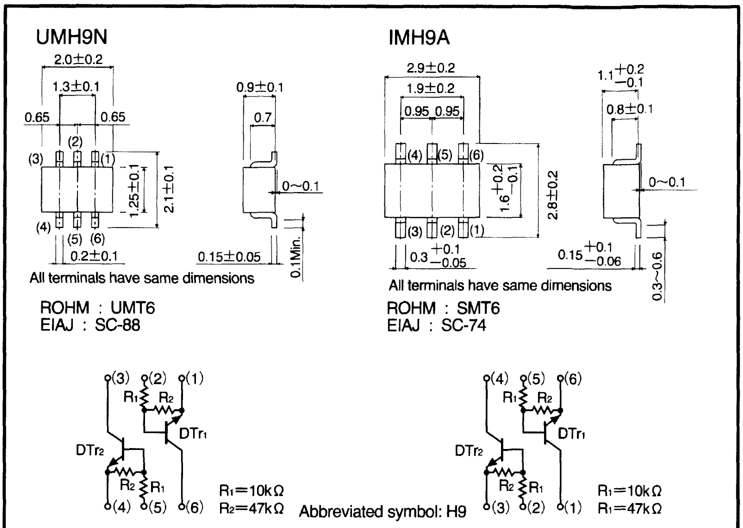
1) Two DTC114Y in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

●Structure

Epitaxial planar type
NPN silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

●Externa dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−6	
Output current		I_O	70	mA
		I_C (Max.)	100	
Power dissipation	UMH9N	Pd	150 (TOTAL)	mW *1
	IMH9A		300 (TOTAL)	*2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-486-C114Y)

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	1.4	—	—		V_O=0.3V, I_O=1mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=5mA/0.25mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	68	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	3.7	4.7	5.7	—	—

*Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TN	T110
Type	Basic ordering unit (pieces)	3000	3000
UMH9N		○	—
IMH9A		—	○

●Electrical characteristic curves

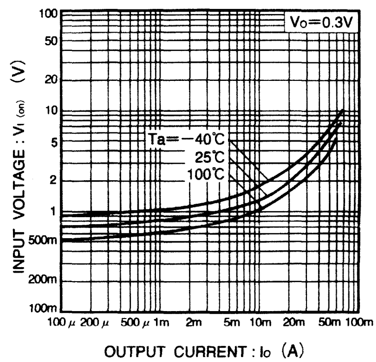


Fig.1 Input voltage vs. output current (ON characteristics)

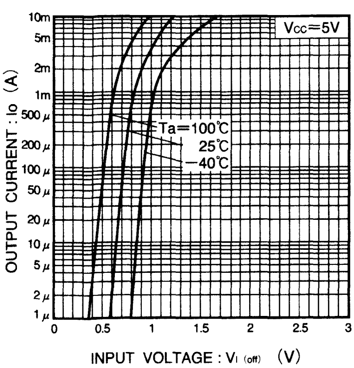


Fig.2 Output current vs. input voltage (OFF characteristics)

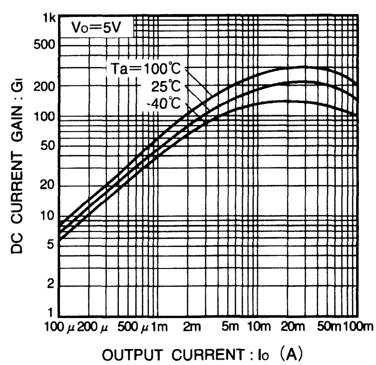


Fig.3 DC current gain vs. output current

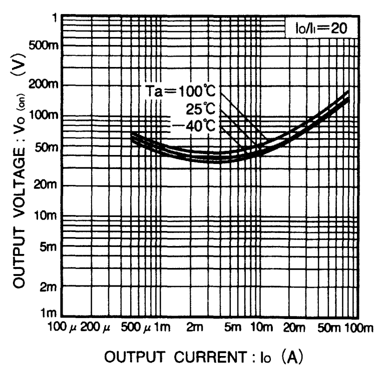


Fig.4 Output voltage vs. output current

Dual transistors

Digital Transistor (Isolated Dual Digital Transistors)

UMH10N / IMH10A

● Features

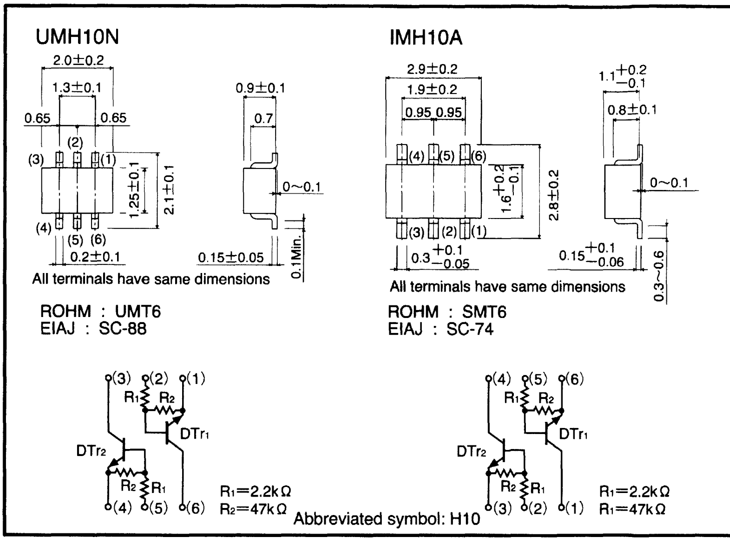
1) Two DTC123J in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

● Structure

Epitaxial planar type
NPN silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

● External dimensions (Units: mm)



● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	12	V
			−5	
Output current		I_O	100	mA
		$I_{C(Max.)}$	100	mA
Power dissipation	UMH10N	Pd	150 (TOTAL)	mW *1
	IMH10A		300 (TOTAL)	*2
Storage temperature		Tstg	−55~150	°C

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-488-C123J)

ROHM

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I(on)}$	1.1	—	—		V_O=0.3V, I_O=5mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O/I_I=5mA/0.25mA
Input current	I_I	—	—	3.6	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	80	—	—	—	V_O=5V, I_O=10mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	17	21	26	—	—

*Transition frequency of mounted transistor

●Packaging specifications

Type	Package	Taping	
	Code	TN	T110
	Basic ordering unit (pieces)	3000	3000
UMH10N		○	—
IMH10A		—	○

●Electrical characteristic curves

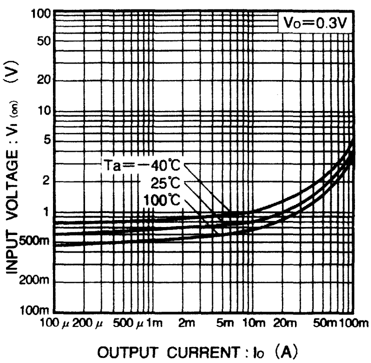


Fig.1 Input voltage vs. output current (ON characteristics)

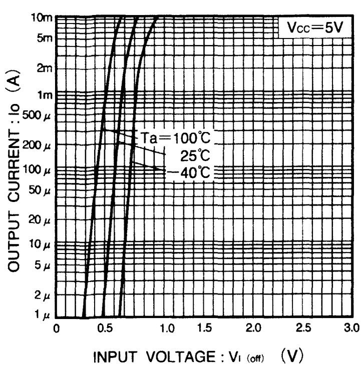


Fig.2 Output current vs. input voltage (OFF characteristics)

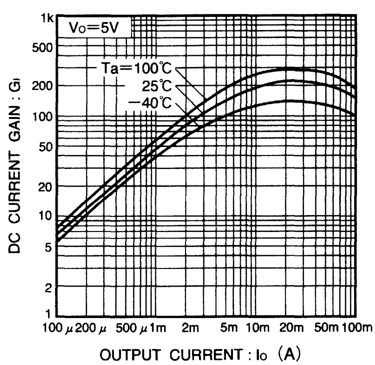


Fig.3 DC current gain vs. output current

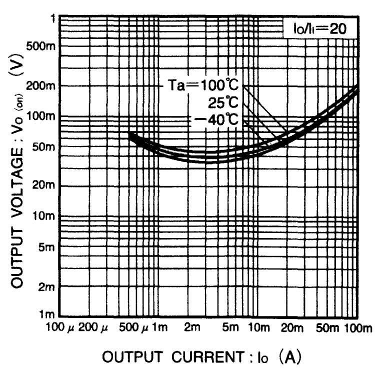


Fig.4 Output voltage vs. output current

Digital Transistor (Isolated Dual Digital Transistors)

UMH11N / IMH11A

● Features

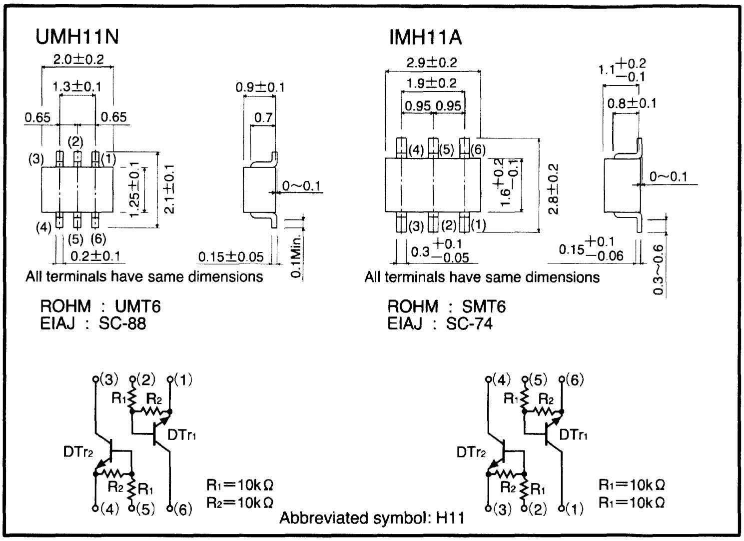
1) Two DTC114E in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

● Structure

Epitaxial planar type
NPN silicon transistor
(Built-in resistor type)

The following characteristics apply to both DTr_1 and DTr_2.

● External dimensions (Units: mm)



● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−10	
Output current		I_O	50	mA
Collector current		$I_{C(Max.)}$	100	mA
Power dissipation	UMH11N	Pd	150 (TOTAL)	mW *1
	IMH11A		300 (TOTAL)	*2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-490-C114E)

ROHM

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I\,(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100 μA
	$V_{I\,(on)}$	3	—	—		V_O=0.3V, I_O=10mA
Output voltage	$V_{O\,(on)}$	—	0.1	0.3	V	I_O/I_I=10mA/0.5mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O\,(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	30	—	—	—	V_O=5V, I_O=5mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10mA, I_E=−5mA, f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

*Transition frequency of mounted transistor

●Packaging specifications

	Package	Taping	
	Code	TN	T110
Type	Basic ordering unit (pieces)	3000	3000
UMH11N		○	—
IMH11A		—	○

●Electrical characteristic curves

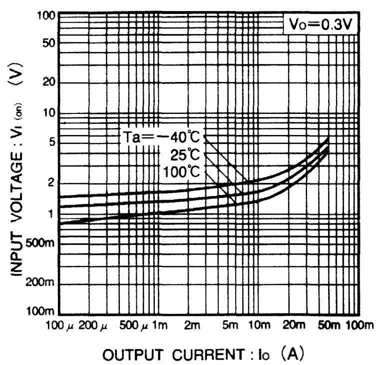


Fig.1 Input voltage vs. output current (ON characteristics)

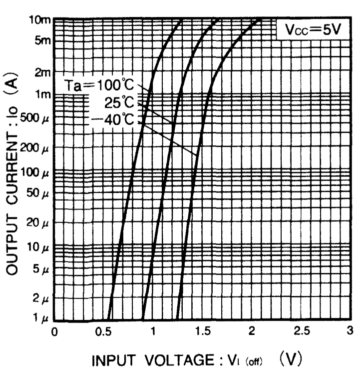


Fig.2 Output current vs. input voltage (OFF characteristics)

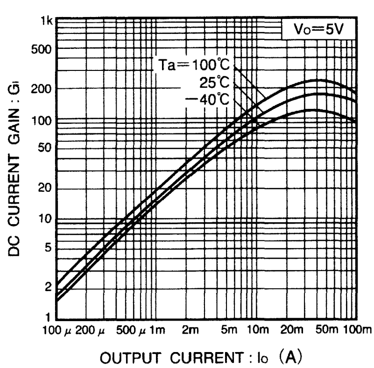


Fig.3 DC current gain vs. output current

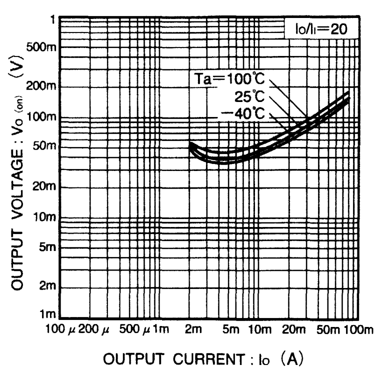


Fig.4 Output voltage vs. output current

General Purpose Transistor (Common Emitter Dual Transistors)

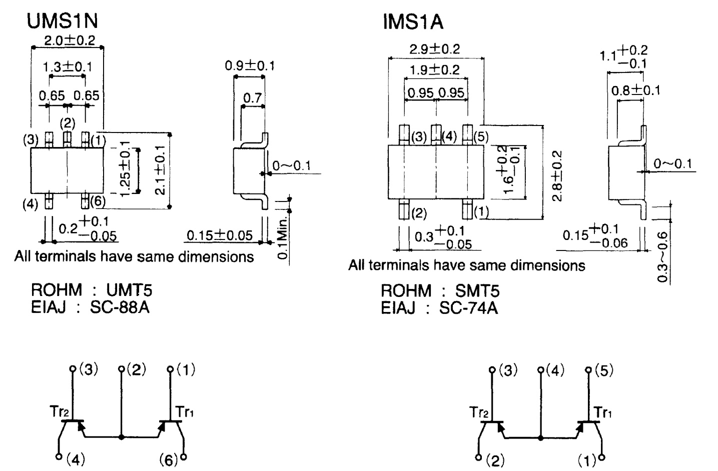
UMS1N / FMS1A

●Features
1) Two 2SA1037AK chips in UMT and SMT packages.
2) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
PNP silicon transistor

The following characteristics apply to both Tr_1 and Tr_2.

●External dimensions (Units: mm)



Abbreviated symbol: S1

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−60	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−6	V
Collector current		I_C	−150	mA
Collector power dissipation	UMS1N	P_C	150 (TOTAL)	mW ∗1
	FMS1A		300 (TOTAL)	∗2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-421-A22)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−50mA/−5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=−6V, I_C=−1mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V, I_E=2mA, f=100MHz
Output capacitance	Cob	—	3	4.5	PF	V_{CB}=−12V, I_E=0A, f=1MHz

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMS1N		○	—
FMS1A		—	○

Dual transistors

●Electrical characteristic curves

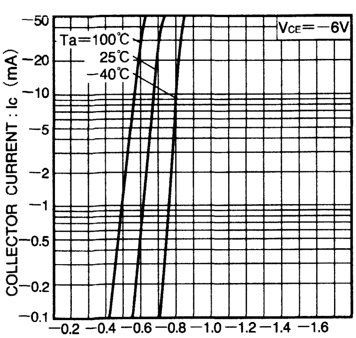


Fig.1 Grounded emitter propagation characteristics

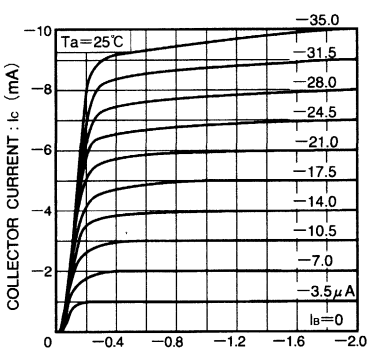


Fig.2 Grounded emitter output characteristics (I)

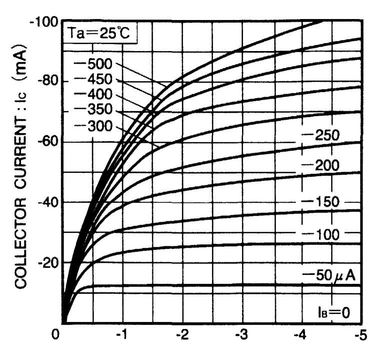


Fig.3 Grounded emitter output characteristics(II)

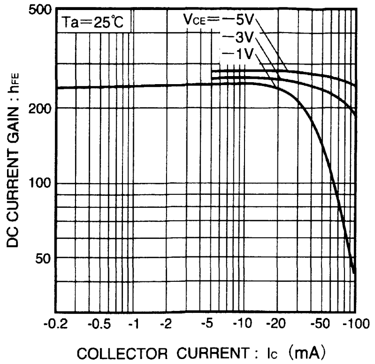


Fig.4 DC current gain vs. collector current (I)

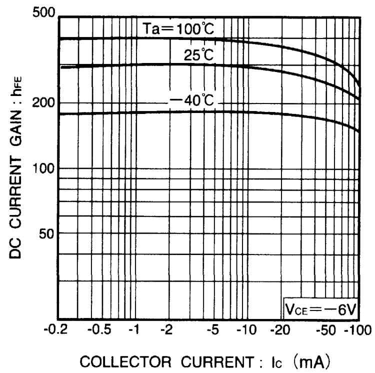


Fig.5 DC current gain vs. collector current (II)

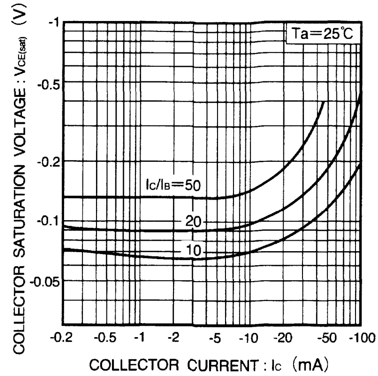


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

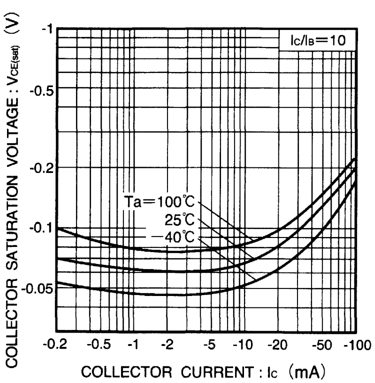


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

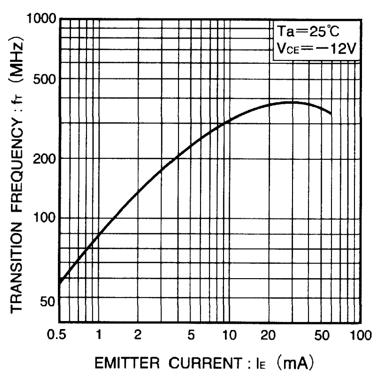


Fig.8 Gain bandwidth product vs. emitter current

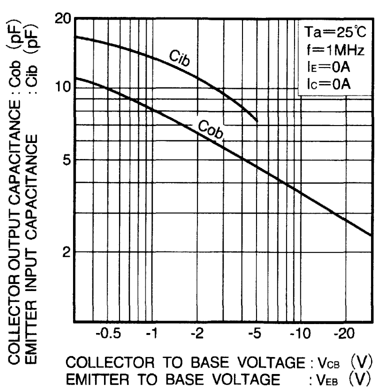


Fig.9 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

General Purpose Transistor (Isolated Dual Transistors)

UMT1N / IMT1A

●Features

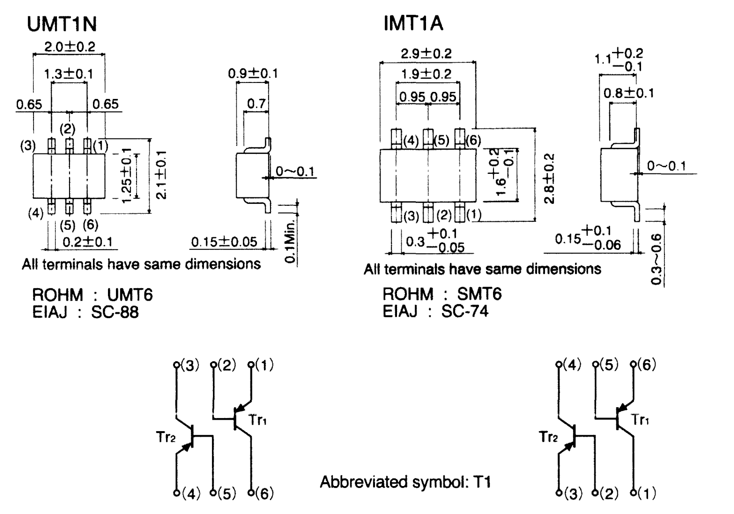
1) Two 2SA1037AK in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.

●Structure

Epitaxial planar type
PNP silicon transistor

The following characteristics apply to both Tr_1 and Tr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−60	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage		V_{EBO}	−6	V
Collector current		I_C	−150	mA
Collector power dissipation	UMT1N	P_C	150 (TOTAL)	mW *1
	IMT1A		300 (TOTAL)	mW *2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-494-A22)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−7V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−50mA/−5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=−6V, I_C=−1mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V, I_E=2mA, f=100MHz
Output capacitance	Cob	—	4	5	pF	V_{CB}=−12V, I_E=0A, f=1MHz

●Packaging specifications

	Package	Taping	
	Code	TR	T108
Type	Basic ordering unit (pieces)	3000	3000
UMT1N		○	—
IMT1A		—	○

●Electrical characteristic curves

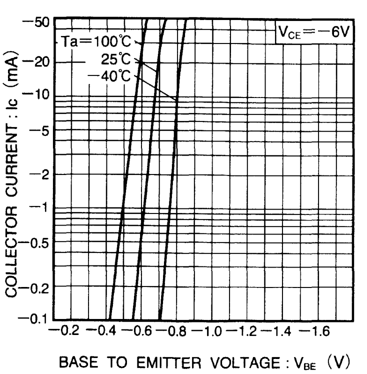


Fig.1 Grounded emitter propagation characteristics

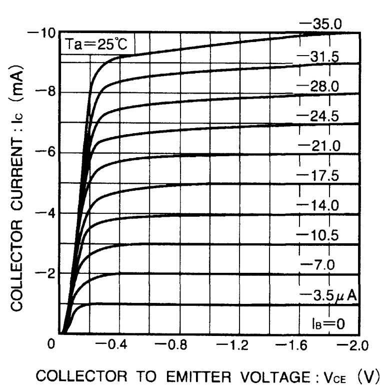


Fig.2 Grounded emitter output characteristics (I)

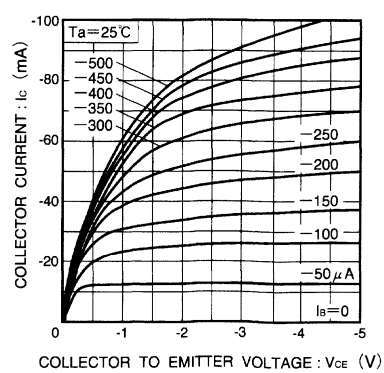


Fig.3 Grounded emitter output characteristics (II)

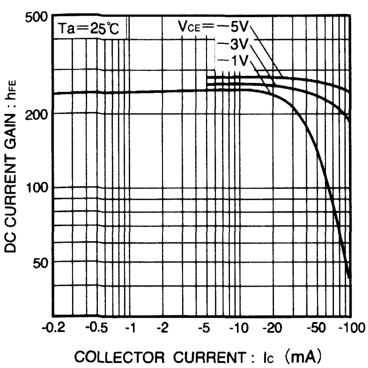


Fig.4 DC current gain vs. collector current (I)

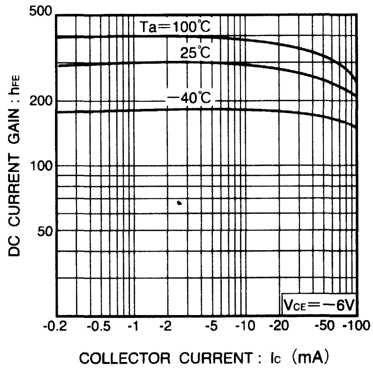


Fig.5 DC current gain vs. collector current (II)

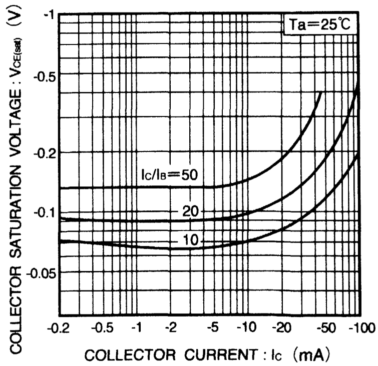


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

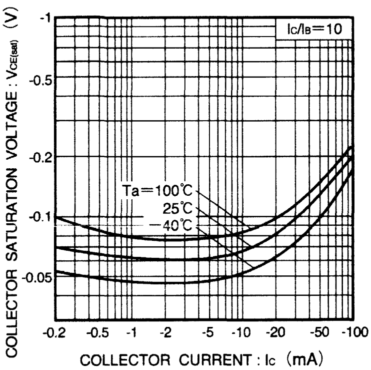


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

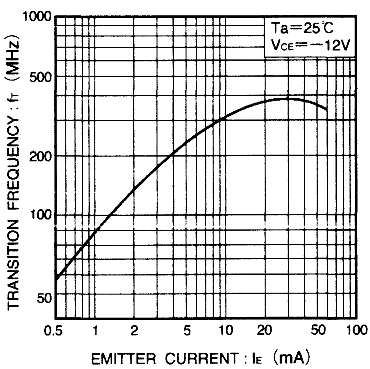


Fig.8 Gain bandwidth product vs. emitter current

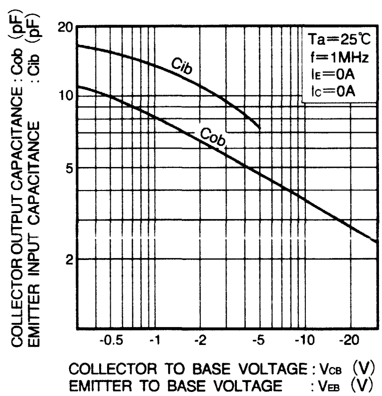


Fig.9 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Dual transistors

General Purpose Transistor (Common Emitter Dual Transistors)

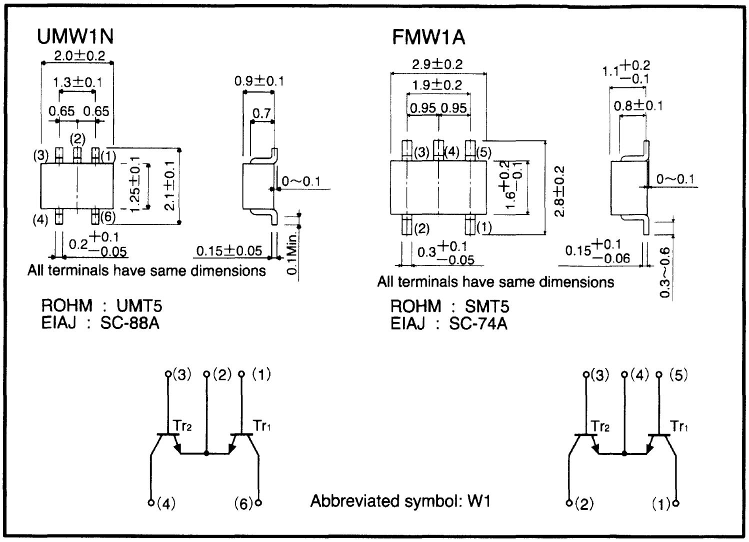
UMW1N / FMW1

●Features
1) Two 2SC241ZK chips in UMT and SMT packages.
2) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
NPN silicon transistor

The following characteristics apply to both Tr_1 and Tr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	60	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	7	V
Collector current		I_C	150	mA
Power dissipation	UMW1N	P_C	150 (TOTAL)	mW *1
	FMW1		300 (TOTAL)	mW *2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

(96-424-C22)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=7V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=50mA/5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=6V, I_C=1mA
Transition frequency	f_T	—	180	—	MHz	V_{CE}=12V, I_E=2mA, f=100MHz
Output capacitance	Cob	—	2	3.5	pF	V_{CB}=12V, I_E=0A, f=1MHz

●Packaging specifications

	Package	Taping	
	Code	TR	T148
Type	Basic ordering unit (pieces)	3000	3000
UMW1N		○	—
FMW1		—	○

Dual transistors

●Electrical characteristic curves

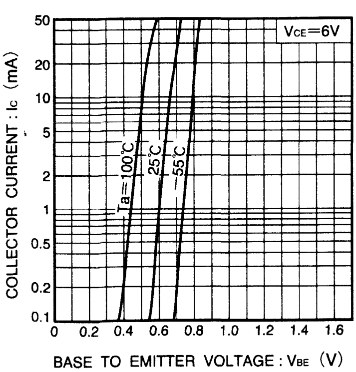


Fig.1 Grounded emitter propagation characteristics

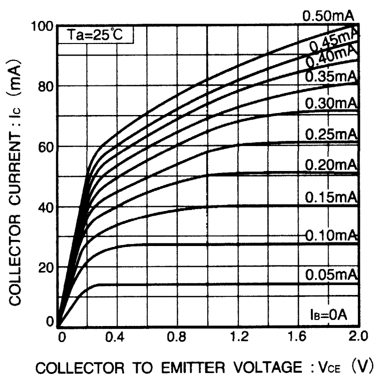


Fig.2 Grounded emitter output characteristics (I)

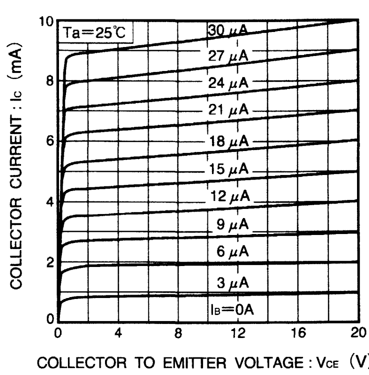


Fig.3 Grounded emitter output characteristics (II)

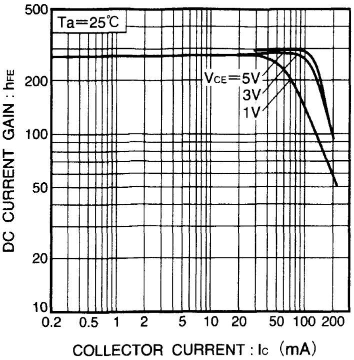


Fig.4 DC current gain vs. collector current (I)

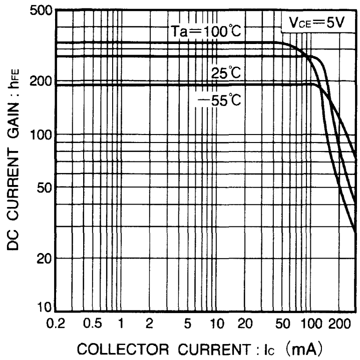


Fig.5 DC current gain vs. collector current (II)

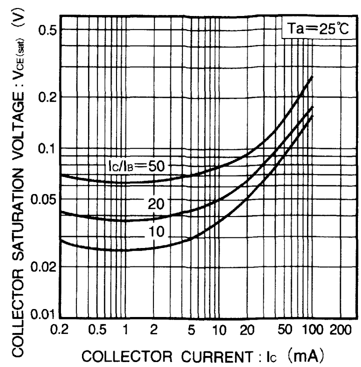


Fig.6 Collector-emitter saturation voltage vs. collector current

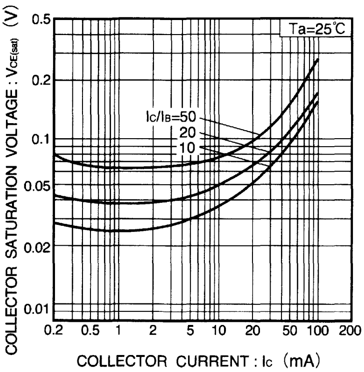


Fig.7 Collector-emitter saturation voltage vs. collector current (I)

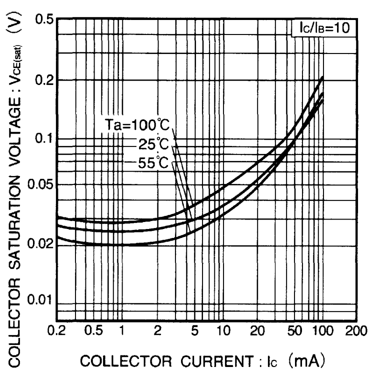


Fig.8 Collector-emitter saturation voltage vs. collector current (II)

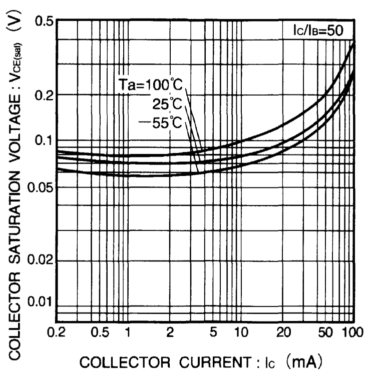


Fig.9 Collector-emitter saturation voltage vs. collector current (III)

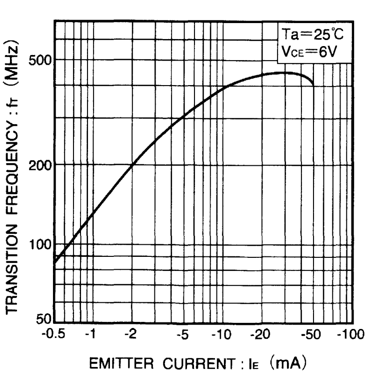


Fig.10 Gain bandwidth product vs. emitter current

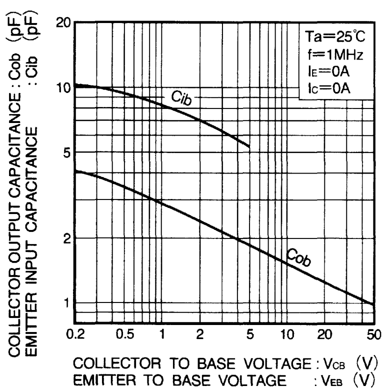


Fig.11 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

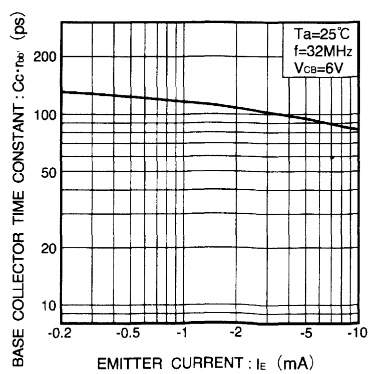


Fig.12 Base-collector time constant vs. emitter current

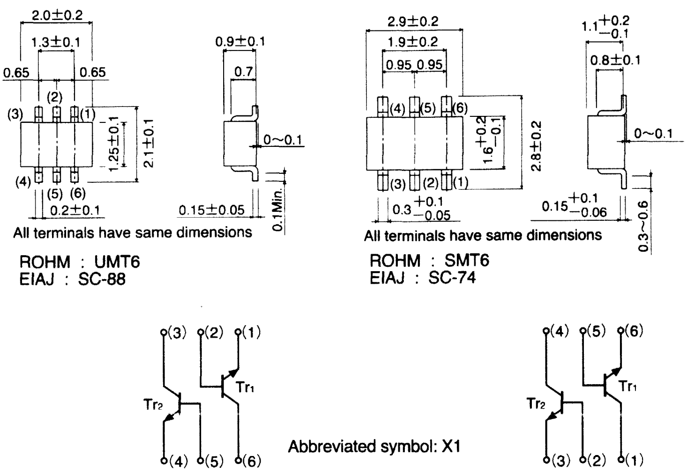
General Purpose Transistor (Isolated Dual Transistors)
UMX1N / IMX1

●Features
1) Two 2SC241ZK chips in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

●Structure
Epitaxial planar type
NPN silicon transistor

The following characteristics apply to both Tr_1 and Tr_2.

