

PHILIPS

Data handbook



Electronic
components
and materials

Semiconductors and
integrated circuits

Part 4a December 1978

Transmitting transistors and modules

SEMICONDUCTORS AND INTEGRATED CIRCUITS

PART 4a — DECEMBER 1978

TRANSMITTING TRANSISTORS AND MODULES

INDEX



GENERAL



TRANSMITTING TRANSISTORS AND MODULES



ACCESSORIES



DATA HANDBOOK SYSTEM

Our Data Handbook System is a comprehensive source of information on electronic components, sub-assemblies and materials; it is made up of three series of handbooks each comprising several parts.

ELECTRON TUBES	BLUE
SEMICONDUCTORS AND INTEGRATED CIRCUITS	RED
COMPONENTS AND MATERIALS	GREEN

The several parts contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where ratings or specifications differ from those published in the preceding edition they are pointed out by arrows. Where application information is given it is advisory and does not form part of the product specification.

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ELECTRON TUBES (BLUE SERIES)

Part 1a	December 1975	ET1a 12-75	Transmitting tubes for communication, tubes for r.f. heating Types PE05/25 to TBW15/25
Part 1b	August 1977	ET1b 08-77	Transmitting tubes for communication, tubes for r.f. heating, amplifier circuit assemblies
Part 2a	November 1977	ET2a 11-77	Microwave tubes Communication magnetrons, magnetrons for microwave heating, klystrons, travelling-wave tubes, diodes, triodes T-R switches
Part 2b	May 1978	ET2b 05-78	Microwave semiconductors and components Gunn, Impatt and noise diodes, mixer and detector diodes, backward diodes, varactor diodes, Gunn oscillators, sub- assemblies, circulators and isolators
Part 3	January 1975	ET3 01-75	Special Quality tubes, miscellaneous devices
Part 4	March 1975	ET4 03-75	Receiving tubes
Part 5a	March 1978	ET5a 03-78	Cathode-ray tubes Instrument tubes, monitor and display tubes, C.R. tubes for special applications
Part 5b	December 1978	ET5b 12-78	Camera tubes and accessories, image intensifiers
Part 6	January 1977	ET6 01-77	Products for nuclear technology Channel electron multipliers, neutron tubes, Geiger-Müller tubes
Part 7a	March 1977	ET7a 03-77	Gas-filled tubes Thyratrons, industrial rectifying tubes, ignitrons, high-voltage rectifying tubes
Part 7b	March 1977	ET7b 03-77	Gas-filled tubes Segment indicator tubes, indicator tubes, switching diodes, dry reed contact units
Part 8	May 1977	ET8 05-77	TV picture tubes
Part 9	March 1978	ET9 03-78	Photomultiplier tubes; phototubes

SEMICONDUCTORS AND INTEGRATED CIRCUITS (RED SERIES)

Part 1a August 1978	SC1a 08-78	Rectifier diodes, thyristors, triacs Rectifier diodes, voltage regulator diodes ($> 1,5 \text{ W}$), transient suppressor diodes, rectifier stacks, thyristors, triacs
Part 1b May 1977	SC1b 05-77	Diodes Small signal germanium diodes, small signal silicon diodes, special diodes, voltage regulator diodes ($< 1,5 \text{ W}$), voltage reference diodes, tuner diodes
Part 2 November 1977	SC2 11-77	Low-frequency and dual transistors
Part 3 January 1978	SC3 01-78	High-frequency, switching and field-effect transistors
Part 4a December 1978	SC4a 12-78	Transmitting transistors and modules
Part 4b September 1978	SC4b 09-78	Devices for optoelectronics Photosensitive diodes and transistors, light emitting diodes, photocouplers, infrared sensitive devices, photoconductive devices
Part 4c July 1978	SC4c 07-78	Discrete semiconductors for hybrid thick and thin-film circuits
Part 5a November 1976	SC5a 11-76	Professional analogue integrated circuits
Part 5b March 1977	SC5b 03-77	Consumer integrated circuits Radio-audio, television
Part 6 October 1977	SC6 10-77	Digital integrated circuits LOCMOS HE4000B family
Signetics integrated circuits 1978		Bipolar and MOS memories Bipolar and MOS microprocessors Analogue circuits Logic - TTL

COMPONENTS AND MATERIALS (GREEN SERIES)

Part 1	June 1977	CM1 06-77	Assemblies for industrial use High noise immunity logic FZ/30-series, counter modules 50-series, NORbits 60-series, 61-series, circuit blocks 90-series, circuit block CSA70(L), PLC modules, input/output devices, hybrid circuits, peripheral devices, ferrite core memory products
Part 2a	October 1977	CM2a 10-77	Resistors Fixed resistors, variable resistors, voltage dependent resistors (VDR), light dependent resistors (LDR), negative temperature coefficient thermistors (NTC), positive temperature coefficient thermistors (PTC), test switches
Part 2b	February 1978	CM2b 02-78	Capacitors Electrolytic and solid capacitors, film capacitors, ceramic capacitors, variable capacitors
Part 3	January 1977	CM3 01-77	Radio, audio, television Components for black and white television, components for colour television
Part 3a	September 1978	CM3a 09-78	FM tuners, television tuners, surface acoustic wave filters
Part 3b	October 1978	CM3b 10-78	Loudspeakers
Part 4a	November 1978	CM4a 11-78	Soft ferrites Ferrites for radio, audio and television, beads and chokes, Ferroxcube potcores and square cores, Ferroxcube transformer cores
Part 4b	December 1976	CM4b 12-76	Piezoelectric ceramics, permanent magnet materials
Part 6	April 1977	CM6 04-77	Electric motors and accessories Small synchronous motors, stepper motors, miniature direct current motors
Part 7	September 1971	CM7 09-71	Circuit blocks Circuit blocks 100 kHz-series, circuit blocks 1-series, circuit blocks 10-series, circuit blocks for ferrite core memory drive
Part 8	February 1977	CM8 02-77	Variable mains transformers
Part 9	March 1976	CM9 03-76	Piezoelectric quartz devices
Part 10	April 1978	CM10 04-78	Connectors

INDEX OF TYPE NUMBERS

Data Handbooks SC1a to SC4c

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	part	section	type no.	part	section	type no.	part	section
AA119	1b	PC	BA217	1b	WD	BAW62	1b	WD
AAZ15	1b	GB	BA218	1b	WD	BAX12	1b	WD
AAZ17	1b	GB	BA219	1b	WD	BAX12A	1b	WD
AAZ18	1b	GB	BA220	1b	WD	BAX13	1b	WD
AC125	2	LF	BA221	1b	WD	BAX14	1b	WD
AC126	2	LF	BA222	1b	WD	BAX14A	1b	WD
AC127	2	LF	BA243	1b	T	BAX15	1b	WD
AC128	2	LF	BA244	1b	T	BAX16	1b	WD
AC128/01	2	LF	BA280	1b	T	BAX17	1b	WD
AC132	2	LF	BA314	1b	Vrg	BAX18	1b	WD
AC187	2	LF	BA314A	1b	Vrg	BAX18A	1b	WD
AC187/01	2	LF	BA315	1b	Vrg	BB105A	1b	T
AC188	2	LF	BA316	1b	WD	BB105B	1b	T
AC188/01	2	LF	BA317	1b	WD	BB105G	1b	T
AD161	2	P	BA318	1b	WD	BB106	1b	T
AD162	2	P	BA379	1b	T	BB110B	1b	T
AF367	3	HFSW	BAS16	4c	Mm	BB110G	1b	T
ASZ15	2	P	BAT17	4c	Mm	BB117	1b	T
ASZ16	2	P	BAT18	4c	Mm	BB119	1b	T
ASZ17	2	P	BAV10	1b	WD	BB204B	1b	T
ASZ18	2	P	BAV18	1b	WD	BB204G	1b	T
BA100	1b	AD	BAV19	1b	WD	BB205A	1b	T
BA102	1b	T	BAV20	1b	WD	BB205B	1b	T
BA145	1a	R	BAV21	1b	WD	BB205G	1b	T
BA148	1a	R	BAV45	1b	Sp	BBY31	4c	Mm
BA157	1a	R	BAV70	4c	Mm	BC107	2	LF
BA158	1a	R	BAV99	4c	Mm	BC108	2	LF
BA159	1a	R	BAW21A	1b	WD	BC109	2	LF
BA182	1b	T	BAW21B	1b	WD	BC140	2	LF
BA216	1b	WD	BAW56	4c	Mm	BC141	2	LF

AD = Silicon alloyed diodes
 GB = Germanium gold bonded diodes
 HFSW = High-frequency and switching transistors
 LF = Low-frequency transistors
 Mm = Discrete semiconductors for hybrid thick and thin-film circuits
 P = Low-frequency power transistors

PC = Germanium point contact diodes
 R = Rectifier diodes
 Sp = Special diodes
 T = Tuner diodes
 Vrg = Voltage regulator diodes
 WD = Silicon whiskerless diodes

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type no.	part	section	type no.	part	section	type no.	part	section
BC146	2	LF	BCW30;R	4c	Mm	BD135	2	P
BC147	2	LF	BCW31;R	4c	Mm	BD136	2	P
BC148	2	LF	BCW32;R	4c	Mm	BD137	2	P
BC149	2	LF	BCW33;R	4c	Mm	BD138	2	P
BC157	2	LF	BCW69;R	4c	Mm	BD139	2	P
BC158	2	LF	BCW70;R	4c	Mm	BD140	2	P
BC159	2	LF	BCW71;R	4c	Mm	BD181	2	P
BC160	2	LF	BCW72;R	4c	Mm	BD182	2	P
BC161	2	LF	BCX17;R	4c	Mm	BD183	2	P
BC177	2	LF	BCX18;R	4c	Mm	BD201	2	P
BC178	2	LF	BCX19;R	4c	Mm	BD202	2	P
BC179	2	LF	BCX20;R	4c	Mm	BD203	2	P
BC200	2	LF	BCX51	4c	Mm	BD204	2	P
BC264A	3	FET	BCX52	4c	Mm	BD226	2	P
BC264B	3	FET	BCX53	4c	Mm	BD227	2	P
BC264C	3	FET	BCX54	4c	Mm	BD228	2	P
BC264D	3	FET	BCX55	4c	Mm	BD229	2	P
BC327	2	LF	BCX56	4c	Mm	BD230	2	P
BC328	2	LF	BCY30A	2	LF	BD231	2	P
BC337	2	LF	BCY31A	2	LF	BD232	2	P
BC338	2	LF	BCY32A	2	LF	BD233	2	P
BC368	2	LF	BCY33A	2	LF	BD234	2	P
BC369	2	LF	BCY34A	2	LF	BD235	2	P
BC546	2	LF	BCY55	2	DT	BD236	2	P
BC547	2	LF	BCY56	2	LF	BD237	2	P
BC548	2	LF	BCY57	2	LF	BD238	2	P
BC549	2	LF	BCY58	2	LF	BD262	2	P
BC550	2	LF	BCY59	2	LF	BD262A	2	P
BC556	2	LF	BCY70	2	LF	BD262B	2	P
BC557	2	LF	BCY71	2	LF	BD263	2	P
BC558	2	LF	BCY72	2	LF	BD263A	2	P
BC559	2	LF	BCY78	2	LF	BD263B	2	P
BC560	2	LF	BCY79	2	LF	BD266	2	P
BC635	2	LF	BCY87	2	DT	BD266A	2	P
BC636	2	LF	BCY88	2	DT	BD266B	2	P
BC637	2	LF	BCY89	2	DT	BD267	2	P
BC638	2	LF	BD115	2	P	BD267A	2	P
BC639	2	LF	BD131	2	P	BD267B	2	P
BC640	2	LF	BD132	2	P	BD291	2	P
BCW29;R	4c	Mm	BD133	2	P	BD292	2	P

DT = Dual transistors
 FET = Field-effect transistors
 LF = Low-frequency transistors

Mm = Discrete semiconductors for hybrid
 thick and thin-film circuits
 P = Low-frequency power transistors

type no.	part	section	type no.	part	section	type no.	part	section
BD293	2	P	BDX64A	2	P	BF195	3	HFSW
BD294	2	P	BDX64B	2	P	BF196	3	HFSW
BD329	2	P	BDX65	2	P	BF197	3	HFSW
BD330	2	P	BDX65A	2	P	BF198	3	HFSW
BD331	2	P	BDX65B	2	P	BF199	3	HFSW
BD332	2	P	BDX66	2	P	BF200	3	HFSW
BD333	2	P	BDX66A	2	P	BF240	3	HFSW
BD334	2	P	BDX66B	2	P	BF241	3	HFSW
BD335	2	P	BDX67	2	P	BF245A	3	FET
BD336	2	P	BDX67A	2	P	BF245B	3	FET
BD433	2	P	BDX67B	2	P	BF245C	3	FET
BD434	2	P	BDX77	2	P	BF256A	3	FET
BD435	2	P	BDX78	2	P	BF256B	3	FET
BD436	2	P	BDX91	2	P	BF256C	3	FET
BD437	2	P	BDX92	2	P	BF324	3	HFSW
BD438	2	P	BDX93	2	P	BF327	3	FET
BD645	2	P	BDX94	2	P	BF336	3	HFSW
BD646	2	P	BDX95	2	P	BF337	3	HFSW
BD647	2	P	BDX96	2	P	BF338	3	HFSW
BD648	2	P	BDY20	2	P	BF362	3	HFSW
BD649	2	P	BDY90	2	P	BF363	3	HFSW
BD650	2	P	BDY91	2	P	BF422	3	HFSW
BD675	2	P	BDY92	2	P	BF423	3	HFSW
BD676	2	P	BDY93	2	P	BF450	3	HFSW
BD677	2	P	BDY94	2	P	BF451	3	HFSW
BD678	2	P	BDY96	2	P	BF457	3	HFSW
BD679	2	P	BDY97	2	P	BF458	3	HFSW
BD680	2	P	BF115	3	HFSW	BF459	3	HFSW
BD681	2	P	BF167	3	HFSW	BF480	3	HFSW
BD682	2	P	BF173	3	HFSW	BF494	3	HFSW
BDX35	2	P	BF177	3	HFSW	BF495	3	HFSW
BDX36	2	P	BF178	3	HFSW	BF550;R	4c	Mm
BDX37	2	P	BF179	3	HFSW	BF622	4c	Mm
BDX62	2	P	BF180	3	HFSW	BF623	4c	Mm
BDX62A	2	P	BF181	3	HFSW	BFQ10	3	FET
BDX62B	2	P	BF182	3	HFSW	BFQ11	3	FET
BDX63	2	P	BF183	3	HFSW	BFQ12	3	FET
BDX63A	2	P	BF184	3	HFSW	BFQ13	3	FET
BDX63B	2	P	BF185	3	HFSW	BFQ14	3	FET
BDX64	2	P	BF194	3	HFSW	BFQ15	3	FET

FET = Field-effect transistors
HFSW = High-frequency and switching transistors
Mm = Discrete semiconductors for hybrid
thick and thin-film circuits

P = Low-frequency power transistors

INDEX

type no.	part	section	type no.	part	section	type no.	part	section
BFQ16	3	FET	BFT93;R	4c	Mm	BGY33	4a	Tra
BFQ17	4c	Mm	BFW10	3	FET	BGY35	4a	Tra
BFQ18A	4c	Mm	BFW11	3	FET	BGY36	4a	Tra
BFQ19	4c	Mm	BFW12	3	FET	BGY37	3	HFSW
BFQ23	3	HFSW	BFW13	3	FET	BLV10	4a	Tra
BFQ24	3	HFSW	BFW16A	3	HFSW	BLV11	4a	Tra
BFQ32	3	HFSW	BFW17A	3	HFSW	BLV20	4a	Tra
BFQ34	3	HFSW	BFW30	3	HFSW	BLV21	4a	Tra
BFQ42	4a	Tra	BFW45	3	HFSW	BLW29	4a	Tra
BFQ43	4a	Tra	BFW61	3	FET	BLW31	4a	Tra
BFR29	3	FET	BFW92	3	HFSW	BLW32	4a	Tra
BFR30	4c	Mm	BFW93	3	HFSW	BLW33	4a	Tra
BFR31	4c	Mm	BFX34	3	HFSW	BLW34	4a	Tra
BFR49	3	HFSW	BFX89	3	HFSW	BLW60	4a	Tra
BFR53;R	4c	Mm	BFY50	3	HFSW	BLW60C	4a	Tra
BFR64	3	HFSW	BFY51	3	HFSW	BLW64	4a	Tra
BFR65	3	HFSW	BFY52	3	HFSW	BLW75	4a	Tra
BFR84	3	FET	BFY55	3	HFSW	BLW76	4a	Tra
BFR90	3	HFSW	BFY90	3	HFSW	BLW77	4a	Tra
BFR91	3	HFSW	BG1895-			BLW78	4a	Tra
BFR92;R	4c	Mm	541	1a	R	BLW79	4a	Tra
BFR93;R	4c	Mm	BG1895-			BLW80	4a	Tra
BFR94	3	HFSW	641	1a	R	BLW81	4a	Tra
BFR95	3	HFSW	BG1897-			BLW82	4a	Tra
BFR96	3	HFSW	541	1a	R	BLW83	4a	Tra
BFS17;R	4c	Mm	BG1897-			BLW84	4a	Tra
BFS18;R	4c	Mm	542	1a	R	BLW85	4a	Tra
BFS19;R	4c	Mm	BG1897-			BLW86	4a	Tra
BFS20;R	4c	Mm	641	1a	R	BLW87	4a	Tra
BFS21	3	FET	BG1897-			BLW95	4a	Tra
BFS21A	3	FET	642	1a	R	BLW98	4a	Tra
BFS22A	4a	Tra	BG1898-			BLX13	4a	Tra
BFS23A	4a	Tra	541	1a	R	BLX13C	4a	Tra
BFS28	3	FET	BG1898-			BLX14	4a	Tra
BFT24	3	HFSW	641	1a	R	BLX15	4a	Tra
BFT25;R	4c	Mm	BGY22	4a	Tra	BLX39	4a	Tra
BFT44	3	HFSW	BGY22A	4a	Tra	BLX65	4a	Tra
BFT45	3	HFSW	BGY23	4a	Tra	BLX66	4a	Tra
BFT46	4c	Mm	BGY23A	4a	Tra	BLX67	4a	Tra
BFT92;R	4c	Mm	BGY32	4a	Tra	BLX68	4a	Tra

FET = Field-effect transistors
HFSW = High-frequency and switching transistors
Mm = Discrete semiconductors for hybrid thick and thin-film circuits

R = Rectifier diodes
Tra = Transmitting transistors and modules

type no.	part	section	type no.	part	section	type no.	part	section
BLX69A	4a	Tra	BRY39			BSX20	3	HFSW
BLX91A	4a	Tra	(SCS)	3	HFSW	BSX21	3	HFSW
BLX92A	4a	Tra	BRY39			BSX45	3	HFSW
BLX93A	4a	Tra	(PUT)	3	HFSW	BSX46	3	HFSW
BLX94A	4a	Tra	BRY61	4c	Mm	BSX47	3	HFSW
BLX95	4a	Tra	BSR12;R	4c	Mm	BSX59	3	HFSW
BLX96	4a	Tra	BSR30	4c	Mm	BSX60	3	HFSW
BLX97	4a	Tra	BSR31	4c	Mm	BSX61	3	HFSW
BLX98	4a	Tra	BSR32	4c	Mm	BT126	1a	Th
BLY87A	4a	Tra	BSR33	4c	Mm	BT128 +	1a	Th
BLY87C	4a	Tra	BSR40	4c	Mm	BT129 +	1a	Th
BLY88A	4a	Tra	BSR41	4c	Mm	BT137 +	1a	Tri
BLY88C	4a	Tra	BSR42	4c	Mm	BT138 +	1a	Tri
BLY89A	4a	Tra	BSR43	4c	Mm	BT139 +	1a	Tri
BLY89C	4a	Tra	BSR56	4c	Mm	BT151 +	1a	Th
BLY90	4a	Tra	BSR57	4c	Mm	BTW23 +	1a	Th
BLY91A	4a	Tra	BSR58	4c	Mm	BTW24 +	1a	Th
BLY91C	4a	Tra	BSS38	3	HFSW	BTW30 +	1a	Th
BLY92A	4a	Tra	BSS50	3	HFSW	BTW31 +	1a	Th
BLY92C	4a	Tra	BSS51	3	HFSW	BTW33 +	1a	Th
BLY93A	4a	Tra	BSS52	3	HFSW	BTW34 +	1a	Tri
BLY93C	4a	Tra	BSS60	3	HFSW	BTW38 +	1a	Th
BLY94	4a	Tra	BSS61	3	HFSW	BTW40 +	1a	Th
BPW22	4b	PDT	BSS63;R	4c	Mm	BTW41 +	1a	Tri
BPW34	4b	PDT	BSS64;R	4c	Mm	BTW42 +	1a	Th
BPX25	4b	PDT	BSS68	3	HFSW	BTW43 +	1a	Tri
BPX29	4b	PDT	BSV15	3	HFSW	BTW45 +	1a	Th
BPX40	4b	PDT	BSV16	3	HFSW	BTW47 +	1a	Th
BPX41	4b	PDT	BSV17	3	HFSW	BTW92 +	1a	Th
BPX42	4b	PDT	BSV52;R	4c	Mm	BTX18 +	1a	Th
BPX47A	4b	PDT	BSV64	3	HFSW	BTX94 +	1a	Tri
BPX70	4b	PDT	BSV78	3	FET	BTY79 +	1a	Th
BPX71	4b	PDT	BSV79	3	FET	BTY87 +	1a	Th
BPX72	4b	PDT	BSV80	3	FET	BTY91 +	1a	Th
BPX94	4b	PDT	BSV81	3	FET	BU105	2	P
BPX95B	4b	PDT	BSW41A	3	HFSW	BU108	2	P
BR100	1a	Th	BSW66	3	HFSW	BU126	2	P
BR101	3	HFSW	BSW67	3	HFSW	BU132	2	P
BRY39	1a	Th	BSW68	3	HFSW	BU133	2	P
			BSX19	3	HFSW	BU204	2	P

+ = series.

FET = Field-effect transistors
HFSW = High-frequency and switching transistors
Mm = Discrete semiconductors for hybrid thick and thin-film circuits
P = Low-frequency power transistors
PDT = Photodiodes or transistors

Th = Thyristors
Tra = Transmitting transistors and modules
Tri = Triacs

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type no.	part	section	type no.	part	section	type no.	part	section
BU205	2	P	BY478	1a	R	BZV38	1b	Vrf
BU206	2	P	BYW19 +	1a	R	BZW10	1a	TS
BU207A	2	P	BYW29 +	1a	R	BZW70 +	1a	TS
BU208A	2	P	BYW30 +	1a	R	BZW86 +	1a	TS
BU209A	2	P	BYW31 +	1a	R	BZW91 +	1a	TS
BU326A	2	P	BYW54	1a	R	BZW93 +	1a	TS
BUX80	2	P	BYW55	1a	R	BZW95 +	1a	TS
BUX81	2	P	BYW56	1a	R	BZW96 +	1a	TS
BUX82	2	P	BYW92 +	1a	R	BZX55 +	1b	Vrg
BUX83	2	P	BYX10	1a	R	BZX61 +	1b	Vrg
BUX84	2	P	BYX22 +	1a	R	BZX70 +	1a	Vrg
BUX85	2	P	BYX25 +	1a	R	BZX75 +	1b	Vrg
BUX86	2	P	BYX29 +	1a	R	BZX79 +	1b	Vrg
BUX87	2	P	BYX30 +	1a	R	BZX84 +	4c	Mm
BY126	1a	R	BYX32 +	1a	R	BZX87 +	1b	Vrg
BY127	1a	R	BYX35	1a	R	BZX90	1b	Vrf
BY164	1a	R	BYX36 +	1a	R	BZX91	1b	Vrf
BY176	1a	R	BYX38 +	1a	R	BZX92	1b	Vrf
BY179	1a	R	BYX39 +	1a	R	BZX93	1b	Vrf
BY184	1a	R	BYX42 +	1a	R	BZY78	1b	Vrf
BY187	1a	R	BYX45 +	1a	R	BZY88 +	1b	Vrg
BY188 +	1a	R	BYX46 +	1a	R	BZY91 +	1a	Vrg
BY206	1a	R	BYX49 +	1a	R	BZY93 +	1a	Vrg
BY207	1a	R	BYX50 +	1a	R	BZY95 +	1a	Vrg
BY208 +	1a	R	BYX52 +	1a	R	BZY96 +	1a	Vrg
BY209	1a	R	BYX55 +	1a	R	BZZ14	1a	Vrg
BY223	1a	R	BYX56 +	1a	R	BZZ15	1a	Vrg
BY224 +	1a	R	BYX71 +	1a	R	BZZ16	1a	Vrg
BY225 +	1a	R	BYX90	1a	R	BZZ17	1a	Vrg
BY226	1a	R	BYX91 +	1a	R	BZZ18	1a	Vrg
BY227	1a	R	BYX96 +	1a	R	BZZ19	1a	Vrg
BY228	1a	R	BYX97 +	1a	R	BZZ20	1a	Vrg
BY277 +	1a	R	BYX98 +	1a	R	BZZ21	1a	Vrg
BY406	1a	R	BYX99 +	1a	R	BZZ22	1a	Vrg
BY407	1a	R	BZV10	1b	Vrf	BZZ23	1a	Vrg
BY409	1a	R	BZV11	1b	Vrf	BZZ24	1a	Vrg
BY409A	1a	R	BZV12	1b	Vrf	BZZ25	1a	Vrg
BY476	1a	R	BZV13	1b	Vrf	BZZ26	1a	Vrg
BY476A	1a	R	BZV14	1b	Vrf	BZZ27	1a	Vrg
BY477	1a	R	BZV15 +	1a	Vrg	BZZ28	1a	Vrg

+ = series.

Mm = Discrete semiconductors for hybrid thick and thin-film circuits
 P = Low-frequency power transistors
 R = Rectifier diodes

TS = Transient suppressor diodes
 Vrf = Voltage reference diodes
 Vrg = Voltage regulator diodes

type no.	part	section	type no.	part	section	type no.	part	section
BZZ29	1a	Vrg	ORP66	4b	Ph	1N3890	1a	R
CNY22	4b	PhC	ORP68	4b	Ph	1N3891	1a	R
CNY23	4b	PhC	ORP69	4b	Ph	1N3892	1a	R
CNY42	4b	PhC	OSB9110	1a	St	1N4009	1b	WD
CNY43	4b	PhC	OSB9210	1a	St	1N4148	1b	WD
CNY44	4b	PhC	OSB9310	1a	St	1N4150	1b	WD
CNY46	4b	PhC	OSB9410	1a	St	1N4151	1b	WD
CNY47	4b	PhC	OSM9110	1a	St	1N4154	1b	WD
CNY47A	4b	PhC	OSM9210	1a	St	1N4446	1b	WD
CNY48	4b	PhC	OSM9310	1a	St	1N4448	1b	WD
CQY11B	4b	LED	OSM9410	1a	St	1N5060	1a	R
CQY11C	4b	LED	OSS9110	1a	St	1N5061	1a	R
CQY24A	4b	LED	OSS9210	1a	St	1N5062	1a	R
CQY46A	4b	LED	OSS9310	1a	St	1N5729B	1b	Vrg
CQY47A	4b	LED	OSS9410	1a	St	1N5730B	1b	Vrg
CQY49B	4b	LED	RPY58A	4b	Ph	1N5731B	1b	Vrg
CQY49C	4b	LED	RPY71	4b	Ph	1N5732B	1b	Vrg
CQY50	4b	LED	RPY76A	4b	I	1N5733B	1b	Vrg
CQY52	4b	LED	RPY82	4b	Ph	1N5734B	1b	Vrg
CQY54	4b	LED	RPY84	4b	Ph	1N5735B	1b	Vrg
CQY58	4b	LED	RPY85	4b	Ph	1N5736B	1b	Vrg
CQY88	4b	LED	RPY86	4b	I	1N5737B	1b	Vrg
CQY89	4b	LED	RPY87	4b	I	1N5738B	1b	Vrg
CQY94	4b	LED	RPY88	4b	I	1N5739B	1b	Vrg
CQY95	4b	LED	RPY89	4b	I	1N5740B	1b	Vrg
CQY96	4b	LED	1N821	1b	Vrf	1N5741B	1b	Vrg
CQY97	4b	LED	1N823	1b	Vrf	1N5742B	1b	Vrg
OA47	1b	GB	1N825	1b	Vrf	1N5743B	1b	Vrg
OA90	1b	PC	1N827	1b	Vrf	1N5744B	1b	Vrg
OA91	1b	PC	1N829	1b	Vrf	1N5745B	1b	Vrg
OA95	1b	PC	1N914	1b	WD	1N5746B	1b	Vrg
OA200	1b	AD	1N914A	1b	WD	1N5747B	1b	Vrg
OA202	1b	AD	1N916	1b	WD	1N5748B	1b	Vrg
ORP10	4b	I	1N916A	1b	WD	1N5749B	1b	Vrg
ORP13	4b	I	1N916B	1b	WD	1N5750B	1b	Vrg
ORP23	4b	Ph	1N3879	1a	R	1N5751B	1b	Vrg
ORP52	4b	Ph	1N3880	1a	R	1N5752B	1b	Vrg
ORP60	4b	Ph	1N3881	1a	R	1N5753B	1b	Vrg
ORP61	4b	Ph	1N3882	1a	R	1N5754B	1b	Vrg
ORP62	4b	Ph	1N3889	1a	R	1N5755B	1b	Vrg



AD = Silicon alloyed diodes
 GB = Germanium gold bonded diodes
 I = Infrared devices
 LED = Light-emitting diodes
 PC = Germanium point contact diodes
 Ph = Photoconductive devices

PhC = Photocouplers
 R = Rectifier diodes
 St = Rectifier stacks
 Vrf = Voltage reference diodes
 Vrg = Voltage regulator diodes
 WD = Silicon whiskerless diodes

INDEX

type no.	part	section	type no.	part	section	type no.	part	section
1N5756B	1b	Vrg	2N3866	4a	Tra	56231	1a	HE
1N5757B	1b	Vrg	2N3924	4a	Tra	56233	1a	A
2N918	3	HFSW	2N3926	4a	Tra	56234	1a	A
2N929	2	LF	2N3927	4a	Tra	56245	2,3,	
2N930	2	LF	2N3966	3	FET		4a	A
2N1613	3	HFSW	2N4030	3	HFSW	56246	1a	
2N1711	3	HFSW	2N4031	3	HFSW		to 4a	A
2N1893	3	HFSW	2N4032	3	HFSW	56253	1a	DH
2N2218	3	HFSW	2N4033	3	HFSW	56256	1a	DH
2N2218A	3	HFSW	2N4036	3	HFSW	56261	2	A
2N2219	3	HFSW	2N4091	3	FET	56261a	2	A
2N2219A	3	HFSW	2N4092	3	FET	56262A	1a	A
2N2221	3	HFSW	2N4093	3	FET	56263	1a	
2N2221A	3	HFSW	2N4347	2	P		to 4a	A
2N2222	3	HFSW	2N4391	3	FET	56264A	1a	A
2N2222A	3	HFSW	2N4392	3	FET	56268	1a	DH
2N2297	3	HFSW	2N4393	3	FET	56271	1a	DH
2N2368	3	HFSW	2N4427	4a	Tra	56278	1a	DH
2N2369	3	HFSW	2N4856	3	FET	56280	1a	DH
2N2369A	3	HFSW	2N4857	3	FET	56290	1a	HE
2N2483	2	LF	2N4858	3	FET	56293	1a	HE
2N2484	2	LF	2N4859	3	FET	56295	1a	A
2N2894	3	HFSW	2N4860	3	FET	56299	1a	A
2N2894A	3	HFSW	2N4861	3	FET	56309B	1a	A
2N2904	3	HFSW	2N5415	3	HFSW	56309R	1a	A
2N2904A	3	HFSW	2N5416	3	HFSW	56312	1a	DH
2N2905	3	HFSW	61SV	4b	I	56313	1a	DH
2N2905A	3	HFSW	40820	3	HFSW	56314	1a	DH
2N2906	3	HFSW	40835	3	HFSW	56315	1a	DH
2N2906A	3	HFSW	40838	3	HFSW	56316	1a	A
2N2907	3	HFSW	56200	2,3,		56318	1a	DH
2N2907A	3	HFSW		4a	A	56319	1a	DH
2N3019	3	HFSW	56201	2	A	56326	2,3	A
2N3020	3	HFSW	56201c	2	A	56333	2,3	A
2N3055	2	P	56201d	2	A	56334	1a	DH
2N3375	4a	Tra	56201j	2	A	56337	1a	A
2N3442	2	P	56203	2	A	56339	2	A
2N3553	4a	Tra	56218	2,3,		56348	1a	DH
2N3632	4a	Tra		4a	A	56349	1a	DH
2N3823	3	FET	56230	1a	HE	56350	1a	DH

A = Accessories
 DH = Diecast heatsinks
 FET = Field-effect transistors
 HE = Heatsink extrusions
 HFSW = High-frequency and switching transistors

I = Infrared devices
 LF = Low-frequency transistors
 P = Low-frequency power transistors
 Tra = Transmitting transistors and modules
 Vrg = Voltage regulator diodes

type no.	part	section	type no.	part	section	type no.	part	section
56351	2	A	56358	1a	A	56363	1a, 2	A
56352	2	A	56359	2	A	56364	1a, 2	A
56353	2	A	56359a	2	A	56366	1a	A
56354	2	A	56360	2	A	56367	2	A
56356	2, 3	A	56360a	2	A	56368	2	A
						56369	2	A

A = Accessories



GENERAL

Type designation
Rating systems
Letter symbols
s-parameters



PRO ELECTRON TYPE DESIGNATION CODE
FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete semiconductor devices — as opposed to integrated circuits —, multiples of such devices and semiconductor chips.

A basic type number consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

FIRST LETTER

The first letter gives information about the material used for the active part of the devices.

- A. GERMANIUM or other material with band gap of 0,6 to 1,0 eV.
- B. SILICON or other material with band gap of 1,0 to 1,3 eV.
- C. GALLIUM-ARSENIDE or other material with band gap of 1,3 eV or more.
- R. COMPOUND MATERIALS (e.g. Cadmium-Sulphide).



SECOND LETTER

The second letter indicates the function for which the device is primarily designed.

- A. DIODE; signal, low power
- B. DIODE; variable capacitance
- C. TRANSISTOR; low power, audio frequency ($R_{th\ j-mb} > 15\ ^\circ C/W$)
- D. TRANSISTOR; power, audio frequency ($R_{th\ j-mb} \leq 15\ ^\circ C/W$)
- E. DIODE; tunnel
- F. TRANSISTOR; low power, high frequency ($R_{th\ j-mb} > 15\ ^\circ C/W$)
- G. MULTIPLE OF DISSIMILAR DEVICES — MISCELLANEOUS; e.g. oscillator
- H. DIODE; magnetic sensitive
- L. TRANSISTOR; power, high frequency ($R_{th\ j-mb} \leq 15\ ^\circ C/W$)
- N. PHOTO-COUPLER
- P. RADIATION DETECTOR; e.g. high sensitivity phototransistor
- Q. RADIATION GENERATOR; e.g. light-emitting diode (LED)
- R. CONTROL AND SWITCHING DEVICE; e.g. thyristor, low power ($R_{th\ j-mb} > 15\ ^\circ C/W$)
- S. TRANSISTOR; low power, switching ($R_{th\ j-mb} > 15\ ^\circ C/W$)
- T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j-mb} \leq 15\ ^\circ C/W$)
- U. TRANSISTOR; power, switching ($R_{th\ j-mb} \leq 15\ ^\circ C/W$)
- X. DIODE; multiplier, e.g. varactor, step recovery
- Y. DIODE; rectifying, booster
- Z. DIODE; voltage reference or regulator (transient suppressor diode, with third letter W)

TYPE DESIGNATION

SERIAL NUMBER

Three figures, running from 100 to 999, for devices primarily intended for consumer equipment. One letter (Z, Y, X, etc.) and two figures, running from 10 to 99, for devices primarily intended for industrial/professional equipment.

This letter has no fixed meaning except W, which is used for transient suppressor diodes.

VERSION LETTER

It indicates a minor variant of the basic type either electrically or mechanically. The letter never has a fixed meaning, except letter R, indicating reverse voltage, e.g. collector to case or anode to stud.

SUFFIX

Sub-classification can be used for devices supplied in a wide range of variants called associated types. Following sub-coding suffixes are in use:

1. VOLTAGE REFERENCE and VOLTAGE REGULATOR DIODES: *ONE LETTER and ONE NUMBER*

The LETTER indicates the nominal tolerance of the Zener (regulation, working or reference) voltage

- A. 1% (according to IEC 63: series E96)
- B. 2% (according to IEC 63: series E48)
- C. 5% (according to IEC 63: series E24)
- D. 10% (according to IEC 63: series E12)
- E. 20% (according to IEC 63: series E6)

The number denotes the typical operating (Zener) voltage related to the nominal current rating for the whole range.

The letter 'V' is used instead of the decimal point.

2. TRANSIENT SUPPRESSOR DIODES: *ONE NUMBER*

The NUMBER indicates the maximum recommended continuous reversed (stand-off) voltage V_R . The letter 'V' is used as above.