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	60	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	7	V
Collector current		I_C	150	mA
Power dissipation	UMX1N	Pd	150(TOTAL)	mW ∗1
	IMX1		300(TOTAL)	∗2
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

Dual transistors

(96-503-C22)

● Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=7V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=50mA/5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=6V, I_C=1mA
Transition frequency	f_T	—	180	—	MHz	V_{CE}=12V, I_E=−2mA, f=100MHz
Output capacitance	Cob	—	2	3.5	pF	V_{CB}=12V, I_E=0A, f=1MHz

● Packaging specifications

	Package	Taping	
	Code	TN	T110
Type	Basic ordering unit (pieces)	3000	3000
UMX1N		○	—
IMX1		—	○

● Electrical characteristic curves

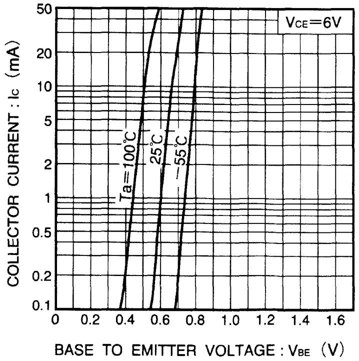


Fig.1 Grounded emitter propagation characteristics

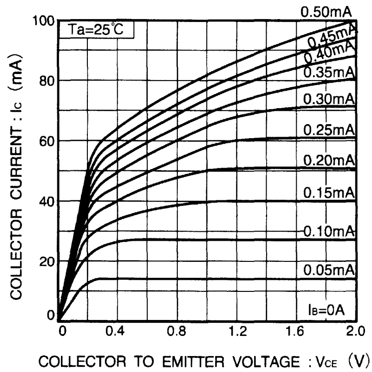


Fig.2 Grounded emitter output characteristics (I)

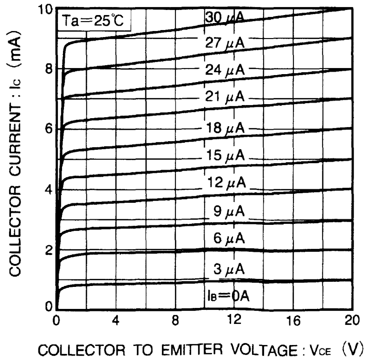


Fig.3 Grounded emitter output characteristics (II)

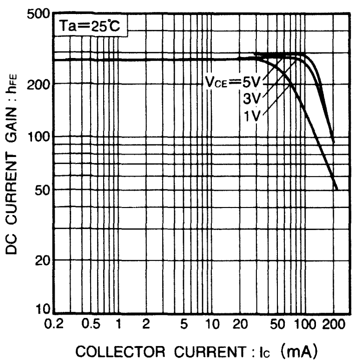


Fig.4 DC current gain vs. collector current (I)

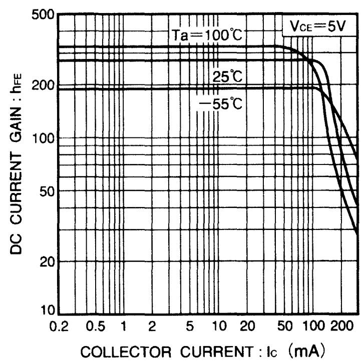


Fig.5 DC current gain vs. collector current (II)

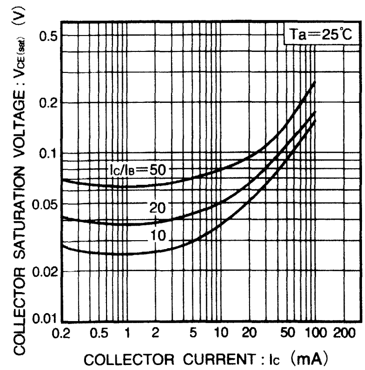


Fig.6 Collector-emitter saturation voltage vs. collector current

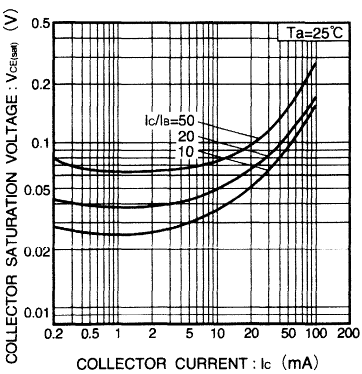


Fig.7 Collector-emitter saturation voltage vs. collector current (I)

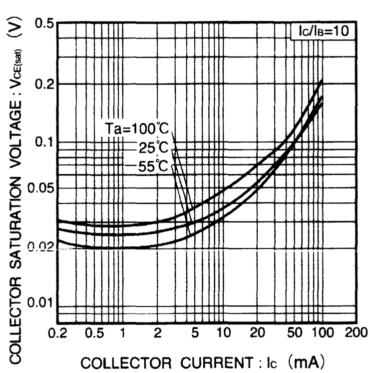


Fig.8 Collector-emitter saturation voltage vs. collector current (II)

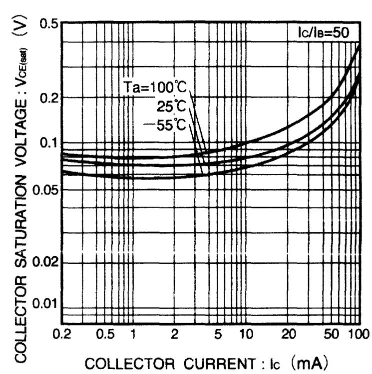


Fig.9 Collector-emitter saturation voltage vs. collector current (III)

Dual transistors

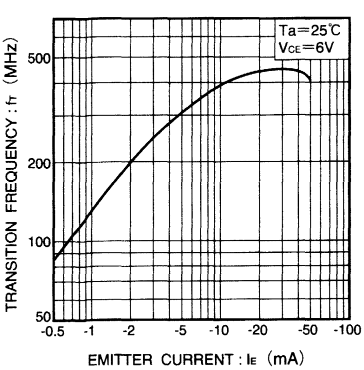


Fig.10 Gain bandwidth product vs. emitter current

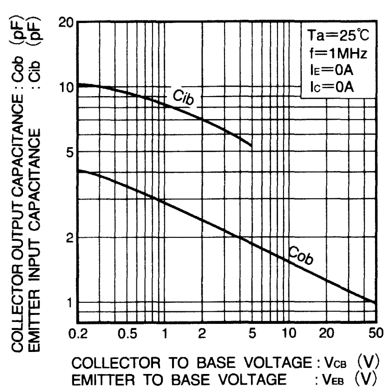


Fig.11 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

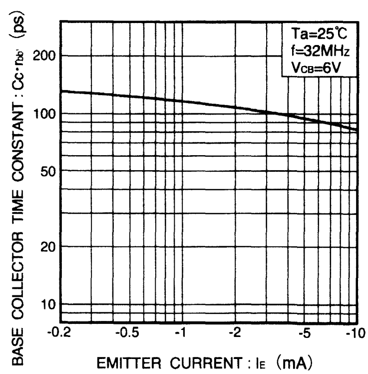


Fig.12 Base-collector time constant vs. emitter current

General Purpose Transistor (Common Emitter Dual Transistors)

UMY1N / FMY1A

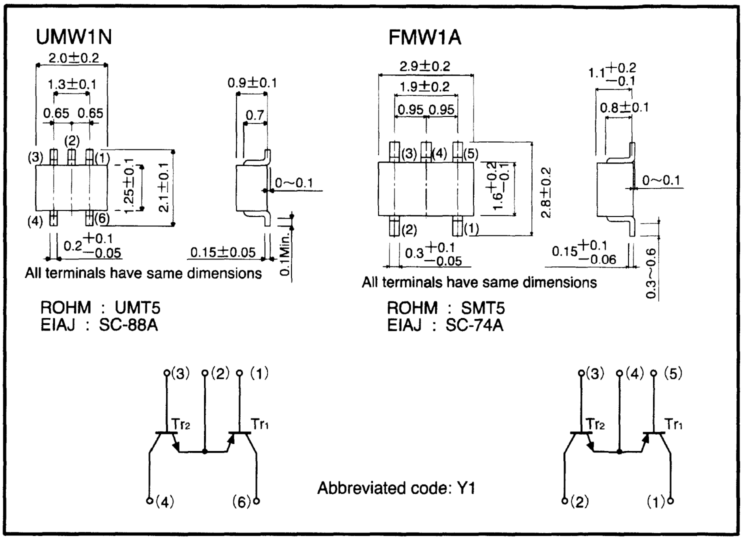
●Features

1) Both 2SA1037AK chip and 2SC241ZK chip in UMT and SMT packages.
2) PNP and NPN transistors are connected in common emitter configuration.
3) Mounting cost and area can be cut in half.

●Structure

Epitaxial planar type
PNP / NPN silicon transistor

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits		Unit
			Tr1	Tr2	
Collector-base voltage		V_{CBO}	−60	60	V
Collector-emitter voltage		V_{CEO}	−50	50	V
Emitter-base voltage		V_{EBO}	−6	7	V
Collector current		I_C	−150	150	mA
Collector power dissipation	UMY1N	P_C	150 (TOTAL)		mW ∗1
	FMY1A		300 (TOTAL)		mW ∗2
Junction temperature		Tj	150		℃
Storage temperature		Tstg	−55~150		℃

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-430-AC22)

ROHM

● Electrical characteristics (Ta = 25°C)

Tr_1

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−50mA/−5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=−6V, I_C=−1mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V, I_E=2mA, f=100MHz
Output capacitance	Cob	—	4	5	pF	V_{CB}=−12V, I_E=0A, f=1MHz

Tr_2

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=7V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=50mA/5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=6V, I_C=1mA
Transition frequency	f_T	—	180	—	MHz	V_{CE}=12V, I_E=−2mA, f=100MHz
Output capacitance	Cob	—	2	3.5	pF	V_{CB}=12V, I_E=0A, f=1MHz

● Packaging specifications

Type	Package	Taping	
	Code	TR	T148
	Basic ordering unit (pieces)	3000	3000
UMY1N		○	—
FMY1A		—	○

●Electrical characteristic curves

Tr1 (PNP)

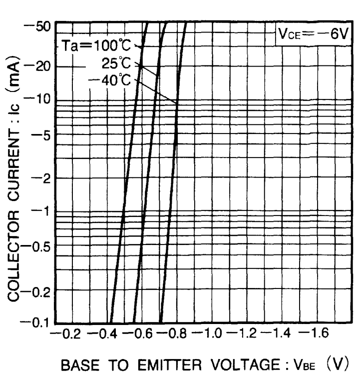


Fig.1 Grounded emitter propagation characteristics

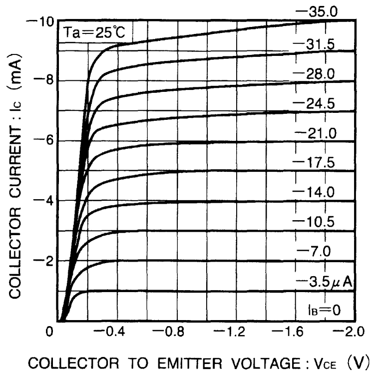


Fig.2 Grounded emitter output characteristics (I)

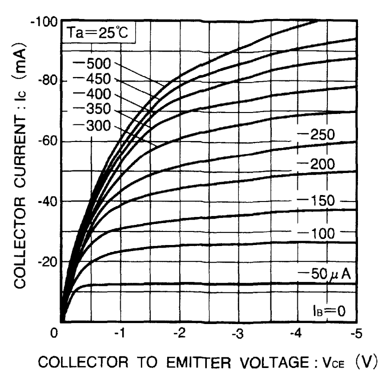


Fig.3 Grounded emitter output characteristics (II)

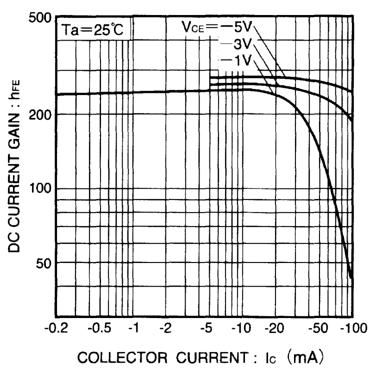


Fig.4 DC current gain vs. collector current (I)

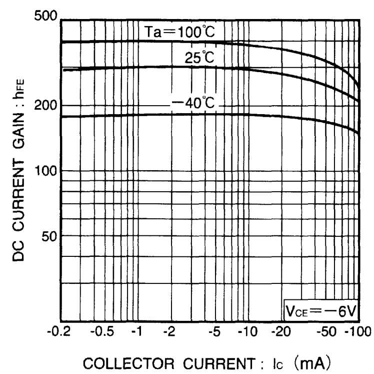


Fig.5 DC current gain vs. collector current (II)

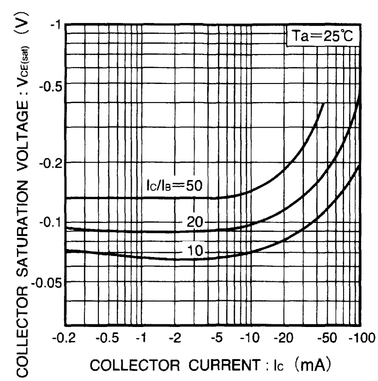


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

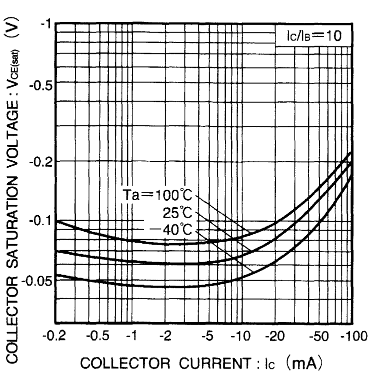


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

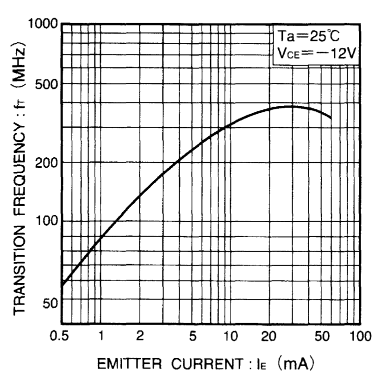


Fig.8 Gain bandwidth product vs. emitter current

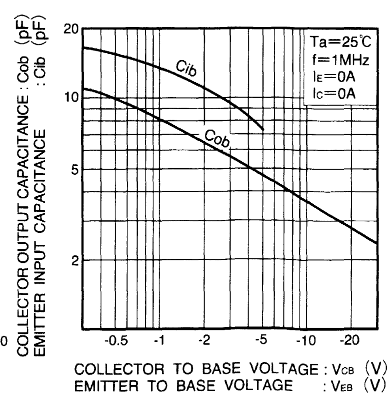


Fig.9 Collector output capacitance vs. collector-base voltage. Emitter input capacitance vs. emitter-base voltage

Tr2 (NPN)

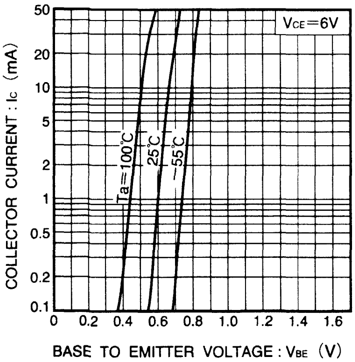


Fig.10 Grounded emitter propagation characteristics

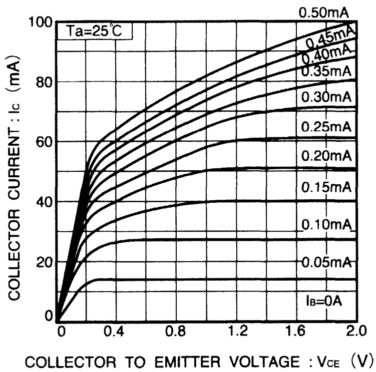


Fig.11 Grounded emitter output characteristics (I)

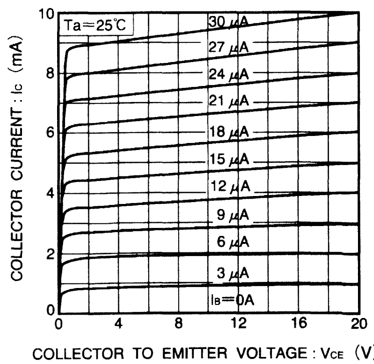


Fig.12 Grounded emitter output characteristics (II)

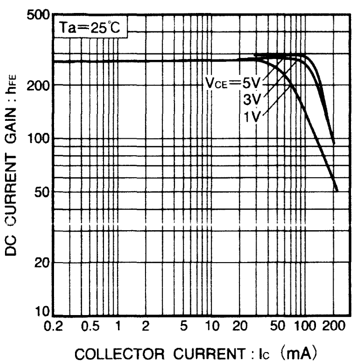


Fig.13 DC current gain vs. collector current (I)

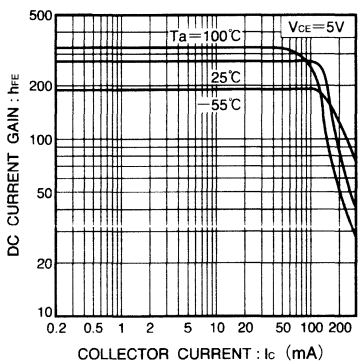


Fig.14 DC current gain vs. collector current (II)

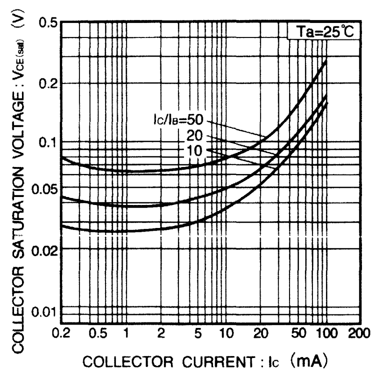


Fig.15 Collector-emitter saturation voltage vs. collector current (I)

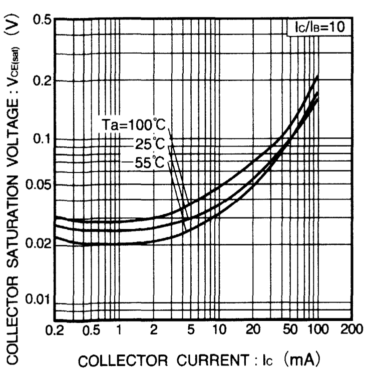


Fig.16 Collector-emitter saturation voltage vs. collector current (II)

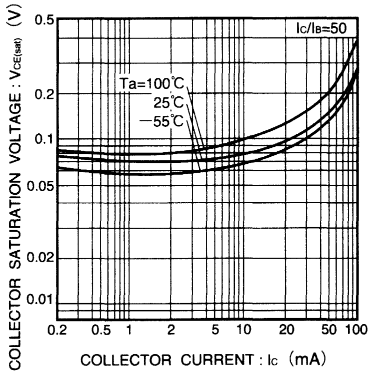


Fig.17 Collector-emitter saturation voltage vs. collector current (III)

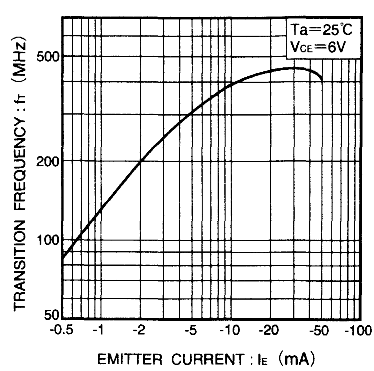


Fig.18 Gain bandwidth product vs. emitter current

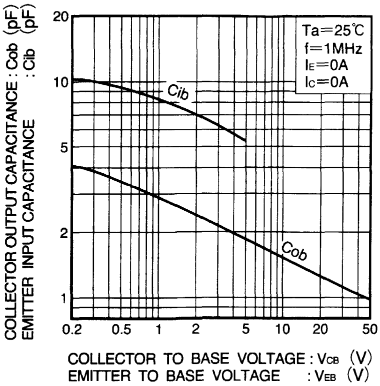


Fig.19 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

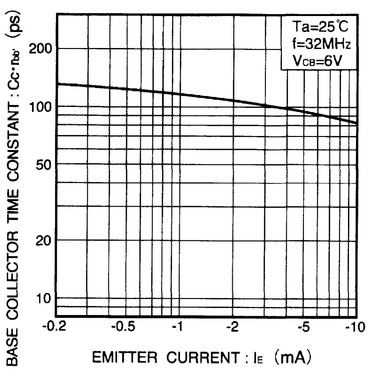


Fig.20 Base-collector time constant vs. emitter current

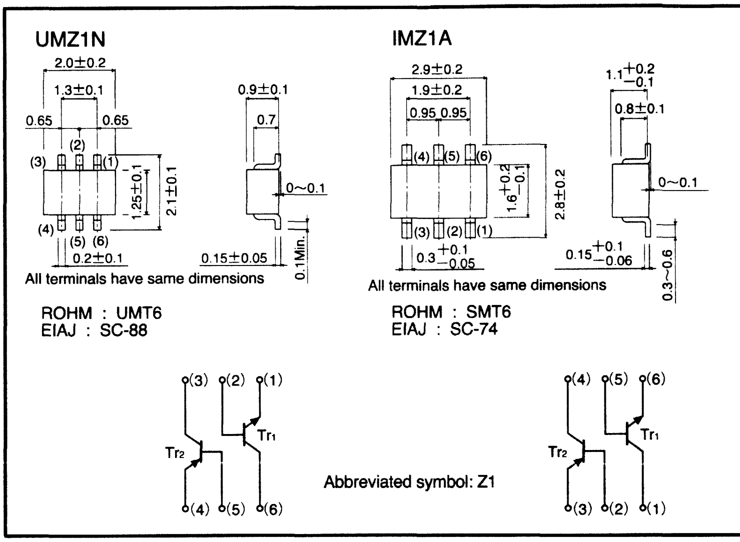
General Purpose Transistor (Isolated Dual Transistors)

UMZ1N / IMZ1A

●Features
1) Both 2SA1037AK chip and 2SC241ZK chip in UMT and SMT packages.
2) Mounting possible with UMT3 or SMT3 automatic mounting machines.
3) Transistor elements are independent, eliminating interference.
4) Mounting cost and area can be cut in half.

●Structure
NPN/PNP epitaxial planar silicon transistor

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits Tr1	Limits Tr2	Unit	
Collector-base voltage		V_{CBO}	60	−60	V	
Collector-emitter voltage		V_{CEO}	50	−50	V	
Emitter-base voltage		V_{EBO}	7	−6	V	
Collector current		I_C	150	−150	mA	
Collector power dissipation	UMZ1N	P_C	150 (TOTAL)		mW	∗1
	IMZ1A		300 (TOTAL)			∗2
Junction temperature		Tj	150		℃	
Storage temperature		Tstg	−55~150		℃	

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

(96-525-AC22)

●Electrical characteristics (Ta = 25°C)

Tr_1 (NPN)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	7	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=7V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=50mA/5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}/I_C=6V/1mA
Transition frequency	f_T	—	180	—	MHz	V_{CE}=12V, I_C=−2mA, f=100MHz
Output capacitance	Cob	—	2	3.5	pF	V_{CB}=−12V, I_E=0A, f=1MHz

Tr_2 (PNP)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−50mA/−5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}/I_C=−6V/−1mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V, I_C=2mA, f=100MHz
Output capacitance	Cob	—	4	5	pF	V_{CB}=−12V, I_E=0A, f=1MHz

●Packaging specifications

	Package	Taping	
	Code	TR	T108
Type	Basic ordering unit (pieces)	3000	3000
UMZ1N		○	—
IMZ1A		—	○

●Electrical characteristic curves

Tr1 (NPN)

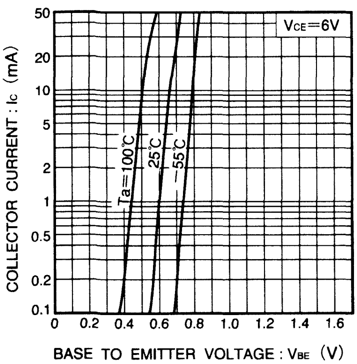


Fig.1 Grounded emitter propagation characteristics

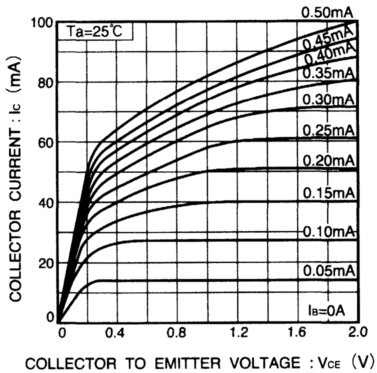


Fig.2 Grounded emitter output characteristics (I)

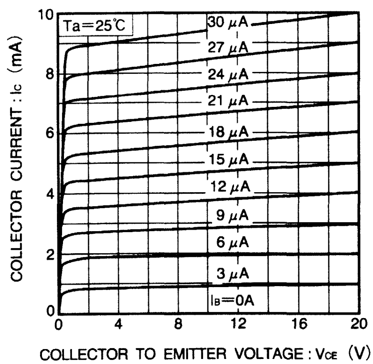


Fig.3 Grounded emitter output characteristics (II)

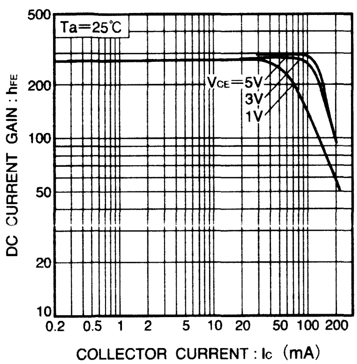


Fig.4 DC current gain vs. collector current (I)

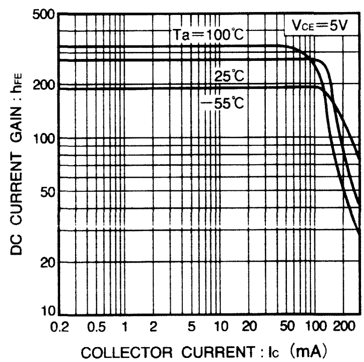


Fig.5 DC current gain vs. collector current (II)

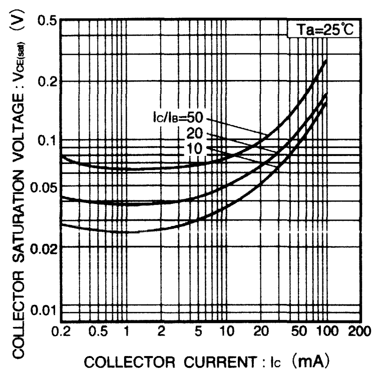


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

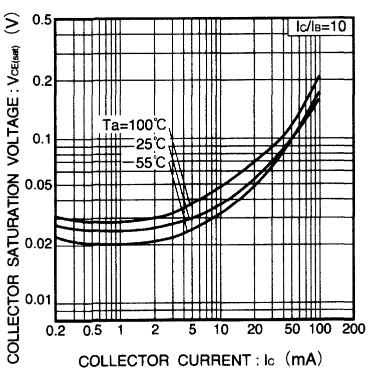


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

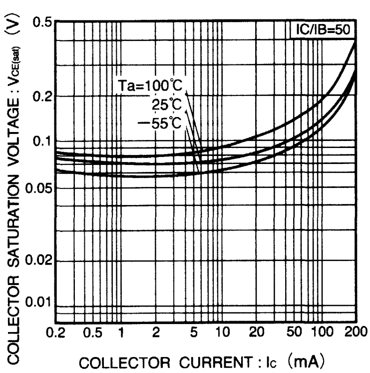


Fig.8 Collector-emitter saturation voltage vs. collector current (III)

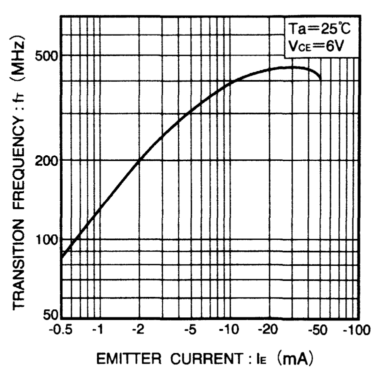


Fig.9 Gain bandwidth product vs. emitter current

Dual transistors

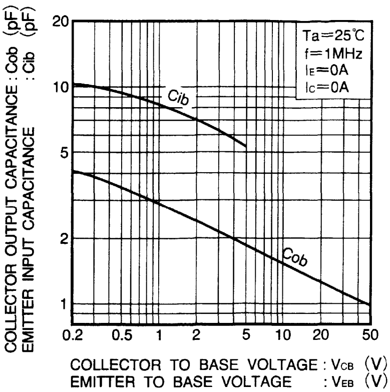


Fig.10 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

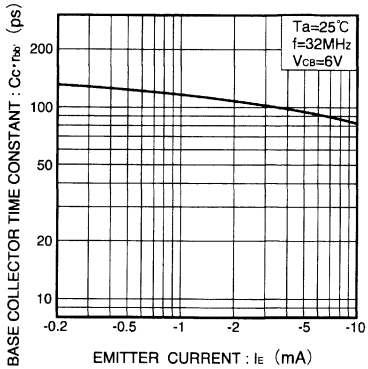


Fig.11 Base-collector time constant vs. emitter current

●Electrical characteristic curves

Tr2 (PNP)

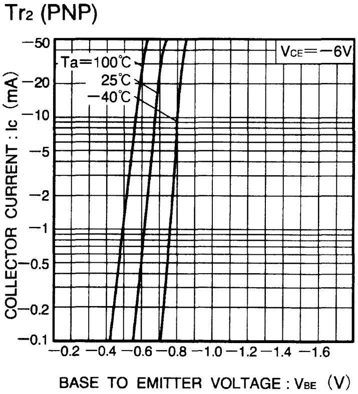


Fig.12 Grounded emitter propagation characteristics

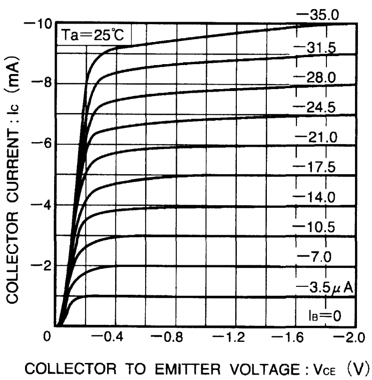


Fig.13 Grounded emitter output characteristics (I)

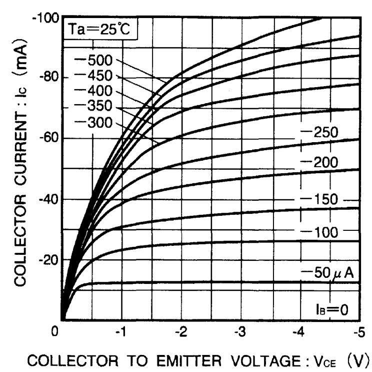


Fig.14 Grounded emitter output characteristics (II)

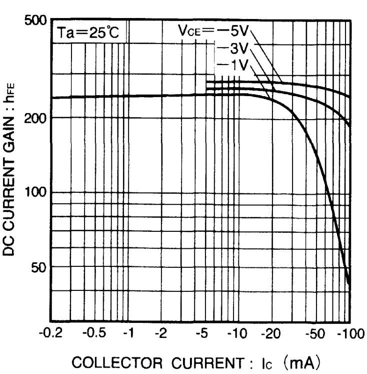


Fig.15 DC current gain vs. collector current (I)

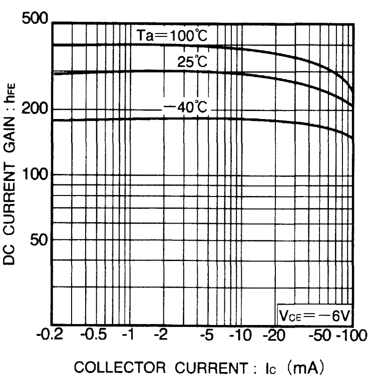


Fig.16 DC current gain vs. collector current (II)

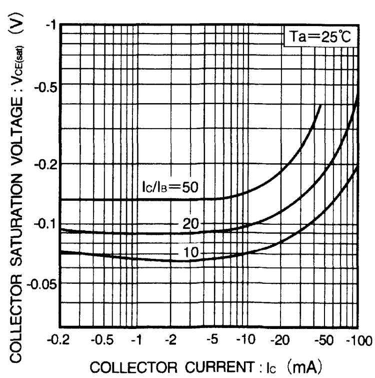


Fig.17 Collector-emitter saturation voltage vs. collector current (I)

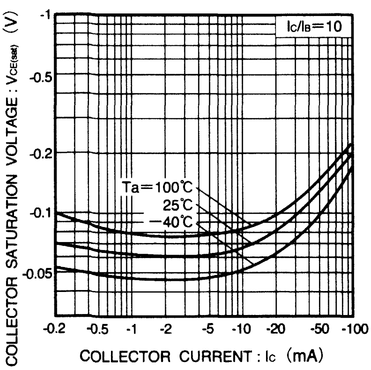


Fig.18 Collector-emitter saturation voltage vs. collector current (Ⅱ)

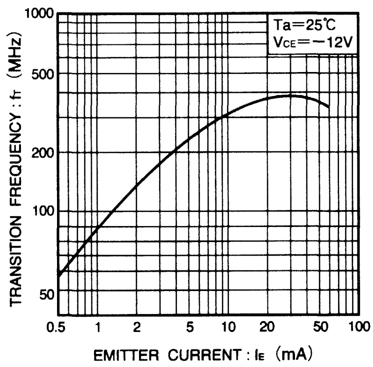


Fig.19 Gain bandwidth product vs. emitter current

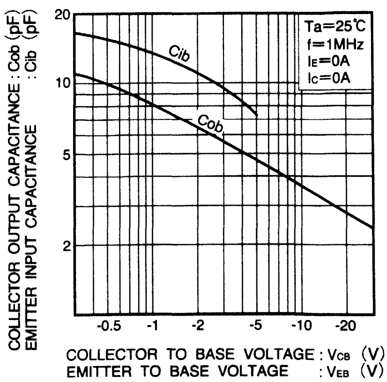


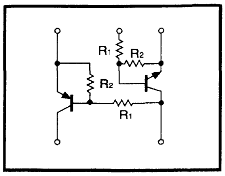
Fig.20 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Dual transistors

Digital Transistor (Dual Digital Transistors for Power Management)
FMC6A

●Features
1) DTA115E and DTC115E transistors are housed in an SMT package.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	Vcc	50	V
Input voltage	VIN	40	V
		−10	
Output current	Ic	100	mA
	Io	20	mA
Power dissipation	Pd	300 (TOTAL)	mW
Storage temperature	Tstg	−55~150	℃

PNP type negative symbols have been omitted.

●Package, marking, and packaging specifications

Type	FMC6A
Package	SMT5
Marking	C6
Code	T148
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Input voltage	$V_{I(off)}$	—	—	0.5	V	Vcc=5/−5V , Io=100/−100μA	
	$V_{I(on)}$	3	—	—		Vo=0.3/−0.3V , Io=1/−1mA	
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	Ic=5/−5mA , Ii=0.25/−0.25mA	
Input current	I_I	—	—	0.15	mA	VI=5/−5V	
Output current	$I_{O(off)}$	—	—	0.5	μA	Vcc=50/−50V	
DC current gain	G_I	82	—	—	—	Io=5/−5mA , Vo=5/−5V	
Transition frequency	f_T	—	250	—	MHz	VCE=10V/−10V , IE=−5mA/5mA , f=100MHz	*
Input resistance	R_1	70	100	130	kΩ	—	
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—	

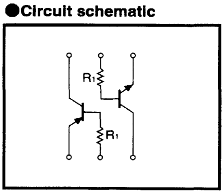
* Transition frequency of mounted resistor. PNP type negative symbols have been omitted.

(94S-830-AC115E)

Digital Transistor (Dual Digital Transistors for Power Management)
IMD1A

●Features
1) DTA124T and DTC124T transistors are housed in an SMT package.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	50	V	
Collector-emitter voltage	V_{CEO}	50	V	
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	100	mA	
Collector power dissipation	Pc	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* 200mW per element must not be exceeded. PNP type negative symbols have been omitted.

●Package, marking, and packaging specifications

Type	IMD1A
Package	SMT6
Marking	D1
Code	T108
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	Ic=50μA	
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	Ic=1mA	
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	IE=50μA	
Collector cutoff current	I_{CBO}	—	—	0.5	μA	VCB=50V	
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	VEB=4V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	Ic/IB=5mA/0.5mA	
DC current transfer ratio	h_{FE}	100	250	600	—	VCE=5V, Ic=1mA	
Transition frequency	f_T	—	250	—	MHz	VCE=10V, IE=−5mA , f=100MHz	*
Input resistance	R_1	15.4	22	28.6	kΩ	—	

* Transition frequency of mounted resistor. PNP type negative symbols have been omitted.

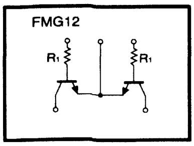
(96-458-AC124T)

ROHM

Digital transistor (Common Emitter Dual Transistor
FMG12

●Features
1) Two DTC323T transistors are housed in an SMT package.
2) Low VCE(sat). Ideal for muting circuit.
3) Can be used with IC = 600 mA

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	30	V	
Collector-emitter voltage	V_{CEO}	15	V	
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	600	mA	
Collector power dissipation	P_C	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* 200 mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	FMG12
Package	SMT6
Marking	G12
Code	T108
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	15	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.04	0.08	V	I_C/I_B=50mA/2.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V , I_C=50mA *1
Transition frequency	f_T	—	200	—	MHz	V_{CE}=10V , I_E=−50mA , f=100MHz *2
Output ON resistance	Ron	—	0.55	—	Ω	V_I=7V , R_L=1kΩ , f=1kHz
Input resistance	R_1	1.54	2.2	2.86	kΩ	—

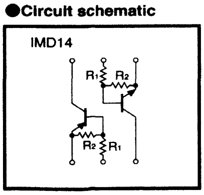
*1 Measured using pulse current *2 Transition frequency of mounted resistor

(96-417-C323T)

General Purpose Transistor (Isolated Dual Transistors)
IMD14

●Features
1) Two 500 mA digital transistors are housed in an SMT package.
2) The drive transistors are independent, eliminating interference.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CC}	50	V	
Input voltage	V_{IN}	5	V	
		−5		
Output voltage	I_C	500	mA	
Power dissipation	Pd	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* 1 200mW per element must not be exceeded. PNP type negative symbols have been omitted.

●Package, marking, and packaging specifications

Type	IMD14
Package	SMT6
Marking	D14
Code	T108
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V , I_O=100 μA
	$V_{I(on)}$	1.1	—	—		V_O=0.3V , I_O=1mA
Output voltage	$V_{O(on)}$	—	—	0.3	V	I_O/I_I=100mA/5mA
Input current	I_I	—	—	17	mA	V_I=3V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V , V_I=0V
DC current gain	G_I*1	82	—	—	—	I_O=100mA , V_O=5V *1
Transition frequency	f_T*2	—	250	—	MHz	V_{CE}=10V , I_E=−50mA , f=100MHz *2
Input resistance	R_1	154	220	286	Ω	—
Resistance ratio	R_2/R_1	36.3	45.5	54.6	—	—

*1 Measured using pulse current *2 Transition frequency of mounted transistor
PNP type negative symbols have been omitted.

(96-470-IMD14)

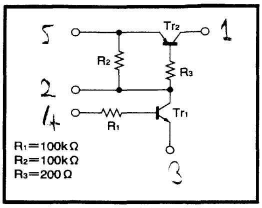
Digital Transistor (Dual Digital Transistors for Power Management)

FMQ2

●Features

1) Two 500 mA class transistors are housed in an SMT package.
2) Up to 500 mA can be driven.
3) Low V_{CE}(sat) of drive transistors for low power dissipation.

●Circuit schematic



●Package, marking, and packaging specifications

Type	FMQ2
Package	SMT5
Marking	Q2
Code	T148
Basic ordering unit (pieces)	3000

●Absolute maximum ratings (Ta = 25℃)

DTr1

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	40	V
Collector-emitter voltage	V_{CEO}	30	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	30	mA

DTr2

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−40	V
Collector-emitter voltage	V_{CEO}	−30	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−500	mA

Total

Parameter	Symbol	Limits	Unit
Power dissipation	Pd	300 (TOTAL)	mW *
Junction temperature	Tj	150	V
Storage temperature	Tstg	−55~150	V

* 200 mW per element must not be exceeded.

●Electrical characteristics (Ta = 25℃)

Tr1

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	30	—	—	V	I_C=1mA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=20V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C=1mA , I_B=0.1mA
DC current transfer ratio	h_{FE}	270	—	—	—	V_{CE}=2V , I_C=1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=5V , I_E=−5mA , f=50MHz *

* Transition frequency of mounted transistor.

Tr2

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	−30	—	—	V	I_C=−1mA
Collector cutoff current	I_{CEO}	—	—	−0.5	μA	V_{CB}=−20V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C=−100mA , I_B=−10mA
DC current transfer ratio	h_{FE}	120	—	—	—	V_{CE}=−2V , I_C=−100mA
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−5V , I_E=50mA , f=50MHz *

* Transition frequency of mounted transistor.

Resistor values

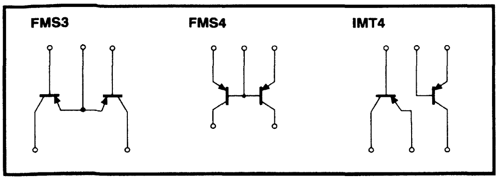
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Resistor 1	R_1	70	100	130	kΩ	—
Resistor 2	R_2	70	100	130	kΩ	—
Resistor 3	R_3	140	200	260	Ω	—

(96-552-FMQ2)

General Purpose (Dual Transistors)
FMS3 / FMS4 / IMT4

●**Features**
1) Two 2SA1514K chips are housed in an SMT package.
2) High breakdown voltage.

●**Circuit schematics**



●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−120	V	
Collector-emitter voltage	V_{CEO}	−120	V	
Emitter-base voltage	V_{EBO}	−5	V	
Collector current	I_C	−50	mA	
Power dissipation	P_C	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* 200 mW per element must not be exceeded.

●**Package, marking, and packaging specifications**

Type	FMS3	FMS4	IMT4
Package	SMT5	SMT5	SMT6
Marking	S3	S4	T4
Code	T148	T148	T108
Basic ordering unit (pieces)	3000	3000	3000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−120	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−120	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−100V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
DC current transfer ratio	h_{FE}	180	—	820	—	V_{CE}/I_C=−6V/−2mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}−12V, I_E=2mA, f=100MHz *
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−10mA/−1mA

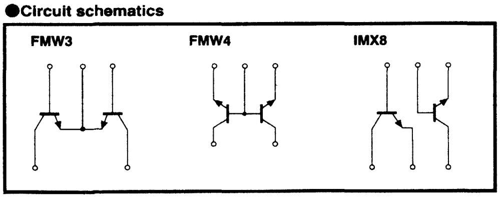
* Transition frequency of mounted transistor.

(94S-389-A41)

General Purpose (Dual Transistors)
FMW3 / FMW4 / IMX8

●**Features**
1) Two 2SC3906K chips are housed in an SMT package.
2) High breakdown voltage.

●**Circuit schematics**



●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	120	V	
Collector-emitter voltage	V_{CEO}	120	V	
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	50	mA	
Power dissipation	P_C	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* 200 mW per element must not be exceeded.

●**Package, marking, and packaging specifications**

Type	FMW3	FMW4	IMX8
Package	SMT5	SMT5	SMT6
Marking	S3	S4	T4
Code	T148	T148	T108
Basic ordering unit (pieces)	3000	3000	3000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	120	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	120	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=100V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
DC current transfer ratio	h_{FE}	180	—	820	—	V_{CE}/I_C=6V/2mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}−12V, I_E=2mA, f=100MHz *
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.5	V	I_C/I_B=10mA/1mA

* Transition frequency of mounted transistor

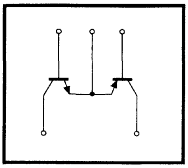
(94S-398-C41)

General Purpose (Dual Transistors)
FMY5

●Features

1) 2SA1514K and 2SC3906K chips are housed in an SMT package.
2) PNP and NPN chips are connected in a common emitter configuration.

●Circuit schematic



● Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	120	V	
Collector-emitter voltage	V_{CEO}	120	V	
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	50	mA	
Power dissipation	P_C	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* 200 mW per element must not be exceeded. PNP type minus symbols have been omitted.

● Package, marking, and packaging specifications

Type	FMY5
Package	SMT5
Marking	Y5
Code	T148
Basic ordering unit (pieces)	3000

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	120	—	—	V	I_C=50/−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	120	—	—	V	I_C=1/−1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50/−50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=100/−100V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4/−4V
DC current transfer ratio	h_{FE}	120	—	820	—	V_{CE}=6/−6V, I_C=2/−2mA
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.5	V	I_C=10/−10mA, I_B=1/−0.1mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=12/−12V, I_E=2/−2mA, f=100MHz *
Output capacitance	Cob	—	3/4	—	pF	V_{CB}=12/−12V, I_E=0A, f=1MHz

Note: / Denotes NPN/PNP. PNP type minus symbols have been omitted. *Transition frequency of mounted resistor.

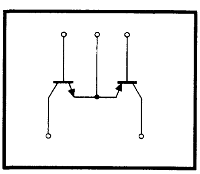
(94S-440-AC41)

Medium Power Transistor (Dual Transistors for Totempoles)
FMY6

●Features

1) 2SA1036K and 2SC2411K chips are housed in an SMT package.
2) PNP and NPN chips are connected in a common emitter configuration.
3) High $I_{Cmax.}$ (Max. 500mA)

●Circuit schematic



● Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	40	V	
Collector-emitter voltage	V_{CEO}	32	V	
Emitter-base voltage	V_{EBO}	5	V	
Collector current	I_C	500	mA	
Power dissipation	Pd	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

*200mW per element must not be exceeded. PNP type negative symbols have been omitted.

●Package, marking, and packaging specifications

Type	FMY6
Package	SMT5
Marking	Y6
Code	T148
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	40	—	—	V	I_C=100/−100 μA
Collector-emitter breakdown voltage	BV_{CEO}	32	—	—	V	I_C=1/−1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=100/−100 μA
Collector cutoff current	I_{CBO}	—	—	1	μA	V_{CB}=20/−20V
Emitter cutoff current	I_{EBO}	—	—	1	μA	V_{EB}=4/−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C=100/−100mA, I_B=10/−10mA
DC current transfer ratio	h_{FE}	120	—	—	—	V_{CE}/I_C=3/−3V, I_C=10/−10mA
Transition frequency	f_T	—	250/200	—	MHz	V_{CE}=5/−5V, I_E=20/−20mA, f=200MHz *
Output capacitance	Cob	—	6.5/7	—	pF	V_{CE}=10/−10V, I_E=0A, f=1MHz

Note: Denotes NPN/PNP. PNP type negative symbols have been omitted. *Transition frequency of mounted resistor.

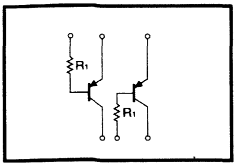
(96-438-BD11)

Digital Transistor (Dual Digital Transistors for Inveter Driver)
IMB7A

●**Features**

1) Two DTA143T transistors are housed in an SMT package.

●**Circuit schematic**



●**Absolute maximum ratings** (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−50	V	
Collector-emitter voltage	V_{CEO}	−50	V	
Emitter-base voltage	V_{EBO}	−5	V	
Collector current	I_C	−100	mA	
Collector power dissipation	P_C	300 (TOTAL)	mW	*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* 200 mW per element must not be exceeded.

●**Package, marking, and packaging specifications**

Type	IMB7A
Package	SMT6
Marking	B7
Code	T110
Basic ordering unit (pieces)	3000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}/I_C=−5V/−1mA
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−5mA/−0.25mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—

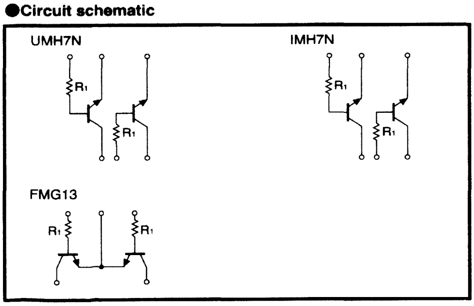
94S-849-A143T)

Digital Transistor (Dual Digital Transistors for Inveter Driver)
UMH7N / FMG13 / IMH7A

●**Features**

1) Two DTA143T transistors are housed in an UMT package.

●**Circuit schematic**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	50	V	
Collector-emitter voltage		V_{CEO}	50	V	
Emitter-base voltage		V_{EBO}	5	V	
Collector current		I_C	100	mA	
Collector power dissipation	UMH7N	P_C	150 (TOTAL)	mW	*1
	FMG13, IMH7A		300 (TOTAL)		*2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

*1 120 mW per element must not be exceeded.
*2 200 mW per element must not be exceeded.

●**Package, marking, and packaging specifications**

Type	UMH7N	FMG13	IMH7A
Package	UMT6	SMT5	SMT6
Marking	H7	G13	H7
Code	TR	T148	T108
Basic ordering unit (pieces)	3000	3000	3000

●**Electrical characteristics** (Ta=25℃)

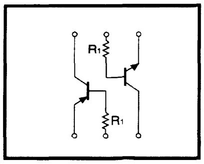
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}/I_C=5V/1mA
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=5mA/0.25mA
Input resistance	R_1	3.29	4.7	6.11	kΩ	—

(94S-877-C143T)

Digital Transistor (Dual Digital Transistors for Inverter Drive)
IMD8A

●Features
1) DTA144T and DTC144T transistors are housed in a SMT package.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	100	mA
Collector power dissipation	P_C	300 (TOTAL)	mW *
Storage temperature	Tstg	−55~150	℃

* 200mW per element must not be exceeded. PNP type negative symbols have been omitted.

●Package, marking, and packaging specifications

Type	IMD8A
Package	SMT6
Marking	D8
Code	T108
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	$I_C=50\mu A$
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	$I_C=1mA$
Emitter-base breakdown voltage	BV_{EBO}	50	—	—	V	$I_E=50\mu A$
Collector cutoff current	I_{CBO}	—	—	0.5	μA	$V_{CB}=50V$
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	$V_{EB}=4V$
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	$I_C=5mA$, $I_B=0.5mA$
DC current transfer ratio	h_{FE}	100	250	600	—	$V_{CE}=5V$, $I_C=1mA$
Input resistance	R_1	32.9	47	61.1	kΩ	—

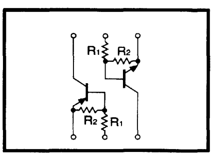
PNP type negative symbols have been omitted.

94S-902-AC144T)

Digital Transistor (Dual Digital Transistors for Inverter Drive)
IMD9A

●Features
1) DTA114Y and DTC114Y transistors are housed in a SMT package.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	50	V
Input voltage	V_{IN}	−6~40	V
Output current	I_O	70	mA
Collector current	$I_{C(Max.)}$	100	mA
Power dissipation	Pd	300 (TOTAL)	mW *
Storage temperature	Tstg	−55~150	℃

* 200mW per element must not be exceeded. PNP type negative symbols have been omitted.

●Package, marking, and packaging specifications

Type	IMD9A
Package	SMT6
Marking	D9
Code	T108
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	$V_{CC}=5V$, $I_O=100\mu A$
	$V_{I(on)}$	1.4	—	—		$V_O=0.3V$, $I_I=1mA$
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	$I_O=5mA$, $I_I=0.25mA$
Input current	I_I	—	—	0.88	mA	$V_I=5V$
Output current	$I_{O(off)}$	—	—	0.5	μA	$V_{CC}=50V$, $V_I=0V$
DC current gain	G_I	68	—	—	—	$I_O=5mA$, $V_O=5V$
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	3.7	4.7	5.7	—	—

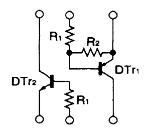
PNP type negative symbols have been omitted.

(94S-904-AC114Y)

Digital Transistor (Dual Digital Transistors for power Management)
IMD10A

●Features
1) Two 500 mA transistors are housed in an SMT package.
2) Up to 500 mA can be driven.
3) Low V_{CE}(sat) of drive transistors for low power dissipation.

●Circuit schematic



●Package, marking, and packaging specifications

Type	IMD10A
Package	SMT6
Marking	D10
Code	T108
Basic ordering unit (pieces)	3000

●Absolute maximum ratings (Ta=25℃)

DTr1

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	−50	V
Input voltage	V_{IN}	−5~5	V
Collector current	I_C	−500	mA

DTr2

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	100	mA

Total

Parameter	Symbol	Limits	Unit
Power dissipation	Pd	300	mW (Total) *
Storage temperature	Tstg	−55~150	℃

* 200 mW per element must not be exceeded.

●Electrical characteristics (Ta=25℃)

DTr1

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V , I_O=−100μA
	$V_{I(on)}$	−1.5	—	—		V_O=−0.3V , I_O=−100mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−100mA , I_I=−5mA
Input current	I_I	—	—	−25	mA	V_I=−2V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V , V_I=0V
DC current gain	G_I	68	—	—	—	I_O=−100mA , V_O=−5V
Transition frequency	f_T	—	200	—	MHz	V_{CE}=−10V , I_E=50mA , f=100MHz *
Input resistance	R_1	70	100	130	Ω	—
Resistance ratio	R_2/R_1	80	100	120	—	—

* Transition frequency of mounted transistor.

DTr2

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C=10mA , I_B=1mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V , I_C=1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA , f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—

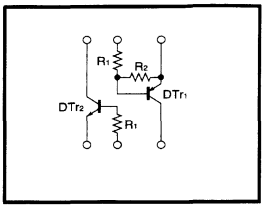
* Transition frequency of mounted transistor.

(96-555-IMD10)

Digital Transistor (Dual Digital Transistors for Power Management)
IMD16A

● Features
1) Two 500 mA class transistors are housed in an SMT package.
2) Up to 500 mA can be driven.
3) Low $V_{CE(sat)}$ of drive transistors for low power dissipation.

● Circuit schematic



● Package, marking, and packaging specifications and h_{FE}

Type	IMD16A
Package	SMT6
Marking	D16
Code	T108
Basic ordering unit (pieces)	3000

● Absolute maximum ratings (Ta=25℃)

DTr1 (PNP)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	−50	V
Input voltage	V_{IN}	−12	V
		5	
Output current	I_C	−500	mA

DTr2 (NPN)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	100	mA

Total

Parameter	Symbol	Limits	Unit
Collector power dissipation	Pd	300 (TOTAL)	mW *
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* 200mW per element must not be exceeded.

●Electrical characteristics (Ta=25℃)

DTr1

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−2	—	—		V_O=−0.3V, I_O=−20mA
Output voltage	$V_{O(on)}$	—	—	−0.3	V	I_O/I_I=−50mA/−2.5mA
Input current	I_I	—	—	−3	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current gain	G_I	82	—	—	—	I_O=−50mA, V_O=−5V *1
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=50mA, f=100MHz *2
Input resistance	R_1	1.54	2.2	2.86	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—

*1 Measured using pulse current. *2 Transition frequency of mounted transistor.

DTr2

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=1mA/0.1mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *
Input resistance	R_1	70	100	130	kΩ	—

* Transition frequency of mounted transistor.

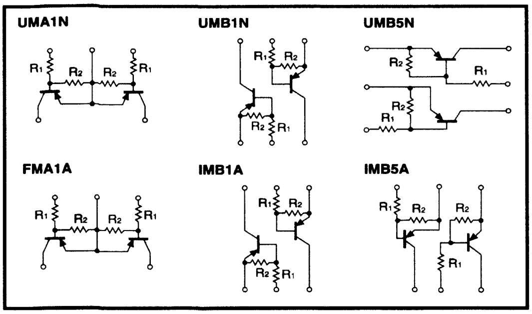
(96-473-IMD16)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMA1N / UMB1N / UMB5N / FMA1A / IMB1A / IMB5A

● **Features**

1) Two DTA124E transistors are housed in a UMT or SMT package.

● **Circuit schematics**



● **Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	−50	V
Input voltage		V_{IN}	−12	V
			5	
Output current		I_O	−100	mA
Power dissipation	UMA1N, UMB1N, UMB5N	Pd	150 (TOTAL)	mW *1
	FMA1A, IMB1A, IMB5A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

● **Package, marking, and packaging specifications**

Type	UMA1N	UMB1N	UMB5N	FMA1A	IMB1A	IMB5A
Package	UMT5	UMT6	UMT6	SMT5	SMT6	SMT6
Marking	A1	B1	B5	A1	B1	B5
Code	TR	TN	TR	T148	T110	T110
Basic ordering unit (pieces)	3000	3000	3000	3000	3000	3000

● **Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	V_{CC}=−5V, I_O=−100μA
	$V_{I(on)}$	−3	—	—		V_O=−0.2V, I_O=−5mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O/I_I=−0.5mA/−10mA
Input current	I_I	—	—	−0.36	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V, V_I=0V
DC current transfer ratio	G_I	56	—	—	—	V_O=−5V, I_O=−5mA
Input resistance	R_1	15.4	22	28.6	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

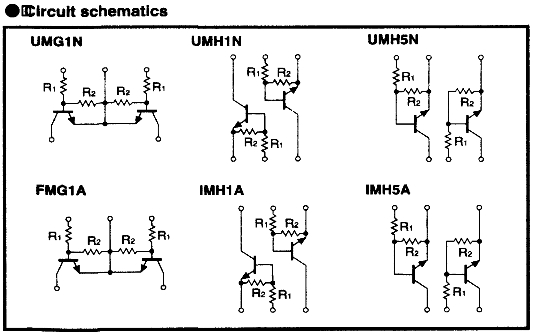
(96-384-A124E)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMG1N / UMH1N / UMH5N / FMG1A / IMH1A / IMH5A

● **Features**

1) Two DTA124E transistors are housed in a UMT or SMT package.

● **Circuit schematics**



● **Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−10	
Output current		I_O	30	mA
Power dissipation	UMG1N, UMH1N, UMH5N	Pd	150 (TOTAL)	mW *1
	FMG1A, IMH1A, IMH5A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

● **Package, marking, and packaging specifications**

Type	UMG1N	UMH1N	UMH5N	FMG1A	IMH1A	IMH5A
Package	UMT5	UMT6	UMT6	SMT5	SMT6	SMT6
Marking	G1	H1	H5	G1	H1	H5
Code	TR	TN	TR	T148	T110	T110
Basic ordering unit (pieces)	3000	3000	3000	3000	3000	3000

● **Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5V, I_O=100μA
	$V_{I(on)}$	3	—	—		V_O=0.2V, I_O=5mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=10mA, I_I=0.5mA
Input current	I_I	—	—	0.36	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V, V_I=0V
DC current gain	G_I	56	—	—	—	V_O=5V, I_O=5mA
Input resistance	R_1	15.4	22	28.6	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—

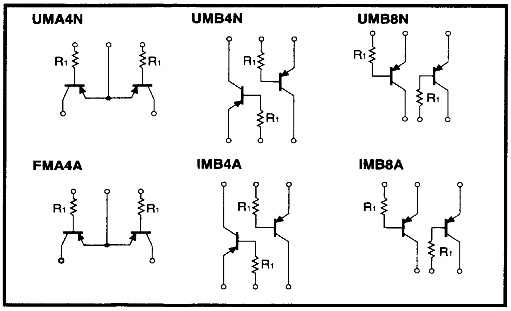
(94S-789-C124E)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMA4N / UMB4N / UMB8N / FMA4A / IMB4A / IMB8A

●**Features**

1) Two DTA114T transistors are housed in a UMT or SMT package.

●**Circuit schematics**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	−50	V	
Collector-emitter voltage		V_{CEO}	−50	V	
Emitter-base voltage		V_{EBO}	−5	V	
Collector current		I_C	−100	mA	
Power dissipation	UMA4N/UMB4N/UMB8N	Pd	150 (TOTAL)	mW	*1
	FMA4A/IMB4A/IMB8A		300 (TOTAL)		*2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

●**Package, marking, and packaging specifications**

Type	UMA4N	UMB4N	UMB8N	FMA4A	IMB4A	IMB8A
Package	UMT5	UMT6	UMT6	SMT5	SMT6	SMT6
Marking	A4	B4	B8	A4	B4	B8
Code	TR	TN	TR	T148	T110	T108
Basic ordering unit (pieces)	3000	3000	3000	3000	3000	3000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−10mA/−1mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=−5V, I_C=−1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA , f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—

* Transition frequency of mounted transistor.

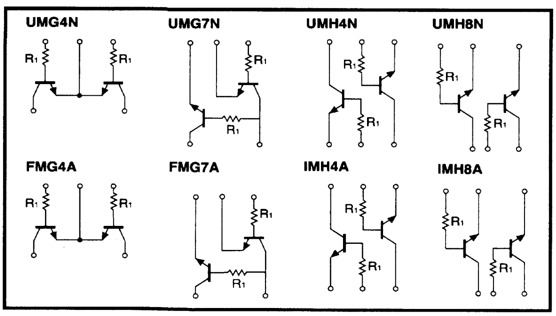
(96-448-A114T)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMG4N / UMG7N / UMH4N / UMH8N / FMG4A / FMG7A / IMH4A / IMH8A

●**Features**

1) Two DTC114T transistors are housed in a UMT or SMT package.

●**Circuit schematics**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	50	V	
Collector-emitter voltage		V_{CEO}	50	V	
Emitter-base voltage		V_{EBO}	5	V	
Collector current		I_C	100	mA	
Ppower dissipation	UMG4N,UMG7N,UMH4N	Pd	150 (TOTAL)	mW	*1
	FMG4A,FMG7A,IMH4A,IMH8A		300 (TOTAL)		*2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

●**Package, marking, and packaging specifications**

Type	UMG4N	UMG7N	UMH4N	UMH8N	FMG4A	FMG7A	IMHA4	IMH8A
Package	UMT5	UMT5	UMT6	UMT6	SMT5	SMT5	SMT6	SMT6
Marking	G4	G7	H4	H8	G4	G7	H4	H8
Code	TR	TR	TN	TR	T148	T148	T110	T108
Basic ordering unit (pieces)	3000	3000	3000	3000	3000	3000	3000	3000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=10mA/1mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5V, I_C=1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA , f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—

* Transition frequency of mounted transistor.

(96-411-C114T)

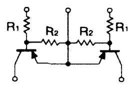
Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMA5N / FMA5A

● Features

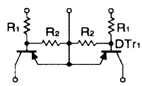
1) Two DTA123J transistors are housed in a UMT or SMT package.

● Circuit schematics

UMA5N



FMA5A



● Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit	
Supply voltage		Vcc	−50	V	
Input voltage		VIN	−12	V	
			5		
Output current		Io	−100	mA	
Power dissipation	UMA5N	Pd	150 (TOTAL)	mW	*
	FMA5A		300 (TOTAL)		
Junction temperature		Tj	150	°C	
Storage temperature		Tstg	−55~150	°C	

* 120 mW per element must not be exceeded for UMA5N, and 200 mW per element must not be exceeded for FMA5A.

● Package, marking, and packaging specifications

Type	UMA5N	FMA5A
Package	UMT5	SMT5
Marking	A5	A5
Code	TR	T148
Basic ordering unit (pieces)	3000	3000

● Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	VI (off)	—	—	−0.5	V	Vcc=−5V , Io=−100 μA
	VI (on)	−1.1	—	—		Vo=−0.3V , Io=−5mA
Output voltage	Vo (on)	—	−0.1	−0.3	V	Io/II=−5mA/0.25mA
Input current	II	—	—	−3.6	mA	VI=−5V
Output current	Io (off)	—	—	−0.5	μA	Vcc=−50V , VI=0V
DC current transfer ratio	GI	80	—	—	—	Vo=−5V , Io=−10mA
Input resistance	R1	1.54	2.2	2.86	kΩ	—
Transition frequency	fT	—	250	—	MHz	VCE=−10V, IE=5mA , f=100MHz *
Resistance ratio	R2/R1	17	21	26	—	—

* Transition frequency of mounted transistor.

(96-384-A123J)

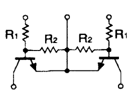
Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMG11N / FMG11A

● Features

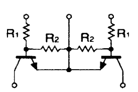
1) Two DTA123J transistors are housed in a UMT or SMT package.

● Circuit schematics

UMG11N



FMG11A



● Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit	
Supply voltage	Vcc	50	V	
Input voltage	VIN	12	V	
		5		
Output current	Io	100	mA	
Power dissipation	Pd	150 (TOTAL)	mW	*
		300 (TOTAL)		
Storage temperature	Tstg	−50~150	°C	

* 120mW per element must not be exceeded.

● Package, marking, and packaging specifications

Type	UMG11N	FMG11A
Package	UMT5	SMT5
Marking	G11	G11
Code	TR	T148
Basic ordering unit (pieces)	3000	3000

● Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	VI (off)	—	—	0.5	V	Vcc=5V , Io=100 μA
	VI (on)	1.1	—	—		Vo=0.3V , Io=5mA
Output voltage	Vo (on)	—	0.1	0.3	V	Io=5mA , II=0.25mA
Input current	II	—	—	3.6	mA	VI=5V
Output current	Io (off)	—	—	0.5	μA	Vcc=50V , VI=0V
DC current gain	GI	80	—	—	—	Io=10mA , Vo=5V
Input resistance	R1	—	2.2	—	kΩ	—
Transition frequency	fT	—	250	—	MHz	VCE=10V, IE=−5mA , f=100MHz *
Resistance ratio	R2/R1	17	21	26	—	—

* Transition frequency of mounted transistor.