3. CONVENTIONAL and CONTROLLED AVALANCHE RECTIFIER DIODES and THYRISTORS: *ONE NUMBER*

The NUMBER indicates the rated maximum repetitive peak reverse voltage (V_{RRM}) or the rated repetitive peak off-state voltage (V_{DRM}), whichever is the lower. Reversed polarity is indicated by letter R, immediately after the number.

4. RADIATION DETECTORS: *ONE NUMBER*, preceded by a hyphen (—)

The NUMBER indicates the depletion layer in μm . The resolution is indicated by a version LETTER.

5. ARRAY OF RADIATION DETECTORS and GENERATORS: *ONE NUMBER*, preceded by a stroke (/).

The NUMBER indicates how many basic devices are assembled into the array.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note

This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note

Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note

The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.



LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

I, i = current
V, v = voltage
P, p = power

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.

In all other instances upper-case basic letters shall be used.

Subscripts

A, a	Anode terminal
(AV), (av)	Average value
B, b	Base terminal, for MOS devices: Substrate
(BR)	Breakdown
C, c	Collector terminal
D, d	Drain terminal
E, e	Emitter terminal
F, f	Forward
G, g	Gate terminal
K, k	Cathode terminal
M, m	Peak value
O, o	As third subscript: The terminal not mentioned is open circuited
R, r	As first subscript: Reverse. As second subscript: Repetitive. As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.
(RMS), (rms)	R. M. S. value
S, s	{ As first or second subscript: Source terminal (for FETS only) As second subscript: Non-repetitive (not for FETS) As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d. c. values.

Upper-case subscripts shall be used for the indication of:

- a) continuous (d. c.) values (without signal)
Example I_B
- b) instantaneous total values
Example i_B
- c) average total values
Example $I_{B(AV)}$
- d) peak total values
Example I_{BM}
- e) root-mean-square total values
Example $I_{B(RMS)}$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

- a) instantaneous values
Example i_b
- b) root-mean-square values
Example $I_{b(rms)}$
- c) peak values
Example I_{bm}
- d) average values
Example $I_{b(av)}$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B , i_B , i_b , I_{bm}

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript F or f should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript R or r should be used.

Examples: I_F , I_R , i_F , $I_{f(rms)}$

Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: V_{BE} , v_{BE} , v_{be} , V_{bem}

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript F or f should be used; for a reverse voltage (anode negative with respect to cathode) the subscript R or r should be used.

Examples: V_F , V_R , v_F , V_{rm}

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: V_{CC} , I_{EE}

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example: V_{CCE}

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{B2} = continuous (d. c.) current flowing into the second base terminal

V_{B2-E} = continuous (d. c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

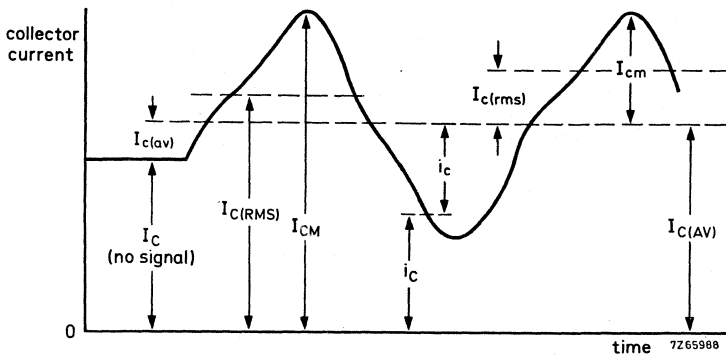
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{2C} = continuous (d. c.) current flowing into the collector terminal of the second unit

V_{1C-2C} = continuous (d. c.) voltage between the collector terminals of the first and the second unit.

Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d.c.) current and a varying component.



LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Definition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

- B, b = susceptance; imaginary part of an admittance
- C = capacitance
- G, g = conductance; real part of an admittance
- H, h = hybrid parameter
- L = inductance
- R, r = resistance; real part of an impedance
- X, x = reactance; imaginary part of an impedance
- Y, y = admittance;
- Z, z = impedance;

Upper-case letters shall be used for the representation of:

- a) electrical parameters of external circuits and of circuits in which the device forms only a part;
- b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

F, f	= forward; forward transfer
I, i (or 1)	= input
L, l	= load
O, o (or 2)	= output
R, r	= reverse; reverse transfer
S, s	= source

Examples: Z_S , h_f , h_F

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples: h_{FE} = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)

R_E = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

Z_e = $R_e + jX_e$ = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: h_{FE} , y_{RE} , h_{fe}

Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer

Examples: h_i (or h_{11})
 h_o (or h_{22})
 h_f (or h_{21})
 h_r (or h_{12})

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: h_{fe} (or h_{21e}), h_{FE} (or h_{21E})

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

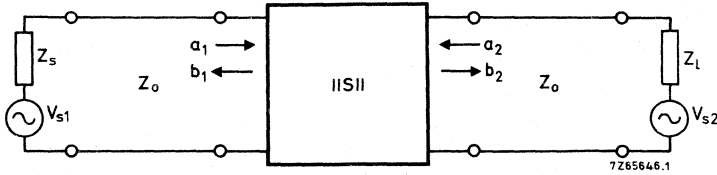
Examples: $Z_i = R_i + jX_i$
 $y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: $\text{Re}(h_{ib})$ etc. for the real part of h_{ib}
 $\text{Im}(h_{ib})$ etc. for the imaginary part of h_{ib}

SCATTERING PARAMETERS

In distinction to the conventional h, y and z-parameters, s-parameters relate to traveling wave conditions. The figure below shows a two-port network with the incident and reflected waves a_1 , b_1 , a_2 and b_2 .



$$a_1 = \frac{V_{i1}}{\sqrt{Z_o}} \qquad a_2 = \frac{V_{i2}}{\sqrt{Z_o}} \qquad 1)$$

$$b_1 = \frac{V_{r1}}{\sqrt{Z_o}} \qquad b_2 = \frac{V_{r2}}{\sqrt{Z_o}}$$

Z_o = characteristic impedance of the transmission line in which the two-port is connected.

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

$$b_1 = s_{11}a_1 + s_{12}a_2$$

$$b_2 = s_{21}a_1 + s_{22}a_2$$

Using the subscripts i for 11, r for 12, f for 21 and o for 22, it follows that:

$$s_i = s_{11} = \left. \frac{b_1}{a_1} \right|_{a_2 = 0}$$

$$s_r = s_{12} = \left. \frac{b_1}{a_2} \right|_{a_1 = 0}$$

$$s_f = s_{21} = \left. \frac{b_2}{a_1} \right|_{a_2 = 0}$$

$$s_o = s_{22} = \left. \frac{b_2}{a_2} \right|_{a_1 = 0}$$

1) The squares of these quantities have the dimension of power.

S-PARAMETERS

The s-parameters can be named and expressed as follows:

$s_i = s_{11}$ = Input reflection coefficient.

The complex ratio of the reflected wave and the incident wave at the input, under the conditions $Z_1 = Z_0$ and $V_{s2} = 0$.

$s_r = s_{12}$ = Reverse transmission coefficient.

The complex ratio of the generated wave at the input and the incident wave at the output, under the conditions $Z_s = Z_0$ and $V_{s1} = 0$.

$s_f = s_{21}$ = Forward transmission coefficient.

The complex ratio of the generated wave at the output and the incident wave at the input, under the conditions $Z_1 = Z_0$ and $V_{s2} = 0$.

$s_o = s_{22}$ = Output reflection coefficient.

The complex ratio of the reflected wave and the incident wave at the output, under the conditions $Z_s = Z_0$ and $V_{s1} = 0$.

TRANSMITTING TRANSISTORS AND MODULES

Type number survey

Selection guide

Line-ups

Envelopes

Soldering recommendations



TYPE NUMBER SURVEY

In this alphanumeric list we present all transmitting transistors and modules mentioned in this hand-book together with the most important data.

type number	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB
BFQ42	TO-39	c.w. class-B	13,5	175	2	11
BFQ43	TO-39	c.w. class-B	13,5	175	4	12
BFS22A	TO-39	c.w. class-B	13,5	175	4	8
BFS23A	TO-39	c.w. class-B	28	175	4	10
BGY22	SOT-75A	c.w.	13,5	380-512	2,5	17
BGY22A	SOT-75A	c.w.	12,5	420-480	2,5	17
BGY23	SOT-75A	c.w.	13,5	380-480	7	4,5
BGY23A	SOT-75A	c.w.	12,5	420-480	7	4,5
BGY32	SOT-132	c.w.	12,5	68-88	18	22,6
BGY33	SOT-132	c.w.	12,5	80-108	18	22,6
BGY35	SOT-132	c.w.	12,5	132-156	18	20,8
BGY36	SOT-132	c.w.	12,5	148-174	18	20,8
BLV10	SOT-123	c.w. class-B	13,5	175	8	9
BLV11	SOT-123	c.w. class-B	13,5	175	15	8
BLV20	SOT-123	c.w. class-B	28	175	8	12
BLV21	SOT-123	c.w. class-B	28	175	15	10
BLW29	SOT-120	c.w. class-B	13,5	175	15	10
BLW31	SOT-120	c.w. class-B	13,5	175	28	9
BLW32	SOT-122	class-A	25	860	0,5 (note 1)	11
BLW33	SOT-122	class-A	25	860	1,0 (note 1)	10
BLW34	SOT-122	class-A	25	860	1,8 (note 1)	9
BLW60	SOT-56	c.w. class-B	12,5	175	45	5,5
		s.s.b. class-AB	12,5	1,6-28	3-30 (note 2)	19,5
BLW60C	SOT-120	c.w. class-B	12,5	175	45	5,5
		s.s.b. class-AB	12,5	1,6-28	3-30 (note 2)	19,5
BLW64	SOT-56	class-A	25	224,25	10 (note 3)	9,5
BLW75	SOT-105	class-A	25	224,25	14 (note 3)	8
BLW76	SOT-121A	s.s.b. class-AB	28	1,6-28	8-80 (note 2)	13
		c.w. class-B	28	108	80	7,9
BLW77	SOT-121B	s.s.b. class-AB	28	1,6-28	15-130 (note 2)	12
		c.w. class-B	28	87,5	130	7,5
BLW78	SOT-121A	c.w. class-B	28	150	100	6
		s.s.b. class-A	26	28	30 (note 4)	19,5
BLW79	SOT-122	c.w. class-B	12,5	470	2	9
		c.w. class-B	12,5	175	2	13,5
BLW80	SOT-122	c.w. class-B	12,5	470	4	8
		c.w. class-B	12,5	175	4	15

Notes:

1. P_o sync at d_{im} < -60 dB.
2. P.E.P. at d₃ < -30 dB.
3. P_o sync at d_{im} < -55 dB.
4. P.E.P. at d₃ < -40 dB.

TYPE NUMBER SURVEY

type number	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB
BLW81	SOT-122	c.w. class-B	12,5	470	10	6
		c.w. class-B	12,5	175	10	13,5
BLW82	SOT-119	c.w. class-B	12,5	470	30	5
		c.w. class-B	13,5	470	30	6,1
BLW83	SOT-123	s.s.b. class-A	26	1,6-28	0-10	20
		s.s.b. class-AB	28	1,6-28	3-30	21
BLW84	SOT-123	c.w. class-B	28	175	25	9
BLW85	SOT-123	c.w. class-B	12,5	175	45	5
		s.s.b. class-AB	12,5	1,6-28	3-30 (note 1)	19,5
BLW86	SOT-123	c.w. class-B	28	175	45	7,5
		s.s.b. class-AB	28	1,6-28	5-47,5 (note 1)	19
		s.s.b. class-A	26	1,6-28	17 (note 2)	22
BLW87	SOT-123	c.w. class-B	13,5	175	25	6
BLW95	SOT-121A	s.s.b. class-AB	50	28	160	14
BLW98	SOT-122	class-A	25	860	3,5 (note 3)	6,5
BLX13	SOT-56	s.s.b. class-A	26	28	0-8 (note 2)	18
		s.s.b. class-AB	28	28	25 (note 1)	18
		c.w. class-B	28	70	25	17
BLX13C	SOT-120	s.s.b. class-A	26	1,6-28	0-8 (note 2)	20
		s.s.b. class-AB	28	1,6-28	3-25 (note 1)	21
BLX14	SOT-55	s.s.b. class-A	28	1,6-28	15 (note 2)	13
		s.s.b. class-AB	28	1,6-28	7,5-50 (note 1)	13
		c.w. class-B	28	70	50	7,5
BLX15	SOT-55	c.w. class-B	28	30	50	16
		s.s.b. class-AB	50	1,6-28	20-150 (note 1)	14
		s.s.b. class-A	40	1,6-28	30 (note 2)	14
BLX39	SOT-120	c.w. class-B	50	70	150	10
		c.w. class-B	50	108	150	7,5
		c.w. class-B	28	175	45	7,5
BLX65	TO-39	s.s.b. class-AB	28	1,6-28	5-42,5 (note 1)	19
		s.s.b. class-A	26	1,6-28	15 (note 2)	20
		c.w. class-B	12,5	470	2	6
BLX66	SOT-48	c.w. class-B	12,5	175	2	12
		c.w. class-B	12,5	470	2,5	8,5
BLX67	SOT-48	c.w. class-B	12,5	175	3	20
		c.w. class-B	12,5	470	2,5	8,5
BLX68	SOT-48	c.w. class-B	12,5	175	3	20
		c.w. class-B	12,5	470	7	5
		c.w. class-B	12,5	175	7,2	12,6
BLX69A	SOT-48	c.w. class-B	13,5	470	20	4
BLX91A	SOT-48	c.w. class-B	28	470	1	11
BLX92A	SOT-48	c.w. class-B	28	470	2,5	11
BLX93A	SOT-48	c.w. class-B	28	470	7	8,5
BLX94A	SOT-48	c.w. class-B	28	470	25	6

Notes:

1. P.E.P. at $d_3 < -30$ dB.

2. P.E.P. at $d_3 < -40$ dB.

3. P_o sync at $d_{im} < -60$ dB.

TYPE NUMBER SURVEY

type number	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB
BLX95	SOT-56	c.w. class-B	28	470	40	4,5
BLX96	SOT-48	class-A	25	860	0,5 (note 1)	6
BLX97	SOT-48	class-A	25	860	1,0 (note 1)	5,5
BLX98	SOT-48	class-A	25	860	3,5 (note 1)	5
BLY87A	SOT-48	c.w. class-B	13,5	175	8	9
BLY87C	SOT-120	c.w. class-B	13,5	175	8	12
BLY88A	SOT-48	c.w. class-B	13,5	175	15	7,5
BLY88C	SOT-120	c.w. class-B	13,5	175	15	8
BLY89A	SOT-56	c.w. class-B	13,5	175	25	6
BLY89C	SOT-120	c.w. class-B	13,5	175	25	6
BLY90	SOT-55	c.w. class-B	12,5	175	50	5
BLY91A	SOT-48	c.w. class-B	28	175	8	12
BLY91C	SOT-120	c.w. class-B	28	175	8	12
BLY92A	SOT-48	c.w. class-B	28	175	15	10
BLY92C	SOT-120	c.w. class-B	28	175	15	10
BLY93A	SOT-56	c.w. class-B	28	175	25	9
BLY93C	SOT-120	c.w. class-B	28	175	25	9
BLY94	SOT-55	c.w. class-B	28	175	50	7
2N3375	TO-60	c.w. class-B	28	100	7,5	8,8
		c.w. class-B	28	400	3	4,8
2N3553	TO-39	c.w. class-B	28	175	2,5	10
2N3632	TO-60	c.w. class-B	28	175	13,5	5,9
2N3866	TO-39	c.w. class-B	28	400	1	10
2N3924	TO-39	c.w. class-B	13,5	175	4	6
2N3926	TO-60	c.w. class-B	13,5	175	7	5,4
2N3927	TO-60	c.w. class-B	13,5	175	12	4,8
2N4427	TO-39	c.w. class-B	12	175	1	10

Note:

1. P_o sync at d_{im} < -60 dB.

SELECTION GUIDE

In this list we present a survey of all transmitting transistors and modules grouped in accordance with the main r.f. power application area together with the most important data.

s.s.b. class-AB; $f = 28$ MHz;
 $d_3; d_5 < -30$ dB

type number	envelope	V_{CE} V	P_L (P.E.P.) W	G_p dB
BLY92A	SOT-48	28	10	20
BLY92C	SOT-120	28	10	20
BLV21	SOT-123	28	10	20
BLX13	SOT-56	28	25	18
BLX13C	SOT-120	28	25	18
BLW83	SOT-123	28	25	18
BLX39	SOT-120	28	40	17
BLW86	SOT-123	28	45	17
BLX14	SOT-55	28	50	13
BLW76	SOT-121A	28	80	13
BLW77	SOT-121B	28	130	12
BLX15	SOT-55	50	150	14
BLW95	SOT-121A	50	160	14

s.s.b. class-A; $f = 28$ MHz;
 $d_3; d_5 < -40$ dB

BLY91A	SOT-48	26	1,3	20
BLY91C	SOT-120	26	1,3	20
BLV20	SOT-123	26	1,3	20
BLY92A	SOT-48	26	2,5	20
BLY92C	SOT-120	26	2,5	20
BLV21	SOT-123	26	2,5	20
BLX13	SOT-56	26	8	18
BLX13C	SOT-120	26	8	20
BLW83	SOT-123	26	10	20
BLX39	SOT-120	26	15	18
BLW86	SOT-123	26	17	20
BLW78	SOT-121A	26	30	18

s.s.b. class-AB; $f = 28$ MHz;
 $d_3; d_5 < -30$ dB

BLY88A	SOT-48	13,5	10	18
BLY88C	SOT-120	13,5	10	18
BLV11	SOT-123	13,5	10	18
BLY89A	SOT-56	13,5	15	18
BLY89C	SOT-120	13,5	15	18
BLW87	SOT-123	13,5	15	18
BLW60	SOT-56	12,5	30	18
BLW60C	SOT-120	12,5	30	18
BLW85	SOT-123	12,5	30	18

s.s.b. class-A; $f = 28$ MHz;
 $d_3; d_5 < -40$ dB

BLY87A	SOT-48	12	1	18
BLY87C	SOT-120	12	1	18
BLV10	SOT-123	12	1	18
BLY88A	SOT-48	12	2	18
BLY88C	SOT-120	12	2	18
BLV11	SOT-123	12	2	18
BLY89A	SOT-56	12	6	18
BLY89C	SOT-120	12	6	18
BLW87	SOT-123	12	6	18

SELECTION GUIDE

v.h.f. base stations;
class-B operation

type number	envelope	V _{CE} V	f MHz	P _L W	G _p dB
2N3866	TO-39	28	175	1	15
BFS23A	TO-39	28	175	4	10
BLY91A	SOT-48	28	175	8	12
BLY91C	SOT-120	28	175	8	12
BLV20	SOT-123	28	175	8	12
BLY92A	SOT-48	28	175	15	10
BLY92C	SOT-120	28	175	15	10
BLV21	SOT-123	28	175	15	10
BLY93A	SOT-56	28	175	25	9
BLY93C	SOT-120	28	175	25	9
BLW84	SOT-123	28	175	25	9
BLX39	SOT-120	28	175	45	7,5
BLW86	SOT-123	28	175	45	7,5
BLY94	SOT-55	28	175	50	7
BLW76	SOT-121A	28	108	80	8
BLW78	SOT-121A	28	150	100	6
BLW77	SOT-121B	28	87,5	130	7,5
BLX15	SOT-55	50	108	150	7,5
BLW95	SOT-121A	50	108	160	7,0

v.h.f. mobile transmitters;
class-B operation

2N4427	TO-39	12	175	1	10
BFO42	TO-39	13,5	175	2	11
BFS22A	TO-39	13,5	175	4	8
BFO43	TO-39 ▲	13,5	175	4	12
BLY87A	SOT-48	13,5	175	8	9
BLY87C	SOT-120	13,5	175	8	12
BLV10	SOT-123	13,5	175	8	9
BLW29	SOT-120	13,5	175	15	10
BLY88A	SOT-48	13,5	175	15	7,5
BLY88C	SOT-120	13,5	175	15	7,5
BLV11	SOT-123	13,5	175	15	7,5
BLY89A	SOT-56	13,5	175	25	6
BLY89C	SOT-120	13,5	175	25	6
BLW87	SOT-123	13,5	175	25	6
BLW31	SOT-120	13,5	175	28	9
BLW60	SOT-56	12,5	175	45	5,5
BLW60C	SOT-120	12,5	175	45	5,5
BLW85	SOT-123	12,5	175	45	5
BLY90	SOT-55	12,5	175	50	5

▲ Emitter connected to case.

SELECTION GUIDE

	type number	envelope	V_B V	f MHz	P_L W	G_p dB
u.h.f. modules for mobile transmitters	BGY32	SOT-132	12,5	68-88	18	22,6
	BGY33	SOT-132	12,5	80-108	18	22,6
	BGY35	SOT-132	12,5	132-156	18	20,8
	BGY36	SOT-132	12,5	148-174	18	20,8
u.h.f. modules for mobile transmitters	BGY22	SOT-75A	13,5	380-512	2,5	17
	BGY22A	SOT-75A	12,5	420-480	2,5	17
	BGY23	SOT-75A	13,5	380-480	7,0	4,5
	BGY23A	SOT-75A	12,5	420-480	7,0	4,5

	type number	envelope	V_{CE} V	f MHz	P_L W	G_p dB
u.h.f. base stations class-B operation	2N3866	TO-39	28	470	1	7
	BLX91A	SOT-48	28	470	1	11
	BLX92A	SOT-48	28	470	2,5	11
	BLX93A	SOT-48	28	470	7	8,5
	BLX94A	SOT-48	28	470	25	6
	BLX95	SOT-56	28	470	40	4,5
u.h.f. mobile transmitters class-B operation	BLX65	TO-39	12,5	470	2	6
	BLW79	SOT-122	12,5	470	2	9
	BLX66	SOT-48▲	12,5	470	2,5	8,5
	BLX67	SOT-48	12,5	470	2,5	8,5
	BLW80	SOT-122	12,5	470	4	8
	BLX68	SOT-48	12,5	470	7	5
	BLW81	SOT-122	12,5	470	10	6
	BLX69A	SOT-48	13,5	470	20	4
BLW82	SOT-119	12,5	470	30	5	

	type number	envelope	f MHz	P_o sync W	d_{im} dB	G_p dB	V_{CE} V	I_C mA
TV transposer circuits band III; class-A operation	BLX91A	SOT-48	225	0,45	55	17	25	75
	BLX92A	SOT-48	225	0,7	55	17	25	115
	BLX93A	SOT-48	225	1,6	55	15	25	260
	BLX94A	SOT-48	225	5	55	12	25	800
	BLW64	SOT-56	225	10	55	10	25	1600
	BLW75	SOT-105	225	14	55	8	25	2400
TV transposer circuits band IV-V; class-A operation	BFR96 ●	SOT-37	860	0,08	60	10	10	50
	BFQ34 ●	SOT-122	860	0,3	60	10	15	120
	BLW32	SOT-122	860	0,5	60	12	25	150
	BLX96	SOT-48	860	0,5	60	6	25	250
	BLW33	SOT-122	860	1,0	60	10	25	300
	BLX97	SOT-48	860	1,0	60	5,5	25	500
	BLW34	SOT-122	860	1,8	60	9	25	600
	BLX98	SOT-48	860	3,5	60	5	25	850
BLW98	SOT-122	860	3,5	60	6,5	25	850	

- ▲ Without stud.
- See Handbook SC3.

In this section we present information on recommended circuit line-ups in the main r.f. power application areas. A comprehensive range of output power levels is indicated together with our recommended types in the particular line-up configuration. The necessary drive power level for each line-up is indicated in the first column.

More detailed application information as well as computer aided design parameters are available on request.

S.S.B. TRANSMITTERS (1,5 MHz – 30 MHz)

input power mW	1st stage	2nd stage	3rd stage	P _L (P.E.P.) W	V _{CE} V	stud S flange F
30	BLY87C *	2 x BLY89C		30	13	S
30	BLV10 *	2 x BLW87		30	13	F
50	BLY88C *	2 x BLW60C		50	13	S
50	BLV11 *	2 x BLW85		50	13	F
100	BLY89C *	4 x BLW60C		100	13	S
100	BLW87 *	4 x BLW85		100	13	F
50	BLY91C *	2 x BLX13C		50	28	S
50	BLV20 *	2 x BLW83		50	28	F
150	BLW83 *	2 x BLW76		150	28	F
250	2 x BLW83 *	2 x BLW77		250	28	F
500	2 x BLW86 *	4 x BLW77		450	28	F
300	2 x BLX13C **	2 x BLX15		300	50	S
300	2 x BLW83 **	2 x BLW95		300	50	F
600	2 x BLX39 **	4 x BLX15		550	50	S
600	2 x BLW86 **	4 x BLW95		550	50	F
40	BLY91C **	2 x BLW78 **	8 x BLX15	1000	50	S/F
40	BLV20 **	2 x BLW78 **	8 x BLW95	1000	50	F

MILITARY COMMUNICATION TRANSMITTERS (25 MHz – 80 MHz)

Input power mW	1st stage	2nd stage	3rd stage	P _L W	V _{CE} V	stud S flange F
30	2N4427 *	2 x BLY87C		15	13	S
30	2N4427 *	2 x BLV10		15	13	F
60	BLY87C *	2 x BLY88C		25	13	S
60	BLV10 *	2 x BLV10		25	13	F
100	BLY87C	2 x BLY89C		50	13	S
100	BLV10	2 x BLW87		50	13	F
50	BLY91C	2 x BLX13C		60	28	S
50	BLV20	2 x BLW83		60	28	F
100	BLY91C	2 x BLX39		90	28	S
100	BLV20	2 x BLW86		90	28	F
15	BLV20 *	2 x BLV20	2 x BLW78	200	28	F
25	BLV20 *	2 x BLW83	2 x BLW77	250	28	F

* Class-A operation.

** 28 V supply voltage; class-A operation.

MOBILE TRANSMITTERS (68 MHz – 87,5 MHz)

input power mW	1st stage	2nd stage		P _L W	V _{CE} V	stud S flange F
20	2N4427	BLY87C		8	13	S
20	2N4427	BLV10		8	13	F
35	2N4427	BLW29		14	13	S
10	BSX19 •	BGY32		18	13	F
70	BFO42	BLW31		28	13	S
160	BFO43	BLW60C		45	13	S
160	BFO43	BLW85		45	13	F

BASE STATIONS (68 MHz – 87,5 MHz)

input power mW	1st stage	2nd stage	3rd stage	P _L W	V _{CE} V	stud S flange F
65	BFS23A	BLY93C		25	28	S
65	BFS23A	BLW84		25	28	F
125	BLX92A	BLX39		50	28	S
15	2N3866	BLV21	BLW78	100	28	F
50	2N3866 **	BLY93C **	BLX15	150	50	S
50	2N3866 **	BLW84 **	BLW95	150	50	F

F.M. BROADCAST TRANSMITTERS (87,5 MHz – 108 MHz)

input power mW	1st stage	2nd stage	3rd stage	P _L W	V _{CE} V	stud S flange F
100	BGY33	2 x BLW85		80	13	F
140	BLX92A	BLX39		50	28	S
40	2N3866	BLV21	BLW78	100	28	F
75	BLX92A **	BLX39 **	BLX15	150	50	S
75	BLX92A **	BLW86 **	BLW95	150	50	S/F
140	BLX92A **	BLX39 **	2 x BLX15	250	50	S
140	BLX92A **	BLW86 **	2 x BLW95	250	50	S/F

A.M. AIRCRAFT TRANSMITTERS (118 MHz – 136 MHz)

input power mW	1st stage	2nd stage	3rd stage	P _L (carr) W	V _{CE} V	stud S flange F
110	BLX92A	BLY93C		6	13/28	S
240	BLY91C	BLX39		12	13/28	S
240	BLV20	BLW86		12	13/28	F
100	BLX92A	BLY93C	BLW78	25	13/28	S/F
100	BLX92A	BLW84	BLW78	25	13/28	S/F

• See Handbook SC3.

** 28 V supply voltage.

PORTABLE AND MOBILE TRANSMITTERS (132 MHz – 174 MHz)

input power mW	1st stage	2nd stage	3rd stage		P _L W	V _{CE} V	stud S flange F
40	2N4427	BFO43			2	7,5	—
100	2N4427	BLY87C			8	13	S
100	2N4427	BLV10			8	13	F
125	BFO42	BLW29			14	13	S
150	BGY36				18	13	F
250	BFO43	BLW31			28	13	S
120	BFO42	BLW29	BLW60C		45	13	S
150	BGY36	BLW85			45	13	F

BASE STATIONS (132 MHz – 174 MHz)

input power mW	1st stage	2nd stage	3rd stage		P _L W	V _{CE} V	stud S flange F
200	BLY91C	BLY93C			25	28	S
200	BLV20	BLW84			25	28	F
25	2N3866	BLY91C	BLX39		50	28	S
25	2N3866	BLV20	BLW86		50	28	F
200	BFS23A	BLY93C	2 x BLX39		100	28	S
200	BFS23A	BLW84	2 x BLW86		100	28	F

TV TRANSMITTERS AND TRANSPOSERS (Band III: 174 MHz – 230 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	P _{o sync} W	V _{CE} V	stud S flange F
15	BLX93A	BLW64	2 x BLW75		25	25	S
60	BLX94A	BLW75	4 x BLW75		50	25	S
10	BLX93A	BLW64	2 x BLW75	8 x BLW75	100	25	S

PORTABLE AND MOBILE TRANSMITTERS (400 MHz – 470 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	P _L W	V _{CE} V	stud S flange F
15	BFR96 •	BLW79	BLW80		2	7,5	S
50	BLW79	BLW80	BLW81		10	13	S
220	BLW79	BLW81	BLX69A		18	13	S
50	BLW79	BLW80	BLW81	BLW82	30	13	S/F

• See Handbook SC3.

BASE STATIONS (400 MHz – 470 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	P _L W	V _{CE} V	stud S flange F
70	BLX91A	BLX93A	BLX94A		25	28	S
70	BLX91A	BLX93A	BLX94A	2 x BLX95	72	28	S

TV TRANSMITTERS AND TRANSPOSERS (Band IV/V: 470 MHz – 860 MHz)

input power mW	1 st stage	2nd stage	3rd stage	4th stage	P _{o sync} W	V _{CE} V	stud S flange F
7	BFQ34 ●	BLW34	BLW98		3	25	S
3	BFQ34 ●	BLW33	BLW98	2 x BLW98	6	25	S
5	BLW32	BLW34	2 x BLW98	4 x BLW98	12	25	S

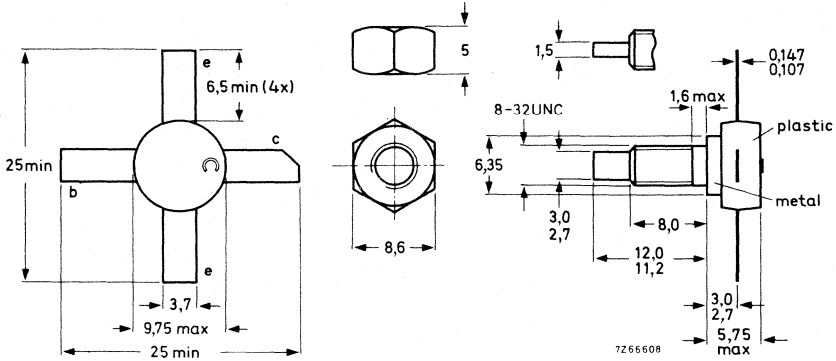


● See Handbook SC3.

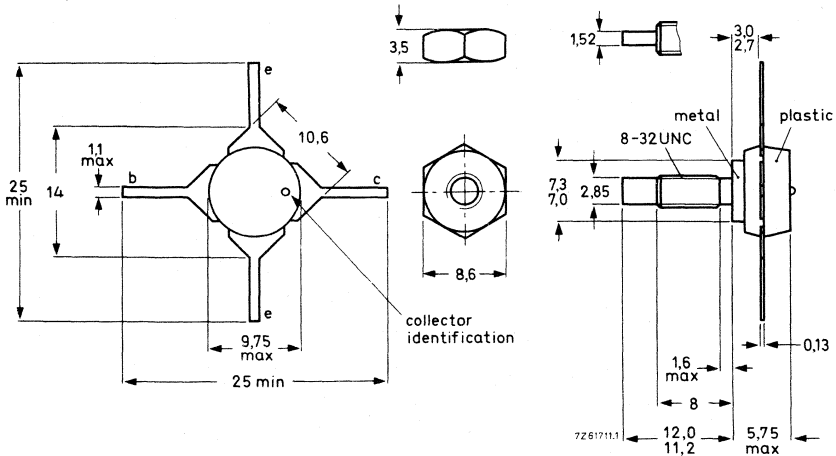
MECHANICAL DATA

SOT-48

Dimensions in mm



SOT-48

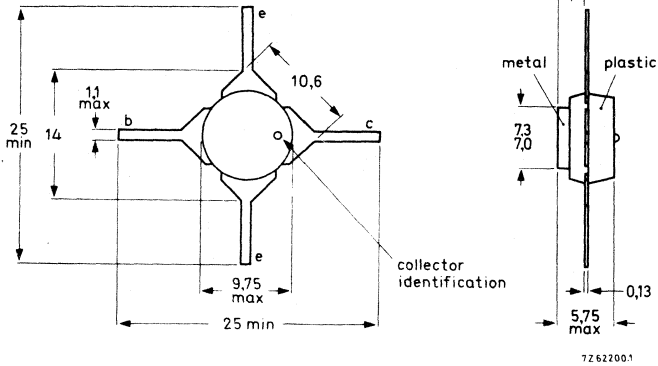


This envelope is also supplied with different collector identification (bevelled collector lead).

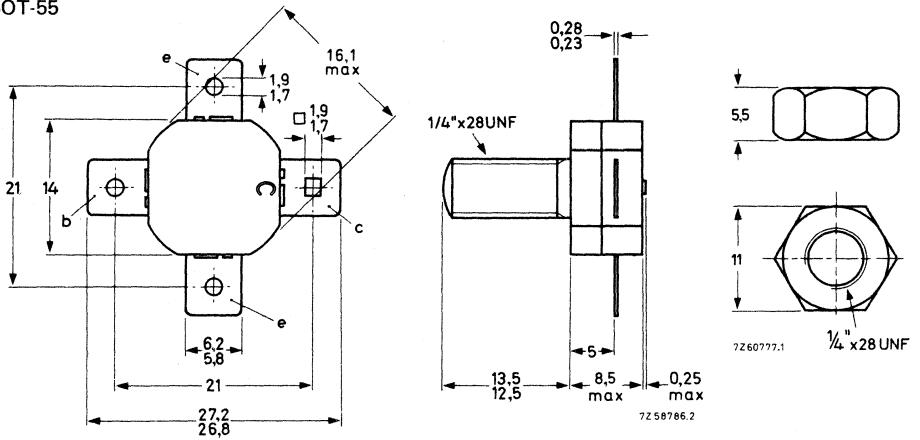
MECHANICAL DATA

SOT-48

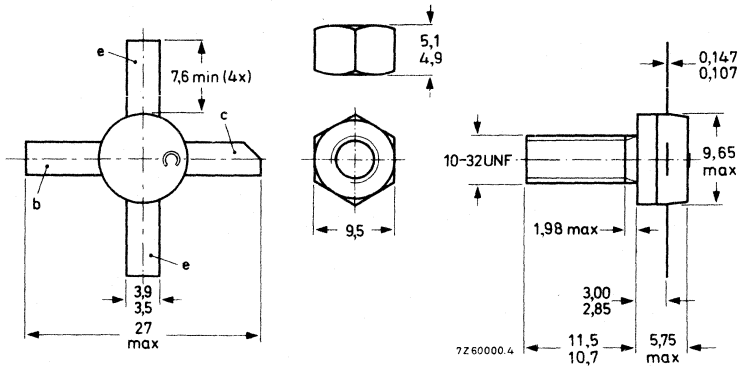
Dimensions in mm



SOT-55



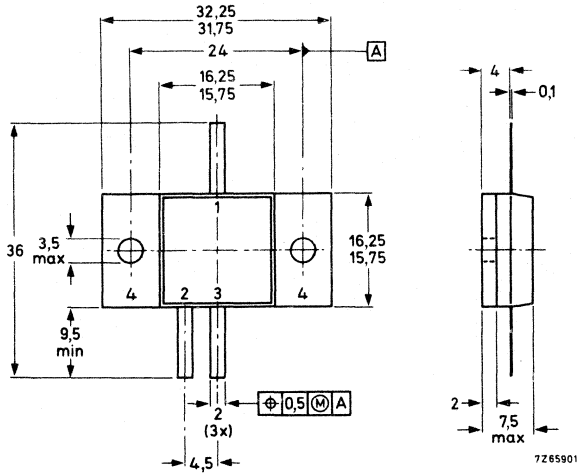
SOT-56



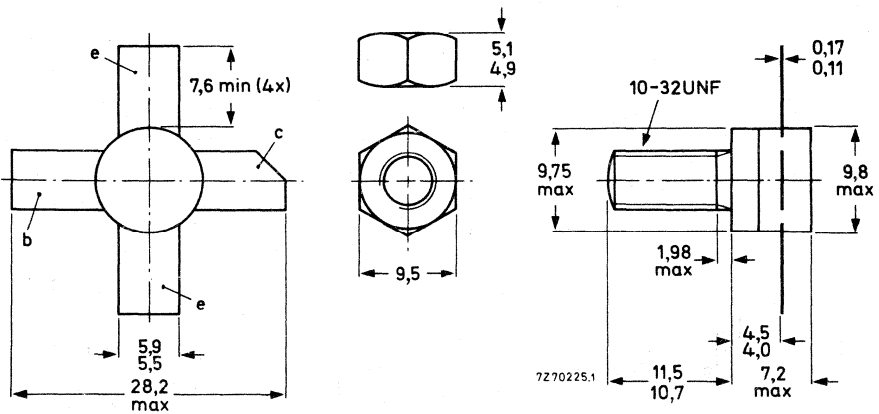
MECHANICAL DATA

SOT-75A

Dimensions in mm



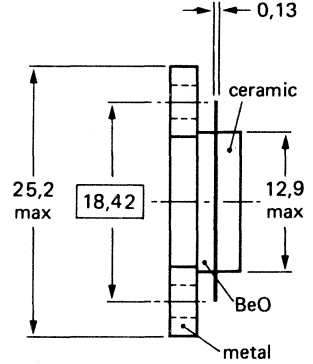
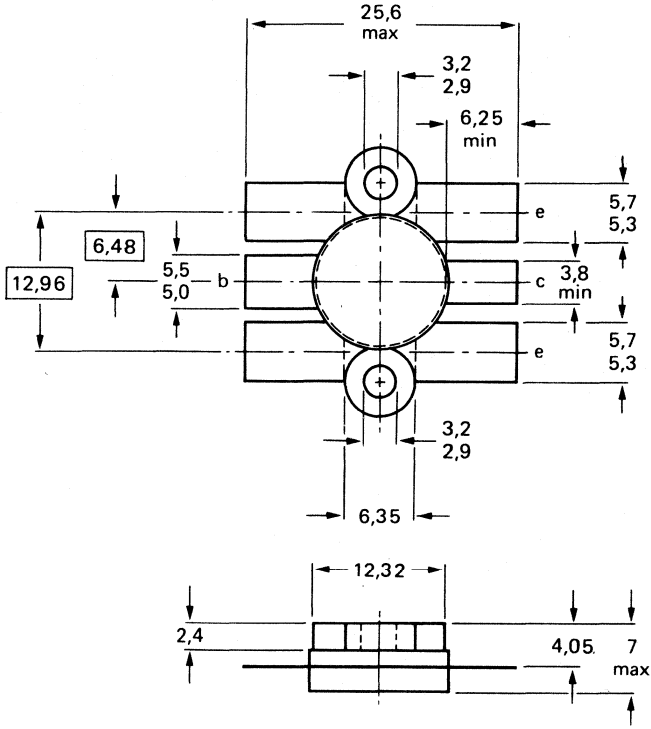
SOT-105



ENVELOPES

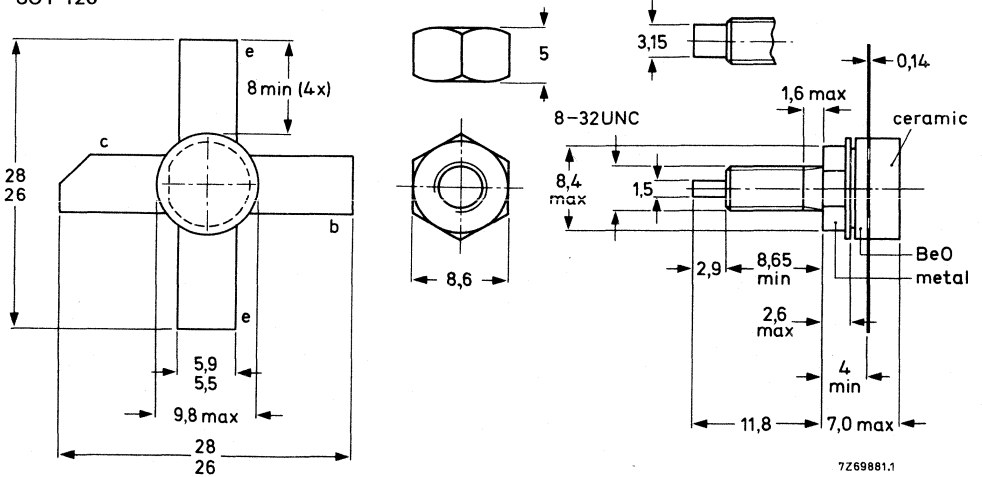
MECHANICAL DATA SOT-119

Dimensions in mm



7Z77385.2

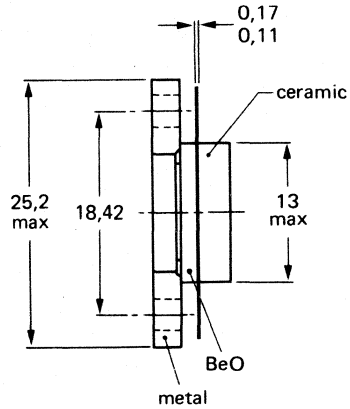
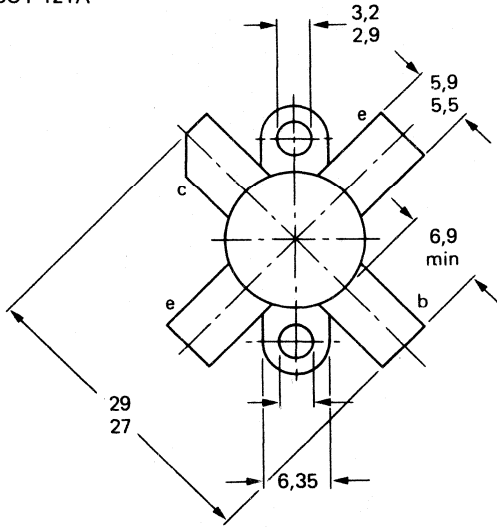
SOT-120



7Z69881.1

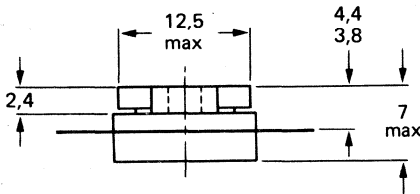
MECHANICAL DATA
SOT-121A

Dimensions in mm

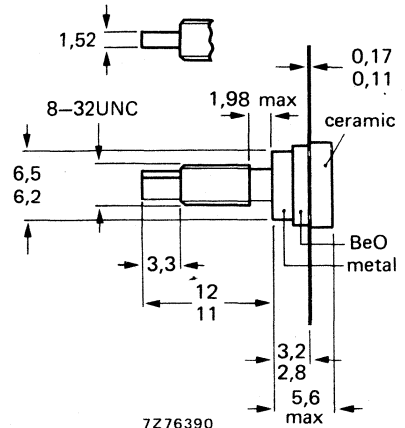
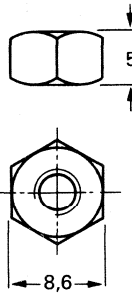
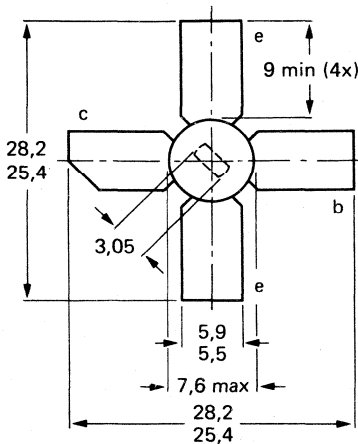


7Z75334.1

SOT-121B is identical to SOT-121A except for the thickness of the leads which lies between 0,23 and 0,27 mm.



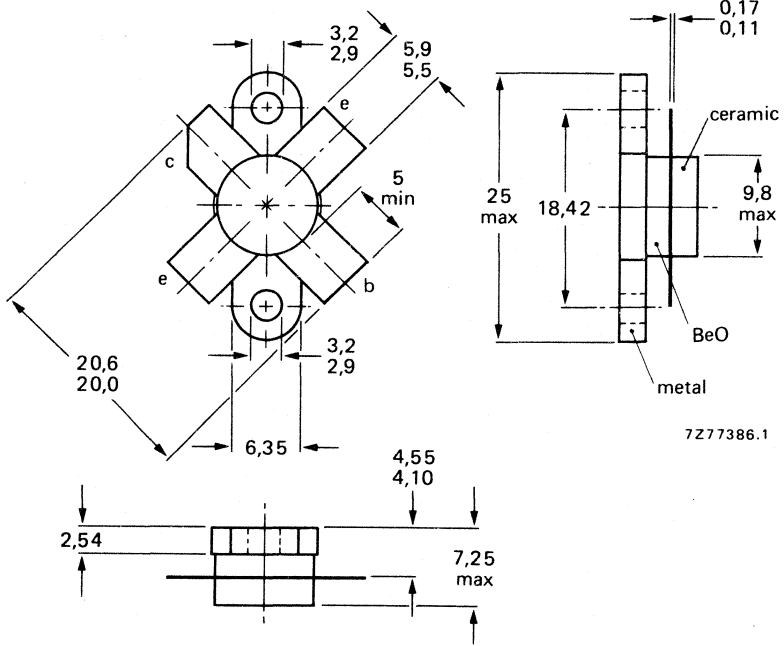
SOT-122



7Z76390

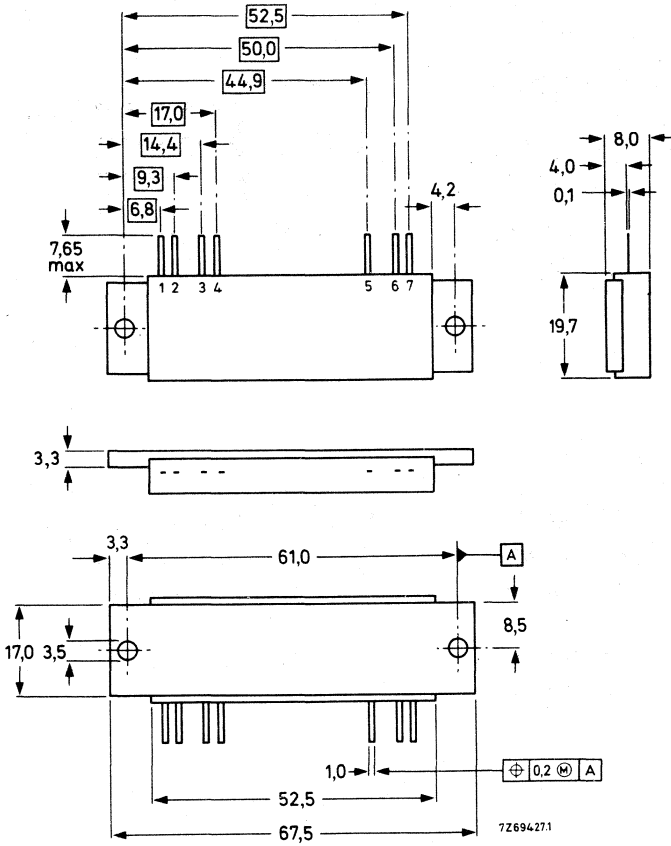
MECHANICAL DATA
SOT-123

Dimensions in mm



MECHANICAL DATA
SOT-132

Dimensions in mm



RULES FOR MOUNTING QUARTER-INCH CAPSTAN HEADERS AS USED FOR R.F. POWER TRANSISTORS

A 5 mm thick brass nut is supplied with each transistor for securing it to a heatsink. To ensure optimum heat transfer and avoid damage to the threaded stud of the transistor the following recommendations should be observed:

-Diameter of mounting hole in heatsink: 4,10 mm (+0,05; -0,00)

-Heatsink to be at least 3 mm thick.

Attachment to a thinner heatsink may damage the mounting stud.

-Heatsink surfaces at the mounting hole to be flat, parallel, and free of burrs or oxidation.

-Mounting nut torque: 0,80 Nm (+0,05; -0,00)
8,0 kg cm (+0,5 ; -0,0)

If security against vibration is required, use a locking compound such as Lock-tite. Do not use washers; they impair the heat transfer.

-Recommended distance from the top surface of heatsink to surface of printed wiring board: 2,9 mm (0,0; -0,2)

Tension in the transistor leads sets the limit on spacing between heatsink and printed wiring board; in general, the leads can withstand more pull in the downward than in the upward direction.

-Solder the leads to the connection pads with resin-cored lead-tin solder, using an iron of normal temperature. Soldering iron temperatures as high as 350 °C are safely tolerable; the transistor can withstand an interior temperature of 250 °C for about ten minutes.

The leads may be tinned, if required, by dipping them into a solder bath at about 230 °C; each lead may be dipped up to its full length. A flux of the quality of Super-Safe is recommended; after tinning, surplus flux should be rinsed away in tap water.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. The BFQ42 is especially suited as a driver transistor for the BLW29 in a two-stage wide-band or semi-wide-band v.h.f. amplifier delivering 15 W output power.

It has a TO-39 metal envelope with the collector connected to the case.

QUICK REFERENCE DATA

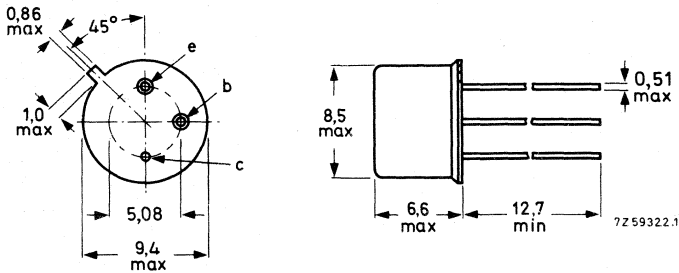
R.F. performance up to $T_{amb} = 25\text{ }^{\circ}\text{C}$; $R_{th\ c-a} = 32\text{ }^{\circ}\text{C/W}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w. class-B	13,5	175	2	> 11	> 60	7,8 - j4,6	22 - j18
c.w. class-B	12,5	175	2	typ. 10,5	typ. 65	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories supplied on request: 56218 (package); 56245 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 18 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 0,6 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 1,8 A

Total power dissipation up to $T_{mb} = 25$ °C

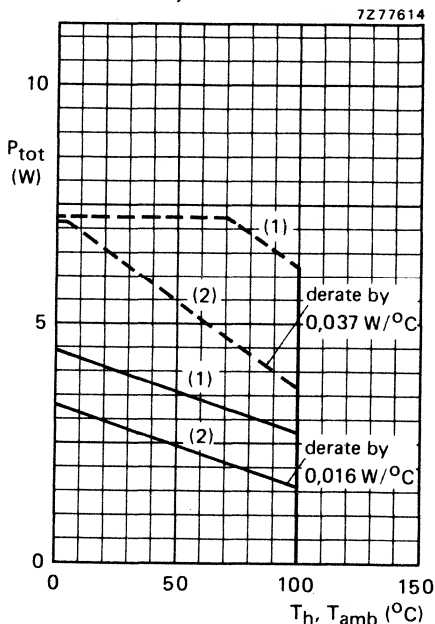
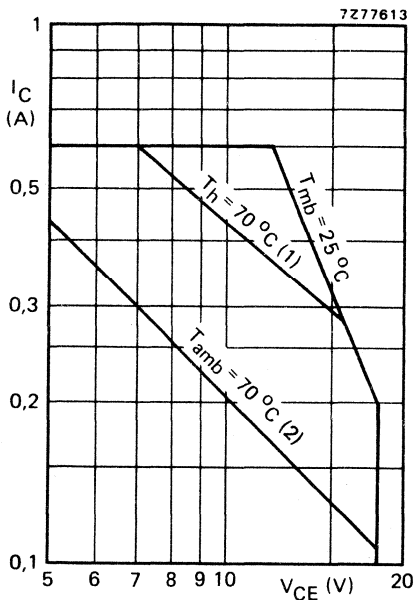
P_{tot} max. 7,2 W

Storage temperature

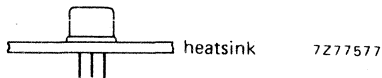
T_{stg} -65 to +200 °C

Junction temperature

T_j max. 200 °C



(1) Mounted on a heatsink.



(2) Free-air operation; using a spring cooling clip.

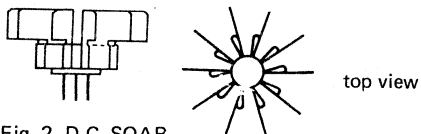


Fig. 2 D.C. SOAR.

(1) Short-time r.f. operation during mismatch;
 $R_{th\ mb-h} = 3$ °C/W; $R_{th\ c-a} = 32$ °C/W;
 $f \geq 1$ MHz.

(2) Continuous d.c. and r.f. operation;
 $R_{th\ mb-h} = 3$ °C/W; $R_{th\ c-a} = 32$ °C/W.

Fig. 3 Total power dissipation; $V_{CE} \leq 16,5$ V.
--- Mounted on a heatsink.
— Free-air operation; using a spring cooling clip having a thermal resistance of 32 °C/W.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	24 °C/W
From junction to case	$R_{th\ j-c}$	=	29 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	3 °C/W

CHARACTERISTICS

$T_j = 25\text{ °C}$

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 2\text{ mA}$

$V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 25\text{ mA}$

$V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 1\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 18\text{ V}$

$I_{CES} < 1\text{ mA}$

Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

$R_{BE} = 10\ \Omega$

$E_{SBO} > 0,5\text{ mJ}$

$E_{SBR} > 0,5\text{ mJ}$

D.C. current gain *

$I_C = 0,25\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 30
10 to 60

Collector-emitter saturation voltage*

$I_C = 0,75\text{ A}; I_B = 0,15\text{ A}$

V_{CEsat} typ. 0,9 V

Transition frequency at $f = 100\text{ MHz}$ *

$-I_E = 0,25\text{ A}; V_{CB} = 13,5\text{ V}$

$-I_E = 0,75\text{ A}; V_{CB} = 13,5\text{ V}$

f_T typ. 750 MHz

f_T typ. 625 MHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 13,5\text{ V}$

C_C typ. 8,6 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 20\text{ mA}; V_{CE} = 13,5\text{ V}$

C_{re} typ. 3,8 pF

* Measured under pulse conditions: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

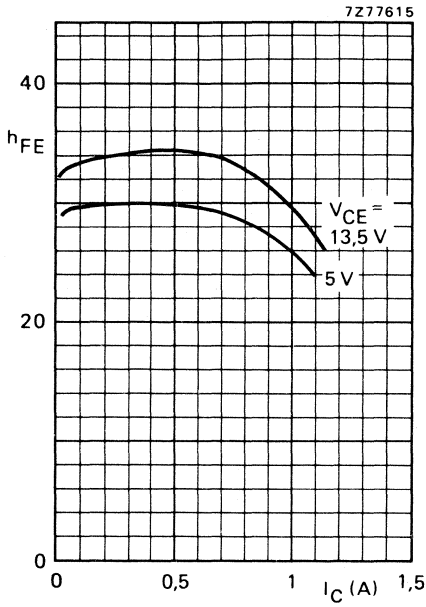


Fig. 4 Typical values; $T_j = 25^\circ\text{C}$.

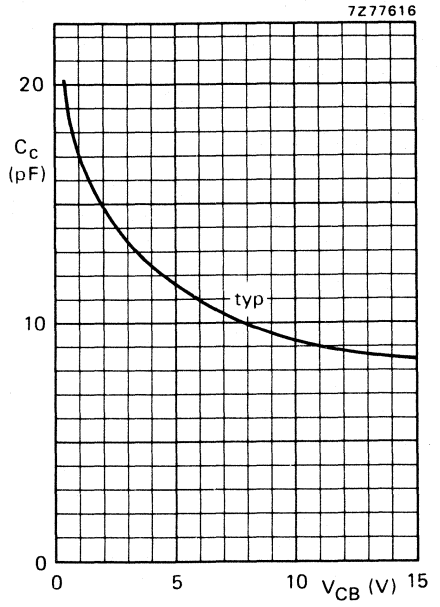


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

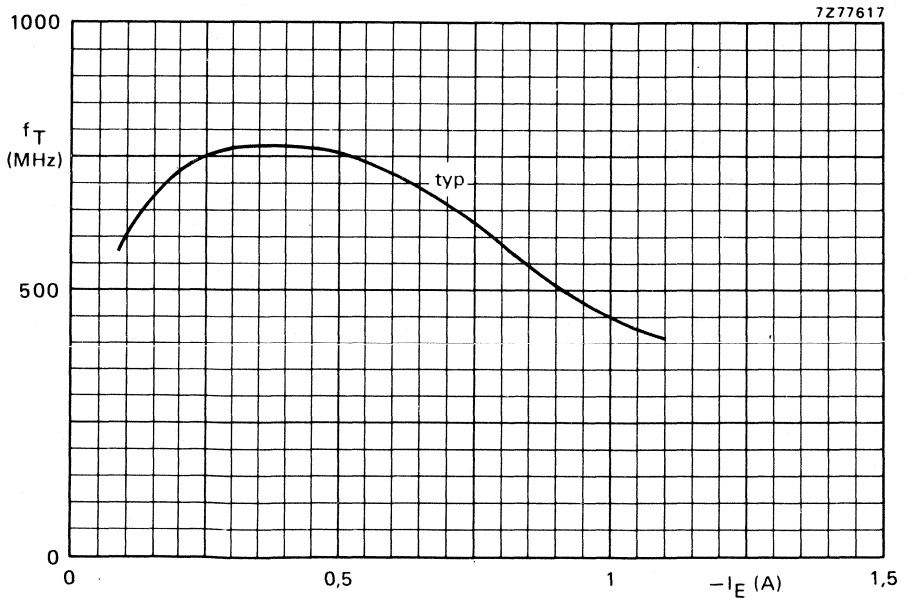


Fig. 6 $V_{CB} = 13.5\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_{amb} = 25\text{ }^{\circ}\text{C}$; $R_{th\ c-a} = 32\text{ }^{\circ}\text{C/W}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	2	< 0,16	> 11	< 0,25	> 60	7,8 - j4,6	22 - j18
175	12,5	2	—	typ. 10,5	—	typ. 65	—	—

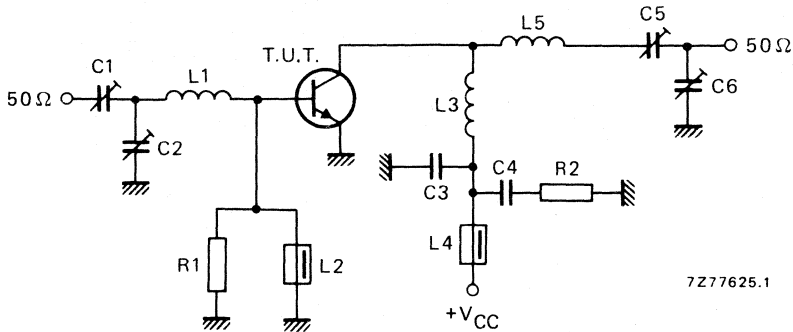


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C2 = C5 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3 = 100 pF ceramic capacitor

C4 = 100 nF polyester capacitor

C6 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

L1 = 3 turns enamelled Cu wire (1,0 mm); int. dia. 4,0 mm; length 4 mm; leads 2 x 5 mm

L2 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = L5 = 4 turns Cu wire (1,0 mm); int. dia. 6,0 mm; length 6 mm; leads 2 x 5 mm

R1 = 220 Ω carbon resistorR2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)

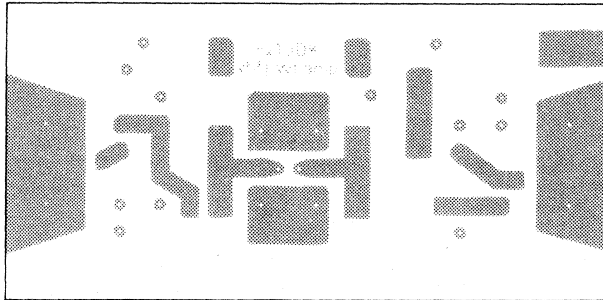
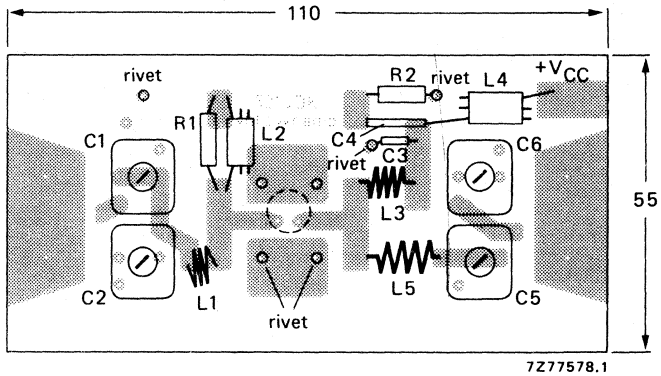


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

Material of printed-circuit board: 1,6 mm epoxy fibre-glass.

The length of the external emitter lead is 1,2 mm.

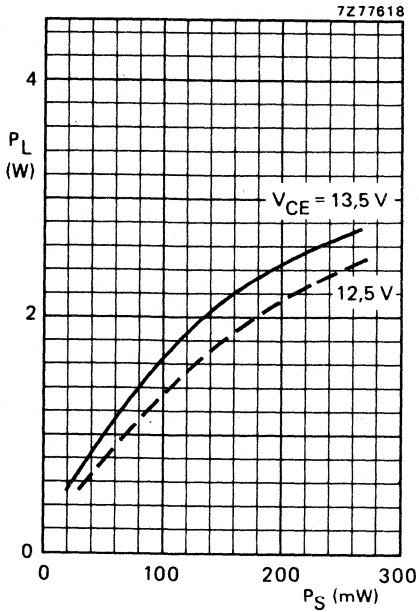


Fig. 9 Typical values; $f = 175$ MHz;
 $T_{amb} = 25$ °C; $R_{th\ c-a} = 32$ °C/W.

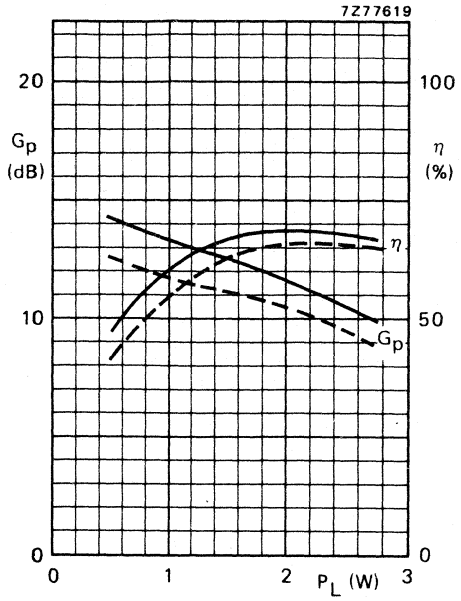


Fig. 10 Typical values; $f = 175$ MHz;
 $T_{amb} = 25$ °C; — $V_{CE} = 13.5$ V;
 - - - $V_{CE} = 12.5$ V; $R_{th\ c-a} = 32$ °C/W.

APPLICATION INFORMATION (continued).

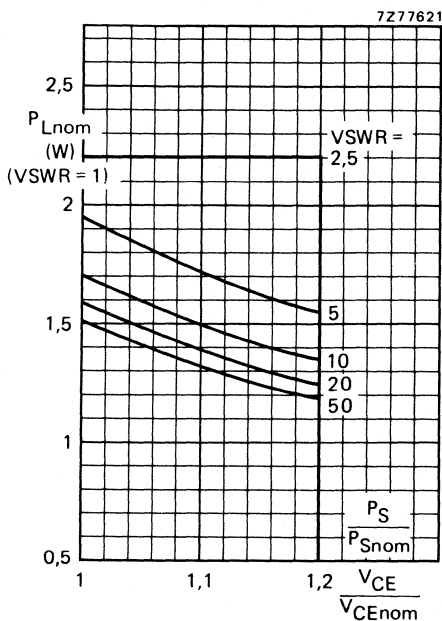
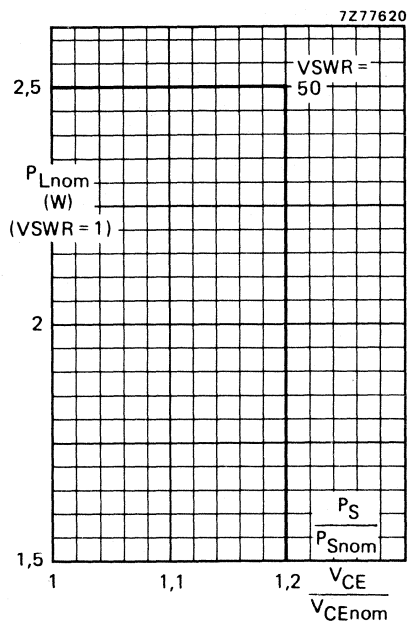


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 3 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

Fig. 12 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ }^\circ\text{C}$; $T_{amb} = 70 \text{ }^\circ\text{C}$; $R_{th \text{ c-a}} = 32 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

Note to Figs 11 and 12:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 100 MHz a base-emitter resistor of $22\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

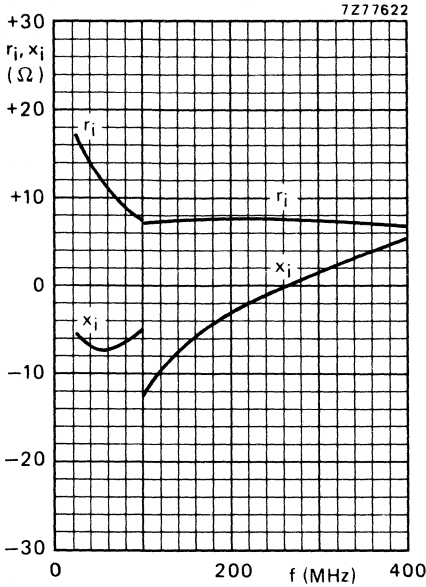


Fig. 13.

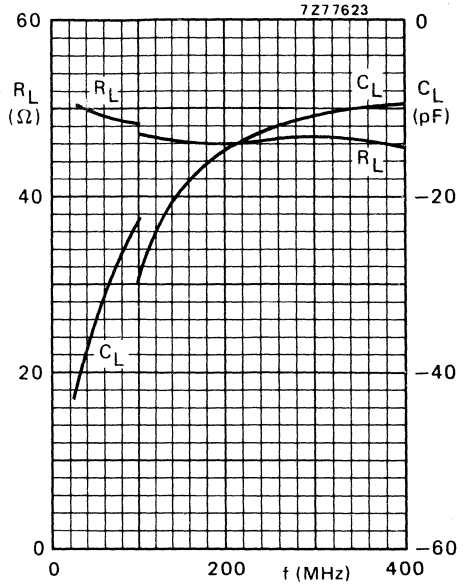
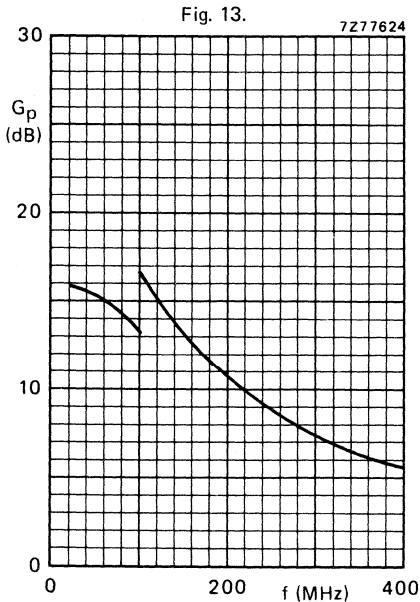


Fig. 14.



Conditions for Figs 13, 14 and 15:
 Typical values; $V_{CE} = 13,5\text{ V}$; $P_L = 2\text{ W}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; $R_{th\ c-a} = 32\text{ }^\circ\text{C/W}$.

Fig. 15.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. The BFQ43 is especially suited as a driver transistor for the BLW31 in a two-stage wide-band or semi-wide-band v.h.f. amplifier delivering 28 W output power.

It has a TO-39 metal envelope with the emitter connected to the case, which enables excellent heatsinking and emitter grounding.

QUICK REFERENCE DATA

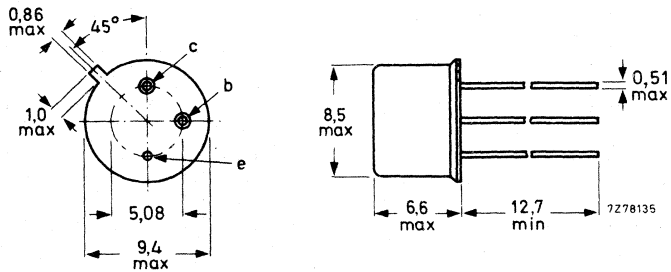
R.F. performance up to $T_H = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w. class-B	13,5	175	4	> 12	> 55	$3,2 + j0,03$	$53 - j29$
c.w. class-B	12,5	175	4	typ. 12	typ. 60	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; emitter connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories supplied on request: 56218 (package); 56245 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	1,25 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	3,75 A
Total power dissipation up to $T_{mb} = 25$ °C	P_{tot}	max.	12 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

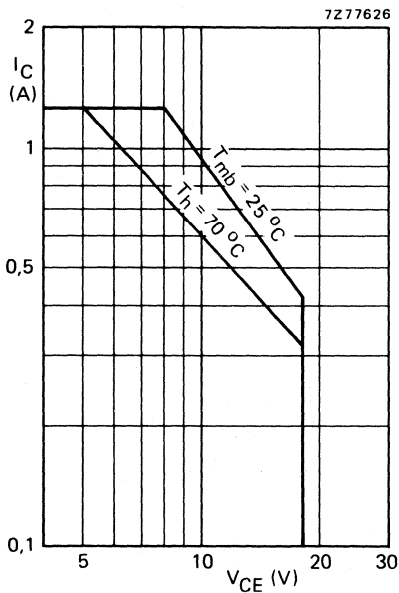
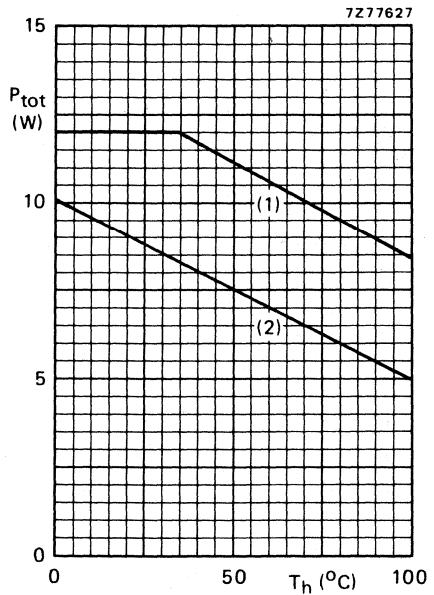


Fig. 2 D.C. SOAR.



- (1) Short-time r.f. operation during mismatch; $f \geq 1$ MHz.
- (2) Continuous d.c. and r.f. operation; derate by 0,05 W/°C.

Fig. 3 Total power dissipation; $V_{CE} \leq 16,5$ V.

THERMAL RESISTANCE (dissipation = 4 W; $T_{mb} = 82$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base

$$R_{th\ j-mb} = 18 \text{ °C/W}$$

From mounting base to heatsink

$$R_{th\ mb-h} = 3 \text{ °C/W}$$

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 5\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 2\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 2\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 0,5\text{ mJ}$ $R_{BE} = 10\ \Omega$ $E_{SBR} > 0,5\text{ mJ}$

D.C. current gain *

 $I_C = 0,5\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 80

Collector-emitter saturation voltage *

 $I_C = 1,5\text{ A}; I_B = 0,3\text{ A}$ V_{CEsat} typ. 0,9 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 0,5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 750 MHz $-I_E = 1,5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 625 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 13,5\text{ V}$ C_C typ. 15 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 20\text{ mA}; V_{CE} = 13,5\text{ V}$ C_{re} typ. 7,3 pF* Measured under pulse conditions: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

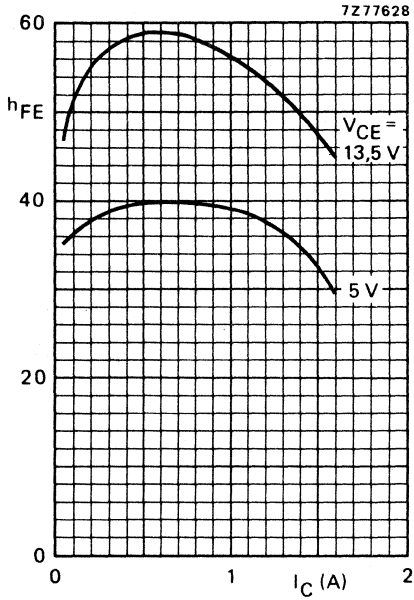


Fig. 4 Typical values; $T_j = 25$ °C.