(94S-813-C123J)

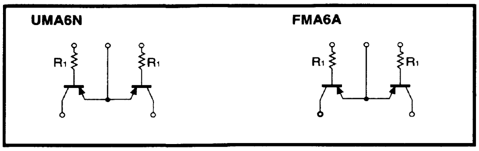
Dual transistors

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMA6N / FMA6A

●Features

1) Two DTA114T transistors are housed in a UMT or SMT package.

●Circuit schematics



●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	−50	V	
Collector-emitter voltage		V_{CEO}	−50	V	
Emitter-base voltage		V_{EBO}	−5	V	
Collector current		I_C	−100	mA	
Collector power dissipation	UMA6N	P_C	150 (TOTAL)	mW	*1
	FMA6A		300 (TOTAL)		*2
Junction temperature		Tj	150	°C	
Storage temperature		Tstg	−55~150	°C	

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMA6A	FMA6A
Package	UMT5	SMT5
Marking	A6	A6
Code	TR	T148
Basic ordering unit (pieces)	3000	3000

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−50V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−5mA/−0.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}/I_C=−5V/−1mA
Transition frequency	f_T	—	250	—	MHz	V_{EB}=10V, I_E=−5mA, f=100MHz *
Input resistance	R_1	32.9	47	61.1	kΩ	—

*Transition frequency of mounted transistor.

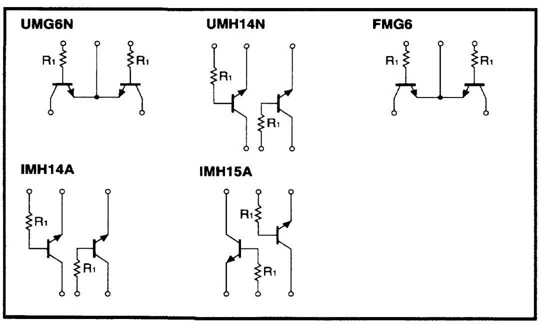
(94S-777-A144T)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMG6N / UMH14N / FMG6A / IMH14A / IMH15A

● Features

1) Two DTC114T transistors are housed in a UMT or SMT package.

●Circuit schematics



●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	5	V
Collector current		I_C	100	mA
Collector power dissipation	UMG6N, UMH14N	P_C	150 (TOTAL)	mW
	FMG6A, IMH14A, IMH15A		300 (TOTAL)	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

●Package, marking, and packaging specifications

Type	UMG6N	UMH14N	FMG6A	IMH14A	IMH15A
Package	UMT5	UMT6	SMT5	SMT6	SMT6
Marking	G6	H14	G6	H14	H15
Code	TR	TR	T148	T108	T110
Basic ordering unit (pieces)	3000	3000	3000	3000	3000

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=5mA/0.5mA
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}/I_C=5V/1mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz *
Input resistance	R_1	32.9	47	61.1	kΩ	—

*Transition frequency of mounted transistor.

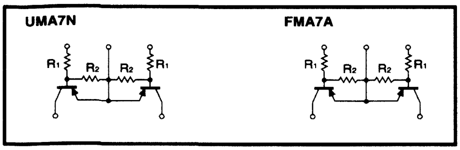
(96-492-C144T)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMA7N / FMA7A

●Features

1) Two DTA143X transistors are housed in a UMT or SMT package.

●Circuit schematics



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		Vcc	−50	V
Input voltage		VIN	−20	V
			7	
Output current		Io	−100	mA
Power dissipation	UMA7N	Pd	150 (TOTAL)	mW *1
	FMA7A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded. *2 200mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMA7N	FMA7A
Package	UMT5	SMT5
Marking	A7	A7
Code	TR	T148
Basic ordering unit (pieces)	3000	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	VI (off)	—	—	−0.3	V	Vcc=−5V , Io=−100 μA
	VI (on)	−2.5	—	—		Vo=−0.3V , Io=−20mA
Output voltage	Vo (on)	—	−0.1	−0.3	V	Io/II=−10mA/−0.5mA
Input current	II	—	—	−1.8	mA	VI=−5V
Output current	Io (off)	—	—	−0.5	μA	Vcc=−50V , VI=0V
DC current gain	GI	30	—	—	—	Vo=−5V , Io=−10mA
Transition frequency	fT	—	250	—	MHz	VCE=−10V , IE=5mA, f=100MHz *
Input resistance	R1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R2/R1	1.7	2.1	2.6	—	—

* Transition frequency of mounted transistor.

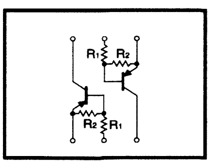
(96-386-A143X)

Digital Transistor (Dual Digital Transistors)
IMB16

●Features

1) Two DTB143X transistors are housed in an SMT package.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	Vcc	−50	V
Input voltage	VIN	−30	V
		7	
Output current	Io	−500	mA
Power dissipation	Pd	300 (TOTAL)	mW *
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* 200 mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	IMB16
Package	SMT6
Marking	B16
Code	T110
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	VI (off)	—	—	−0.3	V	Vcc=−5V , Io=−100 μA
	VI (on)	−2.5	—	—		Vo=−0.3V , Io=−20mA
Output voltage	Vo (on)	—	—	−0.3	V	Io/II=−50mA/−2.5mA
Input current	II	—	—	−1.8	mA	VI=−5V
Output current	Io (off)	—	—	−0.5	μA	Vcc=−50V , VI=0V
DC current gain	GI	56	—	—	—	Io=−50mA , Vo=−5V *1
Transition frequency	fT	—	200	—	MHz	VCE=−10V , IE=50mA , f=100MHz *2
Input resistance	R1	3.29	4.7	6.11	kΩ	—
Resistance ratio	R2/R1	1.7	2.1	2.6	—	—

*1 Measured using pulse current.
*2 Transition frequency of mounted transistor.

(96-456-B143X)

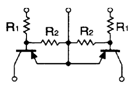
Dual transistors

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMA8N / FMA8A

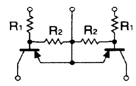
●Features
1) Two DTA114Y transistors are housed in a UMT or SMT package.

●Circuit schematics

UMA8N



FMA8A



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	−50	V
Input voltage	V_{IN}	−40	V
		6	
Output current	I_O	−100	mA
Power dissipation	Pd	300 (TOTAL)	mW *
Storage temperature	Tstg	−50~150	℃

* 200 mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMA8A	FMA8A
Package	UMT5	SMT5
Marking	A8	A8
Code	TR	T148
Basic ordering unit (pieces)	3000	3000

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	V_{CC}=−5V , I_O=−100 μA
	$V_{I(on)}$	−1.4	—	—		V_O=−0.3V , I_O=−1mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	I_O=−10mA , I_I=−0.5mA
Input current	I_I	—	—	−0.88	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	V_{CC}=−50V , V_I=0V
DC current gain	G_I	68	—	—	—	I_O=−5mA , V_O=−5V
Input resistance	R_1	—	10	—	kΩ	—
Resistance ratio	R_2/R_1	3.7	4.7	5.7	—	—

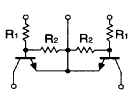
(94S-781-A114Y)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMG5N / FMG5A

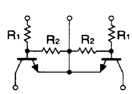
●Features
1) Two DTC114Y transistors are housed in a UMT or SMT package.

●Circuit schematics

UMG5N



FMG5A



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	50	V
Input voltage		V_{IN}	40	V
			−6	
Output current		I_O	100	mA
Power dissipation	UMG5N	Pd	150 (TOTAL)	mW *1
	FMG5A		300 (TOTAL)	*2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMG5N	FMG5A
Package	UMT5	SMT5
Marking	G5	G5
Code	TR	T148
Basic ordering unit (pieces)	3000	3000

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	V_{CC}=5V , I_O=100 μA
	$V_{I(on)}$	1.4	—	—		V_O=0.3V , I_O=1mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	I_O=5mA , I_I=0.25mA
Input current	I_I	—	—	0.88	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50V , V_I=0V
DC current gain	G_I	68	—	—	—	I_O=5mA , V_O=5V
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA, f=100MHz *
Input resistance	R_1	7	10	13	kΩ	—
Resistance ratio	R_2/R_1	3.7	4.7	5.7	—	—

*Transition frequency of mounted transistor.

(94S-799-C114Y)

ROHM

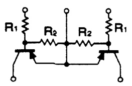
Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMA10N / FMA10A / IMB17A

●Features

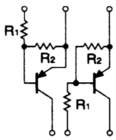
1) Two DTA113Z transistors are housed in a UMT or SMT package.

●Circuit schematics

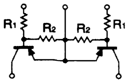
UMA10N



IMB17A



FMA10A



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Supply voltage		Vcc	−50	V	
Input voltage		V_{IN}	−10	V	
			5		
Output current		Io	−100	mA	
Power dissipation	UMA10N	Pd	150 (TOTAL)	mW	∗1
	FMA10A, IMB17A		300 (TOTAL)		∗2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−50~150	℃	

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMA10N	FMA10A	IMB17A
Package	UMT5	SMT5	B17
Marking	A10	A10	T108
Code	TR	T148	3000
Basic ordering unit (pieces)	3000	3000	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.3	V	Vcc=−5V, Io=−100 μA
	$V_{I(on)}$	−3.0	—	—		Vo=−0.3V, Io=−20mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	Io/Ii=−10mA/−0.5mA
Input current	I_I	—	—	−7.2	mA	V_I=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	Vcc=−50V, V_I=0V
DC current gain	G_I	33	—	—	—	Vo=−5V, Io=−5mA
Input resistance	R_1	0.7	1.0	1.3	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V, I_E=5mA, f=100MHz ∗

∗Transition frequency of mounted transistor.

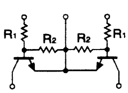
(96-388-A113Z)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMG10N

●Features

1) Two DTC113Z transistors are housed in a UMT package.

●Circuit schematic



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	Vcc	50	V
Input voltage	V_{IN}	10	V
		−5	
Output current	Io	100	mA ∗
Power dissipation	Pd	150 (TOTAL)	mW
Storage temperature	Tstg	−50~150	℃

∗ 120mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMG10N
Package	UMT5
Marking	G10
Code	TR
Basic ordering unit (pieces)	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.3	V	Vcc=5V, Io=100 μA
	$V_{I(on)}$	3	—	—		Vo=0.3V, Io=20mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	Io=10mA, Ii=0.5mA
Input current	I_I	—	—	7.2	mA	V_I=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	Vcc=50V, V_I=0V
DC current gain	G_I	33	—	—	—	Io=5mA, Vo=5V
Input resistance	R_1	0.7	1	1.3	kΩ	—
Resistance ratio	R_2/R_1	8	10	12	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, I_E=−5mA, f=100MHz ∗

∗Transition frequency of mounted transistor.

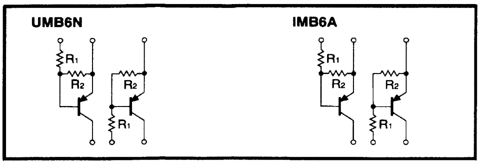
(94S-811-C113Z)

Dual transistors

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMB6N / IMB6A

● Features
1) Two DTA144E transistors are housed in a UMT or SMT package.

● Circuit schematics



● Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Supply voltage		Vcc	−50	V	
Input voltage		V_{IN}	−40	V	
			10		
Output current		Io	50	mA	
Power dissipation	UMB6N	Pd	150 (TOTAL)	mW	*1
	IMB6A		300 (TOTAL)		*2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

● Package, marking, and packaging specifications

Type	UMB6N	IMB6A
Package	UMT6	SMT6
Marking	B6	B6
Code	TR	T110
Basic ordering unit (pieces)	3000	3000

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	−0.5	V	Vcc=−5V , Io=−100 μA
	$V_{I(on)}$	−3.0	—	—		Vo=−0.3V , Io=−2mA
Output voltage	$V_{O(on)}$	—	−0.1	−0.3	V	Io=−10mA , Ii=−0.5mA
Input current	I_I	—	—	−0.18	mA	Vi=−5V
Output current	$I_{O(off)}$	—	—	−0.5	μA	Vcc=−50V , Vi=0V
DC current gain	G_I	68	—	—	—	Io=−5mA , Vo=−5V
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1.0	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−10V , I_E=5mA, f=100MHz *

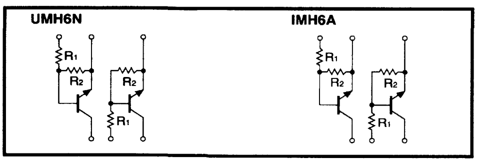
*Transition frequency of mounted transistor.

(94S-846-A144E)

Digital Transistor (Dual Digital Transistors for Inverter Driver)
UMH6N / IMH6A

● Features
1) Two DTC144E transistors are housed in an SMT package.

● Circuit schematics



● Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Supply voltage		Vcc	50	V	
Input voltage		V_{IN}	40	V	
			−10		
Output current		Io	30	mA	
Power dissipation	UMH6N	Pd	150 (TOTAL)	mW	*1
	IMH6A		300 (TOTAL)		*2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−50~150	℃	

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

● Package, marking, and packaging specifications

Type	UMH6N	IMH6A
Package	UMT6	SMT6
Marking	H6	H6
Code	TR	T108
Basic ordering unit (pieces)	3000	3000

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	—	—	0.5	V	Vcc=5V , Io=100 μA
	$V_{I(on)}$	3	—	—		Vo=0.3V , Io=2mA
Output voltage	$V_{O(on)}$	—	0.1	0.3	V	Io/Ii=10mA/0.5mA
Input current	I_I	—	—	0.18	mA	Vi=5V
Output current	$I_{O(off)}$	—	—	0.5	μA	Vcc=50V , Vi=0V
DC current gain	G_I	68	—	—	—	Io/Vo=5mA/5V
Input resistance	R_1	32.9	47	61.1	kΩ	—
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V , I_E=−5mA, f=100MHz *

*Transition frequency of mounted transistor.

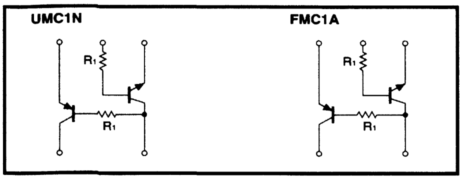
(96-484-C144E)

Digital Transistor (Dual Digital Transistors for Power Management)
UMC1N / FMC1A

●Features

1) DTA143T and DTC143T transistors are housed in a UMT or SMT package.

●Circuit schematics



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	50	V	
Collector-emitter voltage		V_{CEO}	50	V	
Emitter-base voltage		V_{EBO}	5	V	
Collector current		I_C	100	mA	
Collector power dissipation	UMC1N	Pd	150 (TOTAL)	mW	*1
	FMC1A		300 (TOTAL)		*2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

*1 120mW per element must not be exceeded. *2 200mW per element must not be exceeded.
PNP type negative symbols have been omitted.

●Package, marking, and packaging specifications

Type	UMC1N	FMC1A
Package	UMT5	SMT5
Marking	C1	C1
Code	TR	T148
Basic ordering unit (pieces)	3000	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50/−50 μA	
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1/−1mA	
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50/−50 μA	
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=50/−50V	
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4/−4V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C=5/−5mA, I_B=0.25/−0.25mA	
DC current transfer ratio	h_{FE}	100	250	600	—	V_{CE}=5/−5V, I_C=1/−1mA	
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10V, F_E=−5mA, f=100MHz	*
Input resistance	R_1	3.29	4.7	6.11	kΩ	—	

* Transition frequency of mounted transistor. PNP type negative symbols have been omitted.

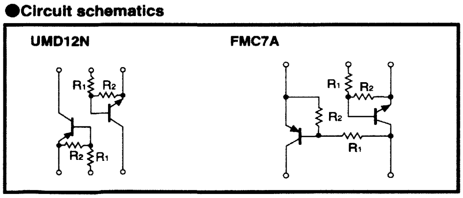
(94S-815-AC143T)

Digital Transistor (Dual Digital Transistors for Power Management)
UMD12N / FMC7A

●Features

1) DTA144E and DTC144E transistors are housed in a UMT or SMT package.

●Circuit schematics



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Supply voltage		V_{CC}	50	V	
Input voltage		V_{IN}	40	V	
			−10		
Output current		I_C	100	mA	
		I_O	30	mA	
Power dissipation	UMD12N	Pd	150 (TOTAL)	mW	*1
	FMC7A		300 (TOTAL)		*2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

*1 120mW per element must not be exceeded. *2 200mW per element must not be exceeded.
PNP type negative symbols have been omitted.

●Package, marking, and packaging specifications

Type	UMD12N	FMC7A
Package	UMT6	SMT5
Marking	D12	C7
Code	TR	T148
Basic ordering unit (pieces)	3000	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Input voltage	$V_{I(off)}$	—	—	0.5	V	V_{CC}=5/−5V , I_O=100/−100 μA	
	$V_{I(on)}$	3	—	—	V	V_O=0.3/−0.3V , I_O=2/−2mA	
Output voltage	$V_{O(on)}$	—	—	0.3	V	I_O=10/−10mA, I_I=0.5/−0.5mA	
Input current	I_I	—	—	0.18	mA	V_I=5/−5V	
Output current	$I_{O(off)}$	—	—	0.5	μA	V_{CC}=50/−50V , V_I=0V	
DC current gain	G_I	68	—	—	—	I_O=5/−5mA , V_O=5/−5V	
Transition frequency	f_T	—	250	—	MHz	V_{CE}=10/−10V , I_E=−5/5mA, f=100MHz	*
Input resistance	R_1	32.9	47	61.1	kΩ	—	
Resistance ratio	R_2/R_1	0.8	1	1.2	—	—	

* Transition frequency of mounted transistor. PNP type negative symbols have been omitted.

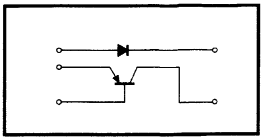
(96-475-AC144E)

Low-frequency Transistor
UML1N

●**Features**

1) The 2SA1037AK and a diode are housed independently in a UMT package.

●**Circuit schematic**



●**Package, marking, and packaging specifications**

Type	UML1N
Package	UMT5
Marking	L1
Code	TR
Basic ordering unit (pieces)	3000

●**Absolute maximum ratings (Ta = 25℃)**

Tr

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−60	V
Collector-emitter voltage	V_{CEO}	−50	V
Emitter-base voltage	V_{EBO}	−6	V
Collector current	I_C	−0.15	A
Collector power dissipatio	P_C	0.15	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

Di

Parameter	Symbol	Limits	Unit
DC reverse voltage	V_R	80	V
Peak reverse voltage	V_{RM}	80	V
Mean rectifying current	I_O	0.1	A
Peak forward voltage	I_{FM}	0.3	A
Surge current	Isurge	4	A
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃
Specified I/O frequencies	f	100	MHz

●**Electrical characteristics (Ta = 25℃)**

Tr

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50μA
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50μA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−60V
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−50mA/−5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=−6V, I_C=−1mA
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V, I_E=−2mA, f=100MHz
Output capacitance	Cob	—	4	5	pF	V_{CB}=−12V, I_E=0A, f=1MHz

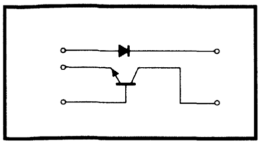
Di

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_F	—	—	1.2	V	I_F=100mA
Reverse current	I_R	—	—	0.1	μA	V_R=70V
Capacitance between terminals	C_T	—	—	3.5	pF	V_R=6V, f=1MHz
Reverse recovery time	trr	—	—	4	ns	V_R=6V, I_F=5mA, RL=50Ω

(SPEC-UML1N)

Low-frequency Transistor
UML2N

●Features
1) The 2SC2412K and a diode are housed independently in a UMT package.

●Circuit schematic


●Package, marking, and packaging specifications

Type	UML2N
Package	UMT5
Marking	L2
Code	TR
Basic ordering unit (pieces)	3000

●Absolute maximum ratings (Ta = 25℃)
Tr

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	60	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	0.15	A
Collector power dissipation	P_C	0.15	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

DI

Parameter	Symbol	Limits	Unit
DC reverse voltage	V_R	80	V
Peak reverse voltage	V_{RM}	80	V
Mean rectifying current	I_O	0.1	A
Peak forward voltage	I_{FM}	0.3	A
Surge current	Isurge	4	A
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃
Specified I/O frequencies	f	100	MHz

●Electrical characteristics (Ta = 25℃)
Tr

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Collector-base breakdown voltag	BV_{CBO}	60	—	—	V	I_C=50 μA
Emitter-base breakdown voltag	BV_{EBO}	6	—	—	V	I_E=50 μA
Collector cutoff curren	I_{CBO}	—	—	0.1	μA	V_{CB}=60V
Emitter cutoff curren	I_{EBO}	—	—	0.1	μA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=50mA/5mA
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=6V, I_C=1mA
Transition frequency	f_T	—	180	—	MHz	V_{CE}=12V, I_E=2mA, f=100MHz
Output capacitance	Cob	—	2	3.5	pF	V_{CB}=12V, I_E=0A, f=1MHz

DI

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_F	—	—	1.2	V	I_F=100mA
Reverse current	I_R	—	—	0.1	μA	V_R=70V
Capacitance between terminals	C_T	—	—	3.5	pF	V_R=6V, f=1MHz
Reverse recovery time	trr	—	—	4	ns	V_R=6V, I_F=5mA, RL=50Ω

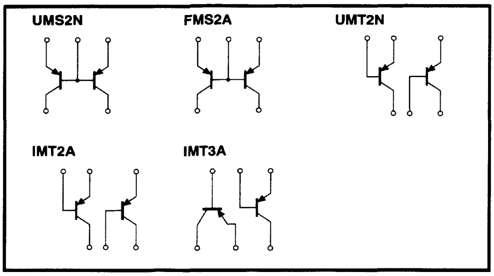
(SPEC-UML2N)

General Purpose (Dual Transistors)
UMS2N / UMT2N / FMS2A / IMT2A / IMT3A

●**Features**

1) Two 2SA1037AK chips are housed in a UMT or SMT package.

●**Circuit schematics**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	−60	V	
Collector-emitter voltage		V_{CEO}	−50	V	
Emitter-base voltage		V_{EBO}	−6	V	
Collector current		I_C	150	mA	
Collector power dissipation	UMS2N, UMT2N	P_C	150 (TOTAL)	mW	∗1
	FMS2A, IMT2A, IMT3A		300 (TOTAL)		∗2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

●**Package, marking, and packaging specifications**

Type	UMS2N	UMT2N	FMS2A	IMT2A	IMT3A
Package	UMT5	UMT6	SMT5	SMT6	SMT6
Marking	S2	T2	S2	T2	T3
Code	TR	TR	T148	T108	T108
Basic ordering unit (pieces)	3000	3000	3000	3000	3000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−60	−	−	V	I_C=−50 μA	
Collector-emitter breakdown voltage	BV_{CEO}	−50	−	−	V	I_C=−1mA	
Emitter-base breakdown voltage	BV_{EBO}	−6	−	−	V	I_E=−50 μA	
Collector cutoff current	I_{CBO}	−	−	−0.1	μA	V_{CB}=−60V	
Emitter cutoff current	I_{EBO}	−	−	−0.1	μA	V_{EB}=−6V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	−0.5	V	I_C/I_B=−50mA/−5mA	
DC current transfer ratio	h_{FE}	120	−	560	−	V_{CE}=−6V , I_C=−1mA	
Transition frequency	f_T	−	140	−	MHz	V_{CE}=−12V , I_E=2mA , f=100MHz	∗
Output capacitance	Cob	−	4	5	pF	V_{CB}=−12V , I_E=0A , f=1MHz	

∗Transition frequency of mounted transistor.

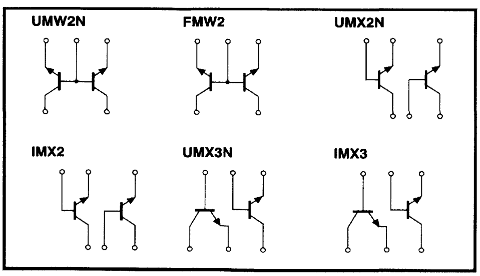
(94S-366-A032)

General Purpose (Dual Transistors)
UMW2N / UMX2N / UMX3N / FMW2 / IMX2 / IMX3

●**Features**

1) Two 2SC2412AK chips are housed in a UMT or SMT package.

●**Circuit schematics**



●**Absolute maximum ratings** (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	60	V	
Collector-emitter voltage		V_{CEO}	50	V	
Emitter-base voltage		V_{EBO}	7	V	
Collector current		I_C	150	mA	
Collector power dissipation	UMW2N, UMX2N, UMX3N	P_C	150 (TOTAL)	mW	∗1
	FMW2, IMX2, IMX3		300 (TOTAL)		∗2
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55~150	℃	

∗1 120mW per element must not be exceeded.
∗2 200mW per element must not be exceeded.

●**Package, marking, and packaging specifications**

Type	UMW2N	UMX2N	UMX3N	FMW2	IMX2	IMX3
Package	UMT5	UMT6	UMT6	SMT5	SMT6	SMT6
Marking	W2	X2	X3	W2	X2	X3
Code	TR	TR	TR	T148	T108	T108
Basic ordering unit (pieces)	3000	3000	3000	3000	3000	3000

●**Electrical characteristics** (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	60	−	−	V	I_C=50 μA	
Collector-emitter breakdown voltage	BV_{CEO}	50	−	−	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	7	−	−	V	I_E=50 μA	
Collector cutoff current	I_{CBO}	−	−	0.1	μA	V_{CB}=60V	
Emitter cutoff current	I_{EBO}	−	−	0.1	μA	V_{EB}=7V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	−	−	0.4	V	I_C/I_B=50mA/5mA	
DC current transfer ratio	h_{FE}	120	−	560	−	V_{CE}=6V , I_C=1mA	
Transition frequency	f_T	−	180	−	MHz	V_{CE}=12V , I_E=2mA , f=100MHz	∗
Output capacitance	Cob	−	2	3.5	pF	V_{CB}=12V , I_E=0mA , f=1kHz	

∗Transition frequency of mounted transistor.

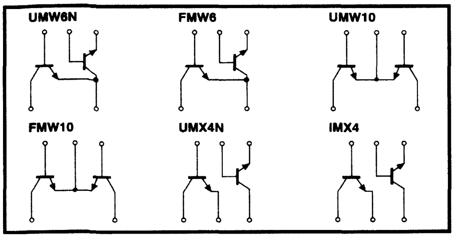
(96-427-C022)

General Purpose (Dual Transistors)
UMW6N / UMW10N / UMX4N / FMW6 / FMW10 / IMX4

●Features

1) Two 2SC3837K chips are housed in a UMT or SMT package.
2) High transition frequency. (f_T=1.5GHz)
3) Low output capacitance. (Cob=0.95pF)

●Circuit schematics



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	30	V
Collector-emitter voltage		V_{CEO}	18	V
Emitter-base voltage		V_{EBO}	3	V
Collector current		I_C	50	mA
Collector power dissipation	UMW6N, UMW10N, UMX4N	Pc	150 (TOTAL)	mW *1
	FMW6, FMW10, IMX4		300 (TOTAL)	mW *2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMW6N	UMW10N	UMX4N	FMW6	FMW10	IMX4
Package	UMT5	UMT6	UMT6	SMT5	SMT6	SMT6
Marking	W6	W10	X4	W6	W10	X4
Code	TR	TR	TR	T148	T148	T108
Basic ordering unit (pieces)	3000	3000	3000	3000	3000	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=10μA
Collector-emitter breakdown voltage	BV_{CEO}	18	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	3	—	—	V	I_E=10μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=10V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=2V
DC current transfer ratio	h_{FE}	27	—	270	—	V_{CE}/I_C=10V/10mA
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.5	V	I_C/I_B=20mA/4mA
h_{FE} pairing	h_{FE1}/h_{FE2}	0.5	1	2	—	V_{CE}/I_C=10V/10mA
Transition frequency	f_T	600	1500	—	MHz	V_{CE}/I_C=10V/10mA, f=200MHz *
Output capacitance	Cob	—	0.95	1.6	pF	V_{CB}/f=10V/1MHz, I_E=0A

* Transition frequency of mounted transistor.

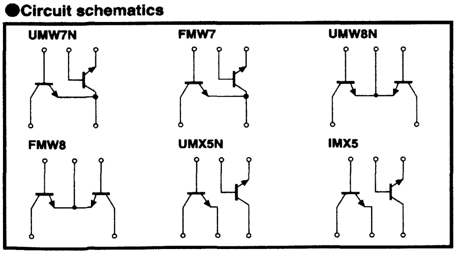
(94S-404-C101)

General Purpose (Dual Transistors)
UMW7N / UMW8N / UMX5N / FMW7 / FMW8 / IMX5

●Features

1) Two 2SC3838K chips are housed in a UMT or SMT package.
2) High transition frequency. (f_T=3.2GHz)
3) Low output capacitance. (Cob=0.9pF)

●Circuit schematics



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	20	V
Collector-emitter voltage		V_{CEO}	11	V
Emitter-base voltage		V_{EBO}	3	V
Collector current		I_C	50	mA
Collector power dissipation	UMW7N, UMW8N, UMX5N	Pc	150 (TOTAL)	mW *1
	FMW7N, FMW8, IMX5		300 (TOTAL)	mW *2
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMW7N	UMW8N	UMX5N	FMW7	FMW8	IMX5
Package	UMT5	UMT6	UMT6	SMT5	SMT6	SMT6
Marking	W7	W8	X5	W7	W8	X5
Code	TR	TR	TR	T148	T148	T108
Basic ordering unit (pieces)	3000	3000	3000	3000	3000	3000

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	20	—	—	V	I_C=10μA
Collector-emitter breakdown voltage	BV_{CEO}	11	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	3	—	—	V	I_E=10μA
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=10V
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=2V
DC current transfer ratio	h_{FE}	27	—	270	—	V_{CE}/I_C=10V/5mA
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.5	V	I_C/I_B=10mA/5mA
h_{FE} pairing	h_{FE1}/h_{FE2}	0.5	1	2	—	V_{CE}/I_C=10V/5mA
Transition frequency	f_T	1.4	3.2	—	GHz	V_{CE}/I_C=10V/10mA, f=200MHz *
Output capacitance	Cob	—	0.9	1.55	pF	V_{CB}/f=10V/1MHz, I_E=0A

* Transition frequency of mounted transistor.

(94S-407-C102)

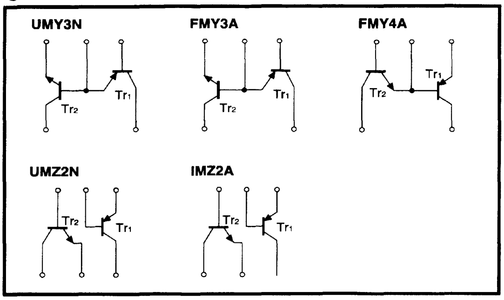
General Purpose Transistor (Power Management)

UMY3N / UMZ2N / FMY3A / FMY4A / IMZ2A

●Features

1) Two 2SA1037AK and 2SC1412K chips are housed in a UMT or SMT package.

●Circuit schematics



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits Tr1	Limits Tr2	Unit	
Collector-base voltage		V_{CBO}	−60	60	V	
Collector-emitter voltage		V_{CEO}	−50	50	V	
Emitter-base voltage		V_{EBO}	−6	7	V	
Collector current		I_C	−150	150	mA	
Collector power dissipation	UMY3N, UMZ2N	P_C	150 (TOTAL)		mW	*1
	FMY3A, FMW4A, IMZ2A		300 (TOTAL)			*2
Junction temperature		Tj	150		℃	
Storage temperature		Tstg	−55~150		℃	

*1 120mW per element must not be exceeded.
*2 200mW per element must not be exceeded.

●Package, marking, and packaging specifications

Type	UMY3N	UMZ2N	FMY3A	FMY4A	IMZ2A
Package	UMT5	UMT6	SMT5	SMT5	SMT6
Marking	Y3	Z2	Y3	Y4	Z2
Code	TR	TR	T148	T148	T108
Basic ordering unit (pieces)	3000	3000	3000	3000	3000

●Electrical characteristics (Ta=25℃)

Tr1

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=−50μA	
Collector-emitter voltage	BV_{CEO}	−50	—	—	V	I_C=−1mA	
Emitter-base breakdown voltage	BV_{EBO}	−6	—	—	V	I_E=−50μA	
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−60V	
Emitter cutoff current	I_{EBO}	—	—	−0.1	μA	V_{EB}=−6V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−50mA/−5mA	
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=−6V , I_C=−1mA	
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V , I_E=2mA , f=100MHz	*
Output capacitance	Cob	—	4	5	pF	V_{CB}=−12V , I_E=0A , f=1MHz	

* Transition frequency of mounted transistor.

Tr2

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50μA	
Collector-emitter voltage	BV_{CEO}	50	—	—	V	I_C=1mA	
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50μA	
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=60V	
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=7V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=50mA/5mA	
DC current transfer ratio	h_{FE}	120	—	560	—	V_{CE}=6V , I_C=1mA	
Transition frequency	f_T	—	180	—	MHz	V_{CE}=12V , I_E=−2mA , f=100MHz	*
Output capacitance	Cob	—	2	3.5	pF	V_{CB}=12V , I_E=0A , f=1MHz	

* Transition frequency of mounted transistor.

(96-434-AC22)

PNP Medium Power Transistor (Switching)
UMT2907A / SST2907A/MMST2907A / RXT2907A / PN2907A

●Features
1) BV_{CEO} < −40V (I_C = −10mA)
2) Complements the UMT2222A/SST2222A/MMST2222A/ RXT2222A/PN2222A.