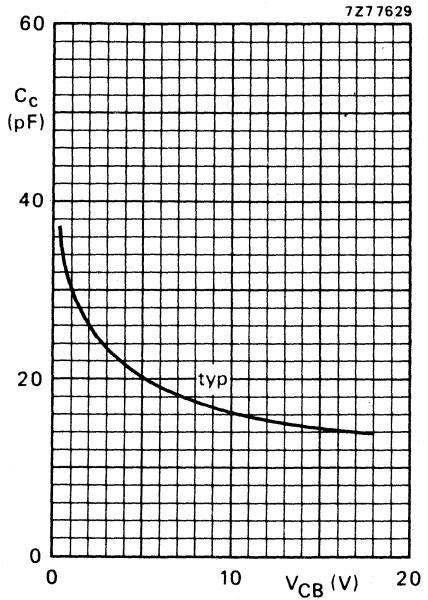


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

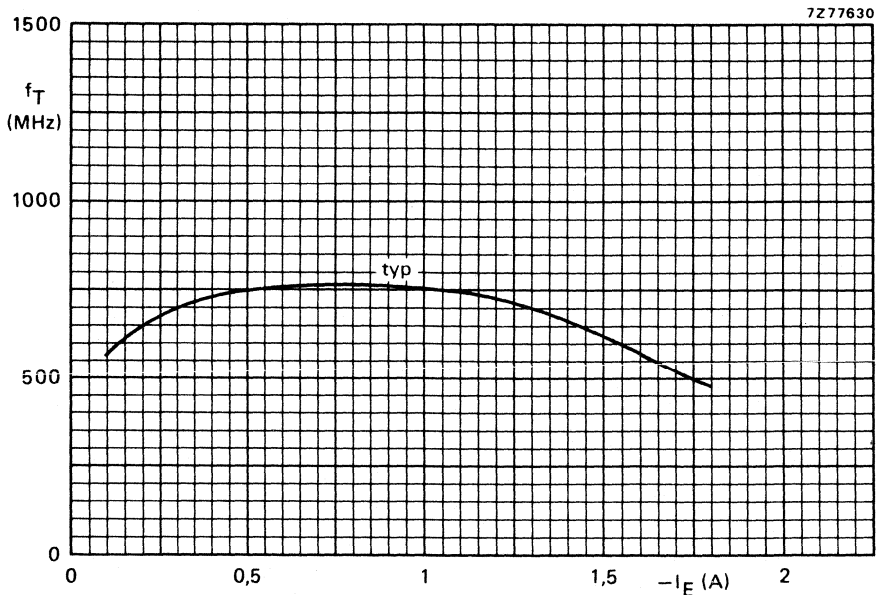


Fig. 6 $V_{CB} = 13.5$ V; $f = 100$ MHz; $T_j = 25$ °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	4	< 0,25	> 12	< 0,54	> 55	$3,2 + j0,03$	$53 - j29$
175	12,5	4	—	typ. 12	—	typ. 60	—	—

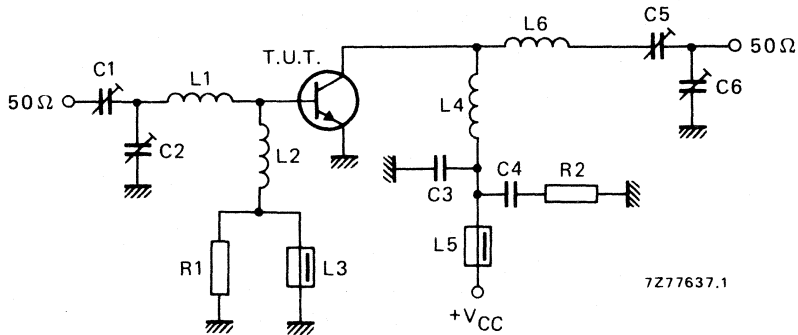


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C5 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3 = 100 pF ceramic capacitor

C4 = 100 nF polyester capacitor

L1 = 2 turns Cu wire (1,0 mm); int. dia. 4,0 mm; length 3 mm; leads 2 x 5 mm

L2 = 7 turns enamelled Cu wire (0,5 mm); int. dia. 3,0 mm; length 4 mm; leads 2 x 5 mm

L3 = L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = 4 turns enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; length 5 mm; leads 2 x 5 mm

L6 = 5 turns enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; length 7,5 mm; leads 2 x 5 mm

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)

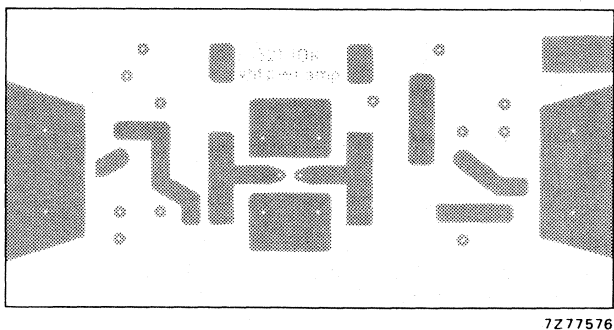
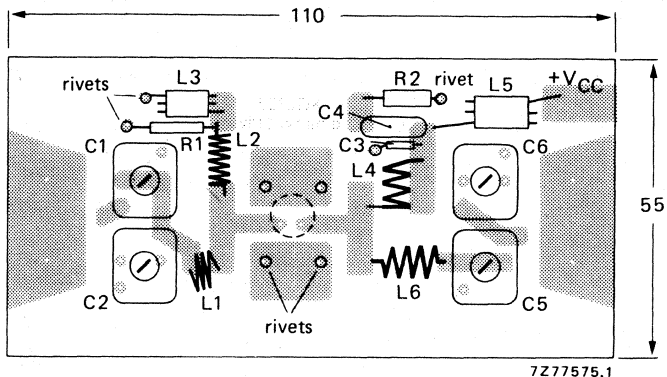


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

Material of printed-circuit board: 1,6 mm epoxy fibre-glass.

The case is directly grounded on the printed-circuit board.

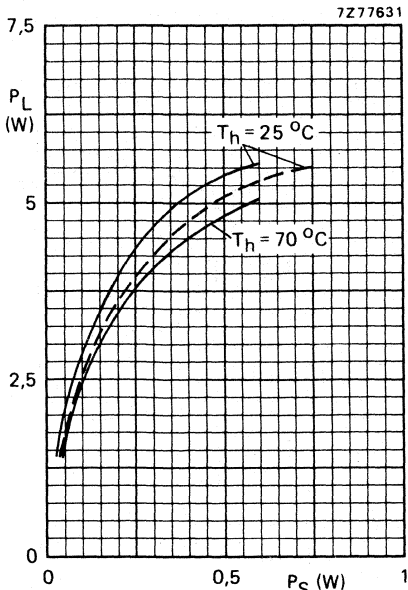


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; --- $V_{CE} = 12,5 \text{ V}$.

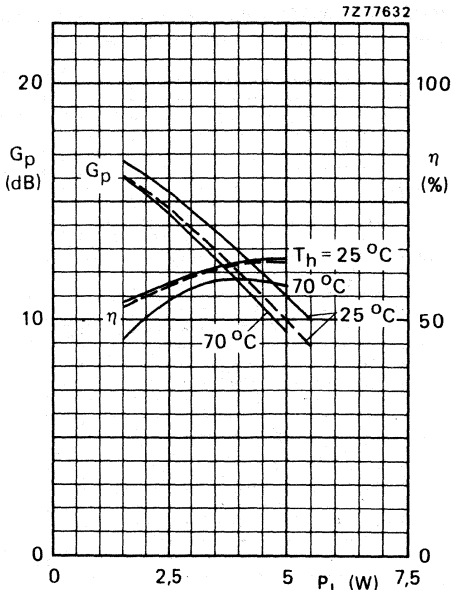


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; --- $V_{CE} = 12,5 \text{ V}$.

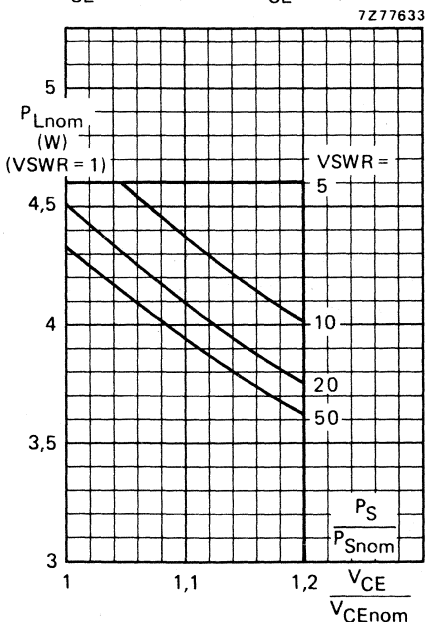


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$.
 $R_{th \text{ mb-h}} = 3 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ or } 12,5 \text{ V}$;
 $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 140 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

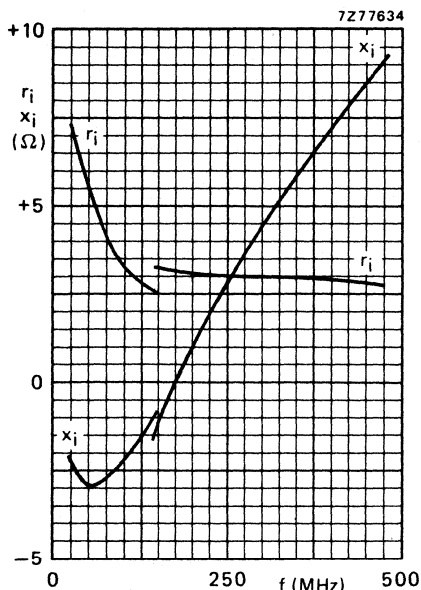


Fig. 12.

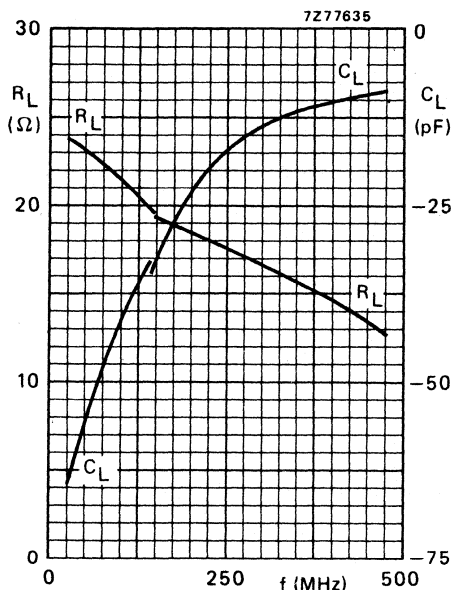
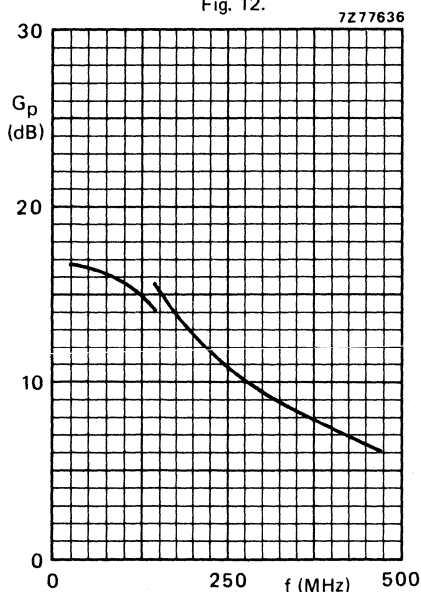


Fig. 13.



Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 13,5\text{ V}$; $P_L = 4\text{ W}$;
 $T_h = 25\text{ }^\circ\text{C}$.

Fig. 14.

V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13,5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a TO-39 metal envelope with the collector connected to the case.

QUICK REFERENCE DATA

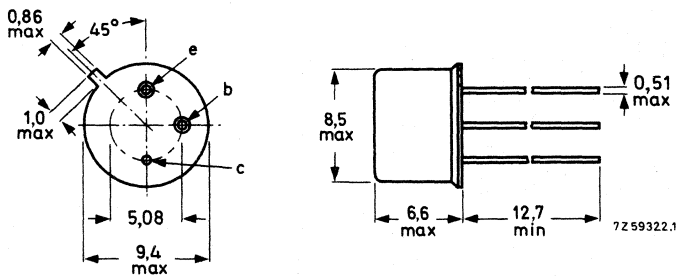
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	13,5	175	4	> 8	> 60	$3,9 + j2,2$	$37 - j22$
c.w.	12,5	175	4	typ. 8	typ. 60	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56218 (package); 56245 (distance disc).

BFS22A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

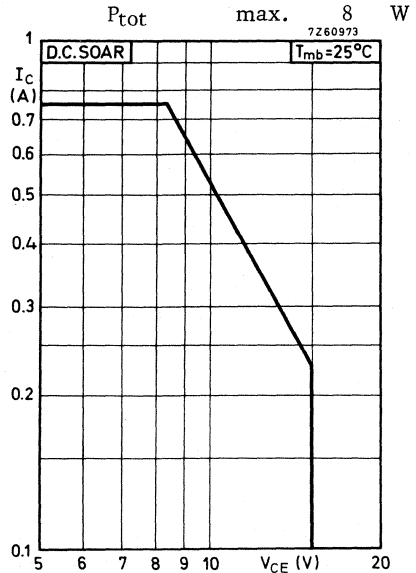
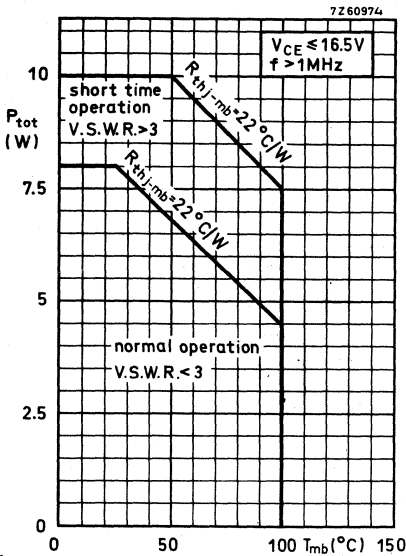
Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

Currents

Collector current (average)	$I_{C(AV)}$	max.	0.75	A
Collector current (peak value) $f > 1\text{ MHz}$	I_{CM}	max.	2.25	A

Power dissipation

Total power dissipation up to $T_{mb} = 25\text{ }^{\circ}\text{C}$
 $f > 1\text{ MHz}$



Temperature

Storage temperature	T_{stg}	-65 to +200	$^{\circ}\text{C}$
Operating junction temperature	T_j	max. 200	$^{\circ}\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{\theta j-mb}$	=	22	$^{\circ}\text{C/W}$
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{\theta mb-h}$	=	2.5	$^{\circ}\text{C/W}$

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 14\text{ V}$ $I_{CEO} < 5\text{ mA}$

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 1\text{ mA}$ $V_{(BR)CBO} > 36\text{ V}$

Collector-emitter voltage
open base, $I_C = 10\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base voltage
open collector, $I_E = 1\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$

open base	E	$>$	0.5	mWs
$-V_{BE} = 1.5\text{ V}; R_{BE} = 33\Omega$	E	$>$	0.5	mWs

D.C. current gain

$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$ $h_{FE} > 5$

Transition frequency

$I_C = 350\text{ mA}; V_{CE} = 10\text{ V}$ f_T typ. 700 MHz

Collector capacitance at $f = 1\text{ MHz}$

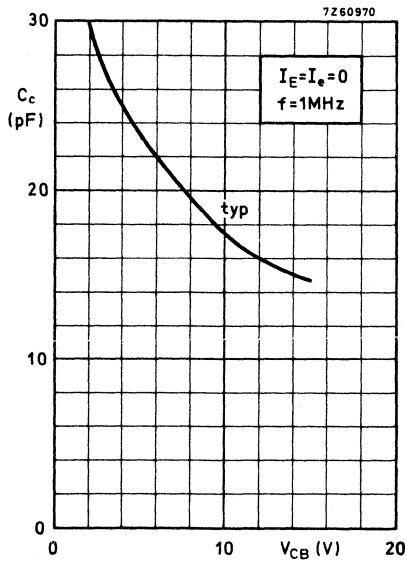
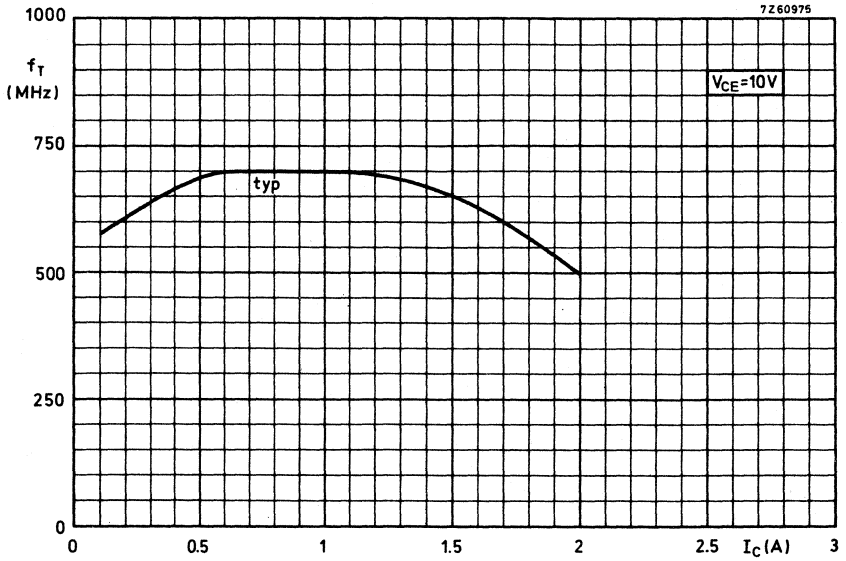
$I_E = I_C = 0; V_{CB} = 15\text{ V}$ C_c typ. 15 pF
 $< 20\text{ pF}$

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 50\text{ mA}; V_{CE} = 15\text{ V}$ C_{re} typ. 11 pF



BFS22A



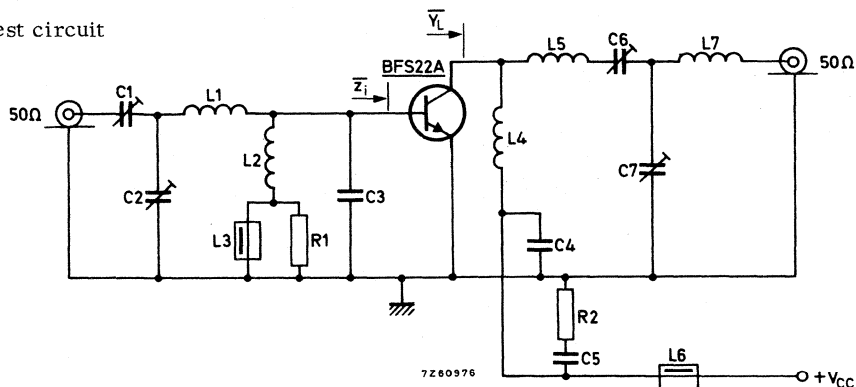
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralised common-emitter class B circuit)

$f = 175 \text{ MHz}$; T_{mb} up to $25 \text{ }^\circ\text{C}$

$V_{CC}(\text{V})$	$P_S(\text{W})$	$P_L(\text{W})$	$I_C(\text{A})$	$G_p(\text{dB})$	$\eta(\%)$	$\bar{z}_i(\Omega)$	$\bar{Y}_L(\text{mA/V})$
13.5	< 0.63	4	< 0.49	> 8	> 60	$3.9 + j2.2$	$37 - j22$
12.5	typ. 0.63	4	typ. 0.53	typ. 8	typ. 60	-	-

Test circuit



- C1 = C6 = 4 to 29 pF air trimmer with insulated rotor
- C2 = C7 = 4 to 29 pF air trimmer with non-insulated rotor
- C3 = 39 pF ceramic
- C4 = 100 pF ceramic
- C5 = 15 nF polyester

L1 = 1 turn enamelled Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm

L2 = 6 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm

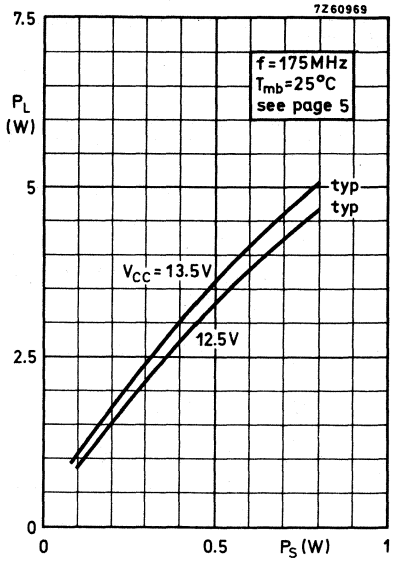
L3 = L6 = ferroxcube choke (code number 4312 020 36640)

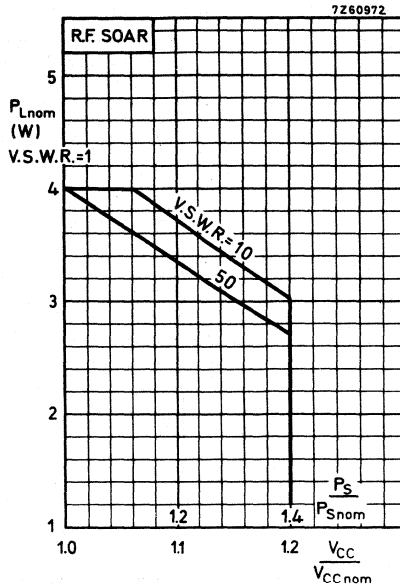
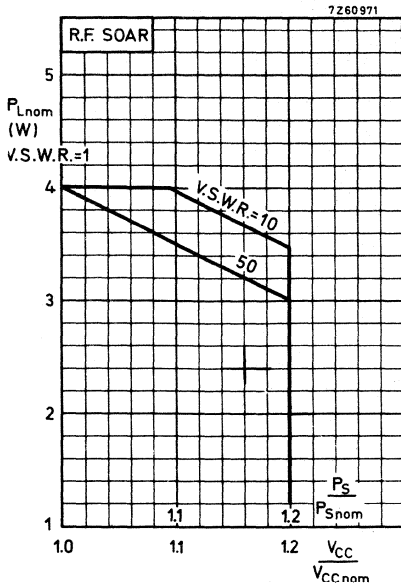
L4 = 8 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm

L5 = 5 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 8 mm; leads 2 x 10 mm

L7 = 7 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 6 mm; leads 2 x 5 mm

R1 = R2 = 10 Ω carbon





Conditions for R.F. SOAR:

$f = 175 \text{ MHz}$ $P_{Snom} = P_S \text{ at } V_{CC} = V_{CCnom} \text{ and } V.S.W.R. = 1$
 $T_{mb} = 70 \text{ }^\circ\text{C}$ see also page 5
 $V_{CCnom} = 12.5 \text{ or } 13.5 \text{ V}$

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs above for safe operation at supply voltages other than the nominal. The graphs show the allowable output power under nominal conditions, as a function of the supply overvoltage ratio, with V. S. W. R. as parameter.

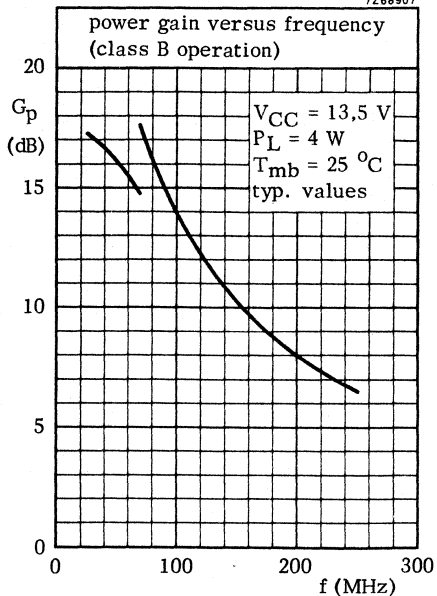
The left hand graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.

The right hand graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).

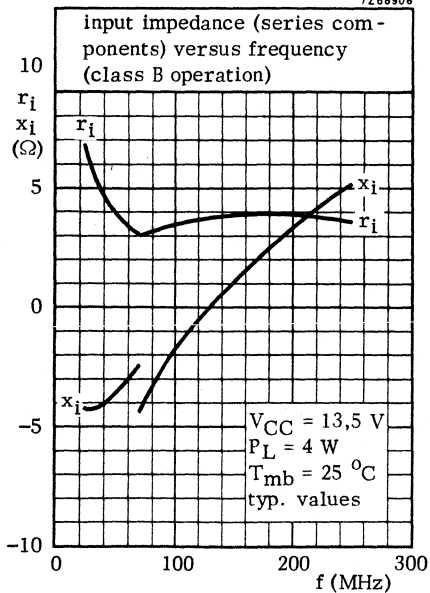
Depending on the operating conditions, the appropriate derating factor may lie in the region between the linear and the square-law functions.

OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.

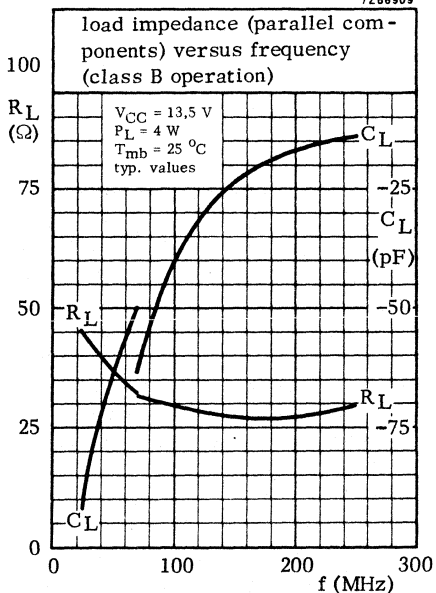
7Z68907



7Z68908



7Z68909



V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 28 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions.

It has a TO-39 metal envelope with the collector connected to the case.

QUICK REFERENCE DATA

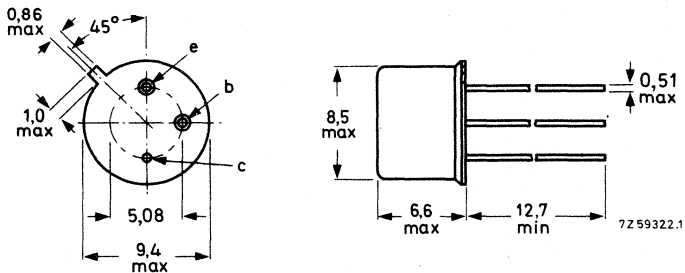
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{Z}_i Ω	\bar{Y}_L mA/V
c.w.	28	175	4	> 10	> 65	$2,3 + j1,6$	$8,9 - j18,1$

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56218 (package); 56245 (distance disc).

BFS23A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

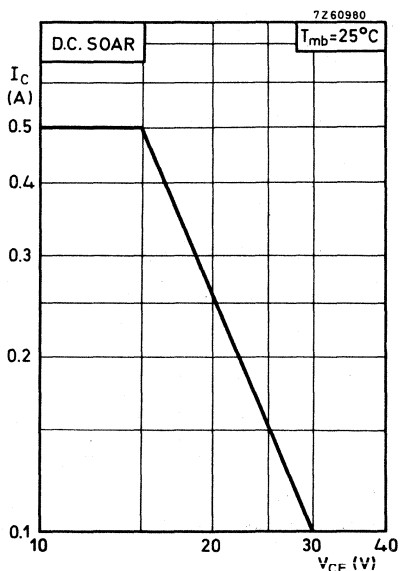
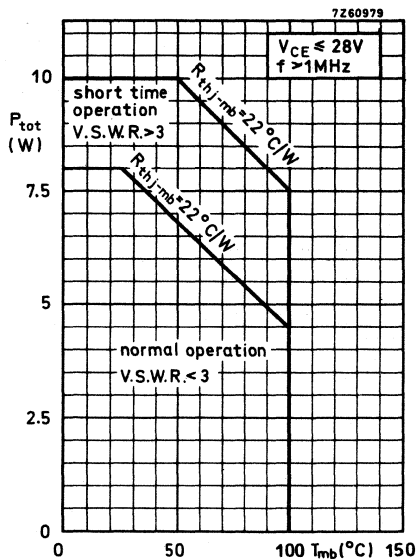
Collector-base voltage (open emitter) peak value	V_{CBOM} max.	65	V
Collector-emitter voltage (open base)	V_{CEO} max.	36	V
Emitter-base voltage (open collector)	V_{EBO} max.	4	V

Currents

Collector current (average)	$I_{C(AV)}$ max.	0.5	A
Collector current (peak value) $f > 1$ MHz	I_{CM} max.	1.5	A

Power dissipation

Total power dissipation up to $T_{mb} = 25$ °C $f > 1$ MHz	P_{tot} max.	8	W
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Temperature

Storage temperature	T_{Stg}	-65 to +200	°C
Operating junction temperature	T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	22	°C/W
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{th mb-h}$	=	2.5	°C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 28\text{ V}$ $I_{CEO} < 5\text{ mA}$

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 1\text{ mA}$ $V_{(BR)CBO} > 65\text{ V}$

Collector-emitter voltage
open base, $I_C = 10\text{ mA}$ $V_{(BR)CEO} > 36\text{ V}$

Emitter-base voltage
open collector; $I_E = 1\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$
open base $E > 0.5\text{ mWs}$
 $-V_{BE} = 1.5\text{ V}; R_{BE} = 33\text{ }\Omega$ $E > 0.5\text{ mWs}$

D. C. current gain

$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$ $h_{FE} > 5$

Transition frequency

$I_C = 400\text{ mA}; V_{CE} = 20\text{ V}$ f_T typ. 500 MHz

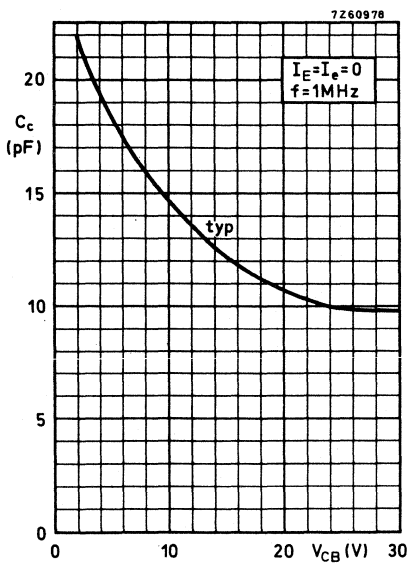
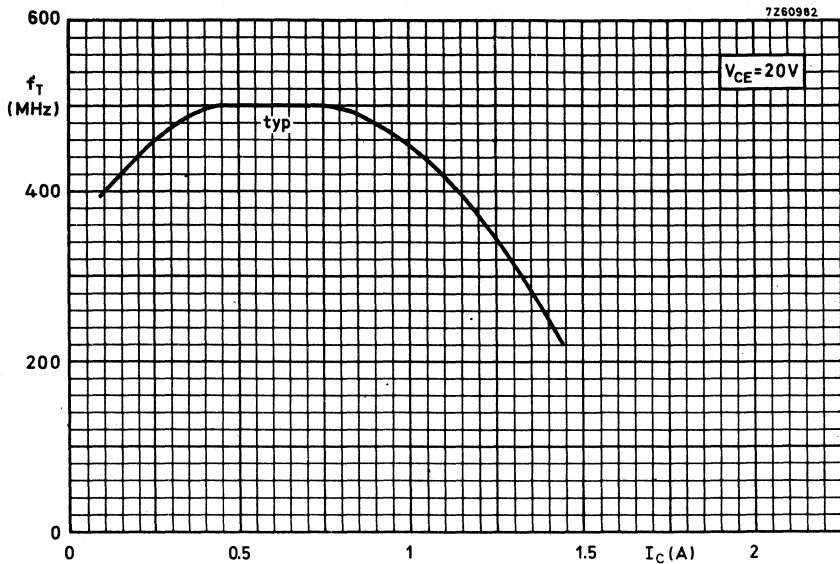
Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 30\text{ V}$ C_c typ. 10 pF
 $< 15\text{ pF}$

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 25\text{ mA}; V_{CE} = 30\text{ V}$ C_{re} typ. 7.5 pF





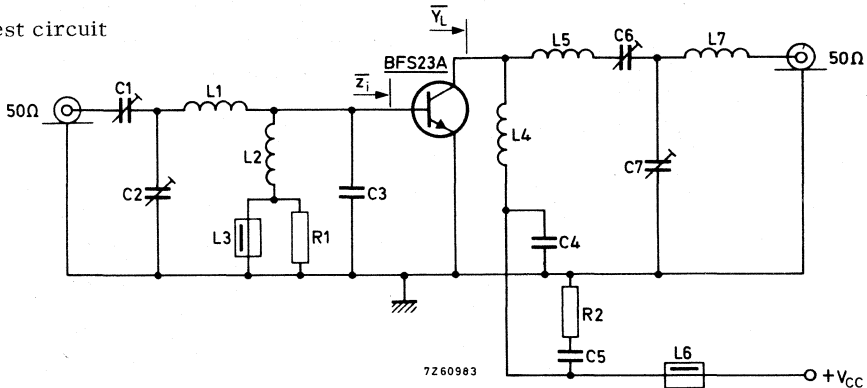
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralised common-emitter class B circuit)

$$V_{CC} = 28 \text{ V}; T_{mb} \text{ up to } 25 \text{ }^\circ\text{C}$$

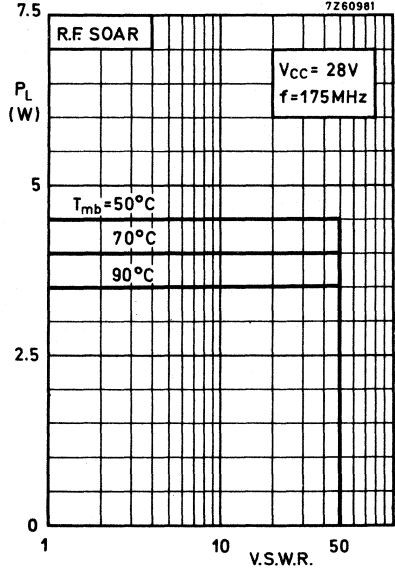
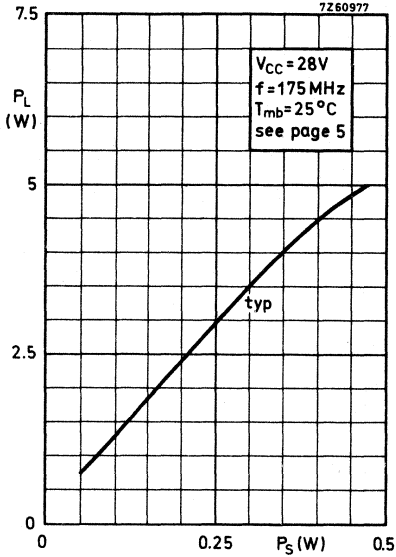
f(MHz)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	< 0.40	4	< 0.22	> 10	> 65	2.3+j1.6	8.9 - j18.1

Test circuit



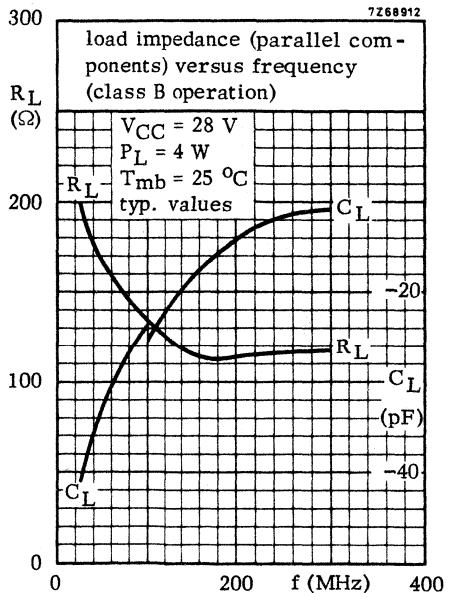
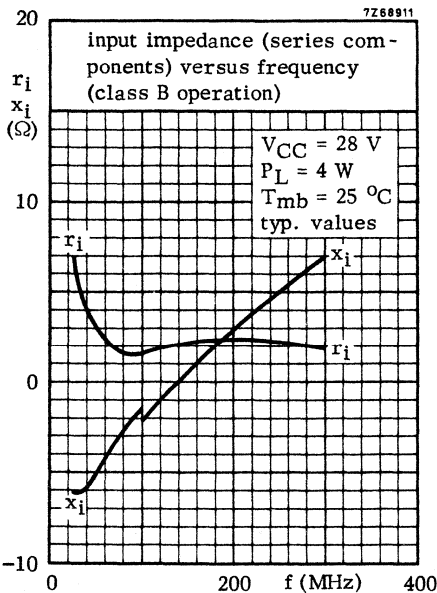
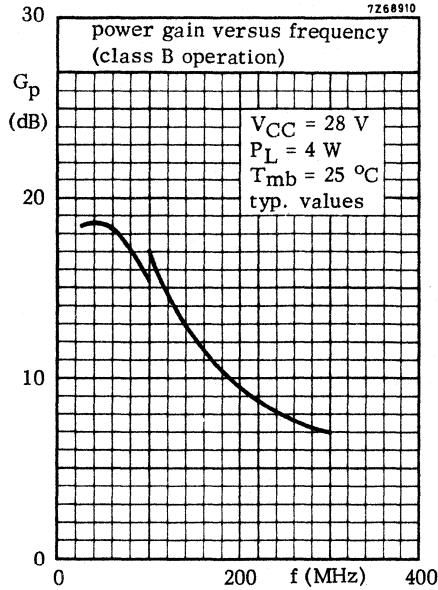
- C1 = C6 = 4 to 29 pF air trimmer with insulated rotor
- C2 = C7 = 4 to 29 pF air trimmer with non-insulated rotor
- C3 = 39 pF ceramic
- C4 = 100 pF ceramic
- C5 = 15 nF polyester

- L1 = 1 turn enamelled Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm
- L2 = 6 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm
- L3 = L6 = ferroxcube choke (code number 4312 020 36640)
- L4 = 8 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm
- L5 = 5 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 8 mm; leads 2 x 10 mm
- L7 = 4 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 6 mm; leads 2 x 5 mm
- R1 = R2 = 10 Ω carbon



For high voltage operation, a stabilized power supply is generally used. The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



U.H.F. POWER AMPLIFIER MODULES

Broadband amplifier modules primarily designed for mobile applications operating directly from 12 V vehicle electrical systems. The module will produce 2,5 W output into a 50 Ω load over the bands 380 to 512 MHz for the BGY22, and 420 to 480 MHz for the BGY22A.

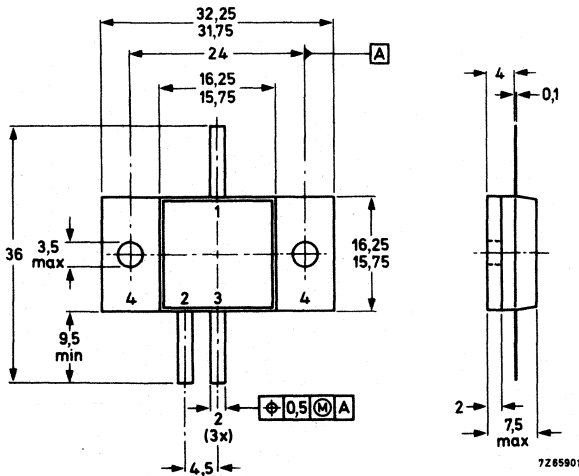
QUICK REFERENCE DATA

Type number	Mode of operation	Freq. range (MHz)	V_B (V)	P_D (mW)	P_L (W)	η (%)	$Z_S = Z_L$ (Ω)
BGY22	c. w.	380 to 512	13,5	50	> 2,5	> 40	50
BGY22	c. w.	380 to 512	13,5	50	typ. 2,9	typ. 50	50
BGY22A	c. w.	420 to 480	12,5	50	> 2,5	> 40	50

MECHANICAL DATA

Dimensions in mm

SOT-75A



Terminal connections

- 1 = input lead
- 2 = + V_B
- 3 = output lead
- 4 = r.f. and d.c. ground

To ensure good thermal contact between mounting base and heatsink, burrs or thickening at the edges of the heatsink holes should be removed and the package bolted down onto a flat surface.

Devices may be soldered directly into a circuit with a soldering iron at a maximum iron temperature of 245 $^{\circ}\text{C}$ for 10 seconds at least 1 mm from the plastic.

BGY22 BGY22A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

D. C. voltages (with respect to flange)

Supply terminal	V_B	max.	18	V
Input terminal	$\pm V_I$	max.	25	V
Output terminal	$\pm V_O$	max.	25	V

Current

Supply current (d. c.)	I_{tot}	max.	800	mA
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Drive power

$V_B = 13,5 \text{ V}; Z_L = 50 \Omega$

P_D	max.	150	mW
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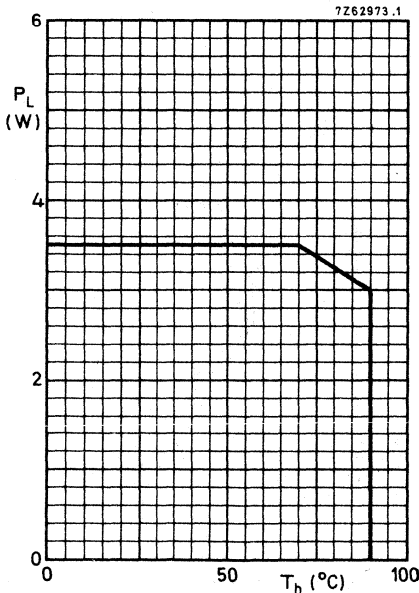
Temperatures

Storage temperature	T_{stg}	-40 to +100	$^{\circ}\text{C}$
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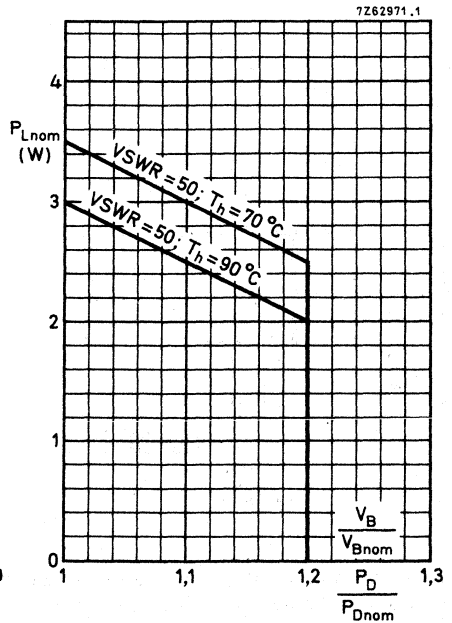
Operating heatsink temperature

T_h	max.	90	$^{\circ}\text{C}$
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P_L for normal operation



P_L for fault condition



Where $P_{Lnom} = P_L$ at $V_B = 13,5 \text{ V}; Z_L = 50 \Omega$ (BGY22)
and $P_{Lnom} = P_L$ at $V_B = 12,5 \text{ V}; Z_L = 50 \Omega$ (BGY22A)

CHARACTERISTICS

$T_h = 25\text{ }^\circ\text{C}$ unless otherwise specified

Reference planes at r. f. input and output terminals are 1 mm from the plastic encapsulation.

Frequency range 380-512 MHz; $V_B = 13,5\text{ V}$ (BGY22)

Frequency range 420-480 MHz; $V_B = 12,5\text{ V}$ (BGY22A)

Quiescent current

$P_D = 0$ I_{BQ} 4,0 to 12,0 mA

Load power

$P_D = 50\text{ mW}$ P_L 2,5 to 3,5 W

Efficiency

$P_D = 50\text{ mW}$ η > 40 %

Supply current

$P_D = 50\text{ mW}$ I_{tot} typ. 475 mA

Harmonic content

$P_D = 50\text{ mW}$ Any harmonic is at least 20 dB down relative to carrier

Input VSWR with respect to 50 Ω

$P_D = 50\text{ mW}$ VSWR < 2

Temperature coefficient of P_L

$P_D = 50\text{ mW}$; $T_h = 25\text{ to }70\text{ }^\circ\text{C}$ typ. -10 mW/ $^\circ\text{C}$

Stability

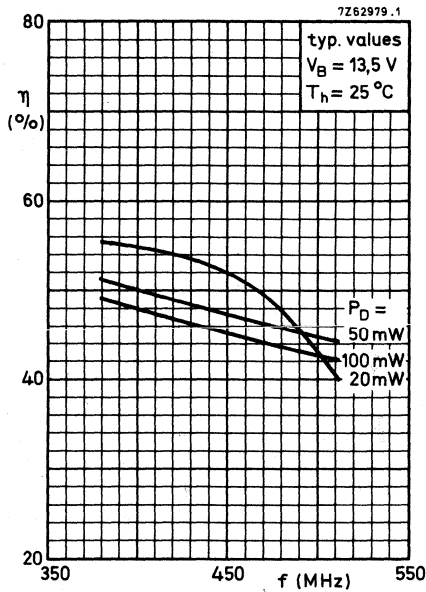
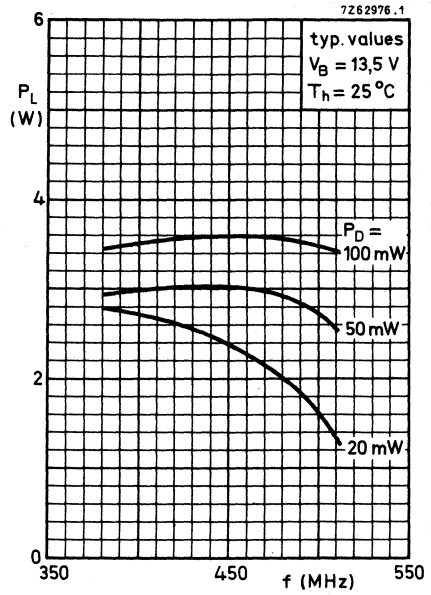
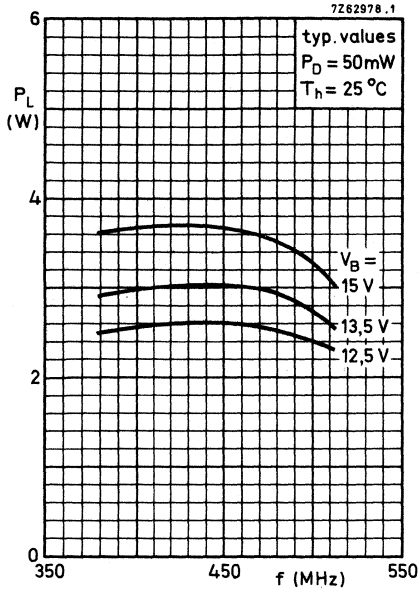
$V_B = 10,5\text{ to }15\text{ V}$; $P_D = 10\text{ mW to }100\text{ mW}$

$T_h = -40\text{ to }+90\text{ }^\circ\text{C}$

Output load VSWR ≤ 3 , all phases

Output load VSWR ≤ 10 , all phases

No instabilities
No appreciable
instabilities



APPLICATION INFORMATION

R.F. performance in c.w. operation; $T_h = 25\text{ }^\circ\text{C}$

Drive source and load impedance $Z_S = Z_L = 50\ \Omega$

Type number	f (MHz)	V_B (V)	P_D (mW)	P_L (W)	η (%)
BGY22	380 to 512	15,0	50	typ. 3,5	typ. 47
BGY22	380 to 512	13,5	50	> 2,5	> 40
BGY22	380 to 512	13,5	50	typ. 2,9	typ. 47
BGY22	380 to 512	12,5	50	typ. 2,5	typ. 47
BGY22A	420 to 480	12,5	50	> 2,5	> 40

The modules are designed to withstand full load mismatch under the following conditions:

$$P_D = P_{Dnom} + 20\%; T_h = 70\text{ }^\circ\text{C}$$

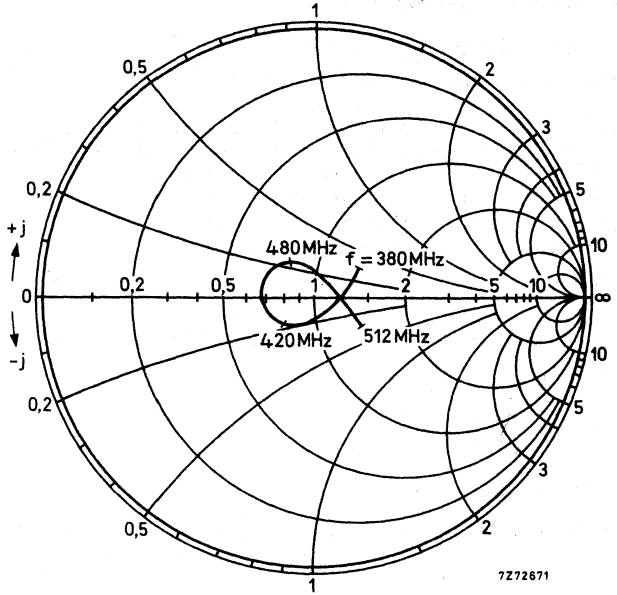
$$V_B = 16,5\text{ V (BGY22)}$$

$$V_B = 15,0\text{ V (BGY22A)}$$

VSWR = 50 at any phase

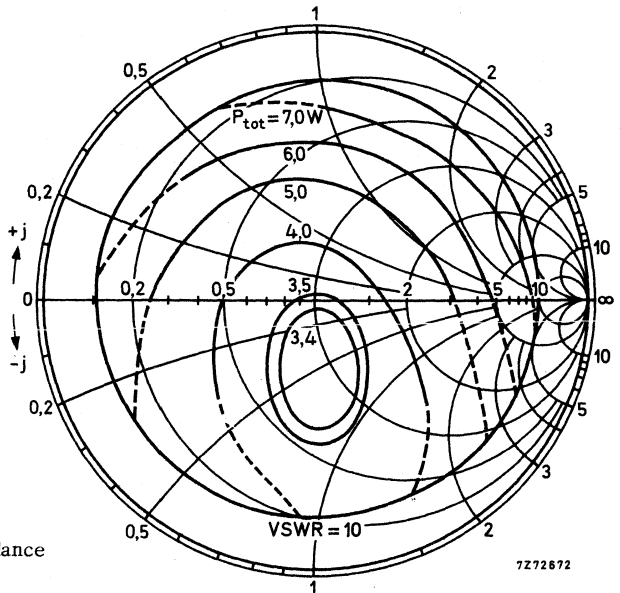
where $P_{Dnom} = P_D$ for 2,5 W module output under nominal conditions.





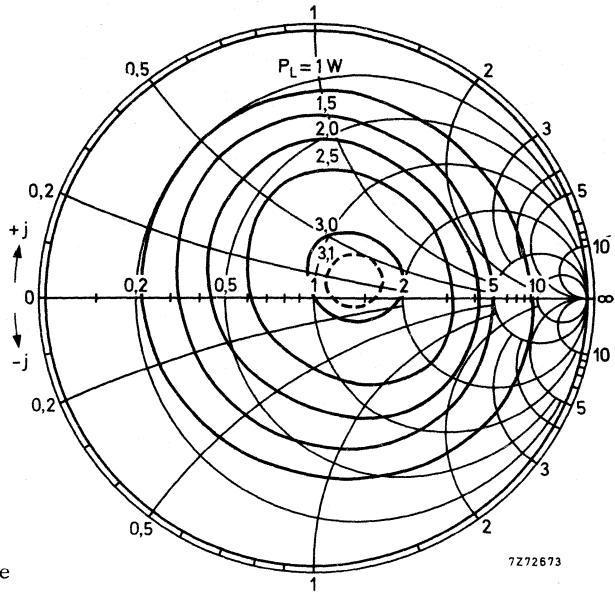
Typical variation of input impedance with frequency

$V_B = 13,5 \text{ V}$
 $f = 470 \text{ MHz}$

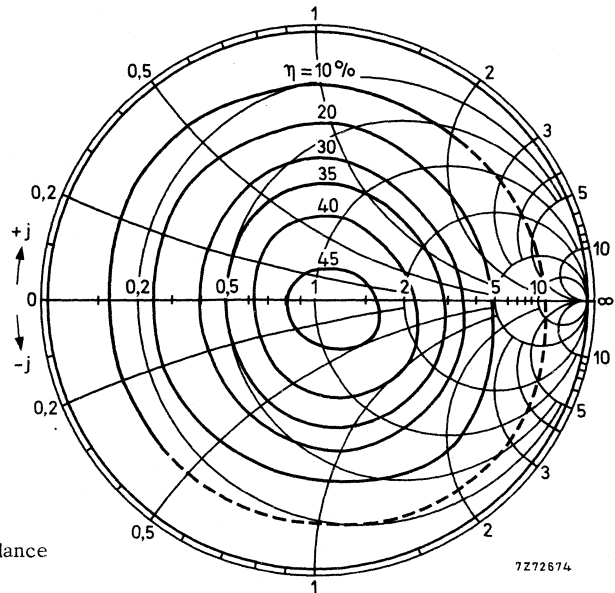


Typical variation of power dissipation with load impedance

$V_B = 13,5 \text{ V}$
 $P_D = 50 \text{ mW}$
 $f = 470 \text{ MHz}$



$V_B = 13,5 \text{ V}$
 $P_D = 50 \text{ mW}$
 $f = 470 \text{ MHz}$



U.H.F. POWER AMPLIFIER MODULES

Broadband amplifier modules primarily designed for mobile applications operating directly from 12 V vehicle electrical systems. The modules are suitable for driving directly from the BGY22 and BGY22A respectively, and when so driven will produce 7 W output into a 50 Ω load over the band 380 to 480 MHz for the BGY23, and 7 W over the band 420 to 480 MHz for the BGY23A.

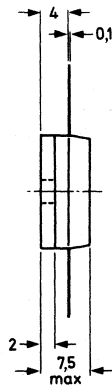
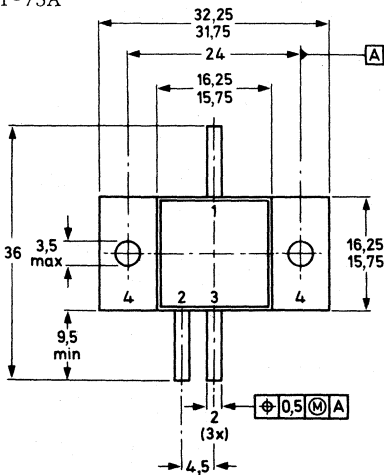
QUICK REFERENCE DATA

Type number	Mode of operation	Freq. range (MHz)	V_B (V)	P_D (W)	P_L (W)	η (%)	$Z_S = Z_L$ (Ω)
BGY23	c. w.	380 - 480	13,5	2,5	> 7,0	> 60	50
BGY23	c. w.	380 - 480	13,5	2,5	typ. 8,3	typ. 71	50
BGY23	c. w.	480 - 512	13,5	2,5	typ. 7,5	typ. 69	50
BGY23A	c. w.	420 - 480	12,5	2,5	> 7,0	> 60	50

MECHANICAL DATA

Dimensions in mm

SOT-75A



Terminal connections

- 1 = input lead
- 2 = + V_B
- 3 = output lead
- 4 = r. f. and d. c. ground

To ensure good thermal contact between mounting base and heatsink, burrs or thickening at the edges of the heatsink holes should be removed and the package bolted down onto a flat surface.

Devices may be soldered directly into a circuit with a soldering iron at a maximum iron temperature of 245 $^{\circ}\text{C}$ for 10 seconds at least 1 mm from the plastic.

BGY23 BGY23A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

D. C. voltages (with respect to flange)

Supply terminal	V_B	max.	18	V
Input terminal (no external d. c. connection)	$\pm V_I$	max.	0,5	V
Output terminal	$\pm V_O$	max.	25	V

Current

Supply current (d. c.)	I_{tot}	max.	1,7	A
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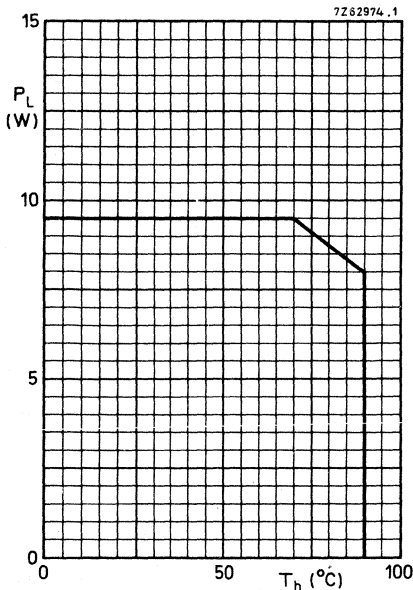
Drive power

$V_B = 13,5$ V; $Z_L = 50$ Ω	P_D	max.	3,5	W
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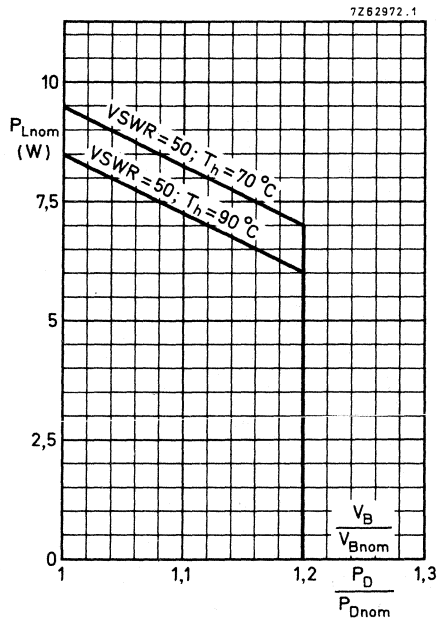
Temperatures

Storage temperature	T_{stg}	-40 to +100	$^{\circ}\text{C}$
Operating heatsink temperature	T_h	max.	90 $^{\circ}\text{C}$

P_L for normal operation



P_L for fault condition



Where $P_{Lnom} = P_L$ at $V_B = 13,5$ V; $Z_L = 50$ Ω (BGY23)
and $P_{Lnom} = P_L$ at $V_B = 12,5$ V; $Z_L = 50$ Ω (BGY23A)

CHARACTERISTICS

$T_h = 25\text{ }^\circ\text{C}$ unless otherwise specified

Reference planes at r. f. input and output terminals are 1 mm from the plastic encapsulation.

Frequency range 380-512 MHz; $V_B = 13,5\text{ V}$ (BGY23)

Frequency range 420-480 MHz; $V_B = 12,5\text{ V}$ (BGY23A)

Quiescent current

$P_D = 0$ $I_{BQ} < 5,0\text{ mA}$

Load power

$P_D = 2,5\text{ W}$; $f = 380\text{-}480\text{ MHz}$ BGY23 $P_L 7,0\text{ to }9,5\text{ W}$

$P_D = 2,5\text{ W}$; $f = 480\text{-}512\text{ MHz}$ BGY23 $P_L \text{ typ. } 7,5\text{ W}$

$P_D = 2,5\text{ W}$; $f = 420\text{-}480\text{ MHz}$ BGY23A $P_L 7,0\text{ to }9,5\text{ W}$

Efficiency

$P_D = 2,5\text{ W}$ $\eta > 60\%$

Supply current

$P_D = 2,5\text{ W}$ $I_{tot} \text{ typ. } 900\text{ mA}$

Harmonic content

$P_D = 2,5\text{ W}$ Any harmonic is at least 20 dB down relative to carrier

Input VSWR with respect to 50 Ω

$P_D = 2,5\text{ W}$ $VSWR < 2$

Temperature coefficient of P_L

$P_D = 2,5\text{ W}$; $T_h = 25\text{ to }70\text{ }^\circ\text{C}$ $\text{typ. } -20\text{ mW}/^\circ\text{C}$

Stability

$V_B = 10,5\text{ V to }15\text{ V}$; $P_D = 1\text{ W to }3,5\text{ W}$

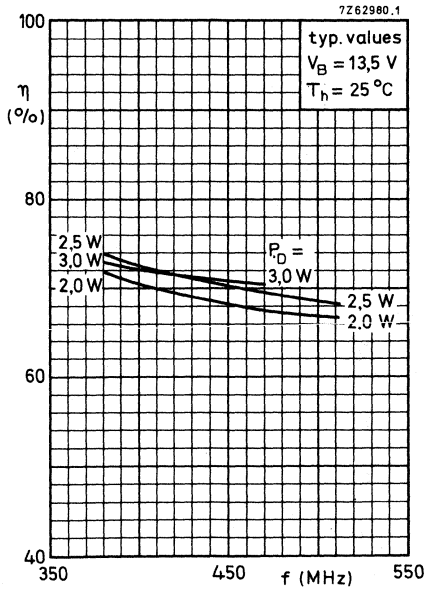
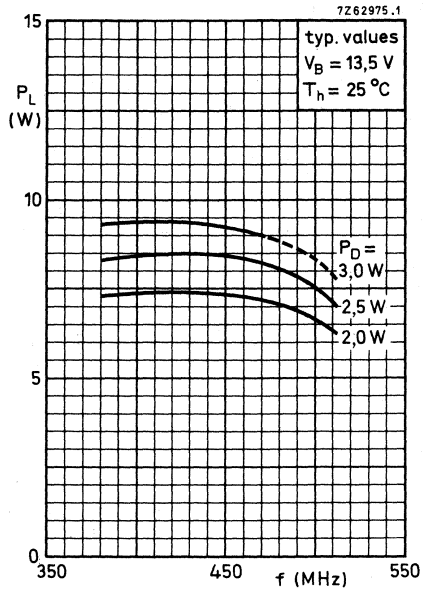
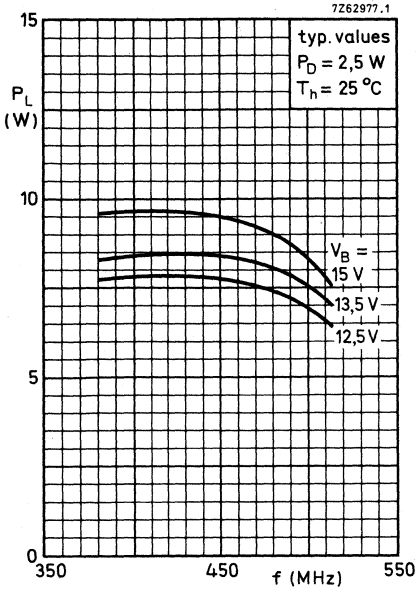
$T_h = -40\text{ }^\circ\text{C to }+90\text{ }^\circ\text{C}$

Output load $VSWR \leq 3$, all phases

Output load $VSWR \leq 10$, all phases

No instabilities
No appreciable
instabilities

BGY23
BGY23A



APPLICATION INFORMATION

R. F. performance in c. w. operation; $T_h = 25\text{ }^\circ\text{C}$

Drive source and load impedance $Z_S = Z_L = 50\ \Omega$

Type number	f (MHz)	V_B (V)	P_D (W)	P_L (W)	η (%)
BGY23	380 to 512	15,0	2,5	typ. 9,0	typ. 65
BGY23	380 to 480	13,5	2,5	> 7,0	> 60
BGY23	380 to 480	13,5	2,5	typ. 8,3	typ. 71
BGY23	480 to 512	13,5	2,5	typ. 7,5	typ. 69
BGY23	380 to 512	12,5	2,5	typ. 7,4	typ. 70
BGY23A	420 to 480	12,5	2,5	> 7,0	> 60

Connection of the BGY22/BGY22A to the BGY23/BGY23A respectively can be either by $50\ \Omega$ transmission line or directly with a total lead length not greater than 2 mm.

The modules are designed to withstand full load mismatch under the following conditions:

$$P_D = P_{Dnom} + 20\%; T_h = 70\text{ }^\circ\text{C}$$

$$V_B = 16,5\text{ V (BGY23)}$$

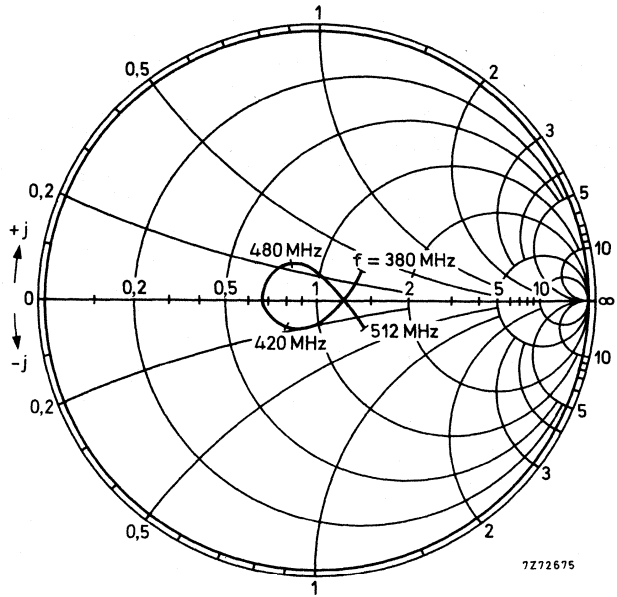
$$V_B = 15,0\text{ V (BGY23A)}$$

$$VSWR = 50\text{ at any phase}$$

where $P_{Dnom} = P_D$ for 7,0 W module output under nominal conditions.



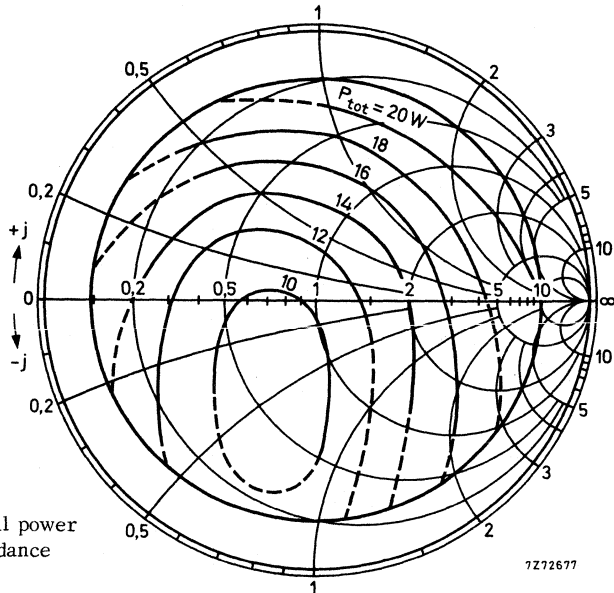
BGY23
BGY23A



$V_B = 13,5 \text{ V}$

$f = 470 \text{ MHz}$

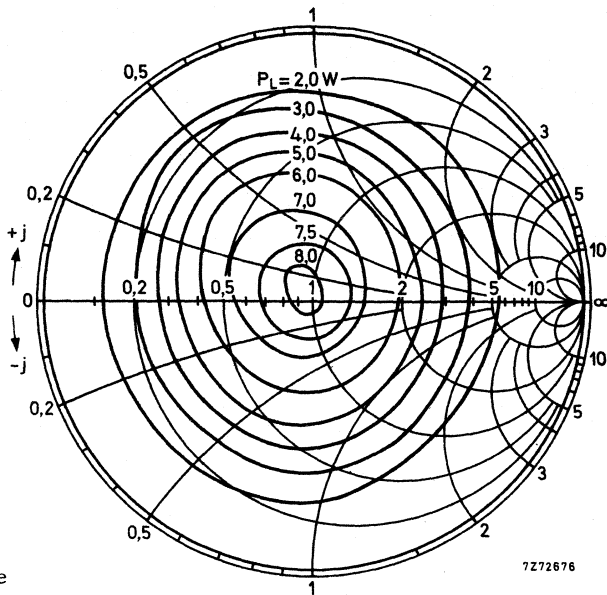
BGY22/23 or
BGY22A/23A
cascaded amplifier



$V_B = 13,5 \text{ V}$

$f = 470 \text{ MHz}$

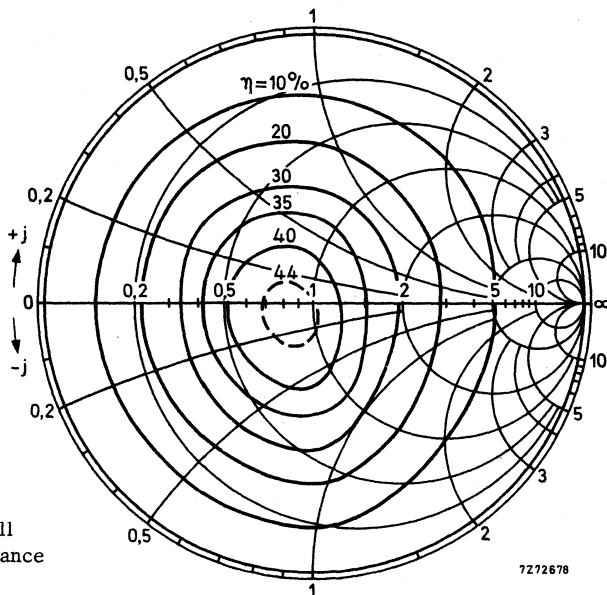
BGY22/23 or
BGY22A/23A
cascaded amplifier



$V_B = 13,5 \text{ V}$

$f = 470 \text{ MHz}$

BGY22/23 or
BGY22A/23A
cascaded amplifier



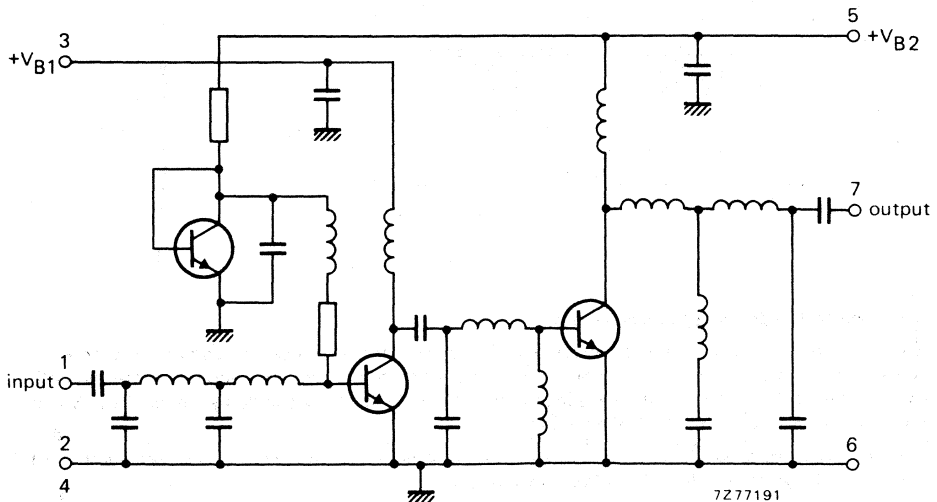
V.H.F. POWER AMPLIFIER MODULES

A range of broadband amplifier modules designed for mobile communications equipments, operating directly from 12 V vehicle electrical systems. The devices will produce 18 W output into a 50 Ω load. The modules consist of a two stage r.f. amplifier using n-p-n transistor chips, together with lumped-element matching components.

QUICK REFERENCE DATA

type number	mode of operation	frequency range f (MHz)	nominal supply voltages $V_{B1} = V_{B2}$ (V)	drive power P_D (mW)	load power P_L (W)	nominal input impedance z_i (Ω)	nominal load impedance Z_L (Ω)
BGY32	c.w.	68 to 88	12,5	100	> 18 typ 23	50	50
BGY33	c.w.	80 to 108	12,5	100	> 18 typ 22	50	50
BGY35	c.w.	132 to 156	12,5	150	> 18 typ 22	50	50
BGY36	c.w.	148 to 174	12,5	150	> 18 typ 21	50	50

CIRCUIT DIAGRAM

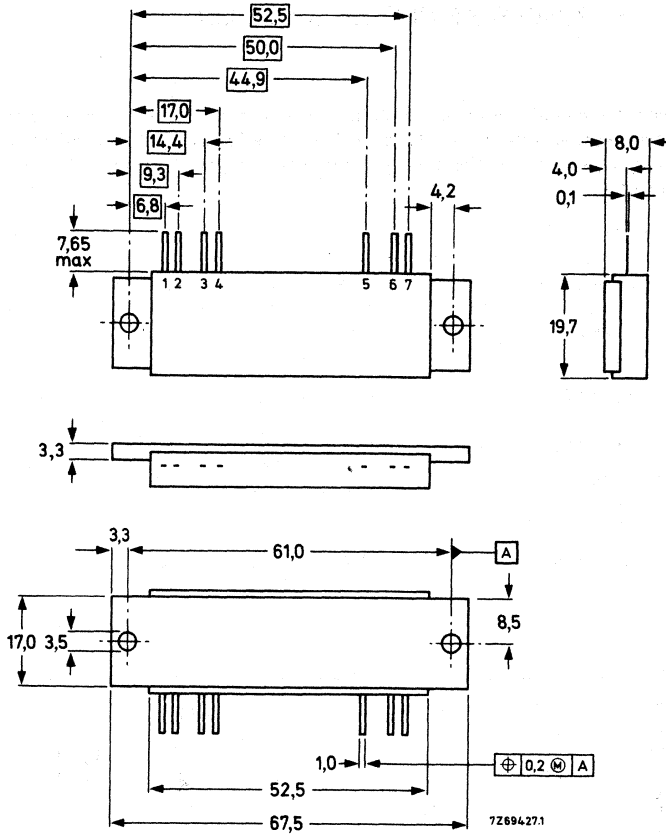


CAUTION These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that they are not dismantled.

MECHANICAL DATA

Fig. 1 SOT-132.

Dimensions in mm



Lead reference

- 1 = Input
- 2 = Earth
- 3 = Supply +V_{B1}
- 4 = Earth
- 5 = Supply +V_{B2}
- 6 = Earth
- 7 = Output

Mounting and soldering recommendations

To ensure good thermal transfer the module should be mounted using heatsink compound onto a heatsink with a flat surface; if an isolation washer is used heatsink compound should be used on both sides of the insulator. Burrs and thickening of the holes in the heatsink should be removed and 3 mm bolts tightened to torques of 0,5 Nm minimum.

Devices may be soldered directly into a circuit with a soldering iron at maximum iron temperature of 245 °C for 10 seconds at least 1 mm from the plastic.