●Package, marking and packaging specifications

Type	UMT2907A	SST2907A	MMST2907A	RXT2907A	PN2907A
Package	UMT3	SST3	SMT3	MPT3	TO-92
Marking	R2F	R2F	R2F	AC ∗	—
Code	T106	T116	T146	T100	T93
Basic ordering unit (pieces)	3000	3000	3000	1000	3000

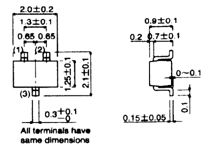
∗ Indicates lot number.

●Absolute maximum ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−60	V
Collector-emitter voltage		V_{CEO}	−60	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−0.6	A
Collector power dissipation	UMT2907A, SST2907A, MMST2907A	P_C	0.2	W
	RXT2907A		0.5	
	PN2907A		0.625	
Junction temperature		Tj	150	°C
Storage temperature		Tstg	−55~150	°C

●External dimensions (Units : mm)

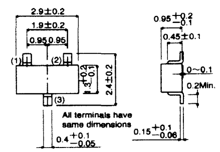
UMT2907A



ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

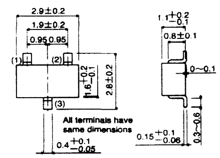
SST2907A



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

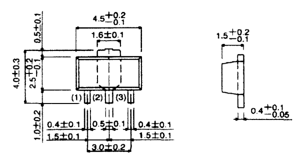
MMST2907A



ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

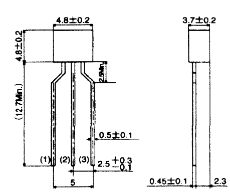
RXT2907A



ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

PN2907A



ROHM : TO-92
EIAJ : SC-43

(1) Base
(2) Collector
(3) Emitter

USA & European specification models

(SPEC-A31)

●Electrical characteristics (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−60	—	—	V	I_C=10 μA
Collector-emitter breakdown voltage	BV_{CEO}	−60	—	—	V	I_C=10mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=10 μA
Collector cutoff current	I_{CBO}	—	—	−100	nA	V_{CB}=−50V
	I_{CES}	—	—	−100		V_{CB}=−30V
Emitter cutoff current	I_{EBO}	—	—	−100	nA	V_{EB}=−3V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.4	V	I_C/I_B=−150mA/−15mA
		—	—	−1.6		I_C/I_B=−500mA/−50mA
Base-emitter saturation voltage	$V_{BE(sat)}$	0.6	—	−1.3	V	I_C/I_B=−150mA/−15mA
		—	—	−2.6		I_C/I_B=−500mA/−50mA
DC current transfer ratio	h_{FE}	75	—	—	—	V_{CE}=−10V , I_C=−0.1mA
		100	—	—		V_{CE}=−10V , I_C=−1mA
		100	—	—		V_{CE}=−10V , I_C=−10mA
		100	—	300		V_{CE}=−10V , I_C=−150mA
		50	—	—		V_{CE}=−10V , I_C=−500mA
Transition frequency	f_T	200	—	—	MHz	V_{CE}=−20V , I_C=−50mA, f=100MHz
Output capacitance	Cob	—	—	8	pF	V_{CB}=−10V , f=100kHz
Emitter input capacitance	Cib	—	—	30	pF	V_{EB}=−2V , f=100kHz
Turn-on time	ton	—	—	50	ns	V_{CC}=−30V , $V_{BE(OFF)}$=−1.5V , I_C=−150mA , I_{B1}=−15mA
Delay time	td	—	—	10	ns	V_{CC}=−30V , $V_{BE(OFF)}$=−1.5V , I_C=−150mA , I_{B1}=−15mA
Rise time	tr	—	—	40	ns	V_{CC}=−30V , $V_{BE(OFF)}$=−1.5V , I_C=−150mA , I_{B1}=−15mA
Turn-off time	toff	—	—	100	ns	V_{CC}=−30V , I_C=−150mA , I_{B1}=I_{B2}=−15mA
Storage time	tstg	—	—	80	ns	V_{CC}=−30V , I_C=−150mA , I_{B1}=I_{B2}=−15mA
Fall time	tf	—	—	30	ns	V_{CC}=−30V , I_C=−150mA , I_{B1}=I_{B2}=−15mA

●Electrical characteristic curves

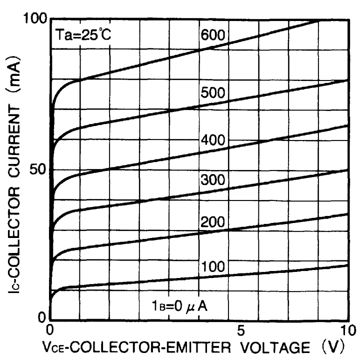


Fig.1 Grounded emitter output characteristics

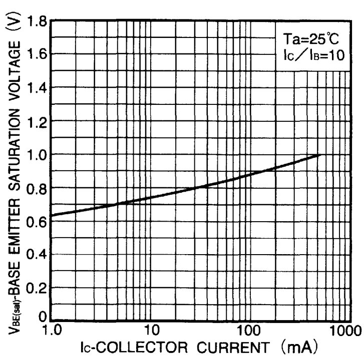


Fig.2 Base-emitter saturation voltage vs. collector current

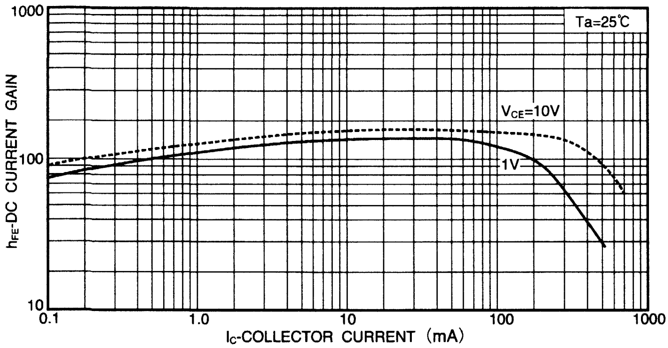


Fig.3 DC current gain vs. collector current (I)

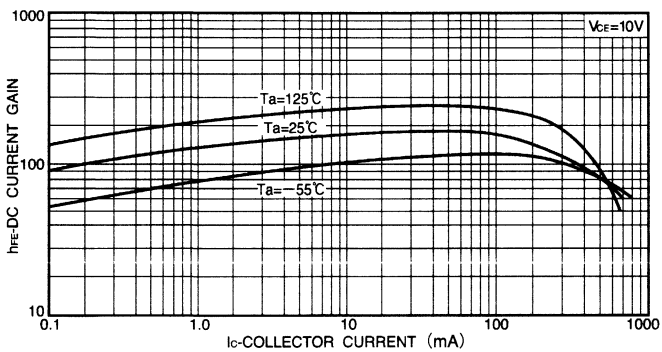


Fig.4 DC current gain vs. collector current (II)

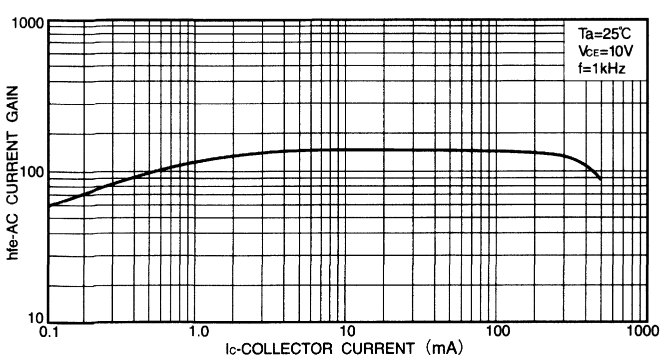


Fig.5 AC current gain vs. collector current

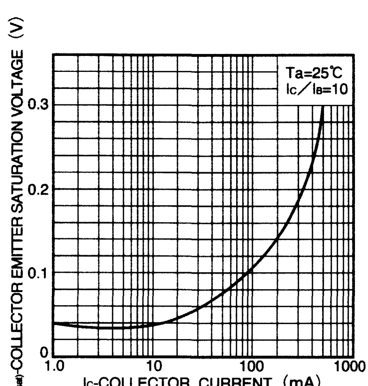


Fig.6 Collector-emitter saturation voltage vs. collector current

USA & European specification models

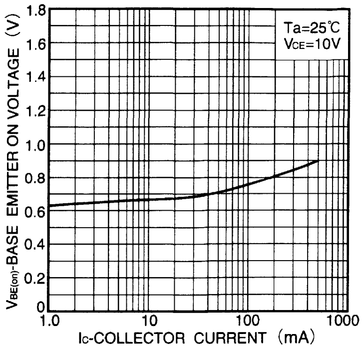


Fig.7 Grounded emitter propagation characteristics

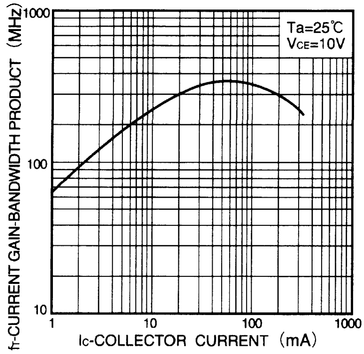


Fig.8 Gain bandwidth product vs. collector current

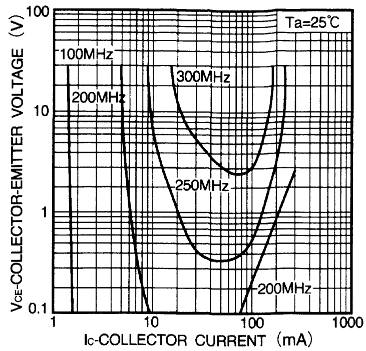


Fig.9 Gain bandwidth product

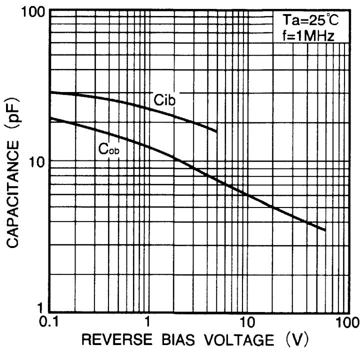


Fig.10 Input/output capacitance vs. voltage

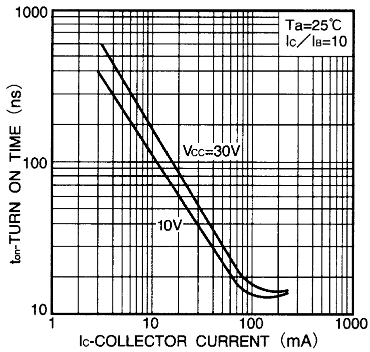


Fig.11 Turn-on time vs. collector current

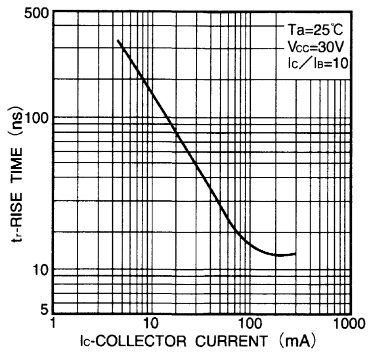


Fig.12 Rise time vs. collector current

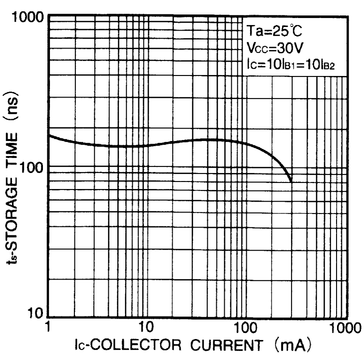


Fig.13 Storage time vs. collector current

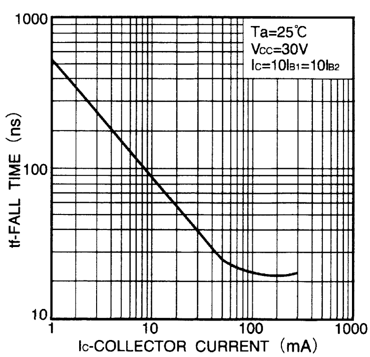


Fig.14 Fall time vs. collector current

PNP Medium Power Transistor (Switching)
UMT4403 / SST4403 / MMST4403 / 2N4403

●Features

1) BVCEO< −40V (IC=1mA)
2) Complements the UMT4401/SST4401/MMST4401/PN4401.

●Package, marking, and packaging specifications

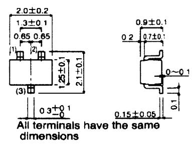
Type	UMT4403	SST4403	MMST4403	2N4403
Package	UMT3	SST3	SMT3	TO-92
Marking	R2T	R2T	R2T	—
Code	T106	T116	T146	T93
Basic ordering unit (pieces)	3000	3000	3000	3000

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		VCBO	−40	V
Collector-emitter voltage		VCEO	−40	V
Emitter-base voltage		VEBO	−6	V
Collector current		IC	−0.6	A
Collector power dissipation	UMT4403 SST4403 MMST4403	PC	0.2	W
	2N4403		0.625	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●External dimensions (Units : mm)

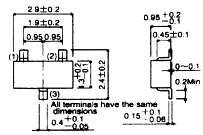
UMT4403



ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

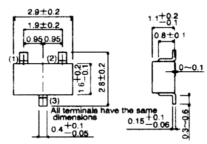
SST4403



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

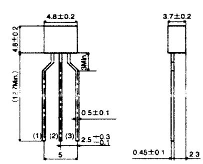
MST4403



ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

2N4403



ROHM : TO-92
EIAJ : SC-43

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BVCBO	−40	—	—	V	IC=−100μA
Collector-emitter breakdown voltage	BVCEO	−40	—	—	V	IC=−1mA
Emitter-base breakdown voltage	BVEBO	−5	—	—	V	IE=−100μA
Collector cutoff current	ICBO	—	—	−0.1	μA	VCB=−35V
Emitter cutoff current	IEBO	—	—	−0.1	μA	VEB=−5V
Collector-emitter saturation voltage	VCE(sat)	—	—	−0.4	V	IC/IB=−150mA/−15mA
		—	—	−0.75		IC/IB=−500mA/−50mA
Base-emitter saturation voltage	VBE(sat)	−0.75	—	−0.95	V	IC/IB=−150mA/−15mA
		—	—	−1.3		IC/IB=−500mA/−50mA
DC current transfer ratio	hFE	30	—	—	—	VCE=−1V , IC=−0.1mA
		60	—	—		VCE=−1V , IC=−1mA
		100	—	—		VCE=−1V , IC=−10mA
		100	—	300		VCE=−1V , IC=−150mA
		20	—	—		VCE=−2V , IC=−500mA
Gain bandwidth product	fT	200	—	—	MHz	VCE=−10V , IE=20mA, f=100MHz
Collector output capacitance	Cob	—	—	8.5	pF	VCB=−10V , f=100KHz
Emitter input capacitance	Cib	—	—	30	pF	VEB=−0.5V , f=100KHz
Delay time	td	—	—	15	ns	VCC=−30V , VEB(OFF)=−2V , IC=−150mA , IB1=−15mA
Rise time	tr	—	—	20	ns	VCC=−30V , VEB(OFF)=−2V , IC=−150mA , IB1=−15mA
Storage time	tstg	—	—	225	ns	VCC=−30V , IC=−150mA , IB1=−IB2=−15mA
Fall time	tf	—	—	30	ns	VCC=−30V , IC=−150mA , IB1=−IB2=−15mA

●Electrical characteristic curves

Refer to pages 496 to 498 for the same UMT2907A/SST2907A/MMST2907A/PN2907A.

USA & European specification models

(SPEC-A31)

PNP General Purpose Transistor
BC858BW/BC858B

●Features
1) $BV_{CEO} < -30V$ ($I_C = -1mA$)
2) Complements the BC848B/BC848BW.

●Package, marking and packaging specifications

Type	BC858BW	BC858B
Package	UMT3	SST3
Marking	G3K	G3K
Code	T106	T116
Basic ordering unit (pieces)	3000	3000

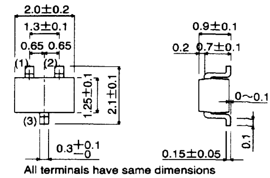
●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−30	V
Collector-emitter voltage	V_{CEO}	−30	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−0.1	A
Collector power dissipation	P_C	0.2	W
		0.35	W∗
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

∗ On 7 x 5 x 0.6 mm ceramic board.

●External dimensions (Units : mm)

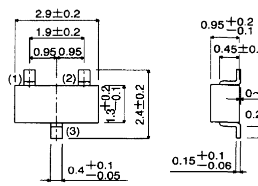
BC858BW (UMT3)



ROHM : UMT3
EIAJ : EC-70

(1) Emitter
(2) Base
(3) Collector

BC858B (SST3)



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−30	—	—	V	$I_C=-50\mu A$
Collector-emitter breakdown voltage	BV_{CEO}	−30	—	—	V	$I_C=-1mA$
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	$I_E=-50\mu A$
Collector cutoff current	I_{CBO}	—	—	−15	μA	$V_{CB}=-30V$
		—	—	−4	μA	$V_{CB}=-30V$, Ta=150℃
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	$I_C/I_B=-10mA/-0.5mA$
		—	—	−0.65	V	$I_C/I_B=-100mA/-5mA$
Base-emitter saturation voltage	$V_{BE(on)}$	−0.6	—	−0.75	V	$V_{CE}/I_C=-5V/-10mA$
DC current transfer ratio	h_{FE}	210	—	480	—	$V_{CE}/I_C=-5V/-2mA$
Transition frequency	f_T	—	250	—	MHz	$V_{CE}=-5V$, $I_E=20mA$, f=100MHz
Output capacitance	Cob	—	4.5	—	pF	$V_{CB}=-10V$, $I_E=0$, f=1MHz

●Electrical characteristic curves

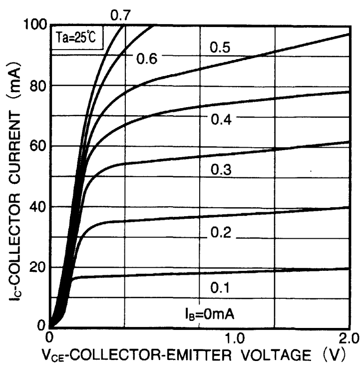


Fig.1 Grounded emitter output characteristics (I)

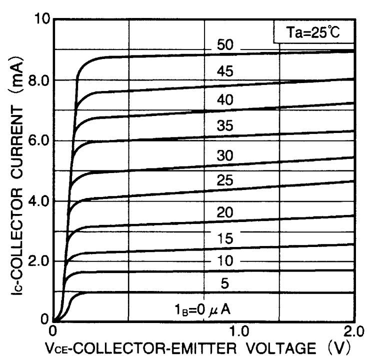


Fig.2 Grounded emitter output characteristics (II)

(SPEC-A32)

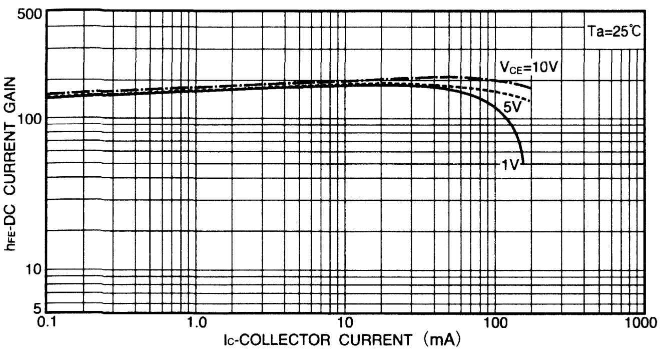


Fig.3 DC current gain vs. collector current (I)

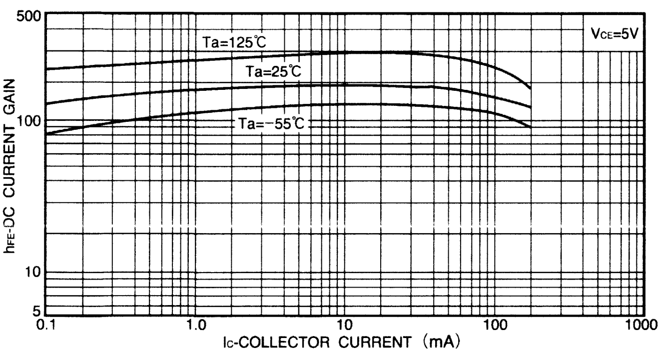


Fig.4 DC current gain vs. collector current (II)

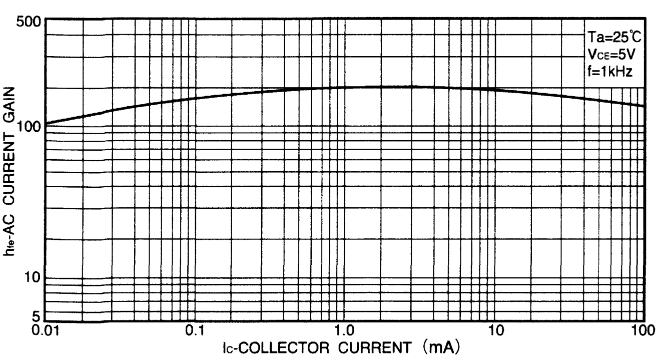


Fig.5 AC current gain vs. collector current

USA & European specification models

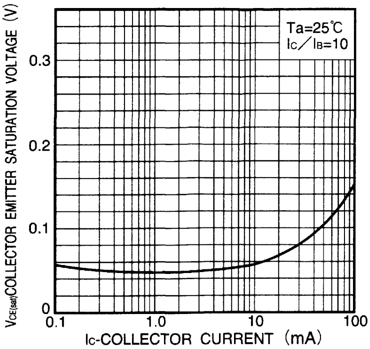


Fig.6 Collector-emitter saturation voltage vs. collector current

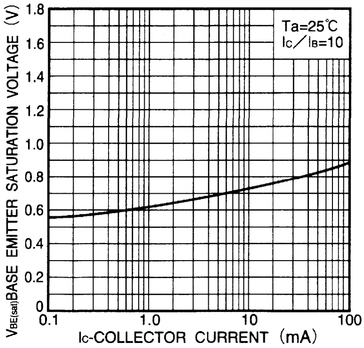


Fig.7 Base-emitter saturation voltage vs. collector current

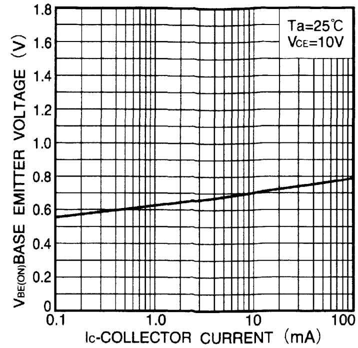


Fig.8 Grounded emitter propagation characteristics

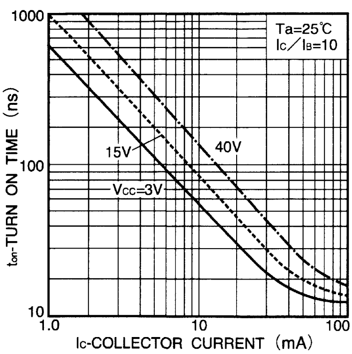


Fig.9 Turn-on time vs. collector current

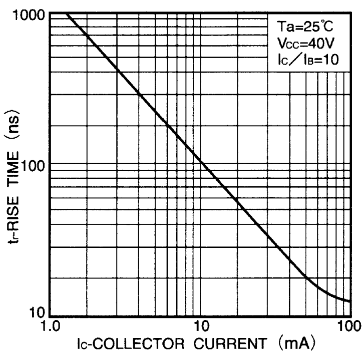


Fig.10 Rise time vs. collector current

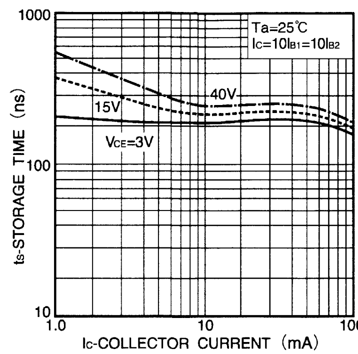


Fig.11 Storage time vs. collector current

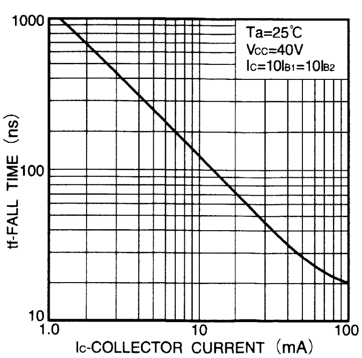


Fig.12 Fall time vs. collector current

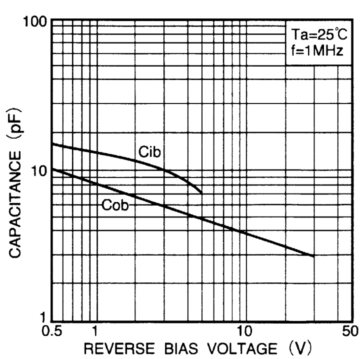


Fig.13 Input/output capacitance vs. voltage

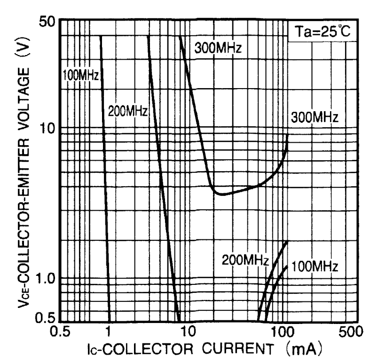


Fig.14 Gain bandwidth product

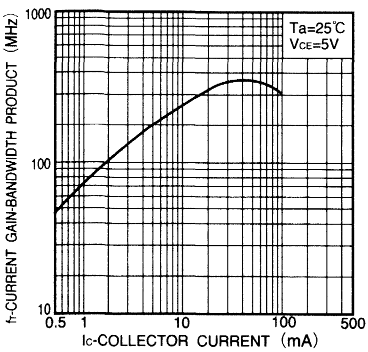


Fig.15 Gain bandwidth product vs. collector current

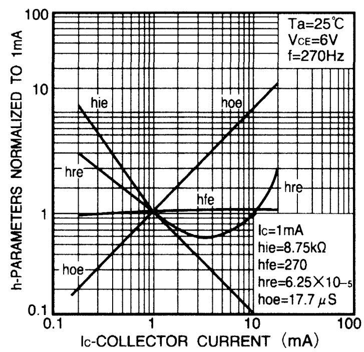


Fig.16 h value vs. collector current

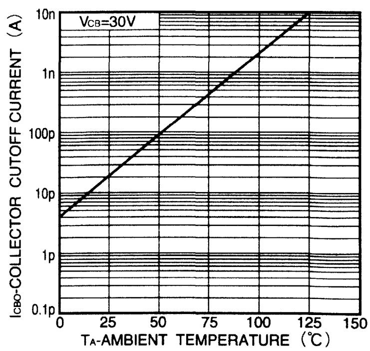


Fig.17 Noise characteristics (I)

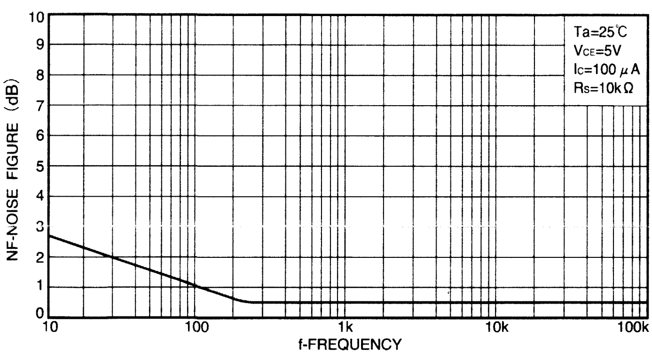


Fig.18 Noise vs. collector current

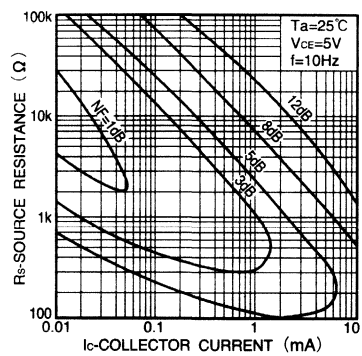


Fig.19 Noise characteristics (Ⅱ)

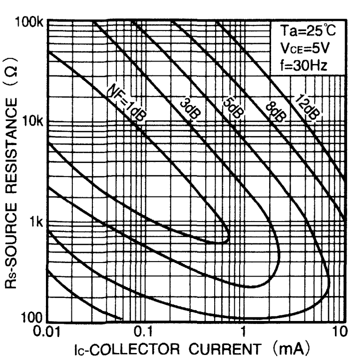


Fig.20 Noise characteristics (Ⅲ)

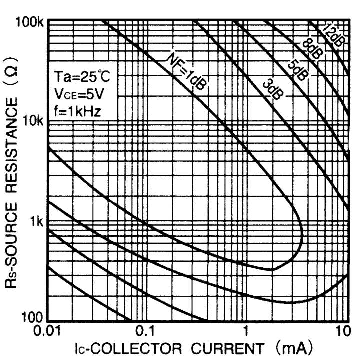


Fig.21 Noise characteristics (Ⅳ)

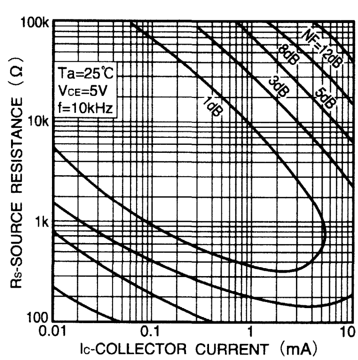


Fig. 22 Noise characteristics (V)

PNP General Purpose Transistor
BC857B

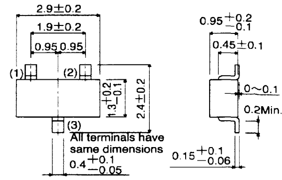
● Features
1) BV_{CEO} < −45V (Ic = −1mA)
2) Complements the BC847B.

● Package, marking, and packaging specifications

Type	BC857B
Package	SST3
Marking	G3F
Code	T116
Basic ordering unit (pieces)	3000

●External dimensions (Units : mm)

BC857B



(1) Emitter
(2) Base
(3) Collector

ROHM : SST3

● Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	−50	V	
Collector-emitter voltage	V_{CEO}	−45	V	
Emitter-base voltage	V_{EBO}	−5	V	
Collector current	I_C	−0.1	A	
Collector power dissipation	P_C	0.2	W	
		0.35		*
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55~150	℃	

* On 7 x 5 x 0.6mm ceramic board.

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−45	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−15	nA	V_{CB}=−30V
		—	—	−4		V_{CB}=−30V , Ta=150℃
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.3	V	I_C/I_B=−10mA/−0.5mA
		—	—	−0.65		I_C/I_B=−100mA/−5mA
Base-emitter saturation voltage	$V_{BE(on)}$	−0.6	—	−0.75	V	V_{CE}/I_C=−5V/−10mA
DC current transfer ratio	h_{FE}	210	—	480	—	V_{CE}/I_C=−5V/−2mA
Transition frequency	f_T	—	250	—	MHz	V_{CE}=−5V , I_E=20mA , f=100MHz
Output capacitance	Cob	—	4.5	—	pF	V_{CB}=−10V , I_E=0 , f=1MHz

● Electrical characteristic curves
Refer to pages 500 to 503 for the same BC858BW/BC858B.

(SPEC-A32)

PNP General Purpose Transistor
SST6839

●Features
1) BV_{CEO} < −40V (I_C = −1mA)
2) Complements the SST6838.

●Package, marking, and packaging specifications

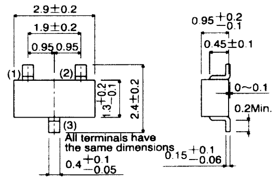
Type	SST6839
Package	SST3
Marking	RFQ
Code	T116
Basic ordering unit (pieces)	3000

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−50	V
Collector-emitter voltage	V_{CEO}	−40	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−0.2	A
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●External dimensions (Units : mm)

SST6839



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−50	—	—	V	I_C=−10μA (Ta=−40℃~125℃)
Collector-emitter breakdown voltage	BV_{CEO}	−40	—	—	V	I_C=−1mA (Ta=−40℃~125℃)
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−30V (Ta=85℃)
		—	—	−5		V_{CB}=−30V (Ta=125℃)
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V (Ta=85℃)
		—	—	−5		V_{EB}=−4V (Ta=125℃)
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−100mA/−10mA (Ta=85℃)
		—	—	−0.7		I_C/I_B=−100mA/−10mA (Ta=125℃)
DC current transfer ratio	h_{FE1}	100	—	—	—	V_{CE}/I_C=−5V/−1mA (Ta=−40℃~25℃)
		—	—	800		V_{CE}/I_C=−5V/−1mA (Ta=85℃)
		—	—	1000		V_{CE}/I_C=−5V/−1mA (Ta=125℃)
DC current transfer ratio	h_{FE2}	100	—	—	—	V_{CE}/I_C=−5V/−100mA (Ta=−40℃~25℃)
Transition frequency	f_T	—	140	—	MHz	V_{CE}=−12V , I_C=−2mA , f=100MHz (Ta=25℃)
Output capacitance	Cob	—	3.5	—	pF	V_{CB}=−12V , I_E=0A , f=1MHz (Ta=25℃)
Emitter input capacitance	Cib	—	17	—	pF	V_{EB}=−0.5V , I_C=0A , f=1MHz (Ta=25℃)

●Electrical characteristic curves
Refer to pages 500 to 503 for the same BC858BW/BC858B.

PNP General Purpose Transistor
UMT3906/SST3906/MMST3906/RXT3906/2N3906

●Features
1) BV_{CEO}< −40V (I_C= −1mA)
2) Complements the UMT3904/SST3904/MMST3904/RXT3904/PN3904.