RATINGS

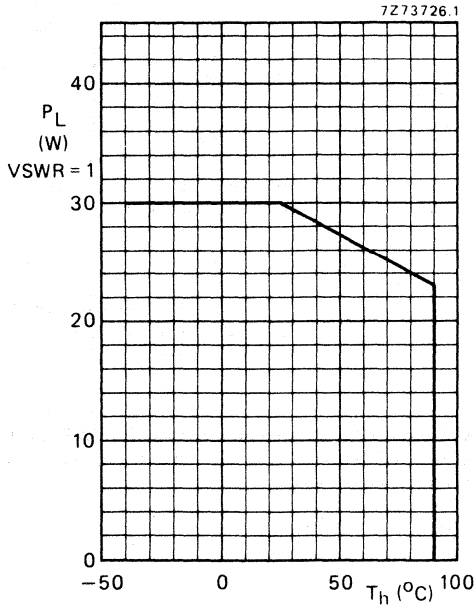
Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. voltages (with respect to flange)

D.C. supply terminals	V_{B1} and V_{B2}	max	15 V
R.F. input terminal	$\pm V_I$	max	25 V
R.F. output terminal	$\pm V_O$	max	25 V

Power

Input drive power BGY32 and BGY33	P_D	max	200 mW
Input drive power BGY35 and BGY36	P_D	max	300 mW
Load power	P_L	max	30 W



Temperatures

Storage temperature	T_{stg}	-40 to 100 °C
Operating heatsink temperature	T_h	max 90 °C

CHARACTERISTICS

$T_h = 25\text{ }^\circ\text{C}$

Quiescent current

$V_{B1} = V_{B2} = 12,5\text{ V}; P_D = 0;$

$R_S = R_L = 50\ \Omega$

Frequency range

Load power

$V_{B1} = V_{B2} = 12,5\text{ V}; R_S = R_L = 50\ \Omega$

BGY32 and BGY33; $P_D = 100\text{ mW}$

BGY35 and BGY36; $P_D = 150\text{ mW}$

		BGY32	BGY33	BGY35	BGY36
I_{BQ1}	typ	6	6	6	6 mA
	I_{BQ2}	13	13	13	13 mA
f	>	68	80	132	148 MHz
	<	88	108	156	174 MHz
P_L	>	18	18	—	— W
	typ	23	22	—	— W
η	>	40	40	—	— %
	typ	50	50	—	— %
P_L	>	—	—	18	18 W
	typ	—	—	22	21 W
η	>	—	—	40	40 %
	typ	—	—	50	50 %

Harmonic output

Any single harmonic will be at least 25 dB down relative to carrier

Input VSWR with respect to 50 Ω

typ 1,5

Stability

The module is stable with load VSWR up to 3 (all phases) when operated with matched output power greater than 6 W.

Ruggedness

The modules are capable of withstanding load mismatch of up to 50 VSWR for short period overload conditions, with P_D , V_{B1} and V_{B2} at maximum values providing the combination does not result in the matched r.f. output power rating being exceeded.

APPLICATION INFORMATION

Supply

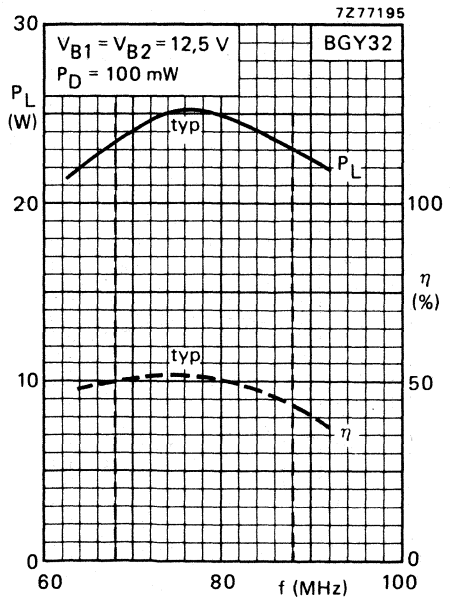
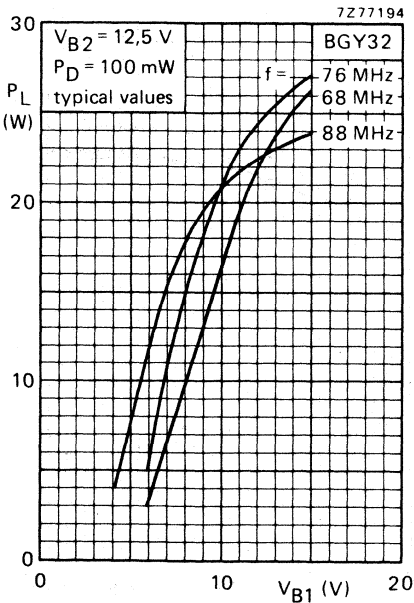
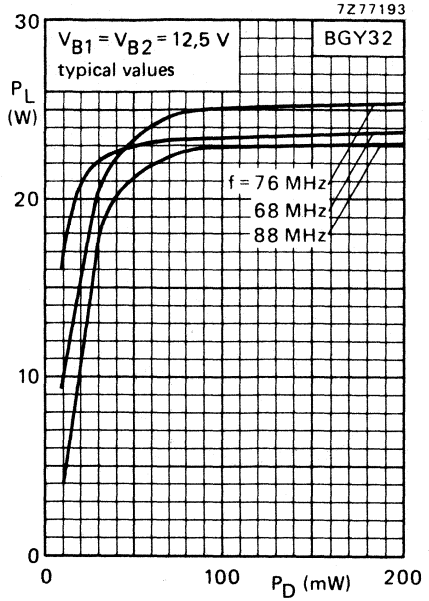
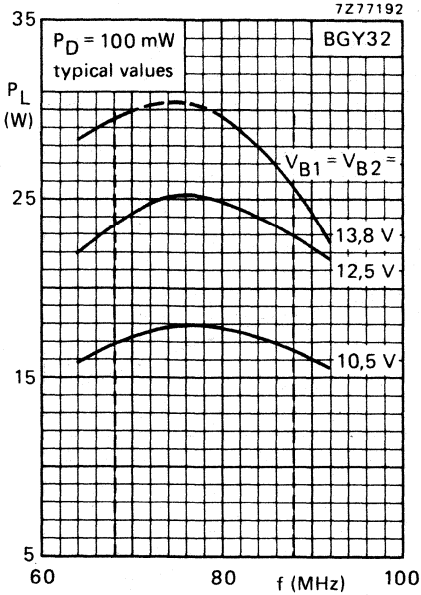
An electrolytic capacitor of 10 μF (25 V), in parallel with a polyester capacitor of 100 nF to earth, is recommended as decoupling arrangement for each power supply pin.

Power rating

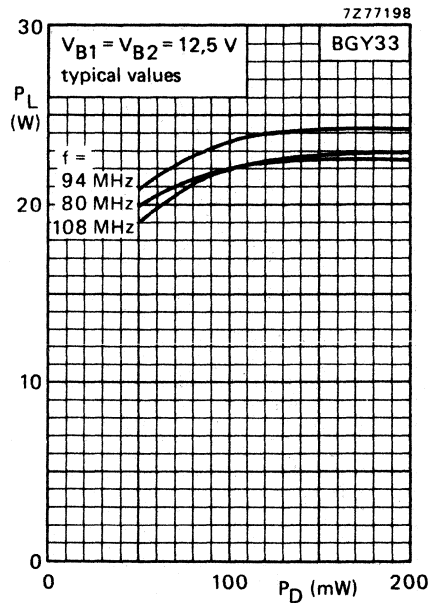
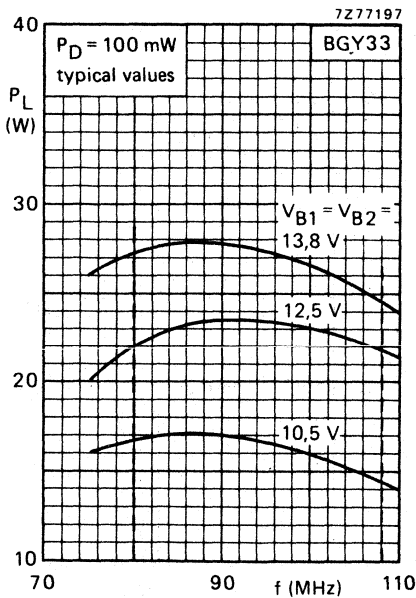
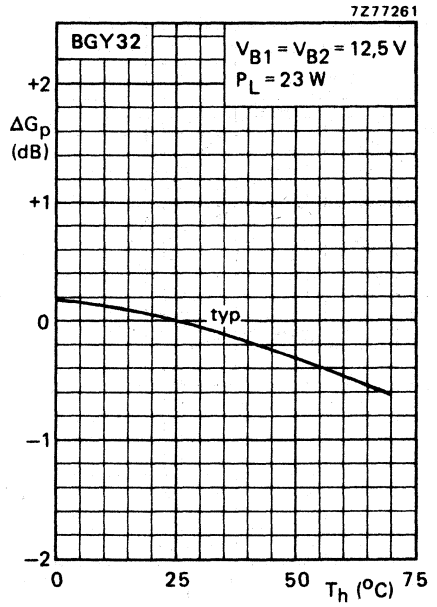
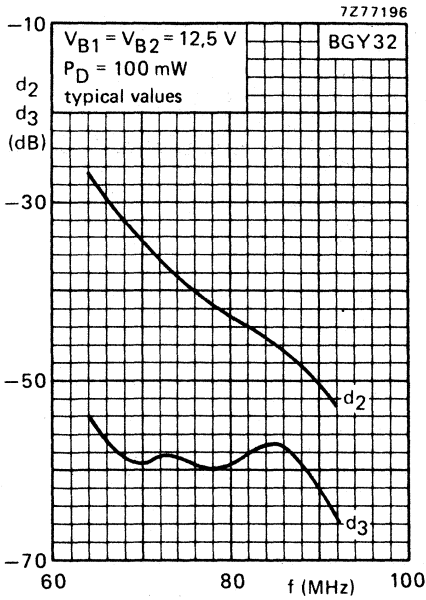
In general it is recommended that the output power from the module under nominal design conditions should not exceed 23 W in order to provide adequate safety margin under fault conditions.

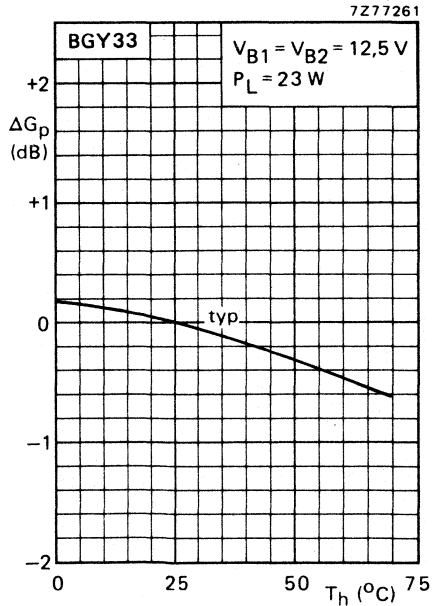
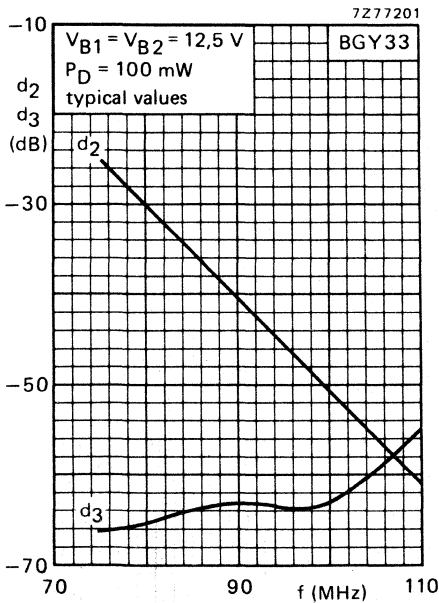
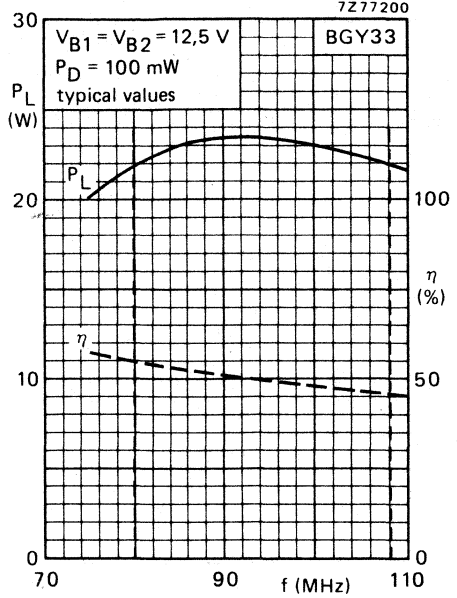
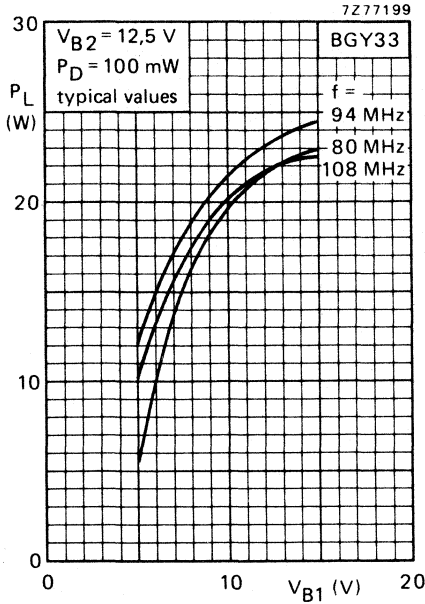
Gain control

Power output can be controlled by variation of the driver stage supply voltage V_{B1} . The supply required is a voltage regulator with a current rating of 0,75 A, and an output voltage range of 3 V to 12 V.

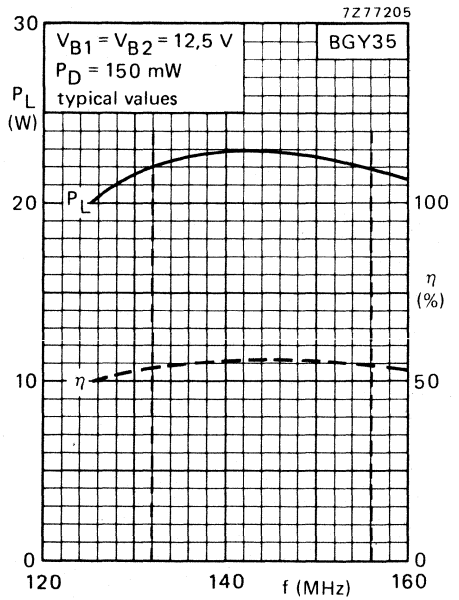
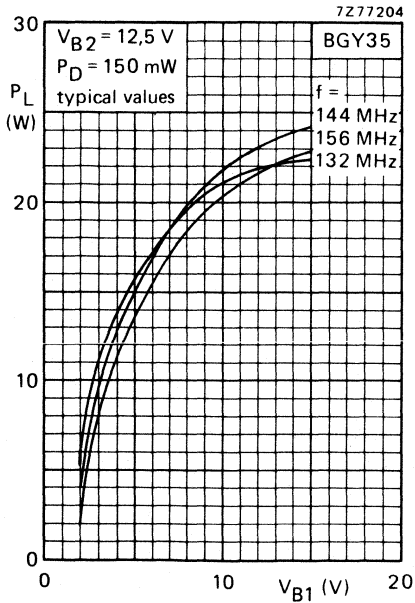
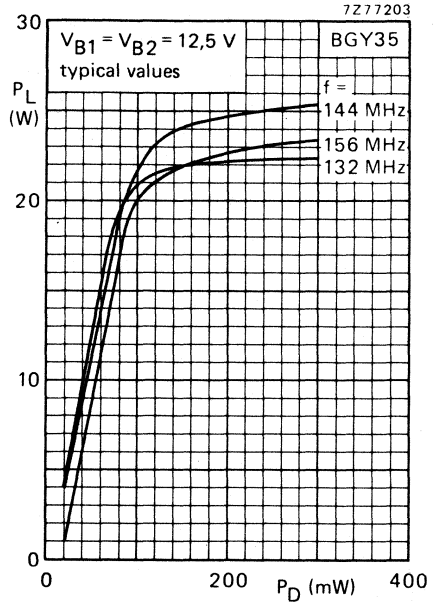
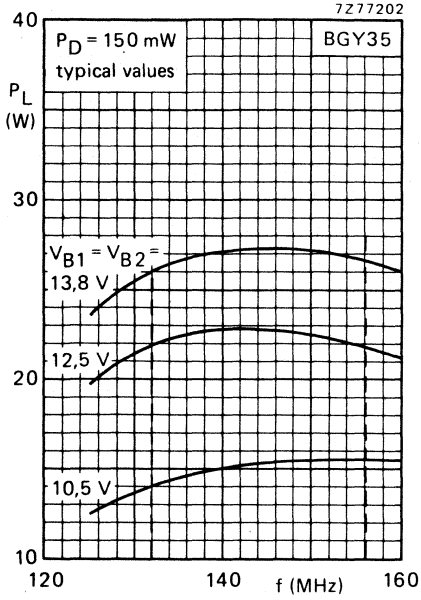


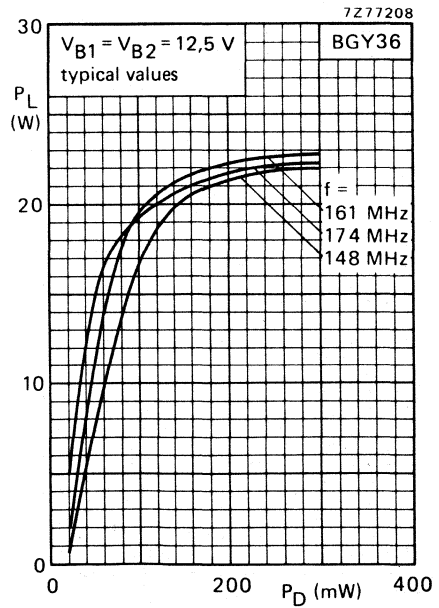
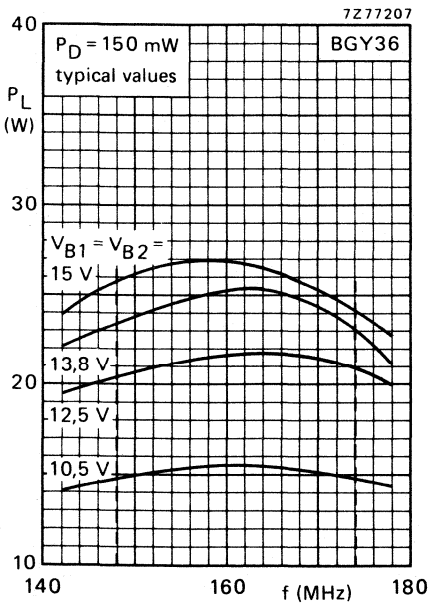
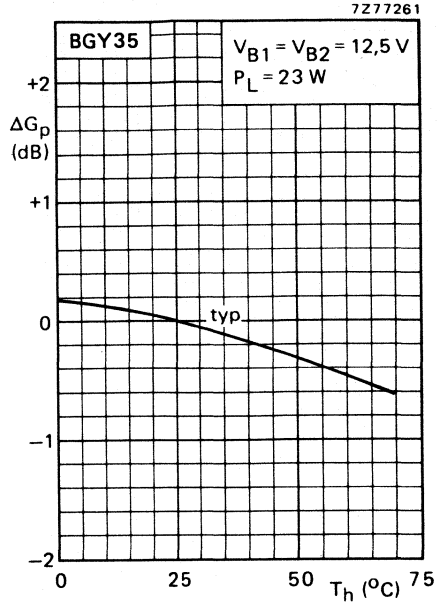
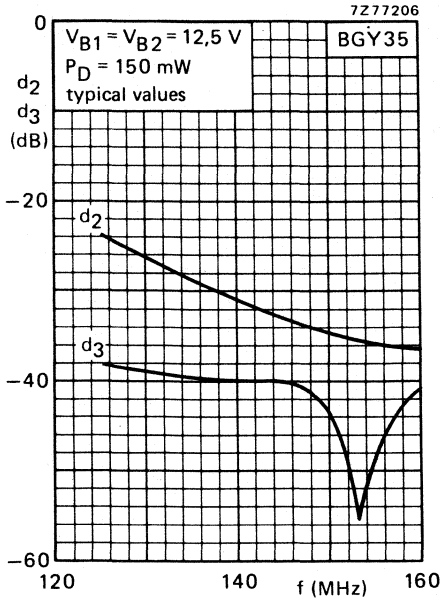
BGY32 BGY33
BGY35 BGY36

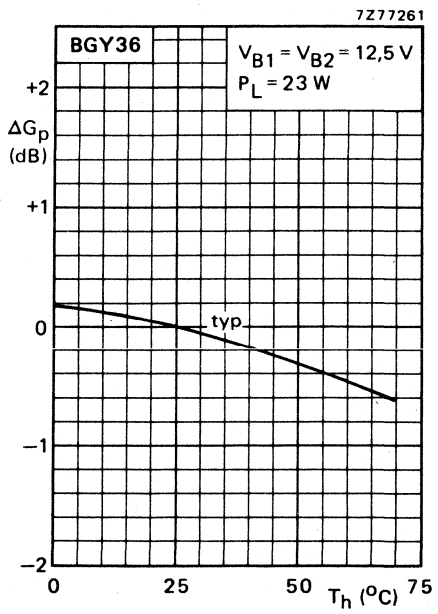
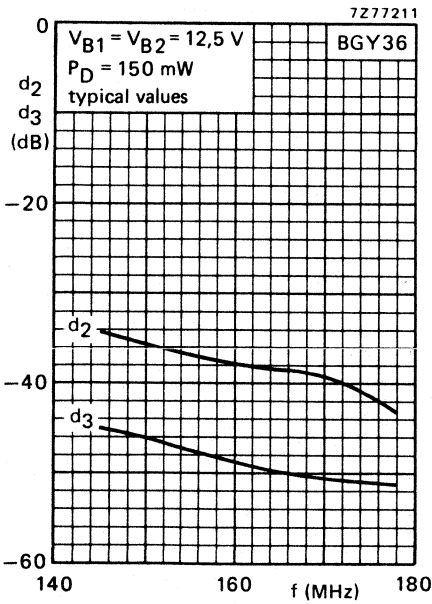
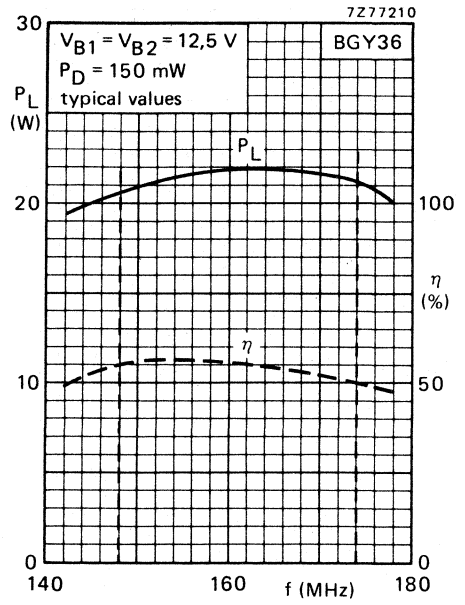
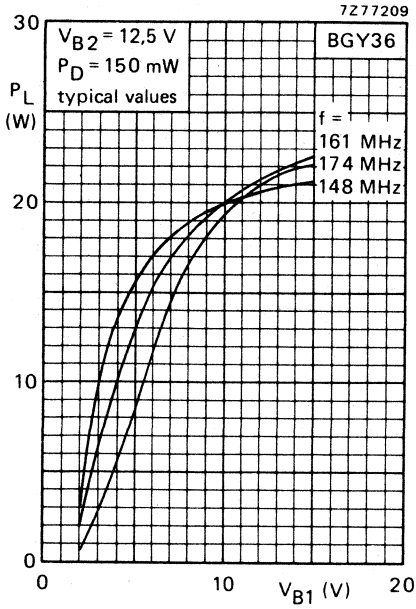




BGY32 BGY33
BGY35 BGY36







DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

BLV10

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

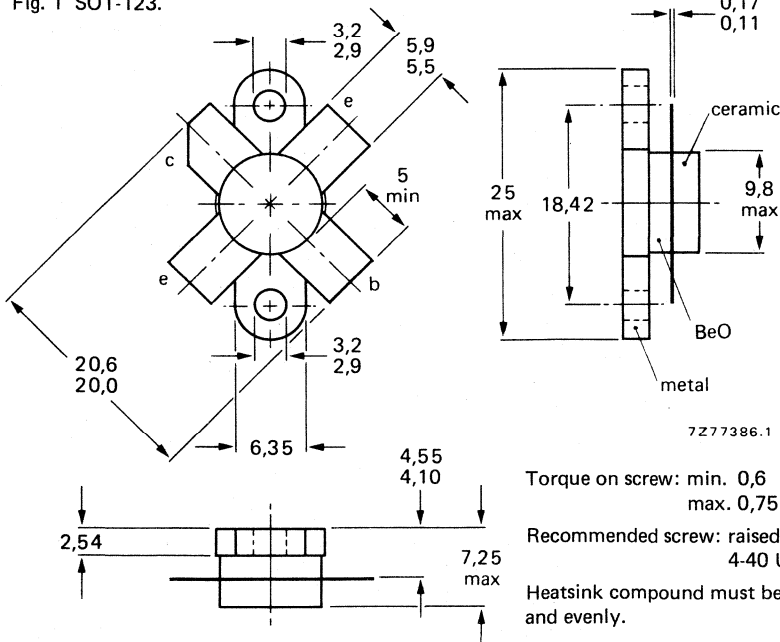
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	13,5	175	8	> 9,0	> 70	2,8 + j1,2	76 - j16
c.w.	12,5	175	8	typ. 10,5	typ. 75	-	-

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: raised cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 18 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 1,5 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 4,0 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rff} max. 20 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

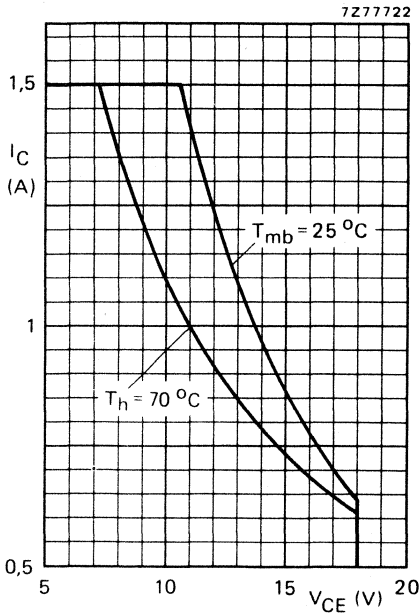


Fig. 2 D.C. SOAR.

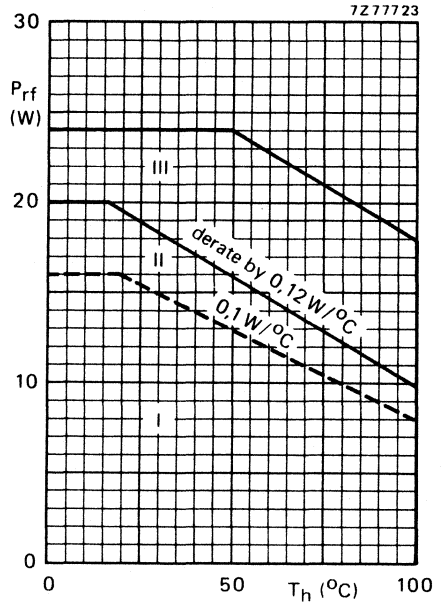


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 8 W; $T_{mb} = 72,4$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb(dc)}$ = 10,7 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb(rf)}$ = 8,6 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 5\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 1\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 2\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 0,5\text{ MJ}$ $R_{BE} = 10\text{ }\Omega$ $E_{SBR} > 0,5\text{ MJ}$

D.C. current gain *

 $I_C = 0,75\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 100

Collector-emitter saturation voltage *

 $I_C = 2\text{ A}; I_B = 0,4\text{ A}$ V_{CEsat} typ. 0,85 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 0,75\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 950 MHz $-I_E = 2\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 850 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 13,5\text{ V}$ C_C typ. 16,5 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 13,5\text{ V}$ C_{re} typ. 12 pF

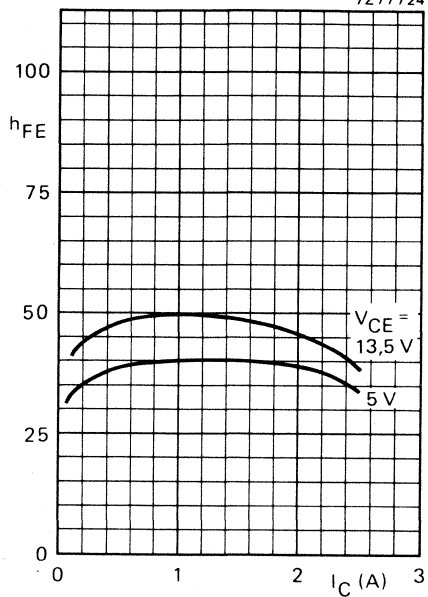
Collector-flange capacitance

 C_{cf} typ. 2 pF

DEVELOPMENT SAMPLE DATA

* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

7277724



7277725

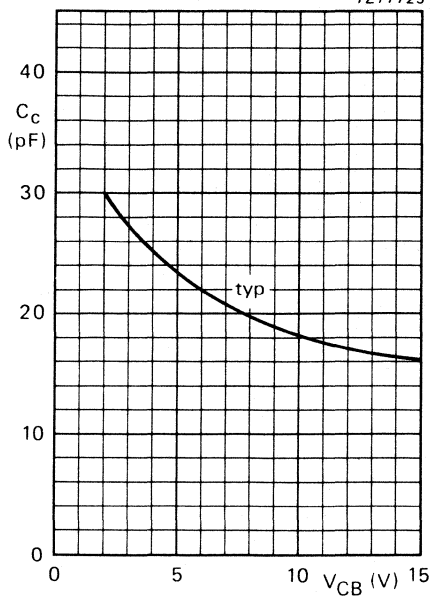


Fig. 4 Typical values; $T_j = 25^\circ C$.

Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

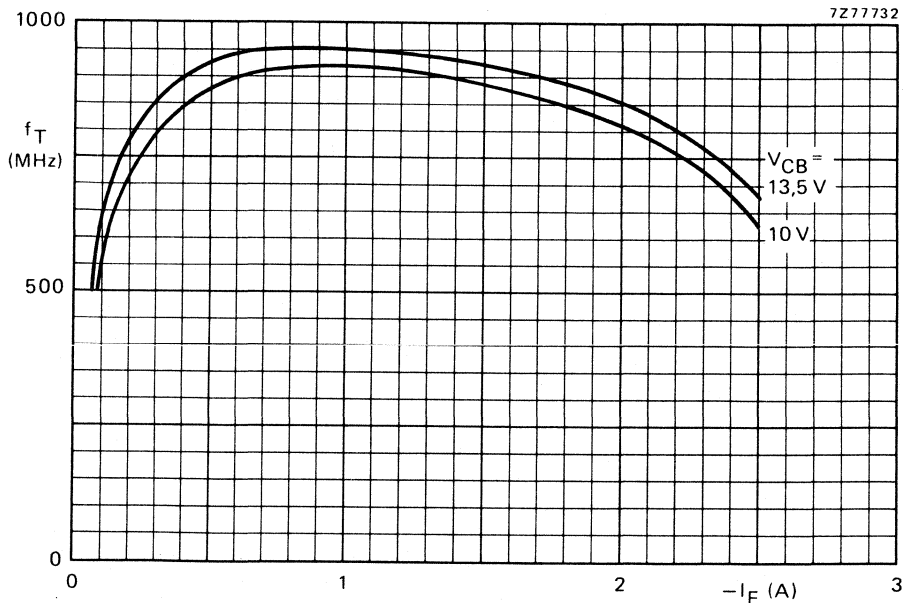


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ C$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

$T_h = 25^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	8	< 1,0	> 9,0	< 0,85	> 70	2,8 + j1,2	76 - j16
175	12,5	8	-	typ. 10,5	-	typ. 75	-	-

DEVELOPMENT SAMPLE DATA

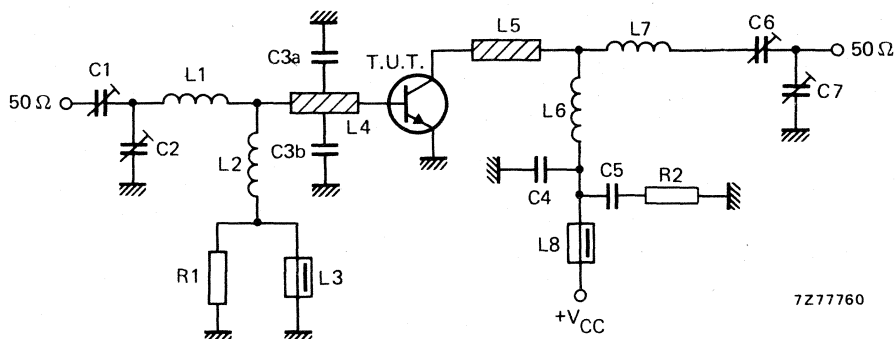


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 5,7 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 7,5 mm; leads 2 x 5 mm

L7 = 3 turns Cu wire (1,6 mm); int. dia. 6,5 mm; length 7,4 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

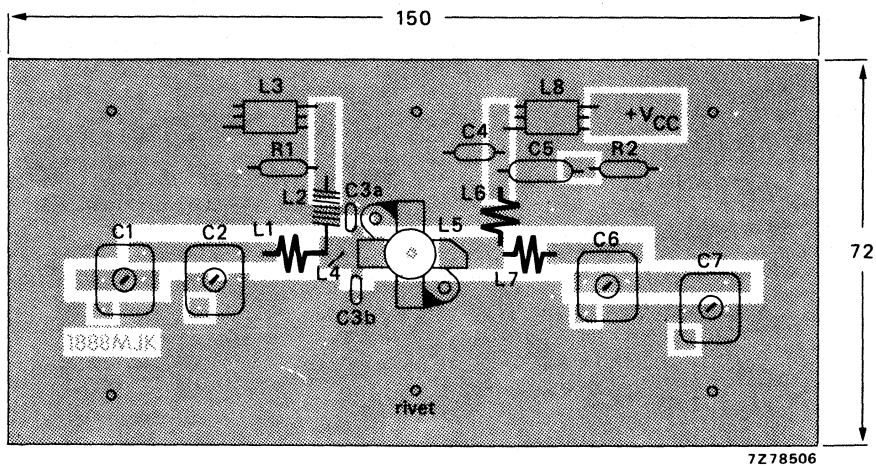
R1 = 10 Ω carbon resistor

R2 = 4,7 Ω carbon resistor

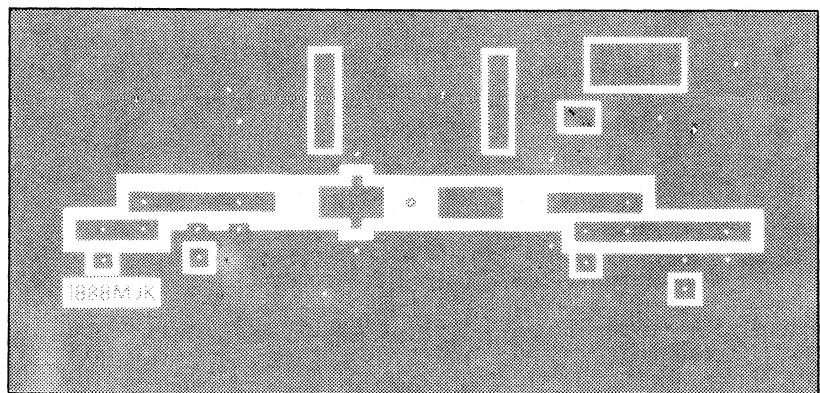
Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.

7Z77760





7Z78506



7Z78508

Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

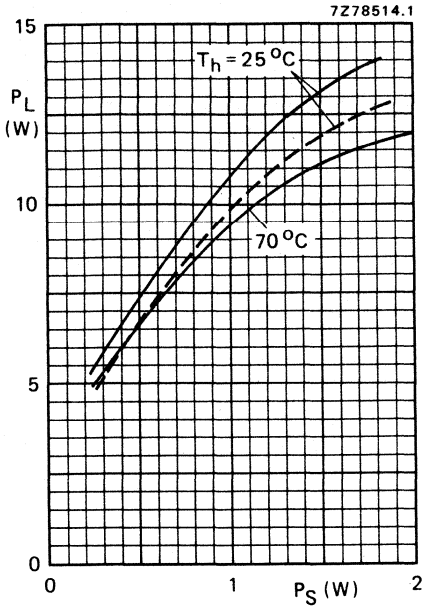


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; --- $V_{CE} = 12,5 \text{ V}$.

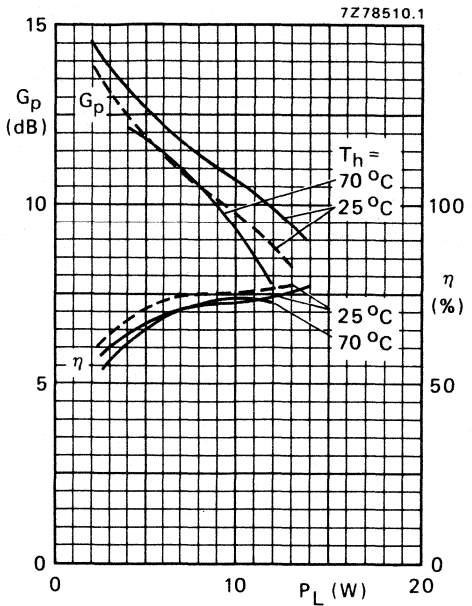


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; --- $V_{CE} = 12,5 \text{ V}$.