●Package, marking and packaging specifications

Type	UMT3906	SST3906	MMST3906	RXT3906	2N3906
Package	UMT3	SST3	SMT3	MPT3	TO-92
Marking	R2A	R2A	R2A	AD*	—
Code	T106	T116	T146	T100	T93
Basic ordering unit (pieces)	3000	3000	3000	1000	3000

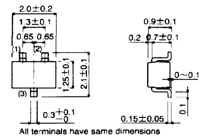
* Indicates lot number.

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−40	V
Collector-emitter voltage		V_{CEO}	−40	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current		I_C	−0.2	A
Collector power dissipation	UMT3906	P_C	0.2	W
	SST3906, MMST3906		0.3	
	RXT3906		0.5	
	2N3906		0.625	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●External dimensions (Units : mm)

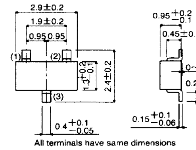
UMT3906



ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

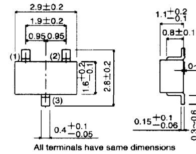
SST3906



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

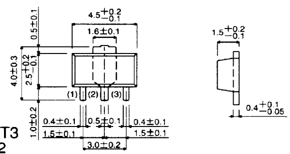
MMST3906



ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

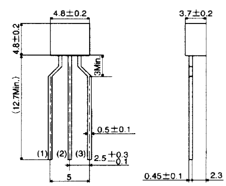
RXT3906



ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

2N3906



ROHM : TO-92
EIAJ : SC-43

(1) Base
(2) Collector
(3) Emitter

● Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−40	—	—	V	I_C= −10 μA
Collector-emitter breakdown voltage	BV_{CEO}	−40	—	—	V	I_C= −10mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E= −10 μA
Collector cutoff current	I_{CES}	—	—	−50	nA	V_{CB}= −30V
Emitter cutoff current	I_{EBO}	—	—	−50	nA	V_{EB}= −3V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.25	V	I_C/I_B= −10mA/−1mA
		—	—	−0.4		I_C/I_B= −50mA/−5mA
Base-emitter saturation voltage	$V_{BE(sat)}$	0.65	—	−0.85	V	I_C/I_B= −10mA/−1mA
		—	—	−0.95		I_C/I_B= −50mA/−5mA
DC current transfer ratio	h_{FE}	60	—	—	—	V_{CE}= −1V , I_C= −0.1mA
		80	—	—		V_{CE}= −1V , I_C= −1mA
		100	—	300		V_{CE}= −1V , I_C= −10mA
		60	—	—		V_{CE}= −1V , I_C= −50mA
		30	—	—		V_{CE}= −1V , I_C= −100mA
Transition frequency	f_T	250	—	—	MHz	V_{CE}= −20V , I_E=10mA, f=100MHz
Output capacitance	Cob	—	—	4.5	pF	V_{CB}= −10V , f=100KHz
Emitter input capacitance	Cib	—	—	10	pF	V_{EB}= −0.5V , f=100KHz
Delay time	td	—	—	35	ns	V_{CC}= −3V , $V_{BE(OFF)}$= −0.5V , I_C= −10mA , I_{B1}= −1mA
Rise time	tr	—	—	35	ns	V_{CC}= −3V , $V_{BE(OFF)}$= −0.5V , I_C= −10mA , I_{B1}= −1mA
Storage time	tstg	—	—	225	ns	V_{CC}= −3V , I_C= −10mA , I_{B1}= −I_{B2}= −1mA
Fall time	tf	—	—	75	ns	V_{CC}= −3V , I_C= −10mA , I_{B1}= −I_{B2}= −1mA

(SPEC-A38)

● Electrical characteristic curves

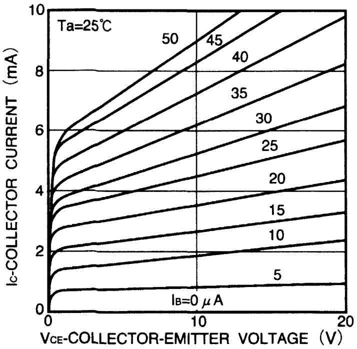


Fig.1 Grounded emitter output characteristics

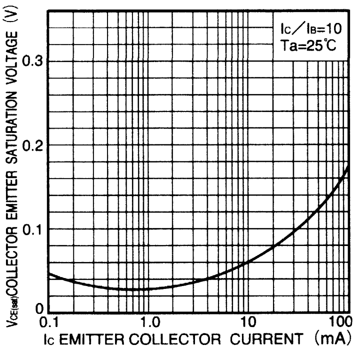


Fig.2 Collector-emitter saturation voltage vs. collector current

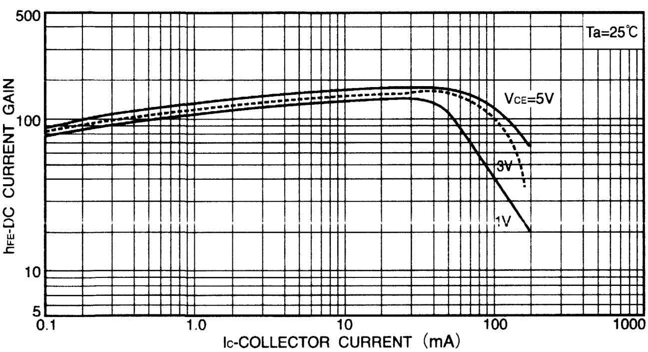


Fig.3 DC current gain vs. collector current (I)

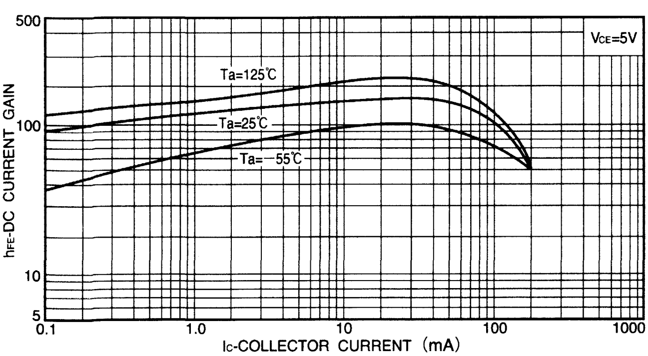


Fig.4 DC current gain vs. collector current (II)

USA & European specification models

●Electrical characteristic curves

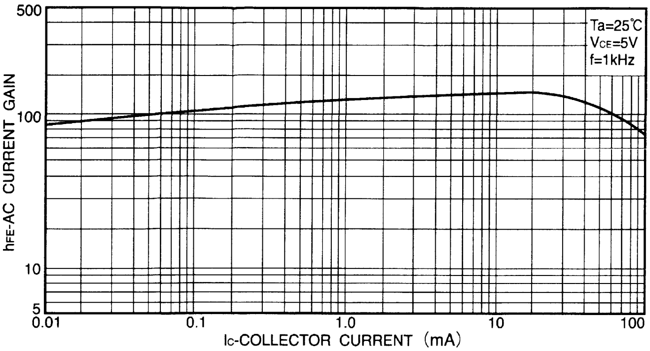


Fig.5 AC current gain vs. collector current

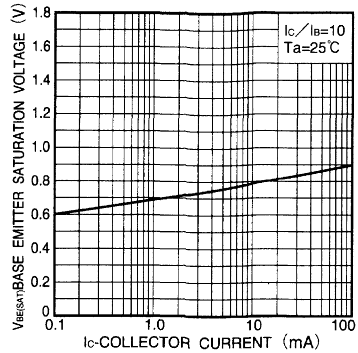


Fig.6 Base-emitter saturation voltage vs. collector current

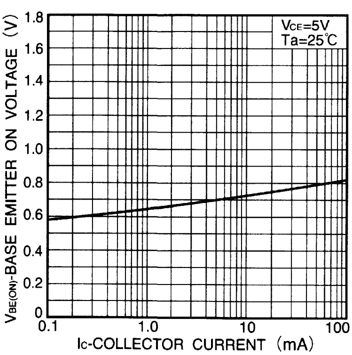


Fig.7 Grounded emitter propagation characteristics

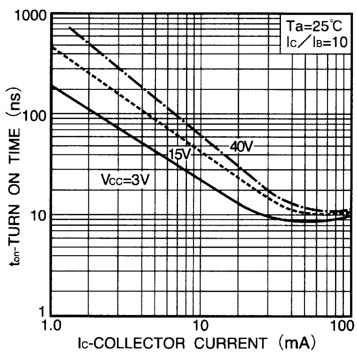


Fig.8 Turn-on time vs. collector current

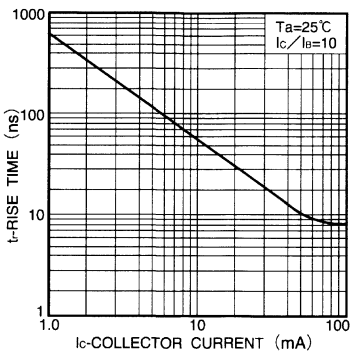


Fig.9 Rise time vs. collector current

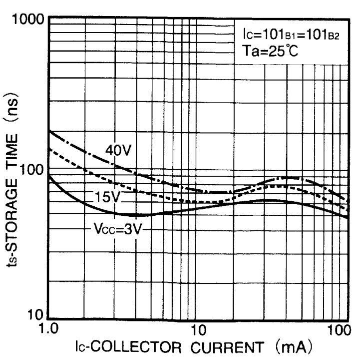


Fig.10 Storage time vs. collector current

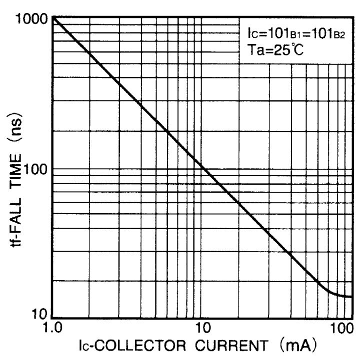


Fig.11 Fall time vs. collector current

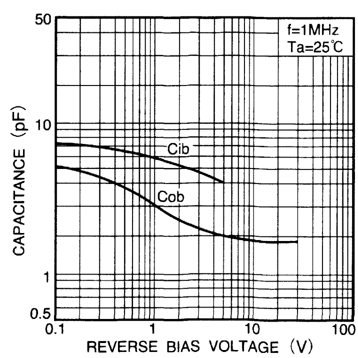


Fig.12 Input/output capacitance vs. voltage

● Electrical characteristic curves

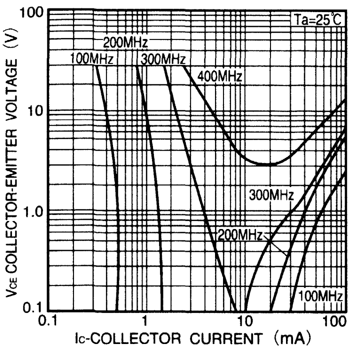


Fig.13 Gain bandwidth product

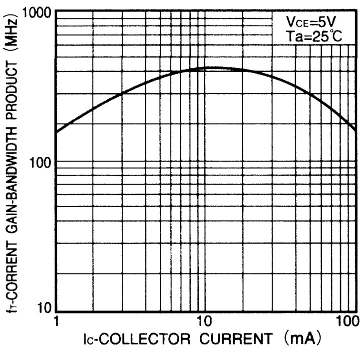


Fig.14 Gain bandwidth product vs. collector current

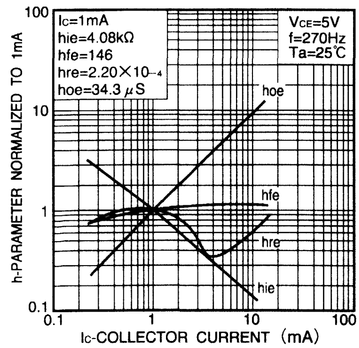


Fig.15 h value vs. collector current

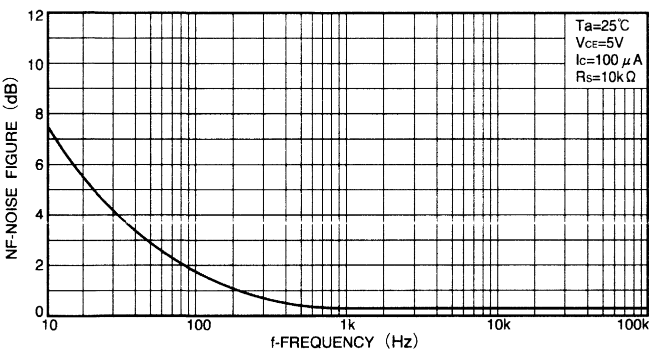


Fig.16 Noise vs. collector current

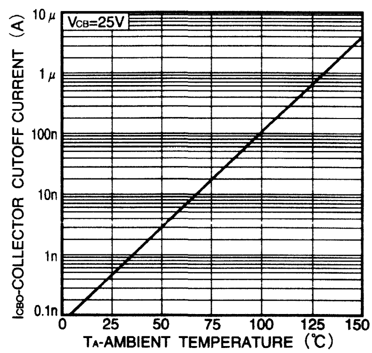


Fig.17 Noise characteristics (I)

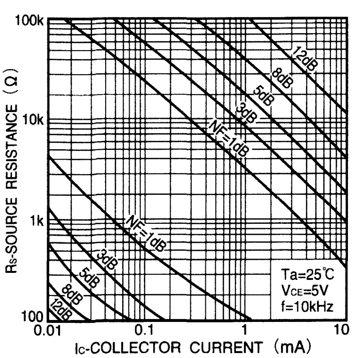


Fig.18 Noise characteristics (II)

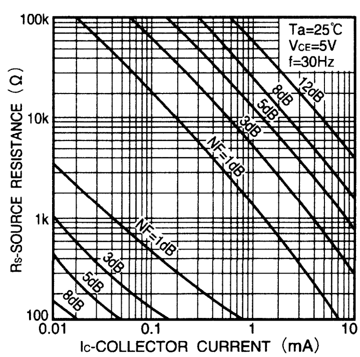


Fig.19 Noise characteristics (III)

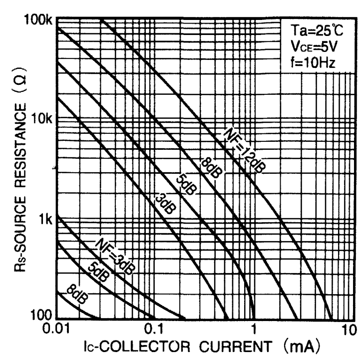


Fig.20 Noise characteristics (IV)

PNP General Purpose Transistor

SSTA56/MMSTA56/MPSA56

●Features

1) BV_{CEO} < −40V (I_C = −1mA)
2) Complements the SSTA06/MMSTA06/MPSA06.

●Package, marking and packaging specifications

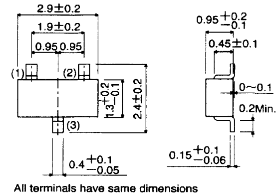
Type	SSTA56	MMSTA56	MPSA56
Package	SST3	SMT3	TO-92
Marking	R2G	R2G	—
Code	T116	T146	T93
Basic ordering unit (pieces)	3000	3000	3000

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	−80	V
Collector-emitter voltage		V_{CEO}	−80	V
Emitter-base voltage		V_{EBO}	−4	V
Collector current		I_C	−0.5	A
Collector power dissipation	SSTA56, MMSTA56	P_C	0.2	W
	MPSA56		0.625	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●External dimensions (Units : mm)

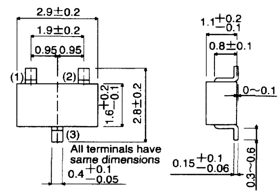
SSTA56



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

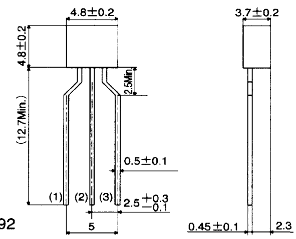
MMSTA56



ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

MPSA56



ROHM : TO-92
EIAJ : SC-43

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−4	—	—	V	I_C=−100μA
Collector-emitter breakdown voltage	BV_{CEO}	−80	—	—	V	I_C=−1mA
Collector cutoff current	I_{CBO}	—	—	−0.1	μA	V_{CB}=−80V
	I_{CEO}	—	—	−1		V_{CE}=−60V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.25	V	I_C/I_B=−100mA/−10mA
Base-emitter saturation voltage	$V_{BE(on)}$	—	—	−1.2	V	V_{IEC}/I_B=−1V/−100mA
DC current transfer ratio	h_{FE}	100	—	—	—	V_{CE}=−1V, I_C=−10mA
		100	—	—		V_{CE}=−1V, I_C=−100mA
Transition frequency	f_T	50	—	—	MHz	V_{CE}=−1V, I_E=100mA, f=100MHz

(SPEC-B93)

ROHM

●Electrical characteristic curves

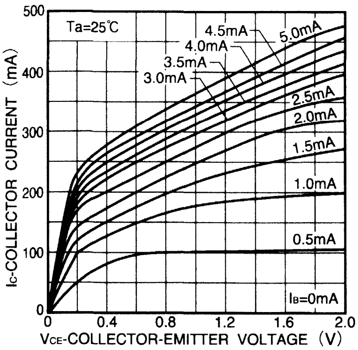


Fig.1 Grounded emitter output characteristics

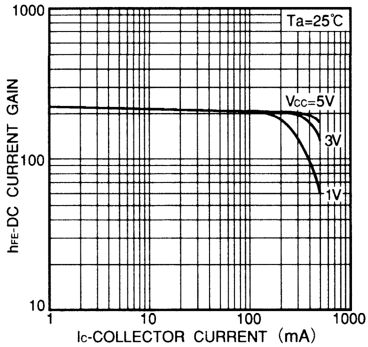


Fig.2 Dc current gain vs. collector current (I)

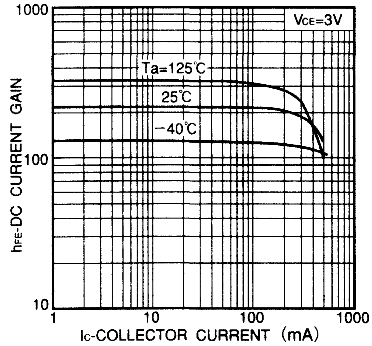


Fig.3 DC current gain vs. collector current (II)

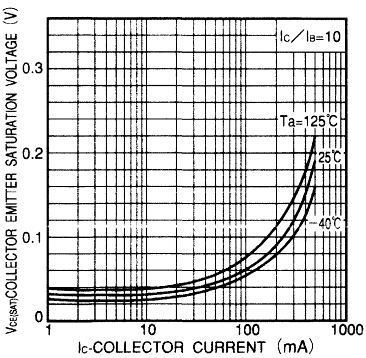


Fig.4 Collector emitter saturation voltage vs. collector current

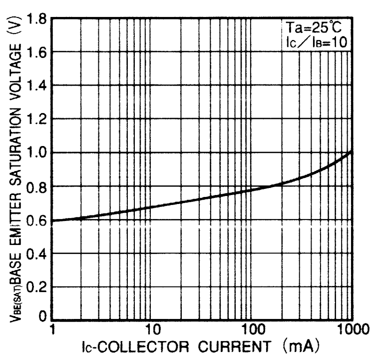


Fig.5 Base-emitter saturation voltage vs. collector current

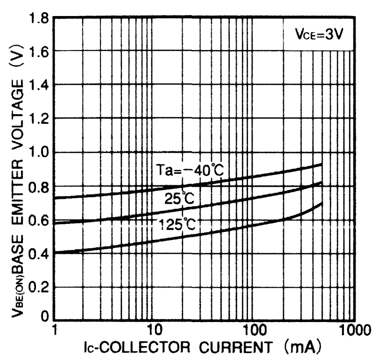


Fig.6 Grounded emitter propagation characteristics

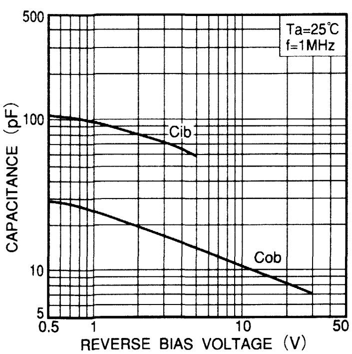


Fig.7 Input/output capecitance vs. voltage

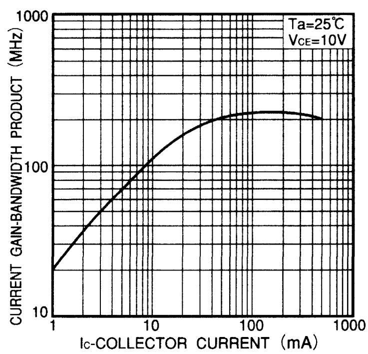


Fig.8 Gain bandwidth product vs. collector current

NPN General Purpose Transistor
BC848BW/BC848B/BC848C

●Features
1) BV_{CEO}<30V (I_C=1mA)
2) Complements the BC858B/BC858BW.

●Package, marking and packaging specifications

Type	BC848BW	BC848B	BC848C
Package	UMT3	SST3	SST3
Marking	G1K	G1K	G1L
Code	T106	T116	T116
Basic ordering unit (pieces)	3000	3000	3000

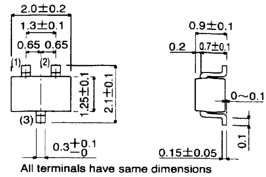
●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	30	V
Collector-emitter voltage	V_{CEO}	30	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	0.1	A
Collector power dissipation	P_C	0.2	W
		0.35	W *
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* On 7 x 5 x 0.6 mm ceramic board.

●External dimensions (Units : mm)

BC848BW

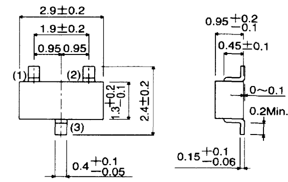


ROHM : UMT3
EIAJ : SC-70

All terminals have same dimensions

(1) Emitter
(2) Base
(3) Collector

BC848B , BC848C



All terminals have same dimensions

ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	I_C=50 μA
Collector-emitter breakdown voltage	BV_{CEO}	30	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	5	—	—	V	I_E=50 μA
Collector cutoff current	I_{CBO}	—	—	15	μA	V_{CB}=30V
		—	—	5	μA	V_{CB}=30V , Ta=150℃
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.25	V	I_C/I_B=10mA/0.5mA
		—	—	0.6	V	I_C/I_B=100mA/5mA
Base-emitter saturation voltage	$V_{BE(on)}$	0.58	—	0.77	V	V_{CE}/I_C=5V/10mA
DC current transfer ratio	h_{FE}	200	—	450	—	V_{CE}/I_C=5V/2mA (BC848B/BW)
		420	—	800	—	V_{CE}/I_C=5V/2mA (BC848C)
Transition frequency	f_T	—	200	—	MHz	V_{CE}=5V , I_E=−20mA , f=100MHz
Output capacitance	Cob	—	3	—	pF	V_{CB}=10V , I_E=0 , f=1MHz
Collector output capacitance	Cib	—	8	—	pF	V_{EB}=0.5V , I_E=0 , f=1MHz

(SPEC-C22)

●Electrical characteristic curves

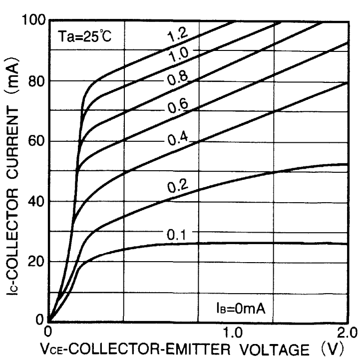


Fig.1 Grounded emitter output characteristics (I)

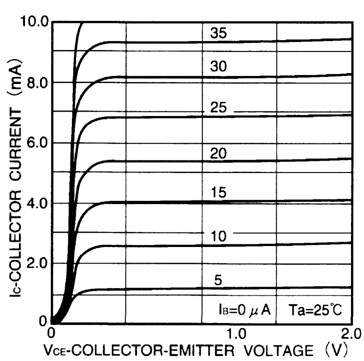


Fig.2 Grounded emitter output characteristics (II)

(SPEC-C22)

ROHM

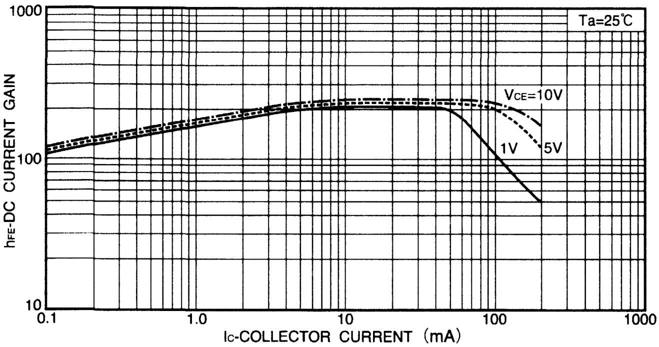


Fig.3 DC current gain vs. collector current (I)

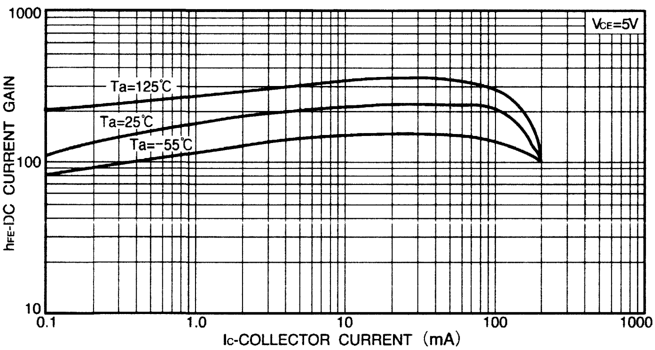


Fig.4 DC current gain vs. collector current (II)

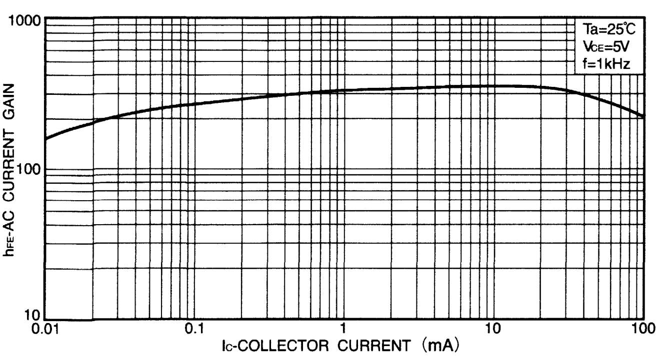


Fig.5 AC current gain vs. collector current

USA & European specification models

● Electrical characteristic curves

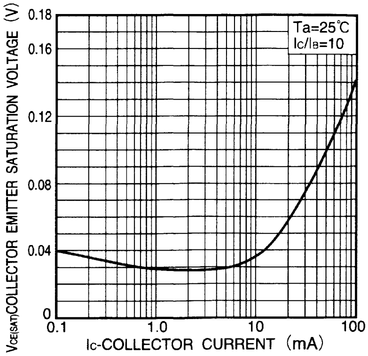


Fig.6 Collector-emitter saturation voltage vs. collector current

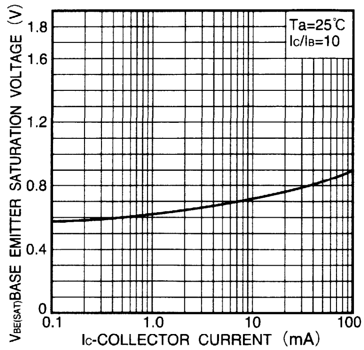


Fig.7 Base-emitter saturation voltage vs. collector current

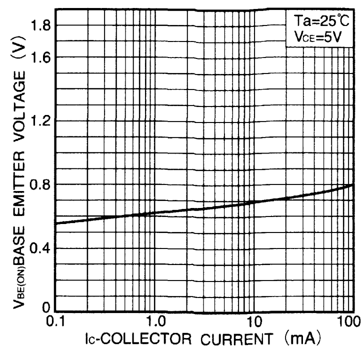


Fig.8 Grounded emitter propagation characteristics

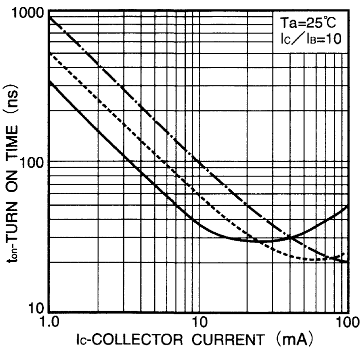


Fig.9 Turn-on time vs. collector current

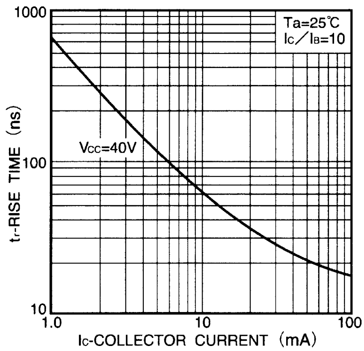


Fig.10 Rise time vs. collector current

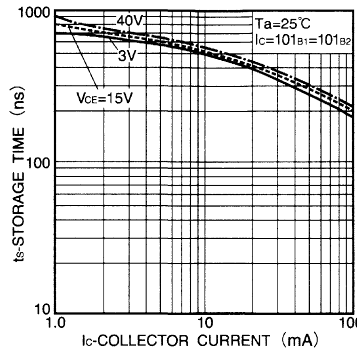


Fig.11 Storage time vs. collector current

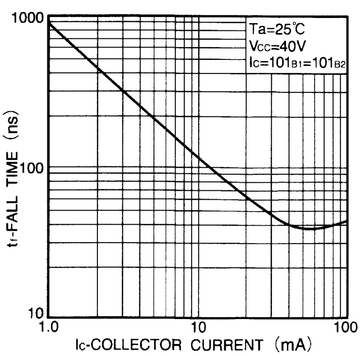


Fig.12 Fall time vs. collector current

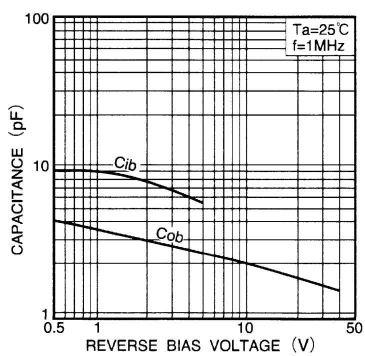


Fig.13 Input/output capacitance vs. voltage

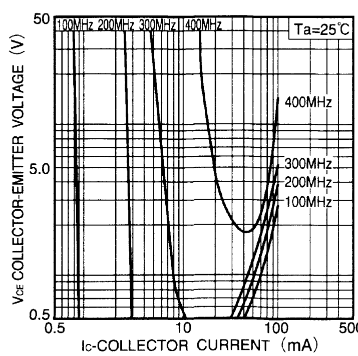


Fig.14 Gain bandwidth product

● Electrical characteristic curves

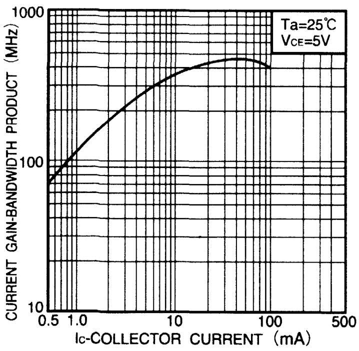


Fig.15 Gain bandwidth product vs. collector current

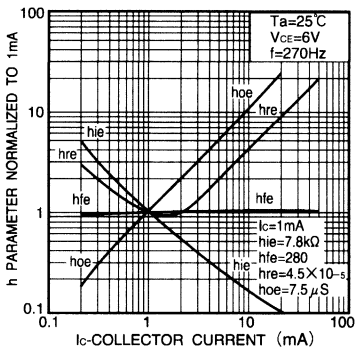


Fig.16 h value vs. collector current

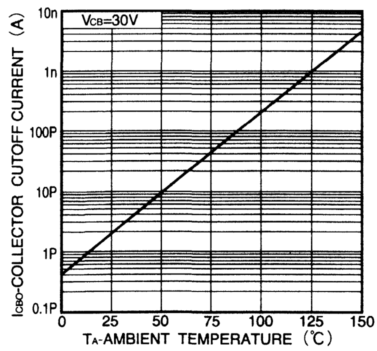


Fig.17 Collector cutoff current

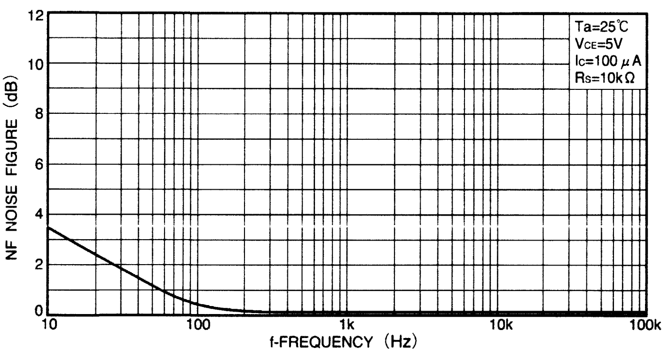


Fig.18 Noise vs. collector current

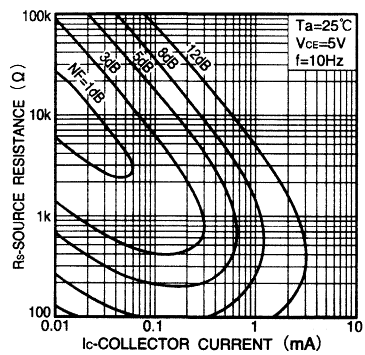


Fig.19 Noise characteristics (I)

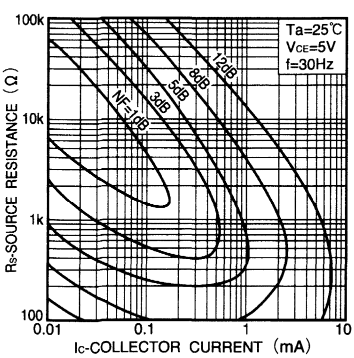


Fig.20 Noise characteristics (II)

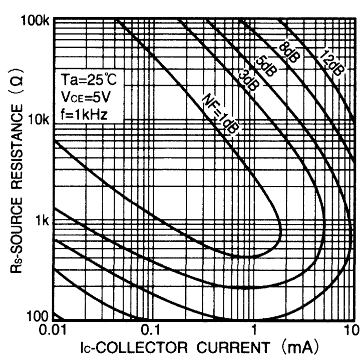


Fig.21 Noise characteristics (III)

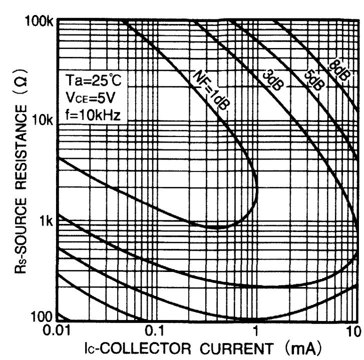


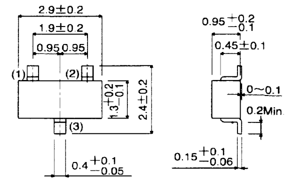
Fig.22 Noise characteristics (IV)

NPN General Purpose Transistor
BC847B

●Features
1) BV_{CEO}<45V (I_C=1mA)
2) Complements the BC857B.

●External dimensions (Units : mm)

BC847B



All terminals have the same dimensions

ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

●Package, marking, and packaging specifications

Type	BC847B
Package	SST3
Marking	G1F
Code	T116
Basic ordering unit (pieces)	3000

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	45	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	0.1	A
Collector power dissipation	P_C	0.2	W
		0.35	W *
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

* On 7 x 5 x 0.6 mm ceramic board.

●Electrical characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	45	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	15	μA	V_{CB}=30V
		—	—	5	μA	V_{CB}=30V , Ta=150℃
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.25	V	I_C/I_B=10mA/0.5mA
		—	—	0.6	V	I_C/I_B=100mA/5mA
Base-emitter saturation voltage	$V_{BE(on)}$	0.58	—	0.77	V	V_{CE}/I_C=5V/10mA
DC current transfer ratio	h_{FE}	200	—	450	—	V_{CE}/I_C=5V/2mA
Transition frequency	f_T	—	200	—	MHz	V_{CE}=5V , I_E=−20mA , f=100MHz
Output capacitance	Cob	—	3	—	pF	V_{CB}=−10V , I_E=0 , f=1MHz
Emitter input capacitance	Cib	—	8	—	pF	V_{EB}=0.5V , I_C=0 , f=1MHz

●Electrical characteristic curves
Refer to pages 512 to 515 for the same BC848BW/BC848B/BC848C.

(SPEC-C22)

NPN General Purpose Transistor
SST6838

●Features
1) BV_{CEO}<40V (I_C=1mA)
2) Complements the SST6839.

●Package, marking, and packaging specifications

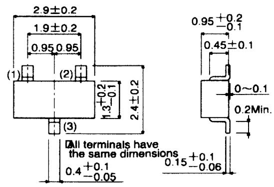
Type	SST6838
Package name	SST3
Marking	RBR
Code	T116
Basic ordering unit (pieces)	3000

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	40	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	0.2	A
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55~150	℃

●External dimensions (Units : mm)

SST6838



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Collector-base breakdown voltage	BV_{CBO}	50	—	—	V	I_C=10μA	(Ta=−40℃~125℃)
Collector-emitter breakdown voltage	BV_{CEO}	40	—	—	V	I_C=1mA	(Ta=−40℃~125℃)
Collector cutoff current	I_{CBO}	—	—	0.5	μA	V_{CB}=30V	(Ta=85℃)
		—	—	5		V_{CB}=30V	(Ta=125℃)
Emitter cutoff current	I_{EBO}	—	—	0.5	μA	V_{EB}=4V	(Ta=85℃)
		—	—	5		V_{EB}=4V	(Ta=125℃)
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=50mA/5mA	(Ta=25℃)
		—	—	0.5		I_C/I_B=10mA/0.2mA	(Ta=85℃)
		—	—	0.7		I_C/I_B=10mA/0.2mA	(Ta=125℃)
DC current transfer ratio	h_{FE1}	200	—	—	—	V_{CE}/I_C=5V/1mA	(Ta=−40℃~25℃)
		—	—	800		V_{CE}/I_C=5V/1mA	(Ta=85℃)
		—	—	1000		V_{CE}/I_C=5V/1mA	(Ta=125℃)
DC current transfer ratio	h_{FE2}	150	—	—	—	V_{CE}/I_C=10V/5mA	(Ta=−40℃~25℃)
Transition frequency	f_T	50	180	—	MHz	V_{CE}=12V , I_C=2mA , f=100MHz	(Ta=25℃)
Output capacitance	Cob	—	2	3.5	pF	V_{CB}=12V , f=1MHz	(Ta=25℃)
Emitter input capacitance	Cib	—	17	—	pF	V_{EB}=0.5V , f=1MHz	(Ta=25℃)

●Electrical characteristic curves
Refer to pages 512 to 515 for the same BC848BW/BC848B/BC848C.

(SPEC-C22)

NPN Medium Power Transistor (Switching)
UMT2222A/SST2222A/MMST2222A/RXT2222A/PN2222A

●Features
1) BV_{CEO}<40V (I_C=10mA)
2) Complements the UMT2907A/SST2907A/MMST2907A /RXT2907A/PN2907A.

●Package, marking and packaging specifications

Type	UMT2222A	SST2222A	MMST2222A	RXT2222A	PN2222A
Package	UMT3	SST3	SMT3	MPT3	TO-92
Marking	R1P	R1P	R1P	CB∗	—
Code	T106	T116	T146	T100	T93
Basic ordering unit (pieces)	3000	3000	3000	1000	3000

∗ Indicates lot number.

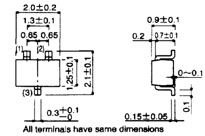
●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	75	V
Collector-emitter voltage		V_{CEO}	40	V
Emitter-base voltage		V_{EBO}	6	V
Collector current		I_C	0.6	A
Collector power dissipation	UMT2222A,SST2222AV, MMST2222A	P_C	0.2	W ∗
	SST2222A		0.35	
	RXT2222A		0.5	
	PN2222A		0.625	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗ On 7 x 5 x 0.6 mm ceramic board

●External dimensions (Units : mm)

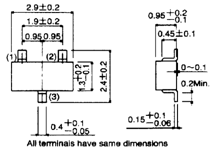
UMT2222A



ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

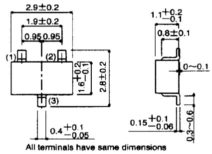
SST2222A



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

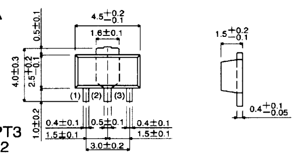
MMST2222A



ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

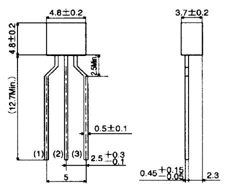
RXT2222A



ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

PN2222A



ROHM : TO-92
EIAJ : SC-43

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	75	—	—	V	I_C=10μA
Collector-emitter breakdown voltage	BV_{CEO}	40	—	—	V	I_C=10mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=10μA
Collector cutoff current	I_{CBO}	—	—	100	nA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	—	—	100	nA	V_{EB}=3V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	I_C/I_B=150mA/15mA
		—	—	1		I_C/I_B=500mA/50mA
Base-emitter saturation voltage	$V_{BE(sat)}$	0.6	—	1.2	V	I_C/I_B=150mA/15mA
		—	—	2		I_C/I_B=500mA/50mA
DC current transfer ratio	h_{FE}	35	—	—	—	V_{CE}=10V , I_C=0.1mA
		50	—	—		V_{CE}=10V , I_C=1mA
		75	—	—		V_{CE}=10V , I_C=10mA
		50	—	—		V_{CE}=1V , I_C=150mA
		100	—	300		V_{CE}=10V , I_C=150mA
		40	—	—		V_{CE}=10V , I_C=500mA
Transition frequency	f_T	300	—	—	MHz	V_{CE}=20V , I_C=−20mA, f=100MHz
Output capacitance	Cob	—	—	8	pF	V_{CB}=10V , f=100kHz
Emitter input capacitance	Cib	—	—	25	pF	V_{EB}=0.5V , f=100kHz
Delay time	td	—	—	10	ns	V_{CC}=30V , $V_{BE(OFF)}$=0.5V , I_C=150mA , I_{B1}=15mA
Rise time	tr	—	—	25	ns	V_{CC}=30V , $V_{BE(OFF)}$=0.5V , I_C=150mA , I_{B1}=15mA
Storage time	tstg	—	—	225	ns	V_{CC}=30V , I_C=150mA , I_{B1}=−I_{B2}=15mA
Fall time	tf	—	—	60	ns	V_{CC}=30V , I_C=150mA , I_{B1}=−I_{B2}=15mA

(SPEC-C31)

●Electrical characteristic curves

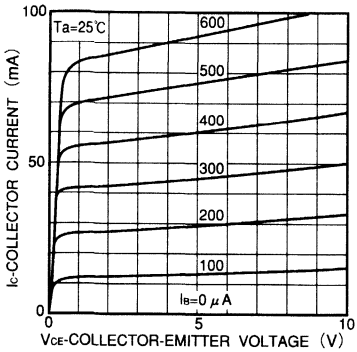


Fig.1 Grounded emitter output characteristics

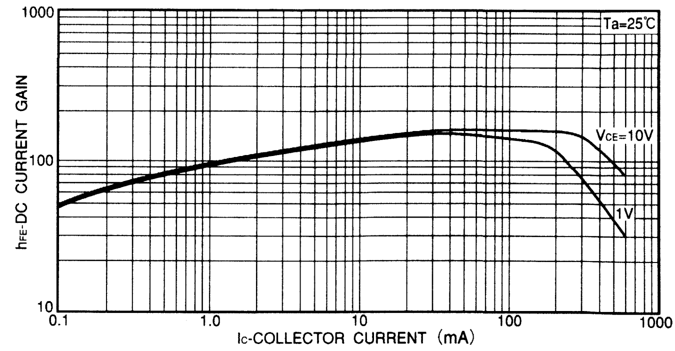


Fig.3 DC current gain vs. collector current (I)

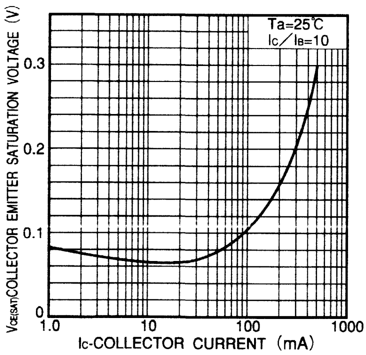


Fig.2 Collector-emitter saturation voltage vs. collector current

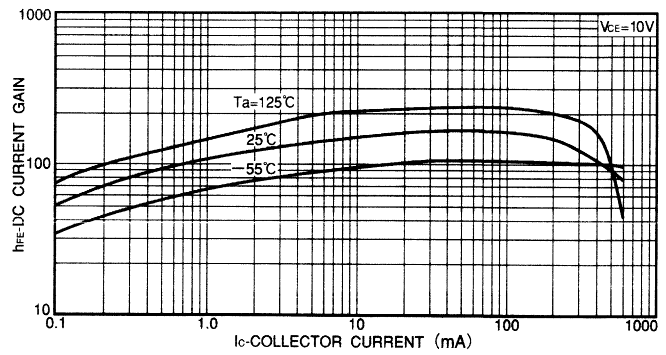


Fig.4 DC current gain vs. collector current (II)

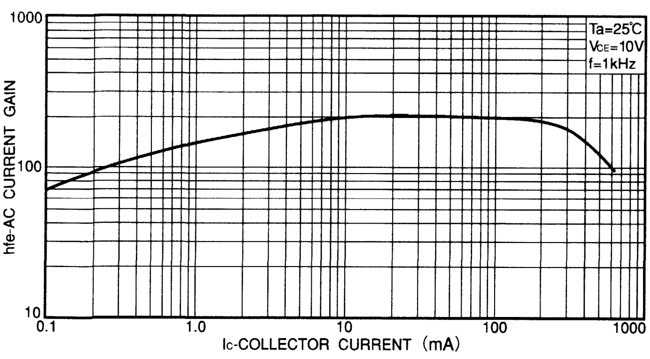


Fig.5 AC current gain vs. collector current

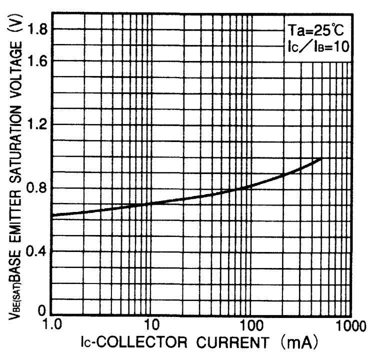


Fig.6 Base-emitter saturation voltage vs. collector current

USA & European specification models

● Electrical characteristic curves

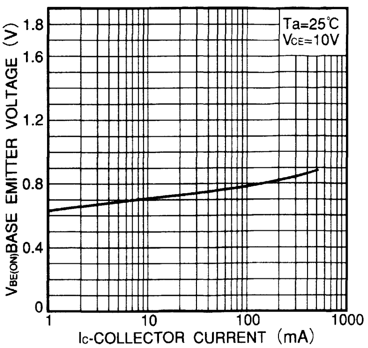


Fig.7 Grounded emitter propagation characteristics

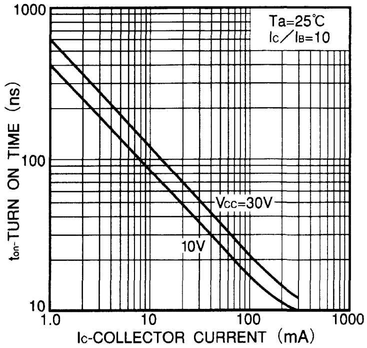


Fig.8 Turn-on time vs. collector current

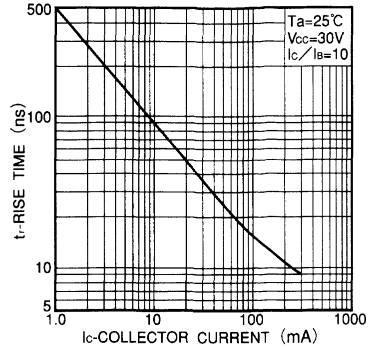


Fig.9 Rise time vs. collector current

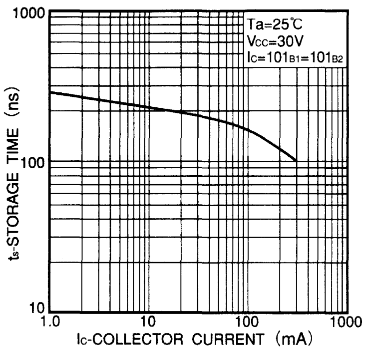


Fig.10 Storage time vs. collector current

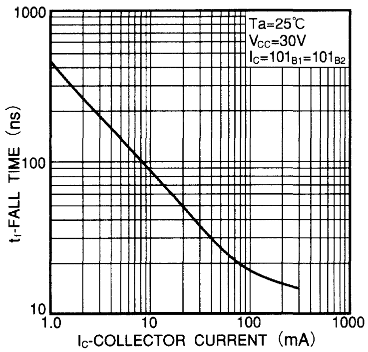


Fig.11 Fall time vs. collector current

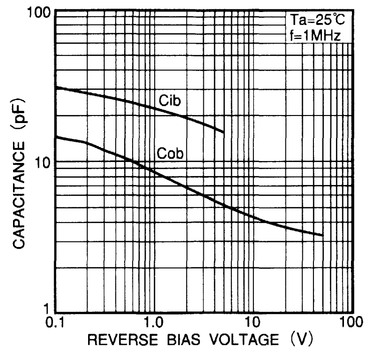


Fig.12 Input/output capacitance vs. voltage

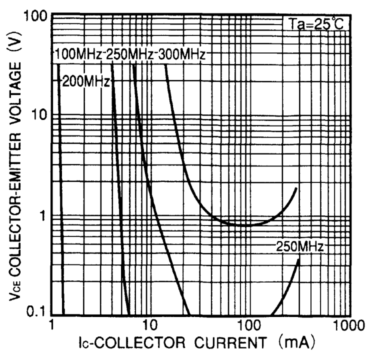


Fig.13 Gain bandwidth product

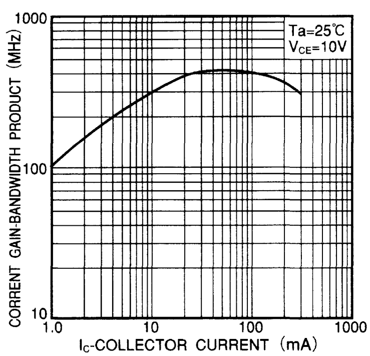


Fig.14 Gain bandwidth product vs. collector current

NPN Medium Power Transistor (Switching)
UMT4401/SST4401/MMST4401/2N4401

●Features
1) BV_{CEO} < 40V (I_C = 1mA)
2) Complements the UMT4403/SST4403/MMST4403/PN4403.

●Package, marking, and packaging specifications

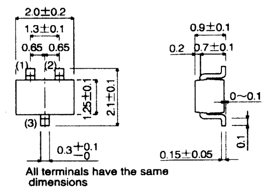
Type	UMT4401	SST4401	MMST4401	2N4401
Package	UMT3	SST3	SMT3	TO-92
Marking	R2X	R2X	R2X	—
Code	T106	T116	T146	T93
Basic ordering unit (pieces)	3000	3000	3000	3000

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	60	V
Collector-emitter voltage		V_{CEO}	40	V
Emitter-base voltage		V_{EBO}	6	V
Collector current		I_C	0.6	A
Collector power dissipation	UMT4401 SST4401 MMST4401	P_C	0.2	W
	2N4401		0.625	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●External dimensions (Units : mm)

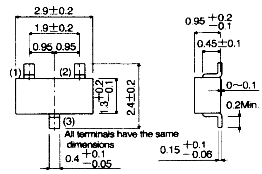
UMT4403



ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

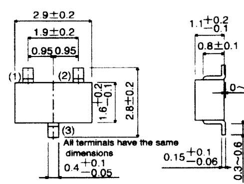
SST4403



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

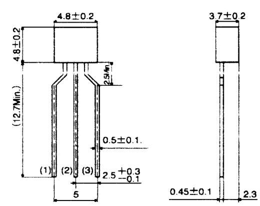
MST4403



ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

PN4403



ROHM : TO-92
EIAJ : SC-43

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=100μA
Collector-emitter breakdown voltage	BV_{CEO}	40	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=100μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=35V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.4	V	I_C/I_B=150mA/15mA
		—	—	0.75		I_C/I_B=500mA/50mA
Base-emitter saturation voltage	$V_{BE(sat)}$	—	—	0.95	V	I_C/I_B=150mA/15mA
		—	—	1.2		I_C/I_B=500mA/50mA
DC current transfer ratio	h_{FE}	20	—	—	—	V_{CE}=1V, I_C=0.1mA
		40	—	—		V_{CE}=1V, I_C=1mA
		80	—	—		V_{CE}=1V, I_C=10mA
		100	—	300		V_{CE}=1V, I_C=150mA
		40	—	—		V_{CE}=2V, I_C=500mA
Transition frequency	f_T	250	—	—	MHz	V_{CE}=10V, I_E=−20mA, f=100MHz
Output capacitance	Cob	—	—	6.5	pF	V_{CB}=10V, f=100KHz
Emitter input capacitance	Cib	—	—	30	pF	V_{EB}=0.5V, f=100KHz
Delay time	td	—	—	15	ns	V_{CC}=30V, $V_{EB(OFF)}$=2V, I_C=150mA, I_{B1}=15mA
Rise time	tr	—	—	20	ns	V_{CC}=30V, $V_{EB(OFF)}$=2V, I_C=150mA, I_{B1}=15mA
Storage time	tstg	—	—	225	ns	V_{CC}=30V, I_C=150mA, I_{B1}=−I_{B2}=15mA
Fall time	tf	—	—	30	ns	V_{CC}=30V, I_C=150mA, I_{B1}=−I_{B2}=15mA

●Electrical characteristic curves
Refer to pages 519 to 520 for the same UMT2222A/SST2222A/MMST2222A/PN2222A.

USA & European specification models

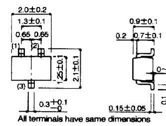
(SPEC-C31)

NPN General Purpose Transistor
UMT3904/SST3904/MMST3904/RXT3904/2N3904

●Features
1) BV_{CEO}<40V (I_C=1mA)
2) Complements the UMT3906/SST3906/MMST3906/RXT3906/PN3906.

●External dimensions (Units : mm)

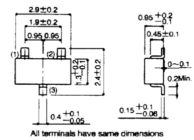
UMT3904



ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

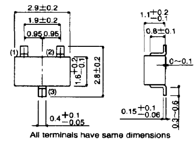
SST3904



ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

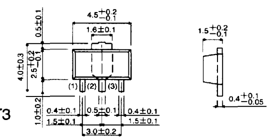
MMST3904



ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

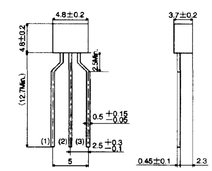
RXT3904



ROHM : MPT3
EIAJ : SC-62

(1) Base
(2) Collector
(3) Emitter

2N3904



ROHM : TO-92
EIAJ : SC-43

(1) Emitter
(2) Base
(3) Collector

●Package, marking and packaging specifications

Type	UMT3904	SST3904	MMST3904	RXT3904	2N3904
Package	UMT3	SST3	SMT3	MPT3	TO-92
Marking	R1A	R1A	R1A	CD ∗	—
Code	T106	T116	T146	T100	T93
Basic ordering unit (pieces)	3000	3000	3000	1000	3000

∗ Indicates lot number.

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	60	V
Collector-emitter voltage		V_{CEO}	40	V
Emitter-base voltage		V_{EBO}	6	V
Collector current		I_C	0.2	A
Collector power dissipation	UMT3904, SST3904, MMST3904	P_C	0.2	W
	SST3904, MMST3904		0.35	W ∗
	RXT3904		0.5	W
	2N3904		0.625	W
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

∗ On 7 x 5 x 0.6 mm ceramic board.

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=10μA
Collector-emitter breakdown voltage	BV_{CEO}	40	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=10μA
Collector cutoff current	I_{CES}	—	—	50	nA	V_{CB}=30V
Emitter cutoff current	I_{EBO}	—	—	50	nA	V_{EB}=3V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.2	V	I_C/I_B=10mA/1mA
		—	—	0.3		I_C/I_B=50mA/5mA
Base-emitter saturation voltage	$V_{BE(sat)}$	0.65	—	0.85	V	I_C/I_B=10mA/1mA
		—	—	0.95		I_C/I_B=50mA/5mA
DC current transfer ratio	h_{FE}	40	—	—	—	V_{CE}=1V , I_C=0.1mA
		70	—	—		V_{CE}=1V , I_C=1mA
		100	—	300		V_{CE}=1V , I_C=10mA
		60	—	—		V_{CE}=1V , I_C=50mA
		30	—	—		V_{CE}=1V , I_C=100mA
Transition frequency	f_T	300	—	—	MHz	V_{CE}=20V , I_E=−10mA, f=100MHz
Output capacitance	Cob	—	—	4	pF	V_{CB}=10V , f=100kHz
Emitter input capacitance	Cib	—	—	8	pF	V_{EB}=0.5V , f=100kHz
Delay time	td	—	—	35	ns	V_{CC}=3V , $V_{BE(OFF)}$=0.5V , I_C=10mA , I_{B1}=1mA
Rise time	tr	—	—	35	ns	V_{CC}=3V , $V_{BE(OFF)}$=0.5V , I_C=10mA , I_{B1}=1mA
Storage time	tstg	—	—	200	ns	V_{CC}=3V , I_C=10mA , I_{B1}=−I_{B2}=1mA
Fall time	tf	—	—	50	ns	V_{CC}=3V , I_C=10mA , I_{B1}=−I_{B2}=1mA

(SPEC-C37)

ROHM

● Electrical characteristic curves

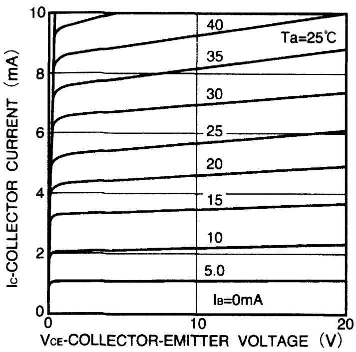


Fig.1 Grounded emitter output characteristics

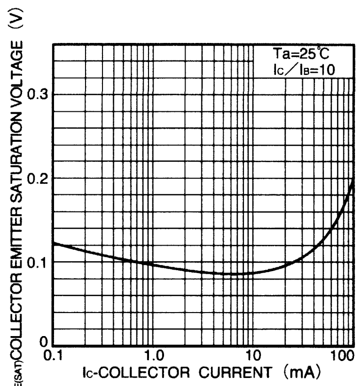


Fig.2 Collector-emitter saturation voltage vs. collector current

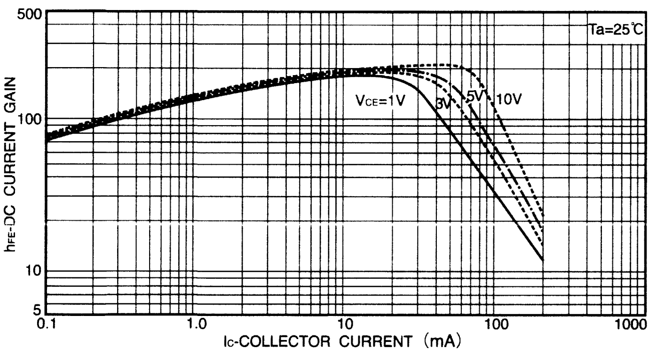


Fig.3 DC current gain vs. collector current (I)

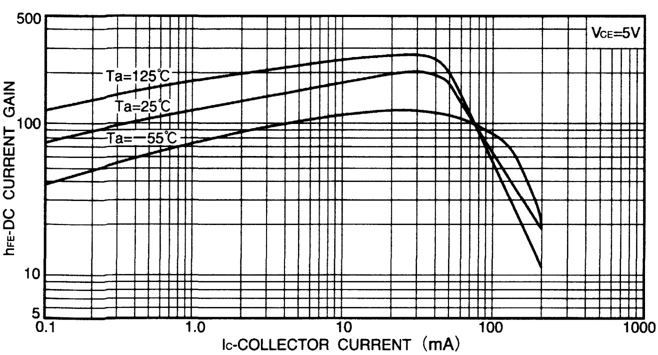


Fig.4 DC current gain vs. collector current (II)

USA & European specification models

● Electrical characteristic curves

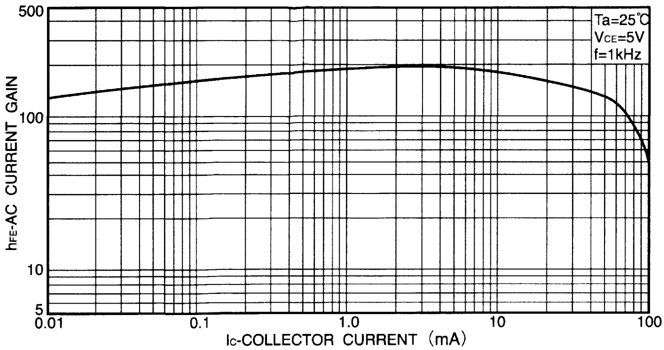


Fig.5 AC current gain vs. collector current

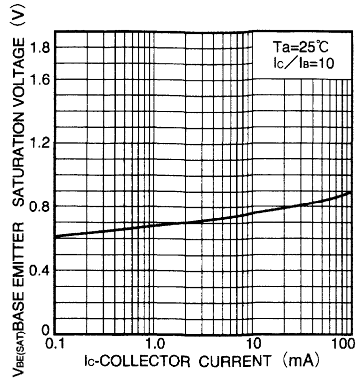


Fig.6 Base-emitter saturation voltage vs. collector current

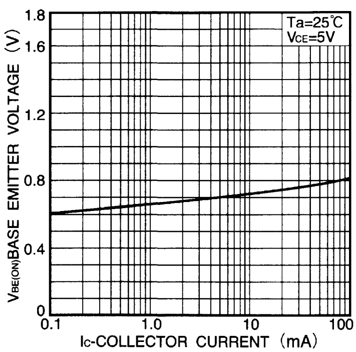


Fig.7 Grounded emitter propagation characteristics

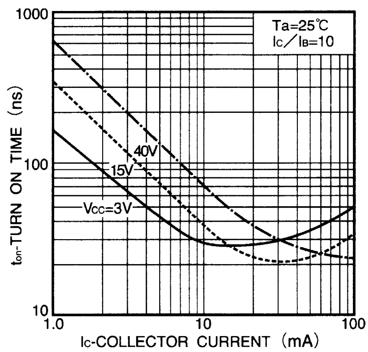


Fig.8 Turn-on time vs. collector current

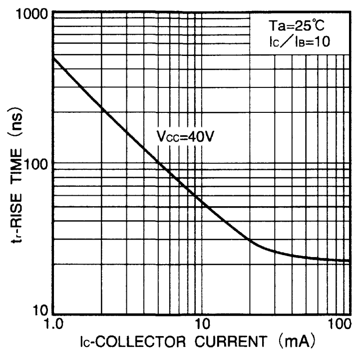


Fig.9 Rise time vs. collector current

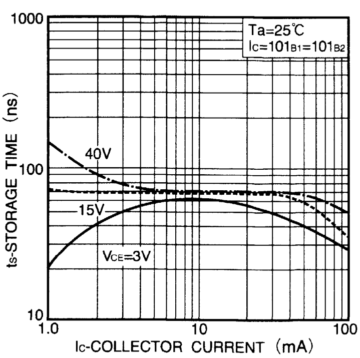


Fig.10 Storage time vs. collector current

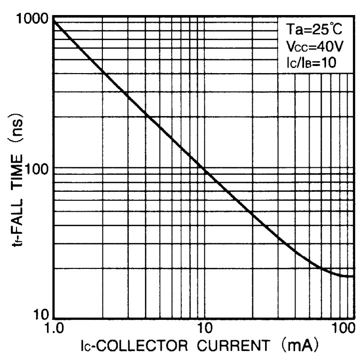


Fig.11 Fall time vs. collector current

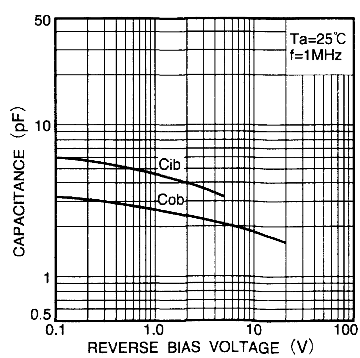


Fig.12 Input/output capacitance vs. voltage

● Electrical characteristic curves

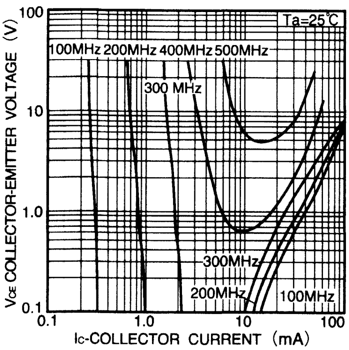


Fig.13 Gain bandwidth product

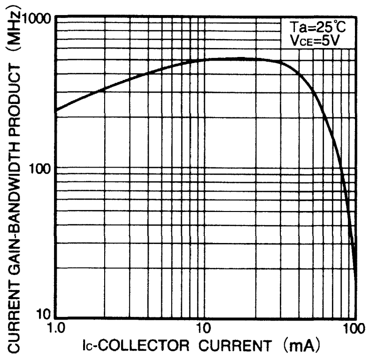


Fig.14 Gain bandwidth product vs. collector current

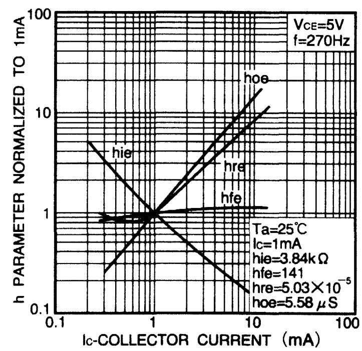


Fig.15 h value vs. collector current

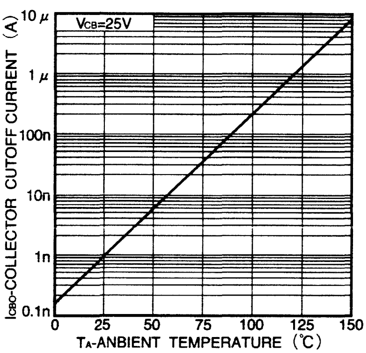


Fig.16 Noise characteristics (I)

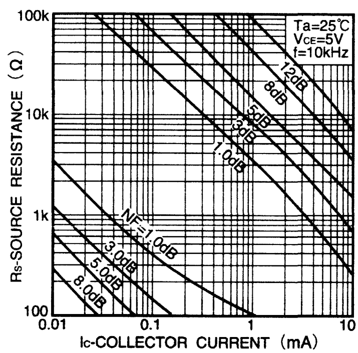


Fig.17 Noise characteristics (II)

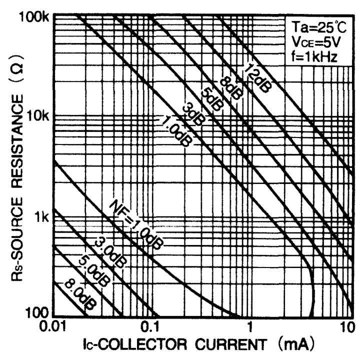


Fig.19 Noise characteristics (III)

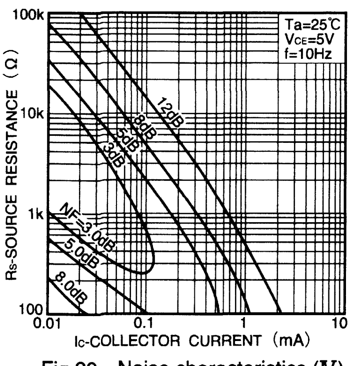


Fig.20 Noise characteristics (IV)

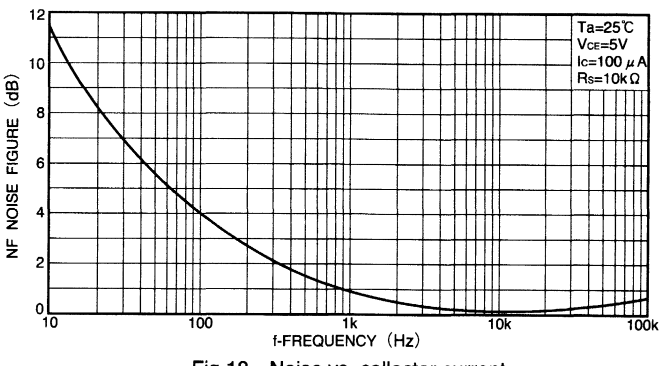


Fig.18 Noise vs. collector current

USA & European specification models

NPN General Purpose Transistor

SSTA06/MMSTA06/MPSA06

●Features

1) BV_{CEO}<40V (I_C=1mA)

2) Complements the SSTA56/MMSTA56/MPSA56.