DEVELOPMENT I SAMPLE DATA

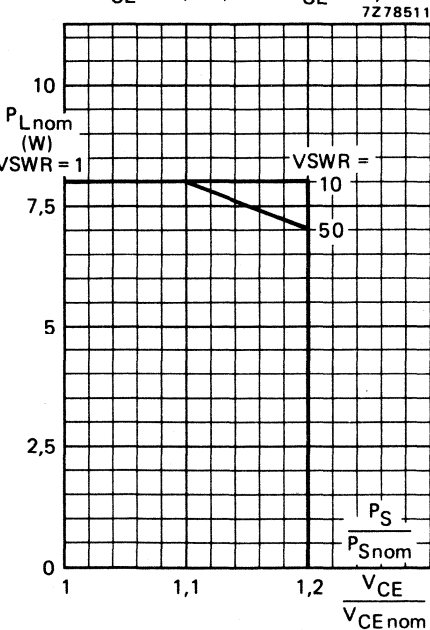


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,3 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

Note to Fig. 11:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

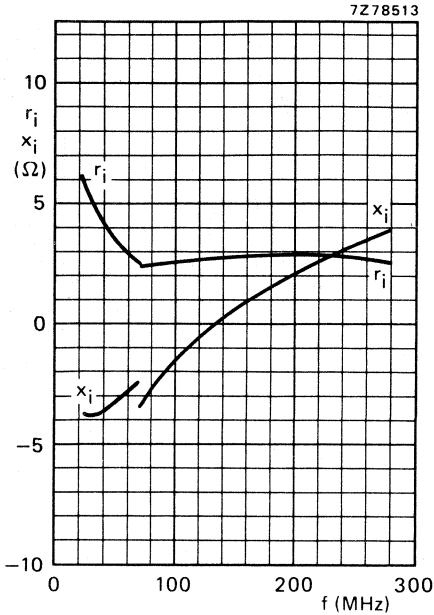


Fig. 12 Input impedance (series components).

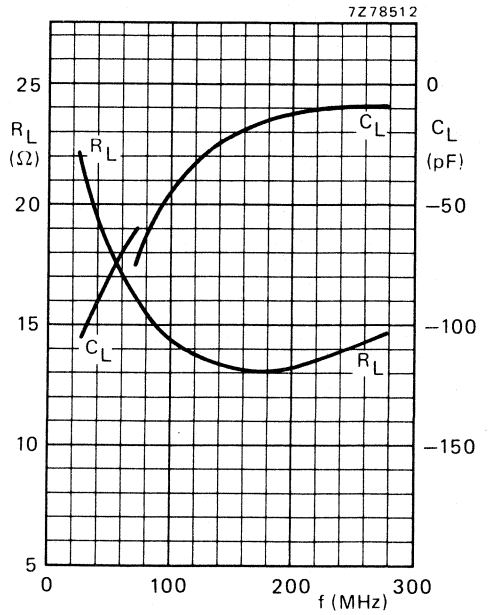


Fig. 13 Load impedance (parallel components).

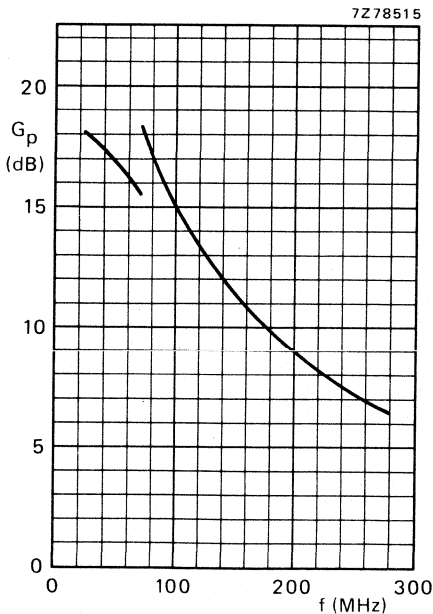


Fig. 14.

Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 13,5 \text{ V}$; $P_L = 8 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

OPERATING NOTE

Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation.
 This resistor must be effective for r.f. only.

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

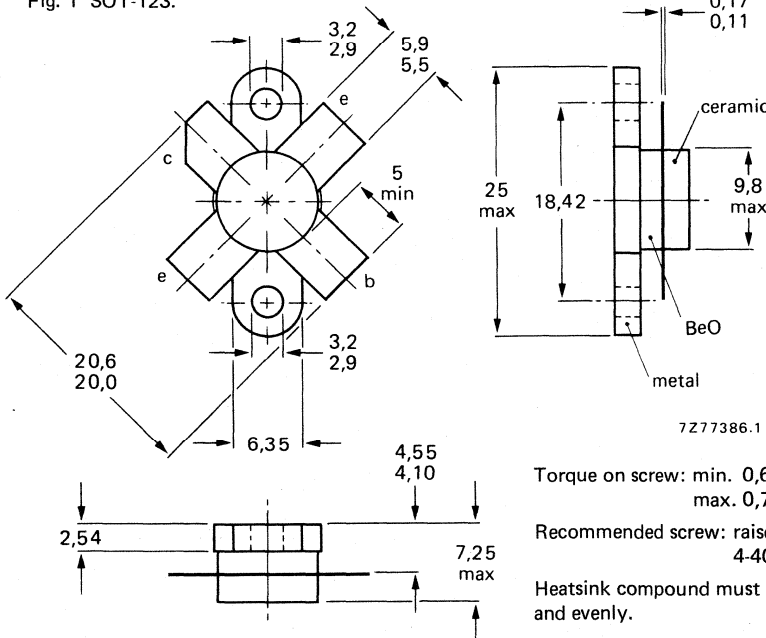
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	13,5	175	15	> 8,0	> 60	2,3 + j2,2	130 - j4,4
c.w.	12,5	175	15	typ. 7,5	typ. 67	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_C(AV)$	max.	3 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	8 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	36 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

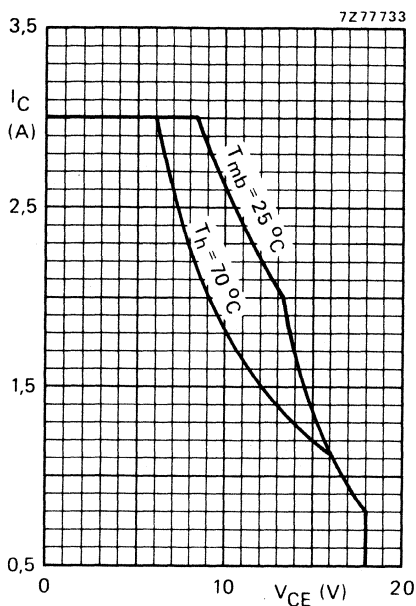


Fig. 2 D.C. SOAR.

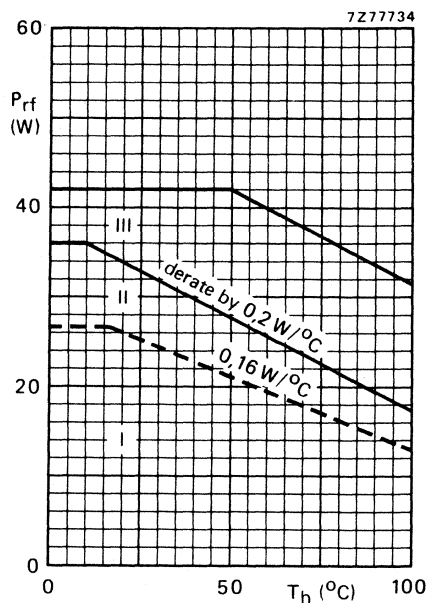


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 15 W; $T_{mb} = 74,5$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th j-mb(dc)}$	=	6,55 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th j-mb(rf)}$	=	4,95 °C/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,3 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 10\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 4\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 4\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 2,5\text{ mJ}$ $R_{BE} = 10\ \Omega$ $E_{SBR} > 2,5\text{ mJ}$

D.C. current gain *

 $I_C = 1,5\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 100

Collector-emitter saturation voltage *

 $I_C = 4,5\text{ A}; I_B = 0,9\text{ A}$ V_{CEsat} typ. 1,0 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 1,5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 850 MHz $-I_E = 4,5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 800 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_E = 0; V_{CB} = 13,5\text{ V}$ C_c typ. 32 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 200\text{ mA}; V_{CE} = 13,5\text{ V}$ C_{re} typ. 23 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF

DEVELOPMENT I SAMPLE DATA

* Measured under pulse conditions: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

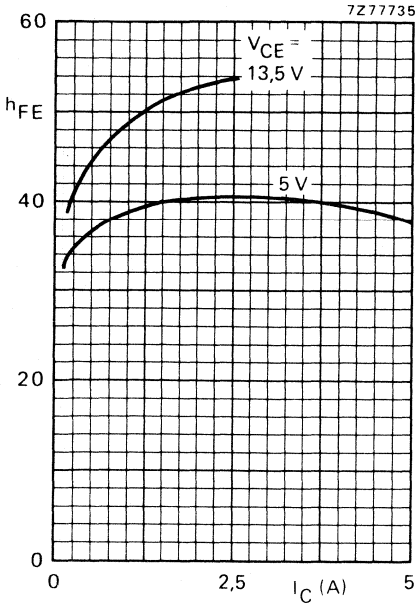


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

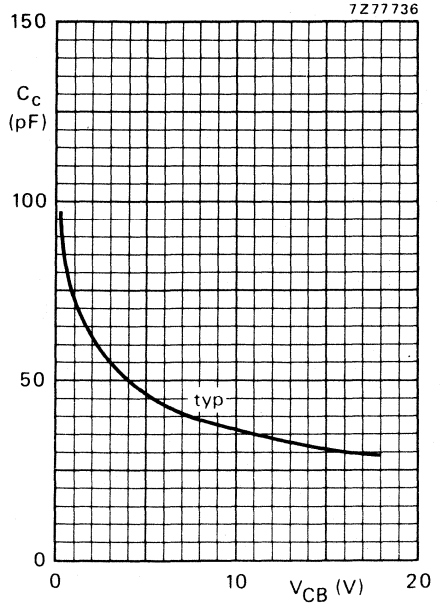


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

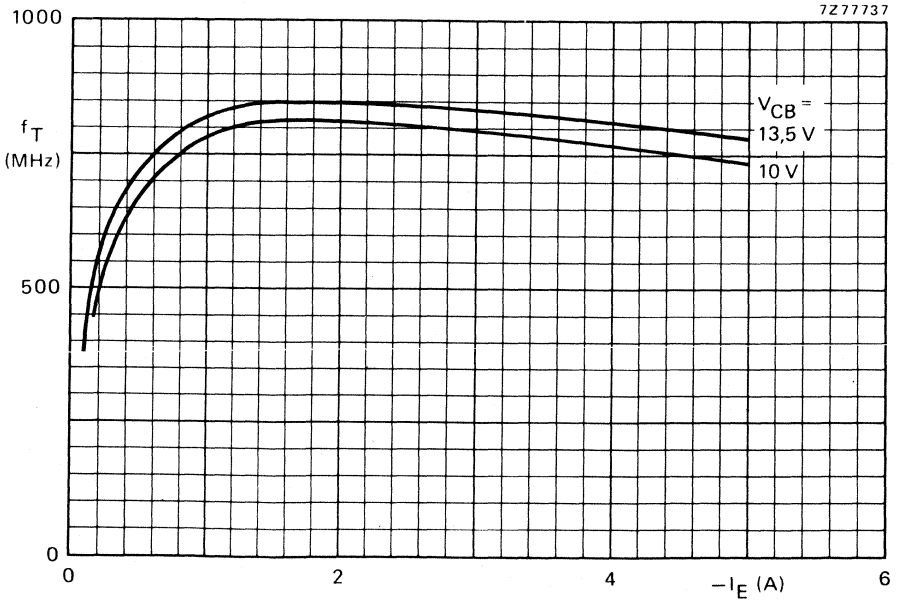


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	15	< 2,4	> 8,0	< 1,85	> 60	$2,3 + j2,2$	$130 - j4,4$
175	12,5	15	—	typ. 7,5	—	typ. 67	—	—

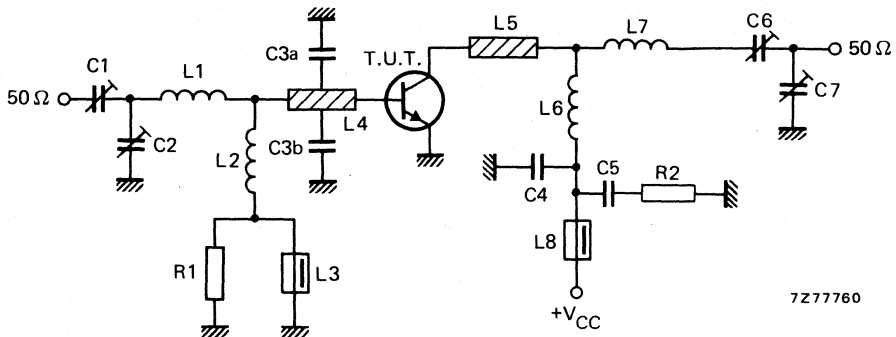


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 5,7 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 7,5 mm; leads 2 x 5 mm

L7 = 3 turns Cu wire (1,6 mm); int. dia. 6,5 mm; length 7,4 mm; leads 2 x 5 mm

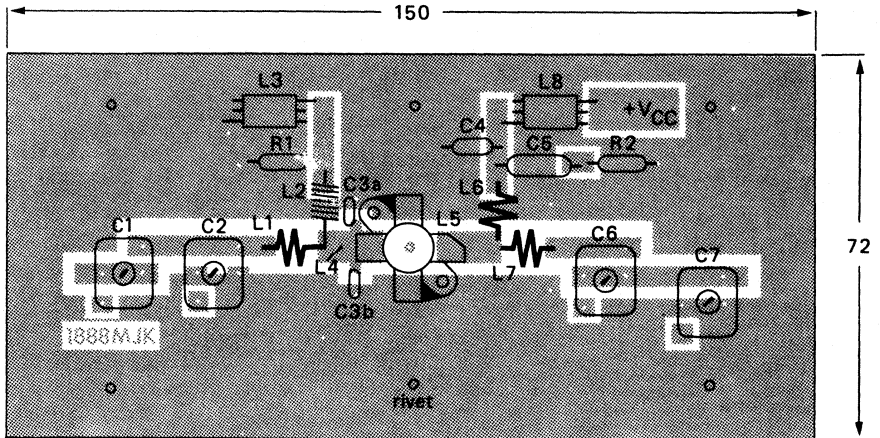
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistorR2 = 4,7 Ω carbon resistor

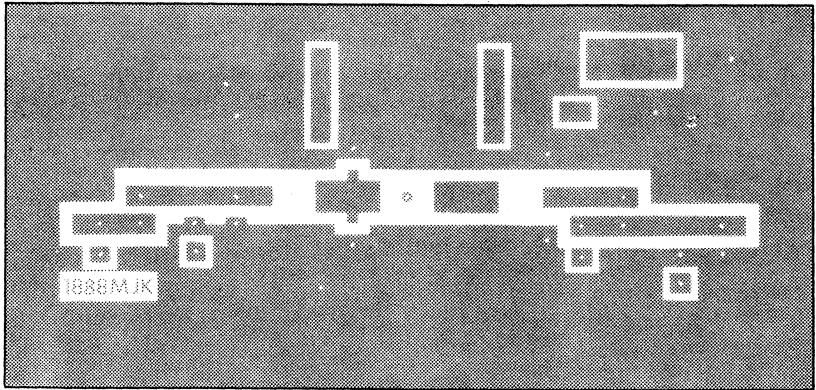
Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



7277760



7Z78506



7Z78508

Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

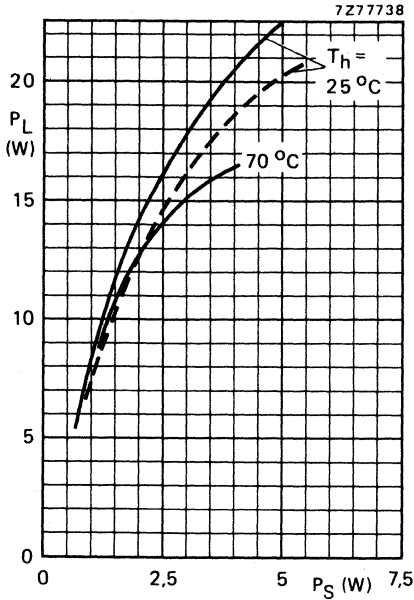


Fig. 9 Typical values; $f = 175\text{ MHz}$;
 — $V_{CE} = 13.5\text{ V}$; - - - $V_{CE} = 12.5\text{ V}$.

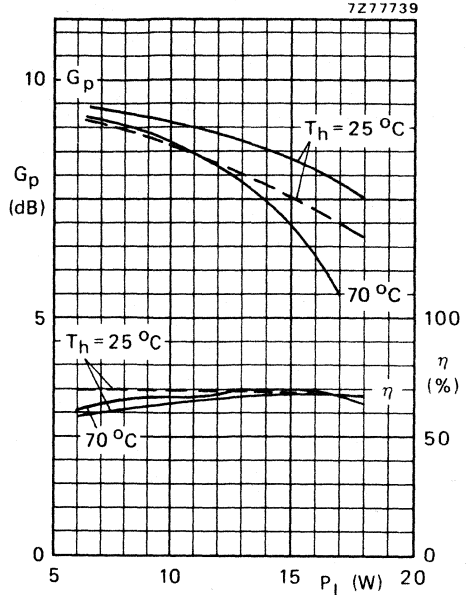


Fig. 10 Typical values; $f = 175\text{ MHz}$;
 — $V_{CE} = 13.5\text{ V}$; - - - $V_{CE} = 12.5\text{ V}$.

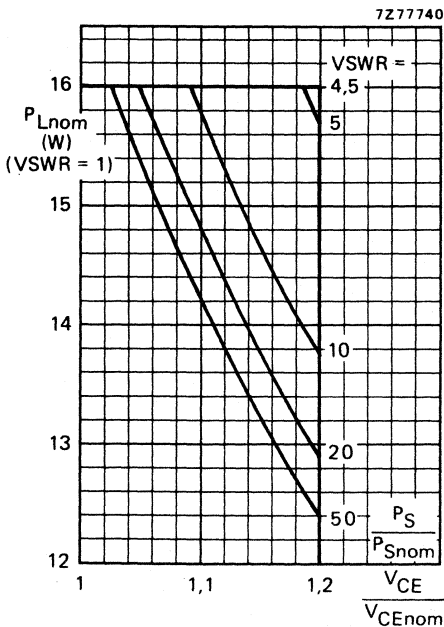


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175\text{ MHz}$; $T_h = 70^\circ\text{C}$;
 $R_{th\text{ mb-h}} = 0.3^\circ\text{C/W}$; $V_{CEnom} = 13.5\text{ V}$ or 12.5 V ; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

Note to Fig. 11:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

DEVELOPMENT JOURNAL



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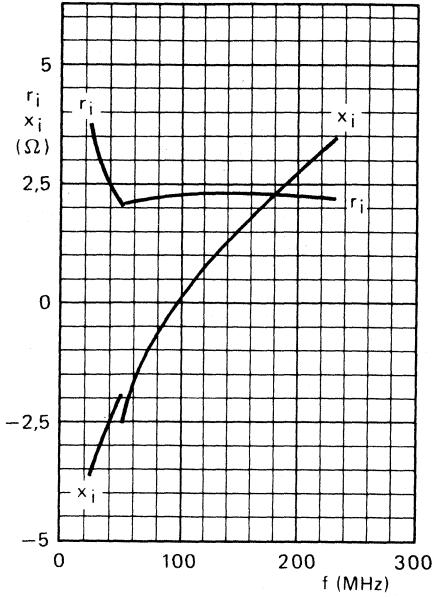


Fig. 12 Input impedance (series components).

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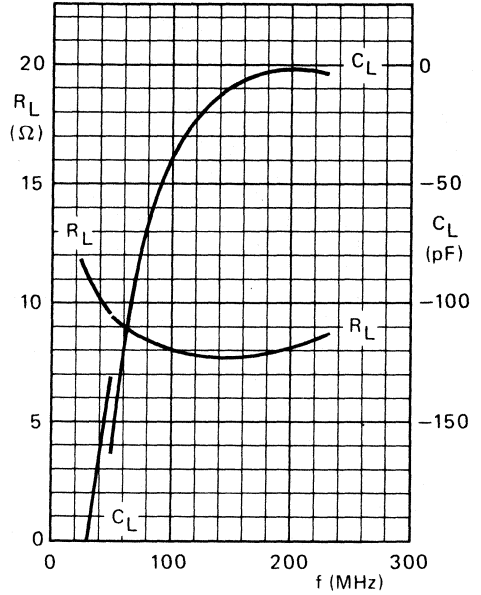
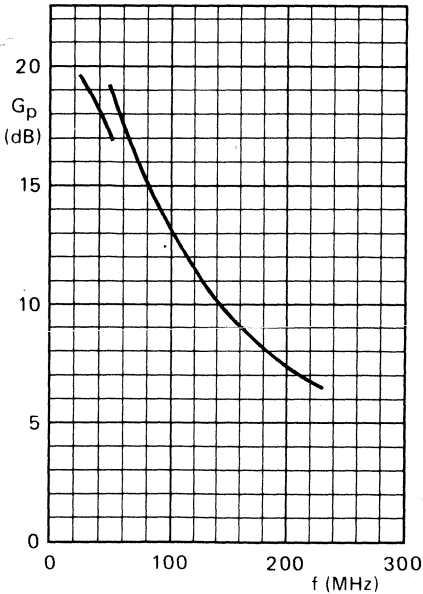


Fig. 13 Load impedance (parallel components).

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Conditions for Figs 12, 13 and 14:

Typical values: $V_{CE} = 13,5 \text{ V}$; $P_L = 15 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

OPERATING NOTE

Below 50 MHz a base-emitter resistor of 10Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

Fig. 14.

DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

BLV20

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

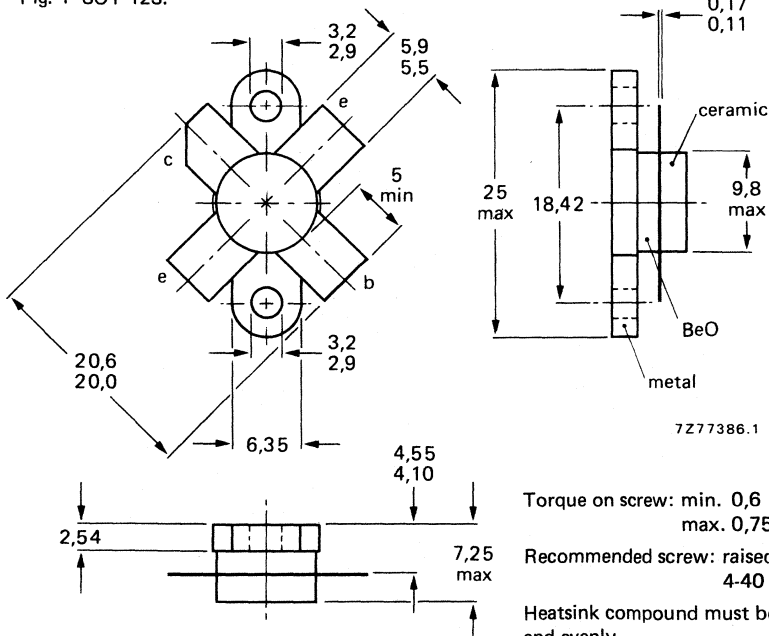
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	28	175	8	> 12	> 65	$1,8 + j0,7$	$18 - j20$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 0,9 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 2,5 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 20 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

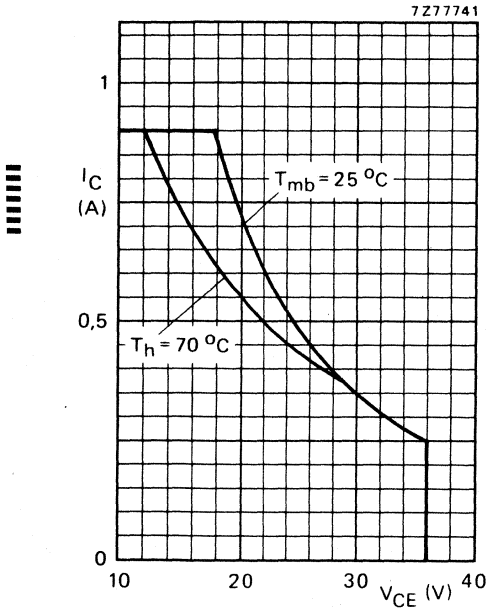


Fig. 2 D.C. SOAR.

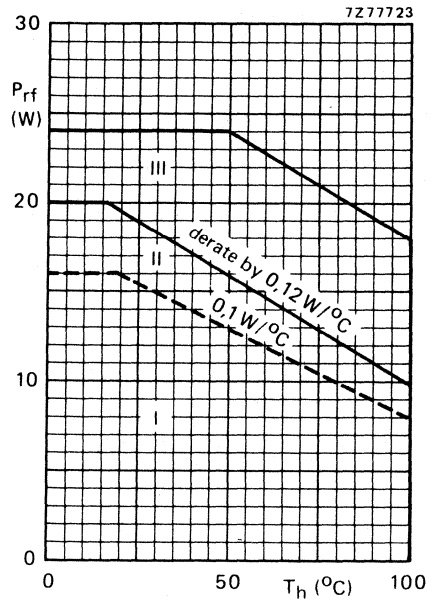


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 8 W; $T_{mb} = 72,4$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb(dc)}$ = 10,7 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb(rf)}$ = 8,6 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 2\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 10\text{ mA}$ $V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 1\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 36\text{ V}$ $I_{CES} < 1\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 0,5\text{ mJ}$ $R_{BE} = 10\ \Omega$ $E_{SBR} > 0,5\text{ mJ}$

D.C. current gain *

 $I_C = 0,4\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 50
10 to 100

Collector-emitter saturation voltage *

 $I_C = 1,25\text{ A}; I_B = 0,25\text{ A}$ V_{CEsat} typ. 0,8 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 0,4\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 600 MHz $-I_E = 1,25\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 520 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ C_c typ. 10 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 28\text{ V}$ C_{re} typ. 7,1 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF

D L V L L U T W E I N I S A M P L E D A T A

* Measured under pulse conditions: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

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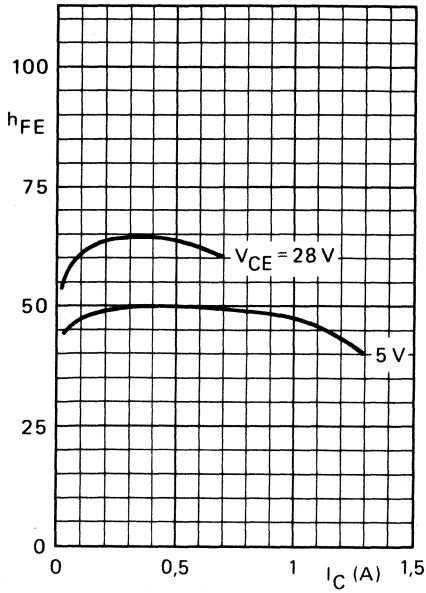


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

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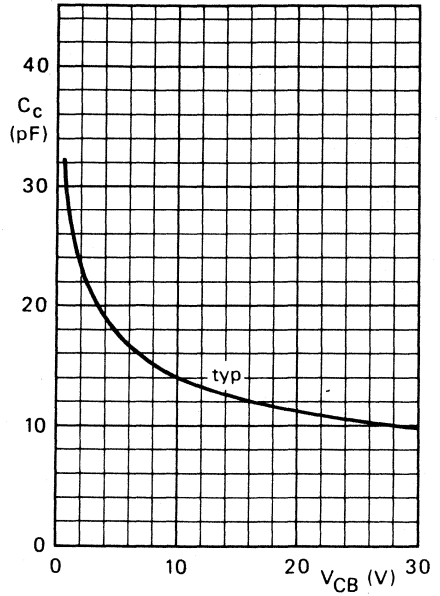


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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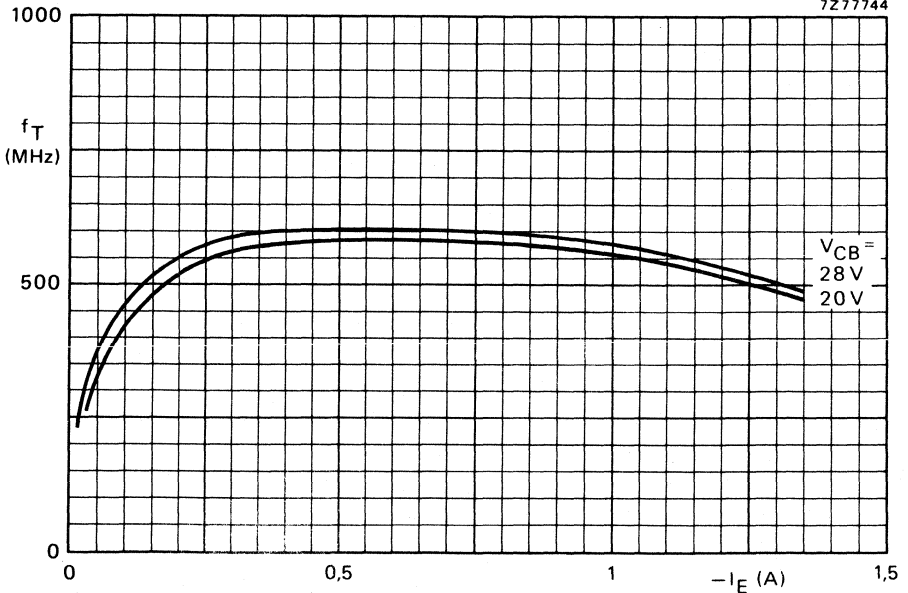


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.



APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	28	8	< 0,5	> 12	< 0,44	> 65	$1,8 + j0,7$	$18 - j20$

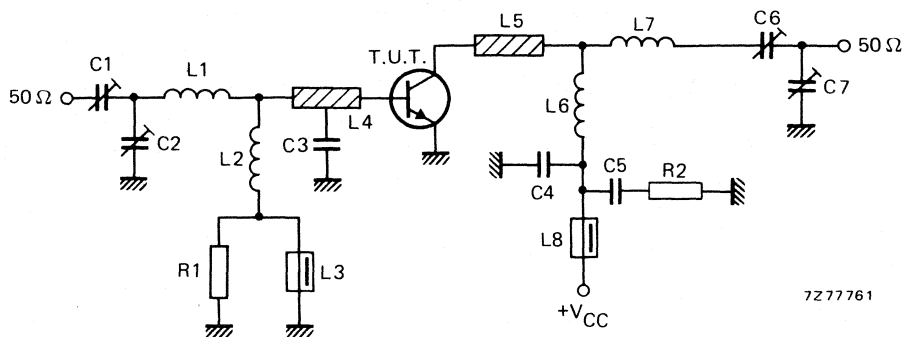


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C6 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor

L6 = 6 turns enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; length 9,2 mm; leads 2 x 5 mm

L7 = 4 turns enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; length 5,0 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistorR2 = 4,7 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



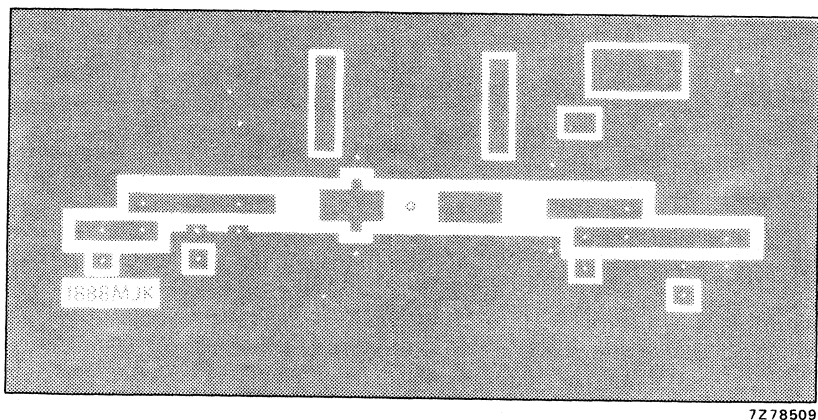
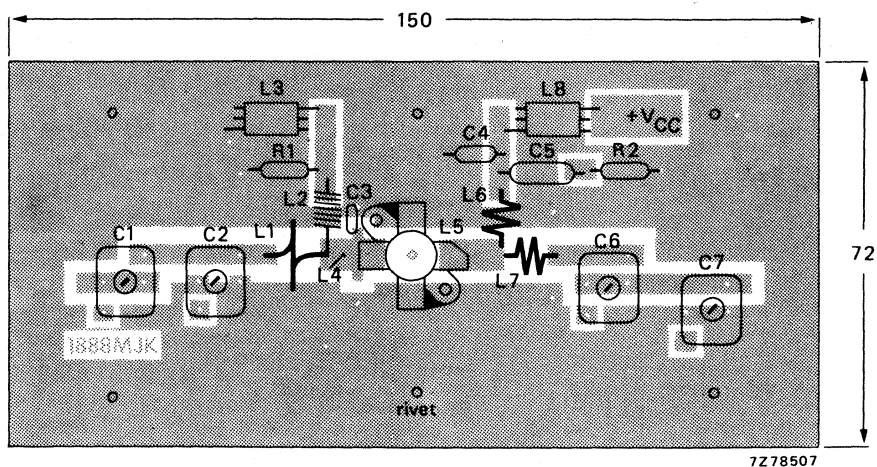


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

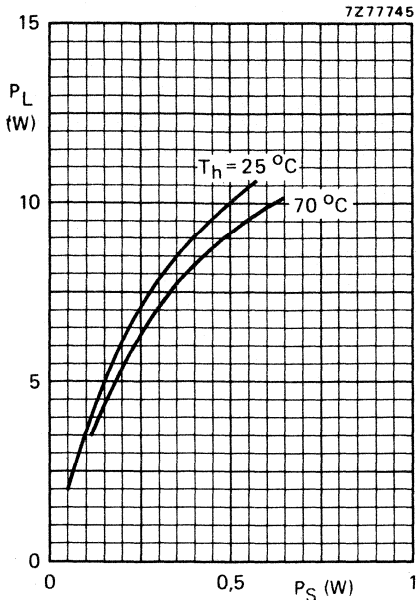


Fig. 9 Typical values; $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$.

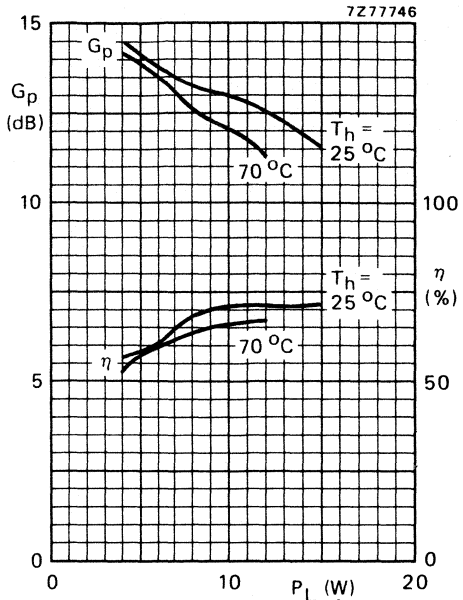


Fig. 10 Typical values; $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$.

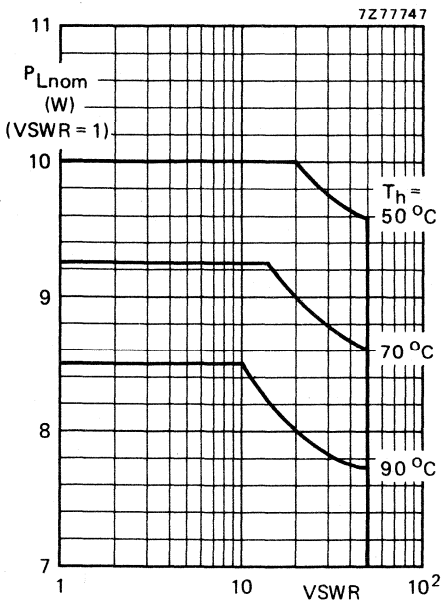


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $R_{th \text{ mb-h}} = 0,3 \text{ } ^\circ\text{C/W}$. The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

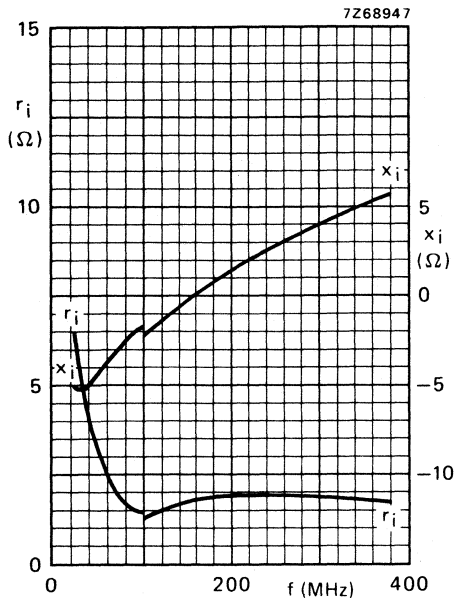


Fig. 12 Input impedance (series components).