●Package, mark and packaging specifications

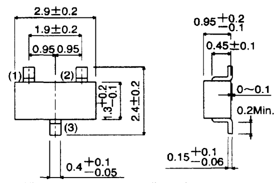
Type	SSTA06	MMSTA06	MPSA06
Package name	SST3	SMT3	TO-92
Mark	R1G	R1G	—
Code	T116	T146	T93
Basic order increment (pieces)	3000	3000	3000

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	80	V
Collector-emitter voltage		V_{CEO}	80	V
Emitter-base voltage		V_{EBO}	4	V
Collector current		I_C	0.5	A
Collector power dissipation	SSTA06, MMSTA06	P_C	0.2	W
	MPSA06		0.625	
Junction temperature		Tj	150	℃
Storage temperature		Tstg	−55~150	℃

●External dimensions (Units : mm)

SSTA06

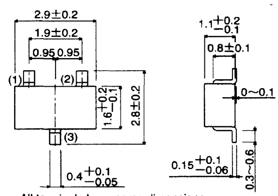


All terminals have same dimensions

ROHM : SST3

(1) Emitter
(2) Base
(3) Collector

MMSTA06

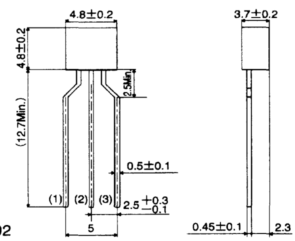


All terminals have same dimensions

ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

MPSA06



ROHM : TO-92
EIAJ : SC-43

(1) Emitter
(2) Base
(3) Collector

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	4	—	—	V	I_C=100 μA
Collector-emitter breakdown voltage	BV_{CEO}	80	—	—	V	I_C=1mA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=80V
	I_{CEO}	—	—	1		V_{CE}=60V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	0.25	V	I_C/I_B=100mA/10mA
Base-emitter saturation voltage	$V_{BE(on)}$	—	—	1.2	V	V_{IEC}/I_B=1V/100mA
DC current transfer ratio	h_{FE}	100	—	—	—	V_{CE}=1V , I_C=10mA
		100	—	—		V_{CE}=1V , I_C=100mA
Transition frequency	f_T	100	—	—	MHz	V_{CE}=2V , I_E=−10mA , f=100MHz

(SPEC-D16)

● Electrical characteristic curves

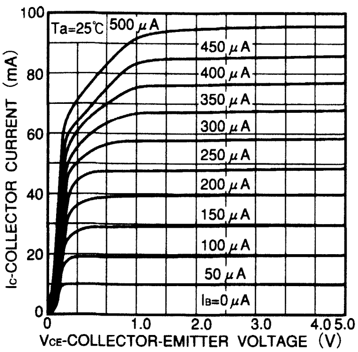


Fig.1 Grounded emitter output characteristics

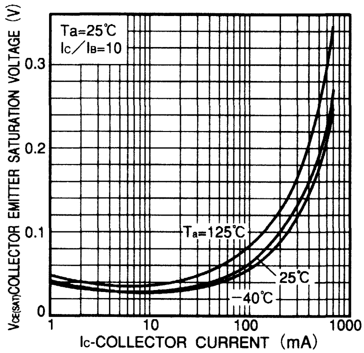


Fig.2 Collector-emitter saturation voltage vs. collector current

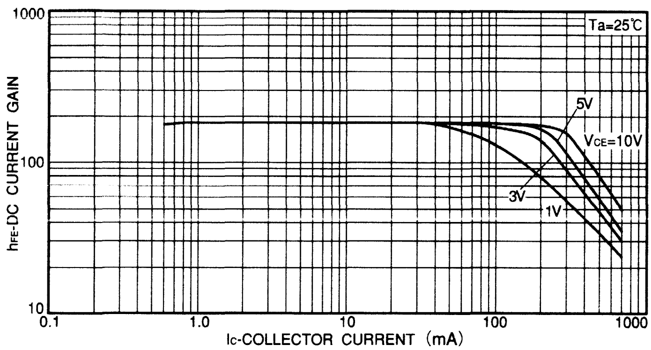


Fig.3 DC current gain vs. collector current (Ⅰ)

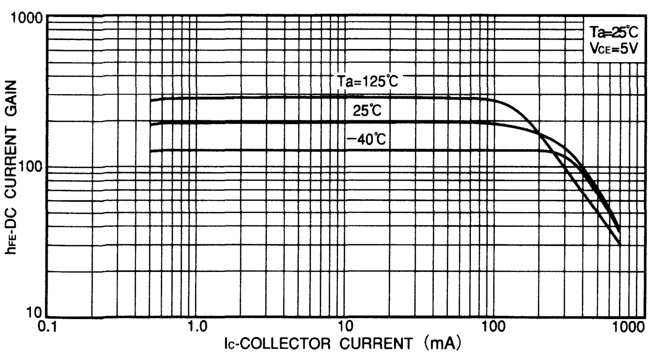


Fig.4 DC current gain vs. collector current (Ⅱ)

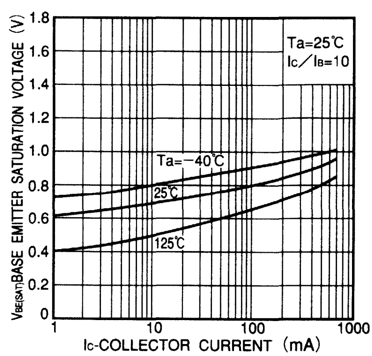


Fig.5 Base-emitter saturation voltage vs. collector current

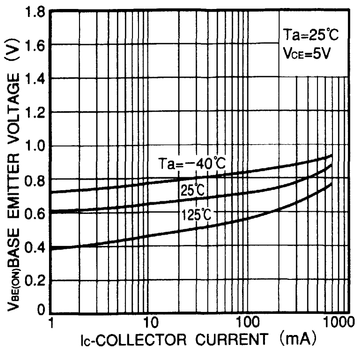


Fig.6 Grounded emitter propagation characteristics

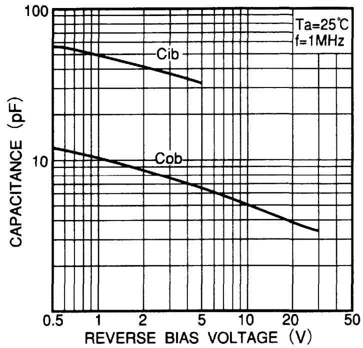


Fig.7 Input/output capacitance vs. voltage

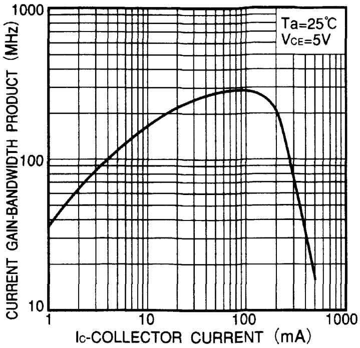


Fig.8 Gain bandwidth product vs. cllector current

IC protector

Circuit protection elements

●Circuit protection elements

ROHM circuit protectors protect semiconductors and their circuits by means of an excellent cutoff capability. Accidents due to load shorts which destroy IC's and valuable LSI's are too numerous to count. Regardless of whether the circuit is AC or DC, the small and light circuit protectors we have developed have little internal resistance during operation within the rated current, but safely and quickly break the circuit above the cutoff current level.

●Features

1) Cutoff is sharp and very stable.
2) Low internal resistance and minimal voltage dropoff.
3) Incombustible.
4) Compact.
5) Continuous usage possible within rated current.
6) Good temperature characteristics.
7) Withstands surges well.
8) UL certified (UL certification number E107856).

●Applications

Current surge protection

Surface mounting Type

●ICP-S series

Product name	Rated current (A)	Cutoff characteristics	Internal resistance Typ.(Ω)	Rated voltage (V)	Operating temperature (℃)	Storage temperature (℃)
ICP-S0.5	0.5	Fig.1	0.150	50	−55~125	−55~125
ICP-S0.7	0.7	Fig.2	0.084			
ICP-S1.0	1.0	Fig.3	0.061			
ICP-S1.2	1.2	Fig.4	0.048			
ICP-S1.8	1.8	Fig.5	0.032			
ICP-S2.3	2.3	Fig.6	0.026			

●Cutoff characteristics

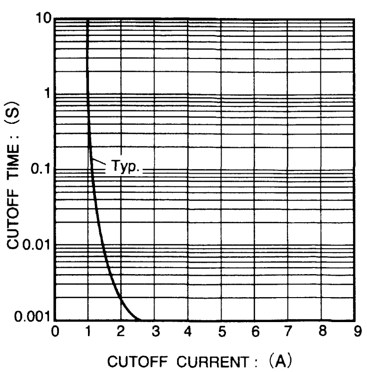


Fig.1 ICP-S0.5

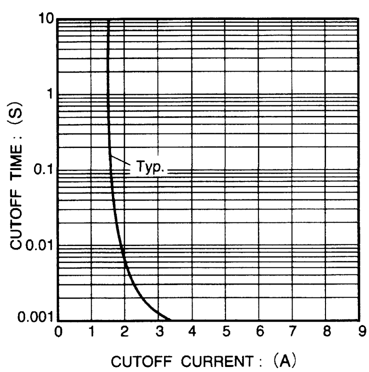


Fig.2 ICP-S0.7

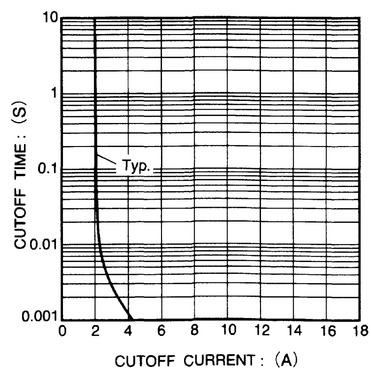


Fig.3 ICP-S1.0

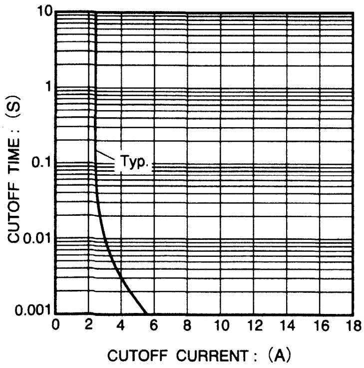


Fig.4 ICP-S1.2

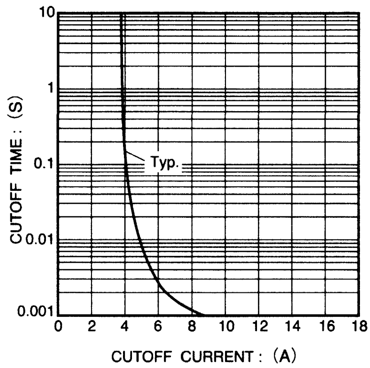


Fig.5 ICP-S1.8

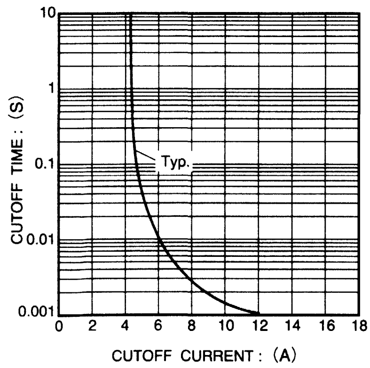
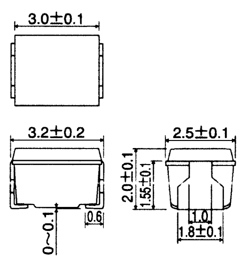


Fig.6 ICP-S2.3

The cutoff characteristics given represent typcal values. Technical documentation regarding ways of using circuit protectors is available from your Rohm representative.

●External dimensions (Units: mm)

ICP-S0.5/S0.7/S1.0/S1.2/S1.8/S2.3



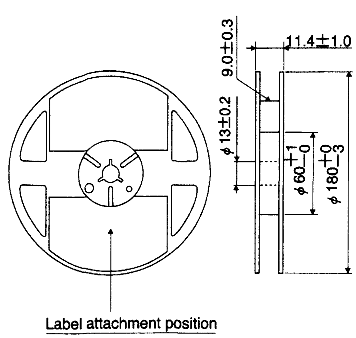
●Packaging specifications

ICP-S Type	Package name	Taping
	Symbol	TN
	Basic order increment (pieces)	2000
ICP-S0.5		○
ICP-S0.7		○
ICP-S1.0		○
ICP-S1.2		○
ICP-S1.8		○
ICP-S2.3		○

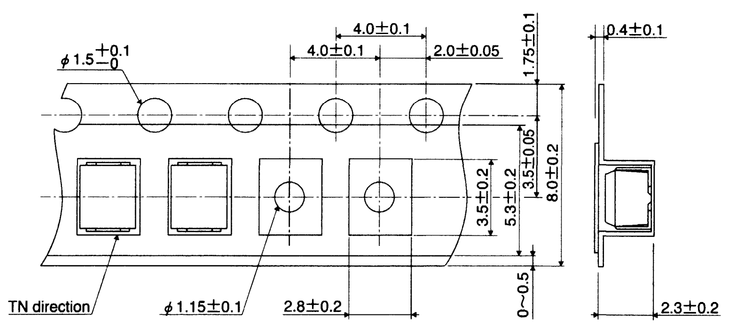
●Taping specifications (Units: mm)

ICP-S taping (TN)

Reel



Tape



Leaded type

ICP-N and ICP-F series

Product name	Rated current (A)	Cutoff characteristics	Internal resistance Typ.(Ω)	Rated voltage (V)	Operating temperature (℃)	Storage temperature(℃)
ICP-N10, ICP-F10	0.4	Fig.1	0.220	50	−55～125	−55～125
ICP-N15, ICP-F15	0.6	Fig.2	0.135			
ICP-N20, ICP-F20	0.8	Fig.3	0.100			
ICP-N25, ICP-F25	1.0	Fig.4	0.070			
ICP-N38, ICP-F38	1.5	Fig.5	0.042			
ICP-N50, ICP-F50	2.0	Fig.6	0.035			
ICP-N70, ICP-F70	2.5	Fig.7	0.023			

●Cutoff characteristics

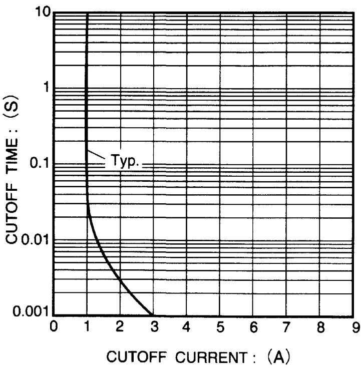


Fig.1 ICP-N10, ICP-F10

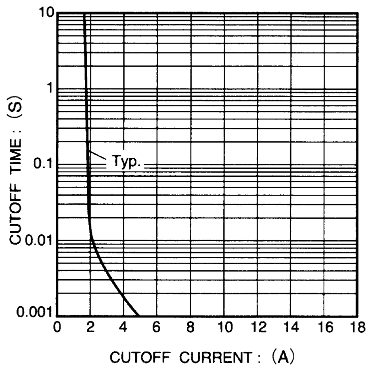


Fig.2 ICP-N15, ICP-F15

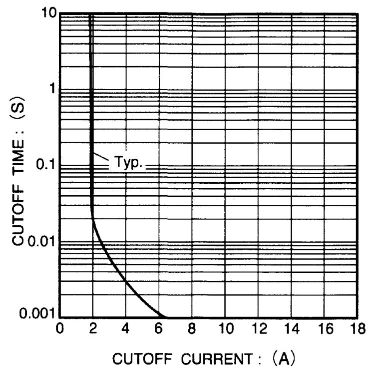


Fig.3 ICP-N20, ICP-F20

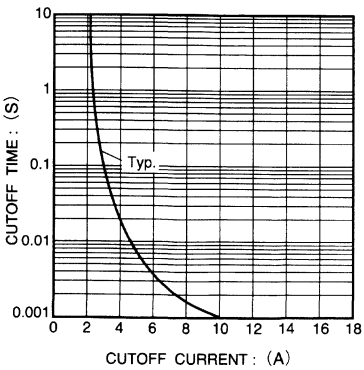


Fig.4 ICP-N25, ICP-F25

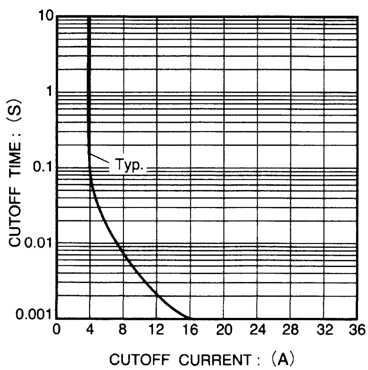


Fig.5 ICP-N38, ICP-F38

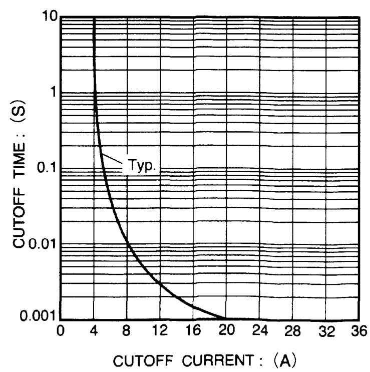


Fig.6 ICP-N50, ICP-F50

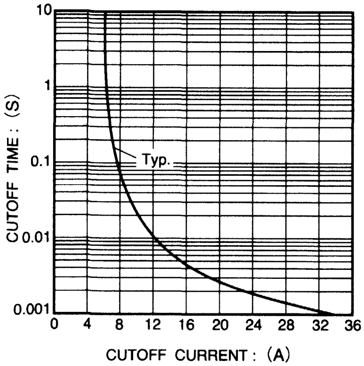


Fig.7 ICP-N70, ICP-F70

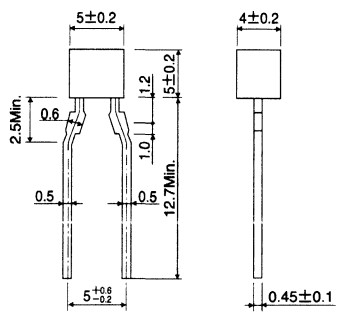
The cutoff characteristics given represent typcal values. Technical documentation regarding ways of using circuit protectors is available from your Rohm representative.

●Packaging specifications

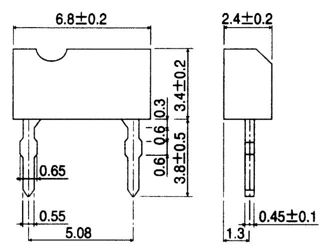
ICP-N, ICP-F Type	Package name	Taping	Bulk
	Symbol	T104	—
	Basic order increment (pieces)	3000	16000
ICP-N10/N15/N20/N25/N38/N50/N70		○	—
ICP-F10/F15/F20/F25/F38/F50/F70		—	○

●External dimensions (Units: mm)

ICP-N10/N15/N20/N25/N38/N50/N70

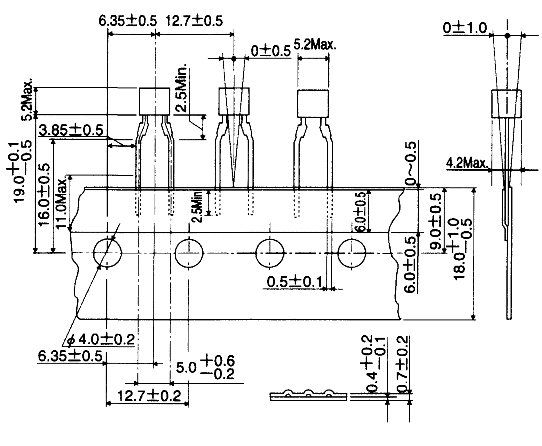


ICP-F10/F15/F20/F25/F38/F50/F70

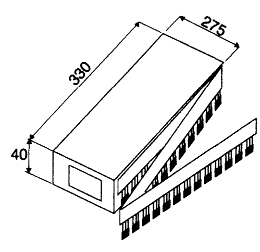


●Taping specifications (Units: mm)

ICP-N taping (T104)



ICP-N zigzag fold taping



IC protector

Maintenance Product list

●Maintenance product list

Maintenance model	Alternate model
2SA1543M	2SA933ASTP
2SA1549	2SA830STP
2SA1554	2SA821STP
2SA1809	2SA1776TV2
2SA1861	2SA1862TL
2SA1886	2SA1885TL
2SA806	2SA821STP
2SA825S	2SA821STP
2SB1008	2SB1239TV2
2SB1033	2SB1655
2SB1043	2SB1241TV2
2SB1044M	2SB1241TV2
2SB1130M	2SB1236TV2
2SB1276	2SA854STP
2SB1289	2SB1290
2SB1293	2SB1290
2SB1294	2SB1290
2SB1341	2SB1568
2SB1354	2SB1655
2SB1356	2SB1290
2SB1460	2SB1639
2SB1517	2SB1185
2SB1595	2SB1240TV2
2SB1650	2SB1236TV2
2SC1741F	2SC1741STP
2SC2410	2SC1741STP
2SC2872	2SC1741ASTP
2SC3078M	2SC1740STP
2SC3984M	2SC1740STP
2SC4014	2SC4043STP
2SC4041	2SC4043STP
2SC4042S	2SC4043STP
2SC4045	2SC4043STP
2SC4205	2SC5113
2SC4277	2SC4129
2SC4723	2SC4081T106
2SC4773	2SC4774T106
2SC4776M	2SC1740STP
2SC4848	2SC4849

Maintenance model	Alternate model
2SC5040K	2SC2412KT146
2SC5072	2SC4617TL
2SD1469M	2SD1865TV2
2SD1778	2SD1855
2SD1986	2SD2399
2SD2039	2SD1765
2SD2145	2SD2144STP
2SD2147	2SD2097TV2
2SD2175	2SD1859TV2R
2SD2279	2SD1864TV2
2SD2322S	2SC1741STP
2SD2422	2SD2025
2SD2450	2SD1862TV2
2SD2566	2SD2400A
2SD2574	2SD2470TP
3AA11	2SB1567×3
3AA12	2SB1340×3
3AC12	2SD1889×3
4AA11	2SB1370×3
4AC26	—
4AE12	2SB1185×2/2SD1762×2
BC68F	BCW68FT116
BC808-16	BC807-25T116
BC808-25	BC807-25T116
BC849B	BC848BT116
BC850B	BC847BT116
BC859B	BC858BT116
BCF32	BCW32T116
BCF33	BCW33T116
BCF68F	BCW68FT116
BCX18	BCX17T116
BF554	BC848AT116
BF799	BFS17T116
BFS19	BC848AT116
DT5A113ZA	DTA123JKAT146×5
DT5A144EA	DTA144EKAT146×5
DT5C144EA	DTC144EKAT146×5
DTA113TE	DTA143TETL
DTA113TSA	DTA143TSATP

Maintenance model	Alternate model
DTA113TUA	DTA113TUAT106
DTA113ZA	DTA113ZSATP
DTA114TN	DTA114TSATP
DTA114TV	DTA114TSATP
DTA114WF	DTA114WSATP
DTA114YA	DTA114YSATP
DTA114YN	DTA114YSATP
DTA115EF	DTA115ESATP
DTA115EL	DTA115ESATP
DTA115EV	DTA115ESATP
DTA123EA	DTA123ESATP
DTA123EF	DTA123ESATP
DTA123YF	DTA123JSATP
DTA124EN	DTA124ESATP
DTA124TF	DTA124TSATP
DTA124XV	DTA124XSATP
DTA143EN	DTA143ESATP
DTA143TA	DTA143TSATP
DTA143XA	DTA143XKAT146
DTA143YS	DTA143ZSATP
DTA143ZA	DTA143ZSATP
DTA144EN	DTA144ESATP
DTA144EV	DTA144ESATP
DT144TF	DTA144TSATP
DTA144WF	DTA144WSATP
DTA144WN	DTA144WSATP
DTA1D3RU	DTA123EUAT106
DTA1D3RKA	DTA123EKAT146
DTA214YK	–
DTA214YU	–
DTB113EA	DTB113ESTP
DTB113EF	DTB113ESTP
DTB113EL	DTB113ESTP
DTB114EL	DTB114ESTP
DTB114TF	DTB143TSTP
DTB123TA	DTB143TSTP
DTB123TF	DTB143TSTP
DTB123YA	DTB123YSTP
DTB133HF	DTB133HSTP

Maintenance model	Alternate model
DTB143EA	DTB143ESTP
DTC113ZFA	DTC113ZSATP
DTC114GE	DTC114GUAT106
DTC114GF	DTC114GSATP
DTC114YA	DTC114YSATP
DTC115EA	DTC115ESATP
DTC115EF	DTC115ESATP
DTC115EL	DTC115ESATP
DTC115USA	DTC144VSATP
DTC115UUA	DTC144VUAT106
DTC123EA	DTC123ESATP
DTC123EVA	DTC123ESATP
DTC123JF	DTC123JSATP
DTC123JV	DTC123JSATP
DTC123YA	DTC123YSATP
DTC123YF	DTC123YSATP
DTC124ENF	DTC124ESATP
DTC124EVA	DTC124ESATP
DTC124GF	DTC124GSATP
DTC124TF	DTC124TSATP
DTC124XA	DTC124XSATP
DTC124XLA	DTC124XSATP
DTC124XV	DTC124XSATP
DTC143EN	DTC143ESATP
DTC143TA	DTC143TSATP
DTC143TV	DTC143TSATP
DTC143YA	DTC143ZSATP
DTC144EN	DTC144ESATP
DTC144EV	DTC144ESATP
DTC144TVA	DTC144TSATP
DTC144VCA	DTC144VKAT146
DTC144VF	DTC144VSATP
DTC144WN	DTC144WSATP
DTC1D3RKA	DTA123EKAT146
DTC1D3RUA	DTA123EUAT146
DTC314TA	DTC314TSTP
DTC314TF	DTC314TSTP
DTC314TL	DTC314TSTP
DTC343TF	DTC343TSTP

Maintenance model	Alternate model
DTC363EA	DTC363ESTP
DTC363TF	DTC363TSTP
DTD113ELA	DTD113ESTP
DTD114TF	DTD123TSTP
DTD123EA	DTD123ESTP
FMJ1A	DTA144EKAT146+Di
FMW11	IMX4T108
FMW12	IMX3T108
FMW9	IMX5T108
ICP-S10	ICP-S0.5TN
ICP-S15	ICP-S0.7TN
ICP-S20	ICP-S1.0TN
ICP-S25	ICP-S1.2TN
ICP-S38	ICP-S1.8TN
ICP-S50	ICP-S2.3TN
IMH13	IMH7AT108
IMX11	IMX4T108
IMX6	IMX2T108
IMX7	IMX17T110
MMST1139	SST8245T116
MMST1139A	SST8245T116
MMST2222	MMST2222AT146
MMST5101	MMSTA70T146
MMST7157	MMST8598T146
MMSTA20	MMST6428T146
MP5A01	2SB1424T100×2
MP5C01	2SD2150T100×2
MP5C02	2SC4672T100×2
MP5D01	DTDG14GPT100×2
MP5E02	2SA1797T100/2SC4672T100
MP5E03	2SB1260T100/2SD1898T100
MP5L01	2SB1424T100+Di
MP5L02	2SB1424T100+Di
MP5M01	2SD2150T100+Di
MP5M02	2SD1960T100+Di
RU101K	—
RXT3421	—
RXT3422	BCX56T100
SST1130	BCW60BT116

Maintenance model	Alternate model
SST1139	SST8245T116
SST2222	SST2222AT146
SST5210	BCW70JT116
SST7157	MMST5086T146
SST7208	BC847AT116
SSTA20	SST6838T116
SSTTIS93	SST2907AT116
UMH12	UMH4NTN
UMT3N	UMT1NTN
UMT918	2SC4082T106
UMW11	UMX5NTR
UMW12N	UMX1NTN
UMW9	UMX5NTR
UMX6N	UMX1NTN
UMY4N	UMZ1NTN

Note: The alternate model poddrdd mostly the same characteristics. However same characteristics may differ, so be sure to confirm the specifications as necessary.

MEMO

ROHM Sales Offices

ROHM CO., LTD.

Head Office
21, Saiin Mizosaki-cho, Ukyo-ku Kyoto 615, Japan
TEL:(075)311-2121 FAX:(075)315-0172

Tokyo Branch
3-14-31, Takanawa, Minato-ku Tokyo 108, Japan
TEL:(03)3445-5321 FAX:(03)3445-5360

ROHM ELECTRONICS CENTRAL SALES OFFICE (DIVISION OF ROHM CORP.)
3034, Owen Drive, Jackson Business Park, Antioch, TN 37013 U.S.A.
TEL:(615)641-2020 FAX:(615)641-2022

ROHM ELECTRONICS NORTHWEST SALES OFFICE (DIVISION OF ROHM CORP.)
226 Airport Parkway, Suite 390 San Jose, CA 95110 U.S.A.
TEL:(408)451-9920 FAX:(408)451-9470

ROHM ELECTRONICS SOUTHWEST SALES OFFICE (DIVISION OF ROHM CORP.)
5973 Avenida Encinas, Suite 220 Carlsbad, CA 92008 U.S.A.
TEL:(760)929-2100 FAX:(760)931-4725

ROHM ELECTRONICS EAST SALES OFFICE (DIVISION OF ROHM CORP.)
One North Winds Center,Suite 200, 2475 North Winds Parkway
Alpharetta, GA 30004 U.S.A.
TEL:(770)753-6030 FAX:(770)753-6035

ROHM ELECTRONICS BRASIL LTDA.
Av. Francisco Matarazzo, 404-7° andar-Agua Branca
05001-100 São Paulo-SP Brasil
TEL:(11)824-9009 FAX:(11)824-9501

ROHM ELECTRONICS GMBH
Karl-Arnold-Straße 15, D-47877 Willich-Münchheide, Federal Republic of Germany
TEL:(2154)9210 FAX:(2154)921400

ROHM ELECTRONICS (U.K.) LIMITED
Whitehall Avenue, Kingston, Milton Keynes, MK10 0AD, United Kingdom
TEL:(1)908-282-666 FAX:(1)908-282-528

ROHM ELECTRONICS (FRANCE) S.A.S.
24 Rue Saarinen, Silic 224, F-94528 Rungis Cedex, France
TEL:(33)1-46759551 FAX:(33)1-46750047

ROHM ELECTRONICS (H.K.) CO., LTD.
Room 1402-8, Tower 1, Silvercord, 30 Canton Road,
Tsimshatsui, Kowloon, Hong Kong
TEL:(2)7406262 FAX:(2)3758971

ROHM ELECTRONICS ASIA PTE. LTD. (RES DIVISION)
9 Temasek Boulevard #21-01/02/03 Suntec Tower Two, Singapore, 038989
TEL:332-2322 FAX:332-5662

ROHM ELECTRONICS TAIWAN CO., LTD.
11F, No.6, Sec.3, Min Chuan E, Road, Taipei, Taiwan, R.O.C.
TEL:(2)500-6956 FAX:(2)503-2869
Kaohsiung Sales Office
17F-A, Chung-Cheng Bldg 2, Chung-Cheng 3RD Road Kaohsiung, Taiwan, R.O.C.
TEL:(7)225-0881 FAX:(7)225-0332

ROHM ELECTRONICS (MALAYSIA) SDN. BHD.
Suite 9-4, 9th Floor, Jaya Shopping Center, Sec. 14, Jalan Semangat, 46100 Petaling
Jaya Selangor, Malaysia
TEL:(3)758-8355 FAX:(3)758-8377

ROHM ELECTRONICS KOREA CORPORATION
Chung-Ang Circulation Complex Business A B/D 8F
1258 Kurobon-dong Kuro-ku Seoul 152-059 Korea
TEL:(2)8182-700 FAX:(2)8182-715

ROHM ELECTRONICS (PHILIPPINES) SALES CORPORATION
People's Technology Complex, Carmona, Cavite, Philippines
TEL:(2)817-3795 FAX:(2)844-5028

SHANGHAI REPRESENTATIVE OFFICE
B-911 Yinghai Building, 250 Cao Xi Lu shanghai, China
TEL:(21)6482-9087 FAX:(21)6482-9708

ROHM ELECTRONICS (THAILAND) CO., LTD.
Unit 2106, 21st Floor Wall Street Tower Building 33/112 Surawong Road,
Kwang Suriyawong, Bangrak, Bangkok 10500 Thailand
TEL:(2)266-2844 FAX:(2)236-2984