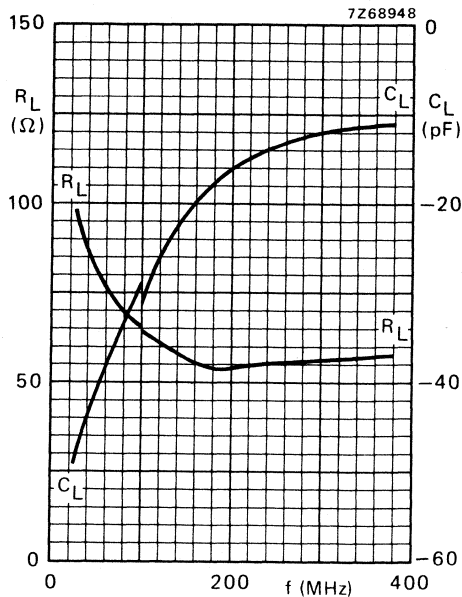


Fig. 13 Load impedance (parallel components).

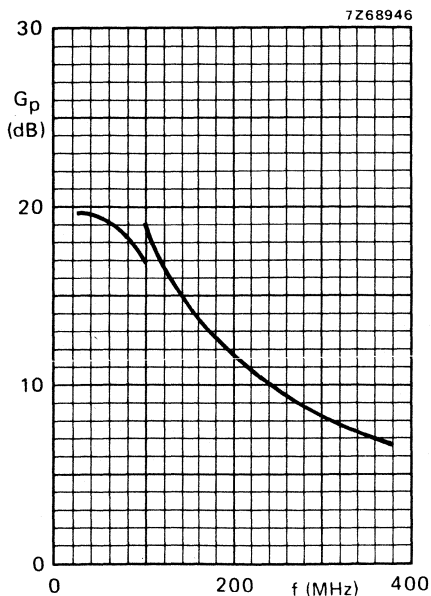


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; $V_{CE} = 28$ V; $P_L = 8$ W;
 $T_h = 25$ °C.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

BLV21

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

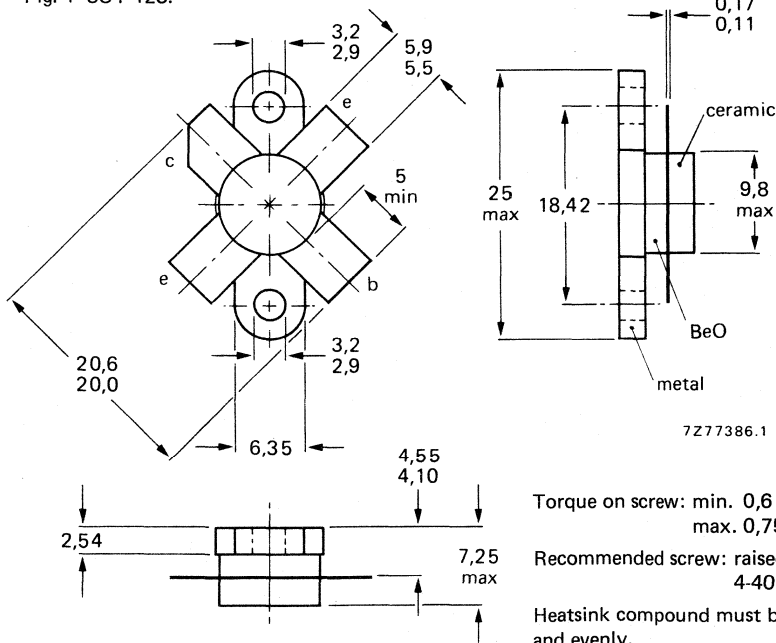
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_D dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	28	175	15	> 10	> 65	$1,4 + j1,85$	$33 - j27,5$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: raised cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_C(AV)$ max. 1,75 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 5,0 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 36 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

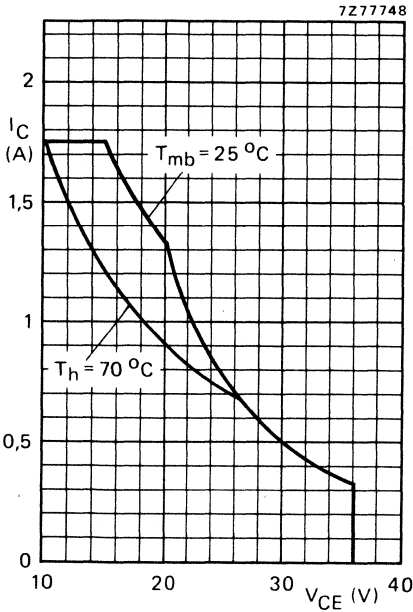


Fig. 2 D.C. SOAR.

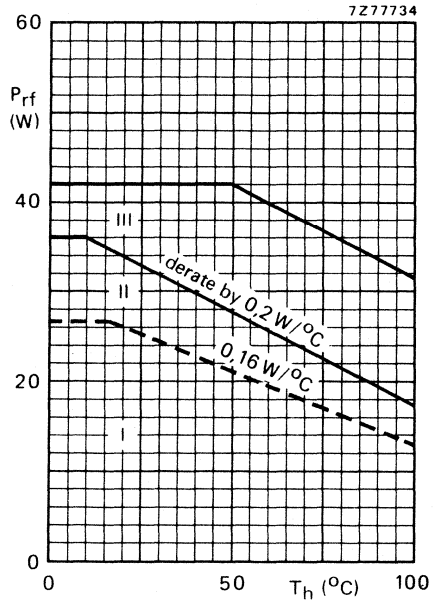


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 15 W; $T_{mb} = 74,5$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb(dc)}$ = 6,55 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb(rf)}$ = 4,95 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 5\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 2\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 36\text{ V}$ $I_{CES} < 2\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 2,5\text{ mJ}$ $R_{BE} = 10\text{ }\Omega$ $E_{SBR} > 2,5\text{ mJ}$

D.C. current gain *

 $I_C = 0,7\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 50
10 to 100

Collector-emitter saturation voltage *

 $I_C = 2\text{ A}; I_B = 0,4\text{ A}$ V_{CEsat} typ. 0,65 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 0,7\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 650 MHz $-I_E = 2\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 625 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ C_c typ. 18 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$ C_{re} typ. 12,8 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF

DEVELOPMENT I DAVIFLE DAIA

* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

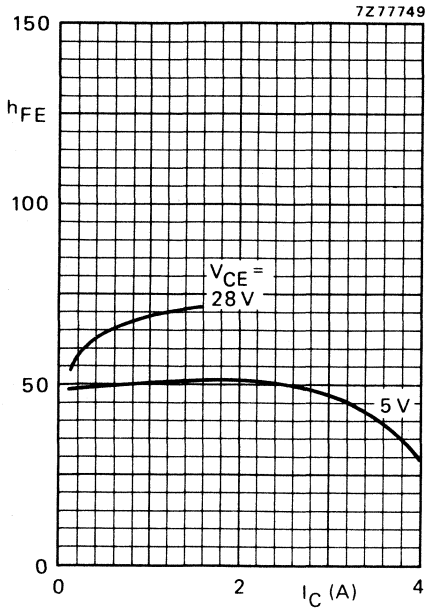


Fig. 4 Typical values; $T_j = 25^\circ C$.

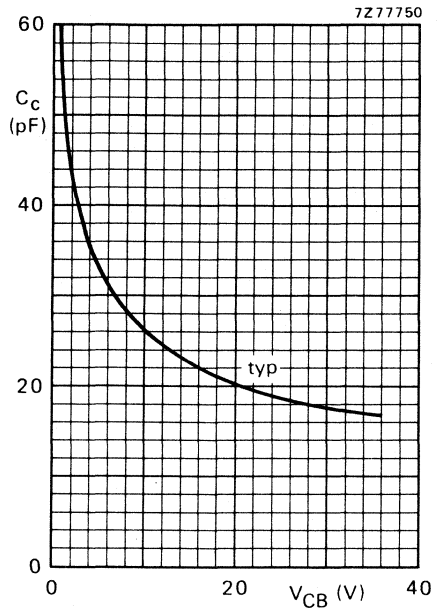


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

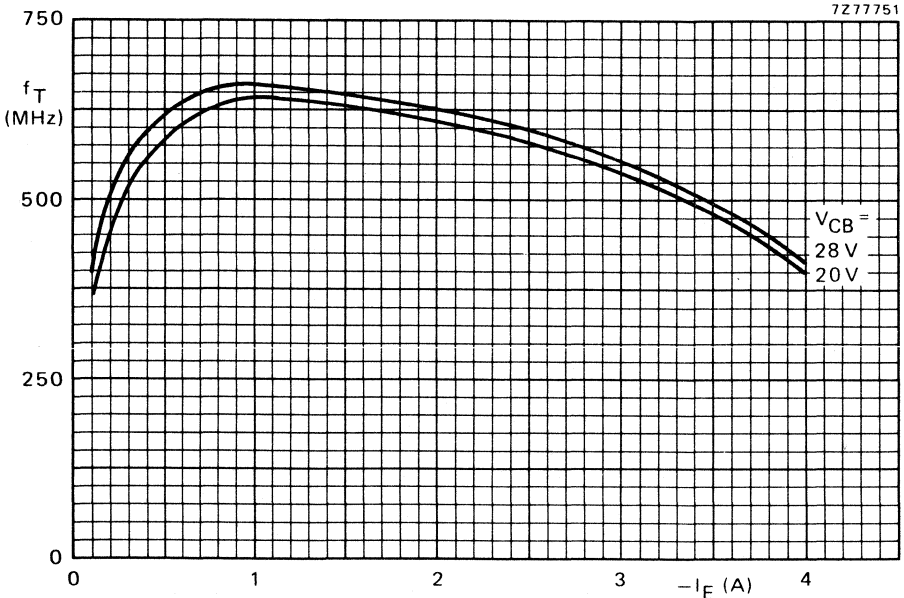


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ C$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	28	15	< 1,5	> 10	< 0,83	> 65	$1,4 + j1,85$	$33 - j27,5$

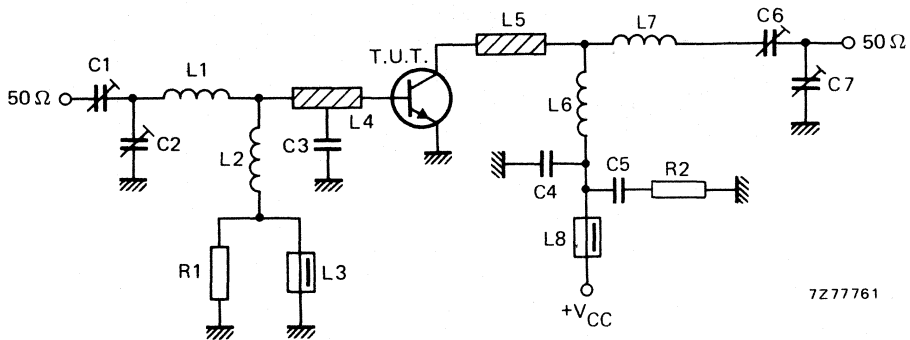


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C6 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor

L6 = 6 turns enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; length 9,2 mm; leads 2 x 5 mm

L7 = 4 turns enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; length 5,0 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistorR2 = 4,7 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.

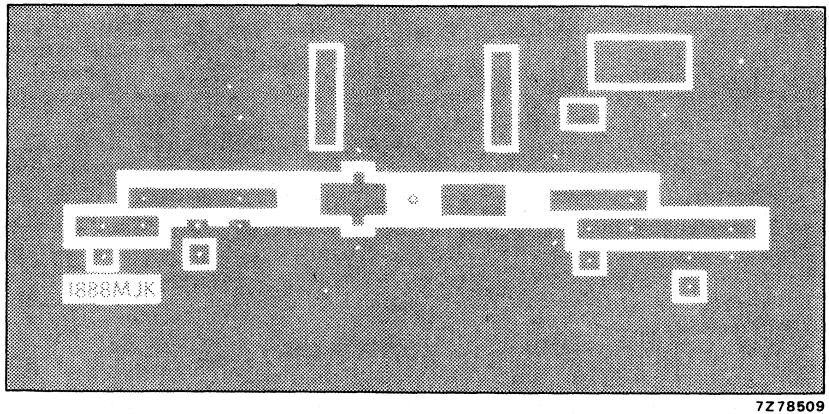
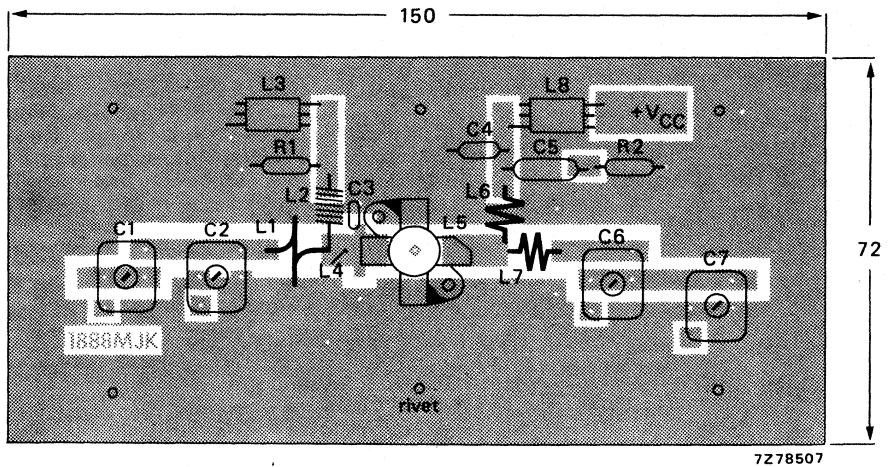


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

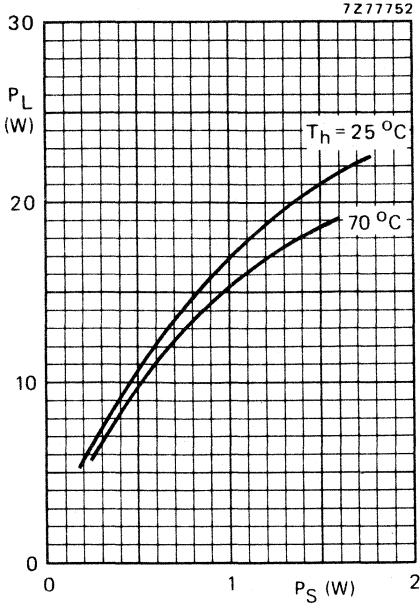


Fig. 9 Typical values; $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$.

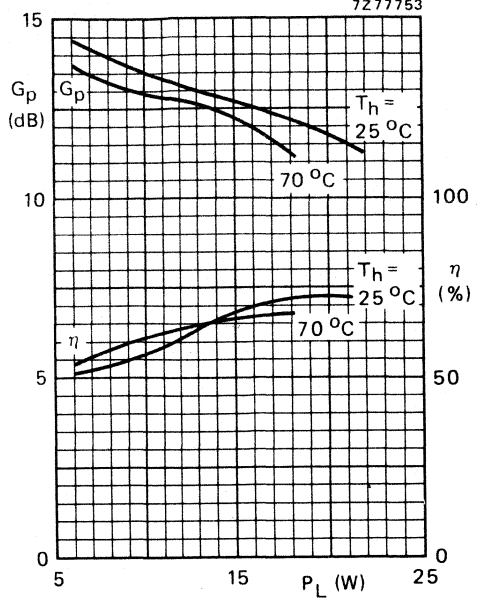


Fig. 10 Typical values; $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$.

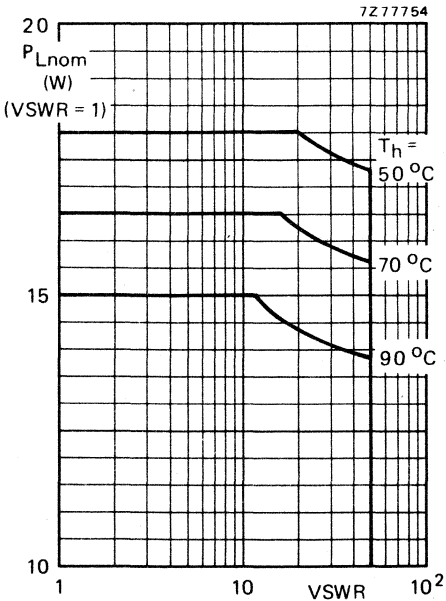


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $R_{th\text{ mb-h}} = 0,3 \text{ } ^\circ\text{C/W}$. The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

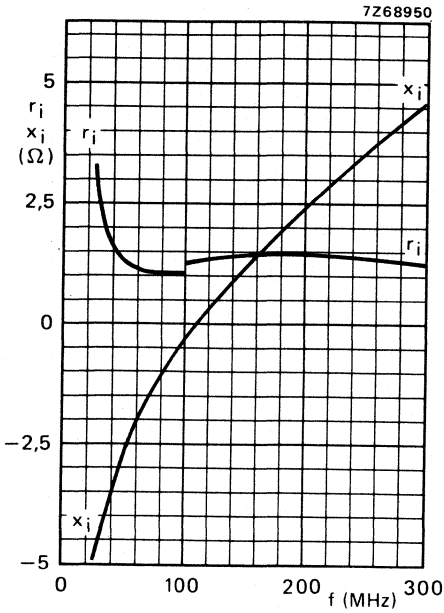


Fig. 12 Input impedance (series components).

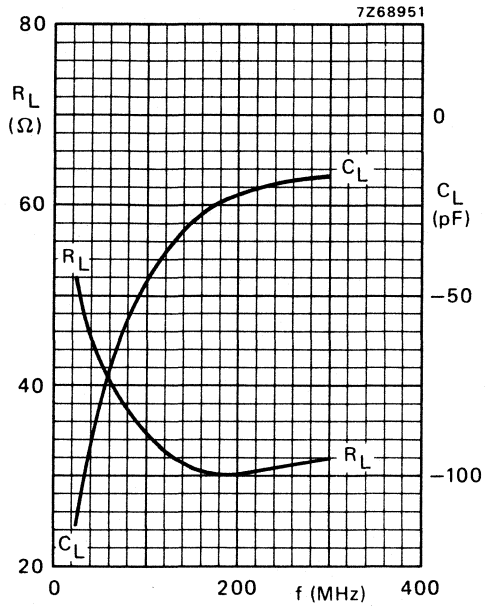


Fig. 13 Load impedance (parallel components).

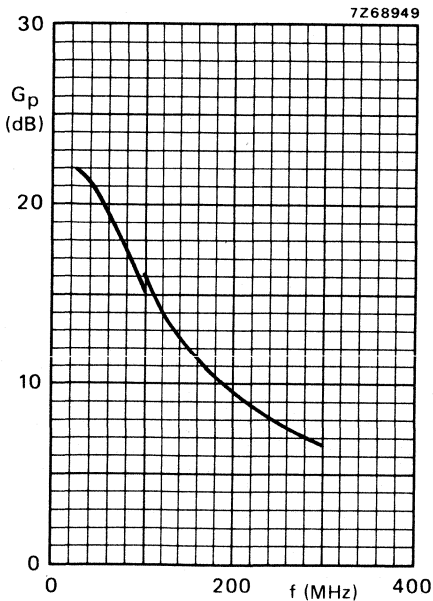


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 15 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. Because of the high gain and excellent power handling capability, the transistor is especially suited for design of wide-band and semi-wide-band v.h.f. amplifiers. Together with a BFO42 driver stage, the chain can deliver 15 W with a maximum drive power of 120 mW at 175 MHz. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

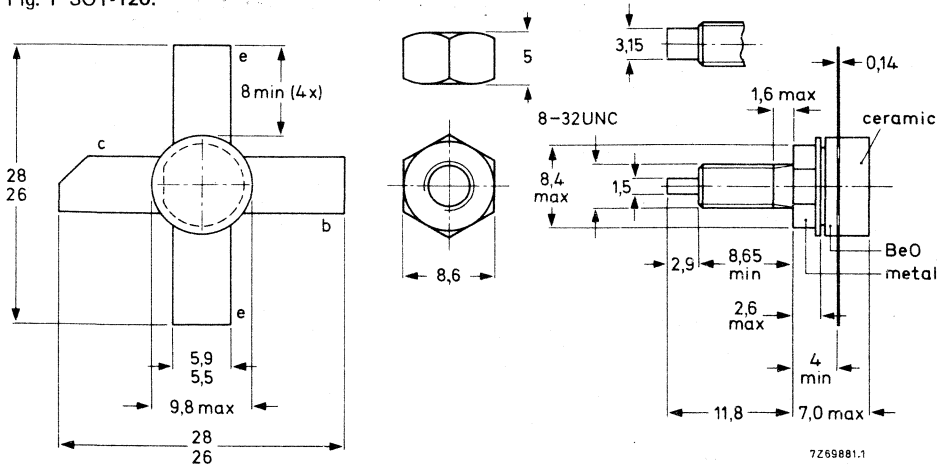
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w. class-B	13,5	175	15	> 10	> 60	1,3 + j0,68	180 - j54
c.w. class-B	12,5	175	15	typ. 10,5	typ. 67	-	-

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	2,75 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	8 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	53 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

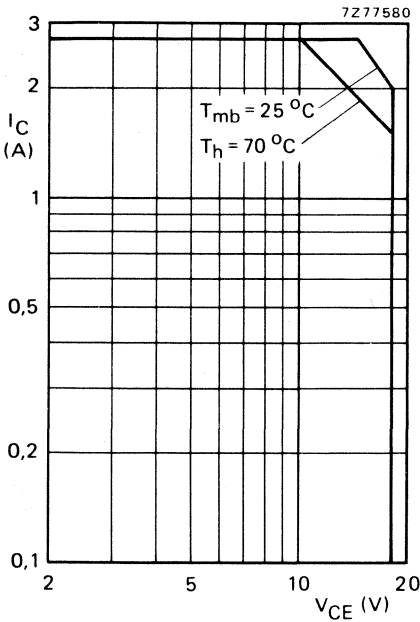


Fig. 2 D.C. SOAR.

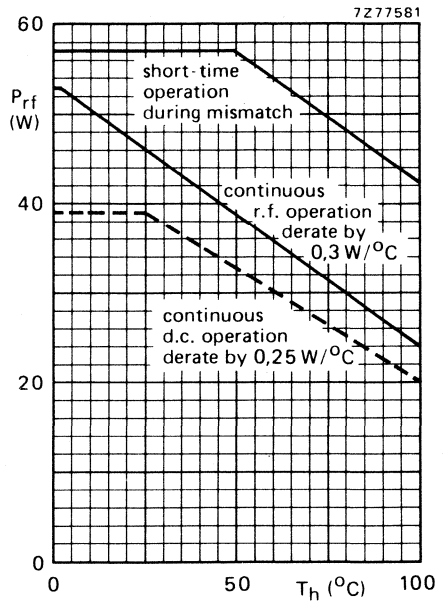


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f \geq 1$ MHz.

THERMAL RESISTANCE (dissipation = 15 W; $T_{mb} = 77$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j-mb(dc)}$	=	3,7 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	3,05 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,45 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 15\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 5\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 5\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $E_{SBO} > 4\text{ mJ}$ $E_{SBR} > 4\text{ mJ}$

D.C. current gain*

 $I_C = 1,75\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 80

Collector-emitter saturation voltage*

 $I_C = 5\text{ A}; I_B = 1\text{ A}$ V_{CEsat} typ. 1,5 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 1,75\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 900 MHz $-I_E = 5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 825 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 13,5\text{ V}$ C_C typ. 43 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 13,5\text{ V}$ C_{re} typ. 27 pF

Collector-stud capacitance

 C_{Cs} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

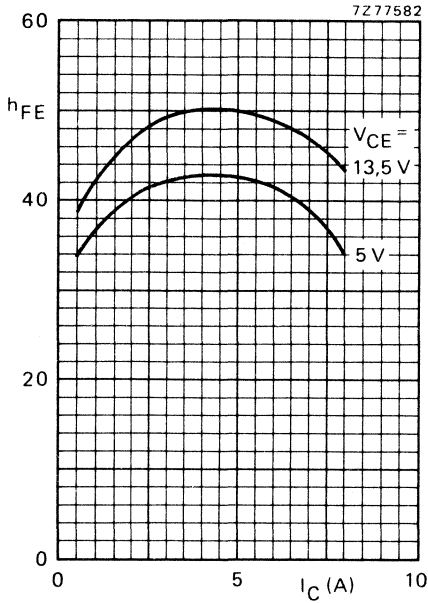


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

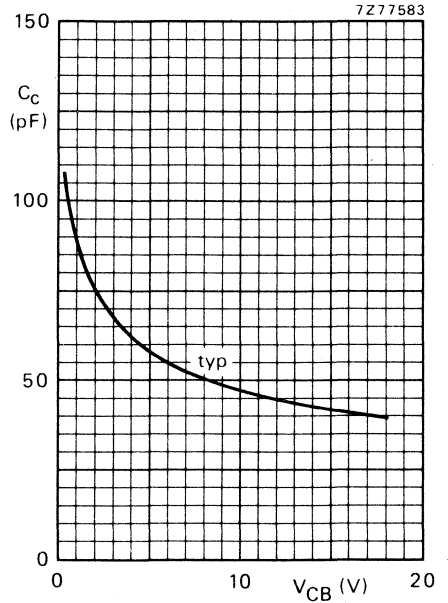


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

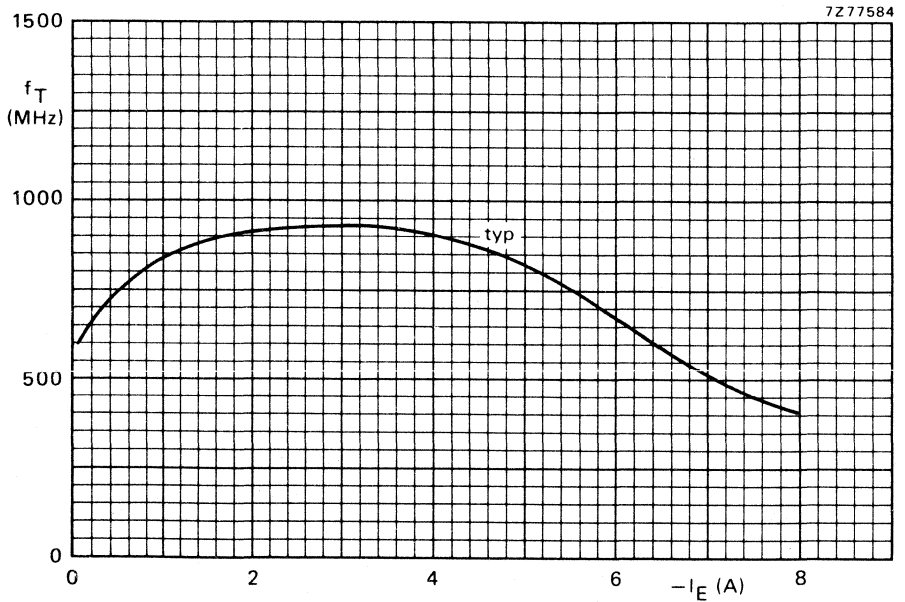


Fig. 6 $V_{CB} = 13.5\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	15	< 1,5	> 10	< 1,85	> 60	$1,3 + j0,68$	$180 - j54$
175	12,5	15	typ. 1,34	typ. 10,5	typ. 1,8	typ. 67	—	—

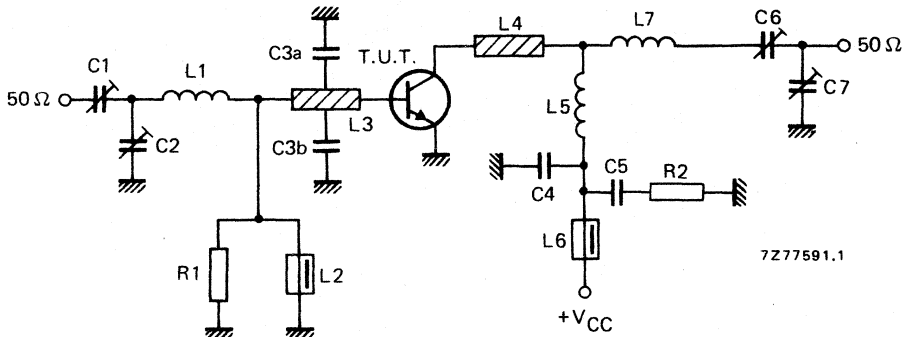


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C6 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 1 nF ceramic capacitor

C5 = 100 nF polyester capacitor

L1 = $\frac{1}{2}$ turn Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm

L2 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = L4 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L5 = $4\frac{1}{2}$ turns closely wound enamelled Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm

L7 = 2 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness $1/16''$.R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)

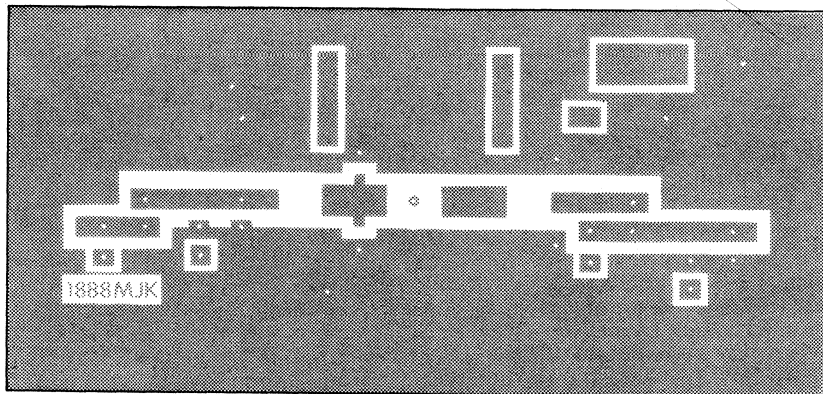
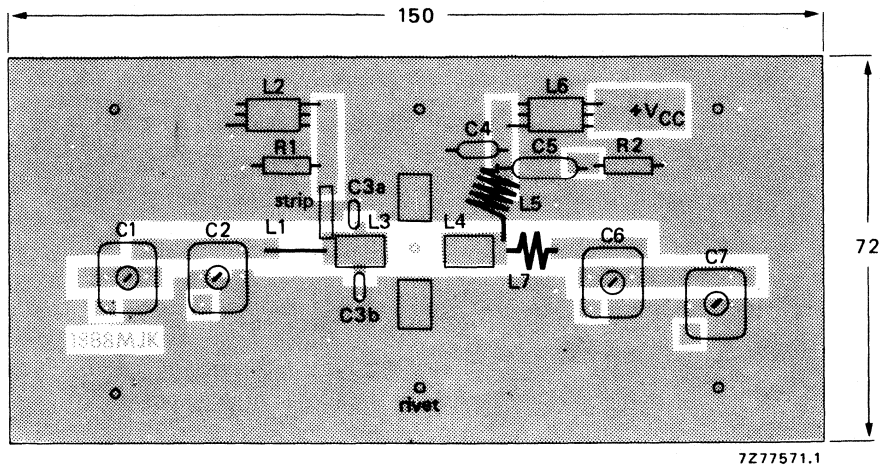


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

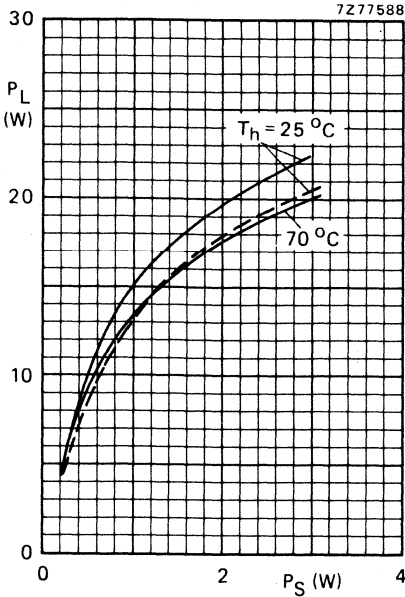


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

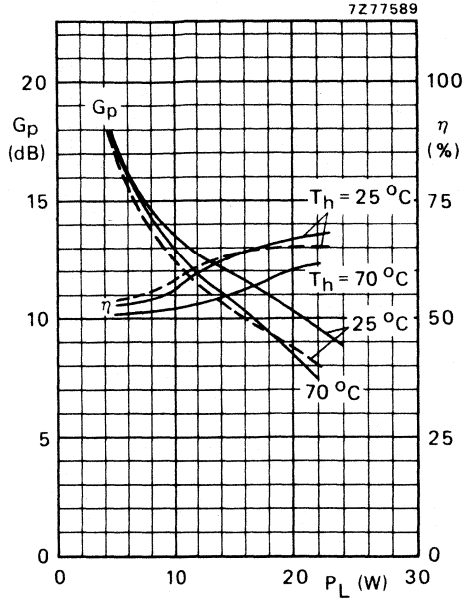


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

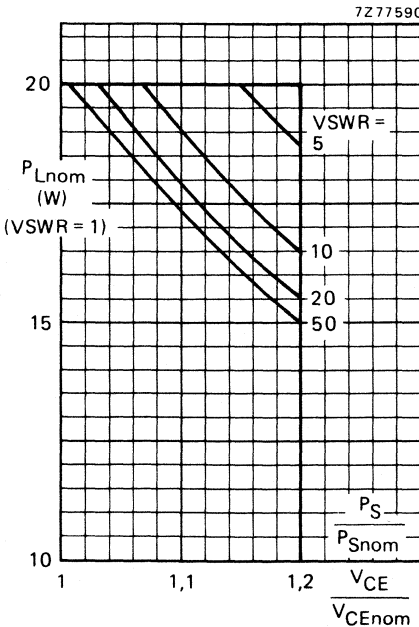


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,45 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$ (see page 5).

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

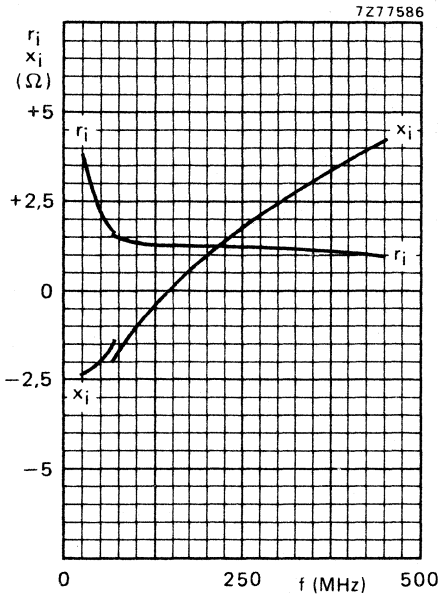


Fig. 12.

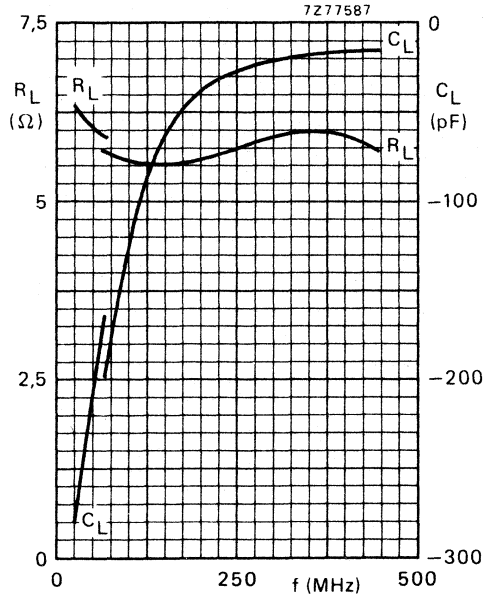
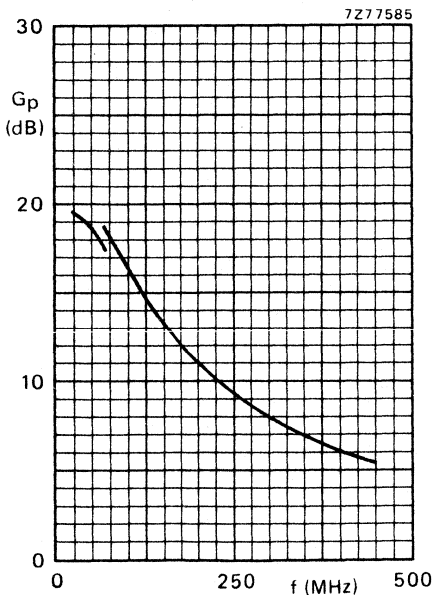


Fig. 13.



Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 13,5$ V; $P_L = 15$ W;
 $T_h = 25$ $^{\circ}$ C.

Fig. 14.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. Because of the high gain and excellent power handling capability, the transistor is especially suited for design of wide-band and semi-wide-band v.h.f. amplifiers. Together with a BFQ43 driver stage, the chain can deliver 28 W with a maximum drive power of 250 mW at 175 MHz. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

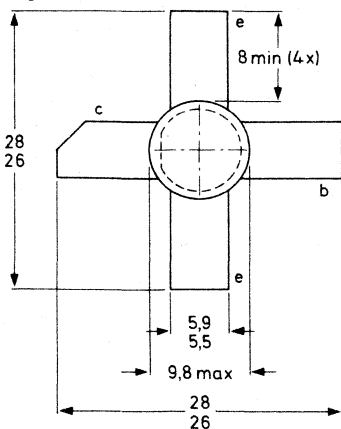
QUICK REFERENCE DATA

R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$

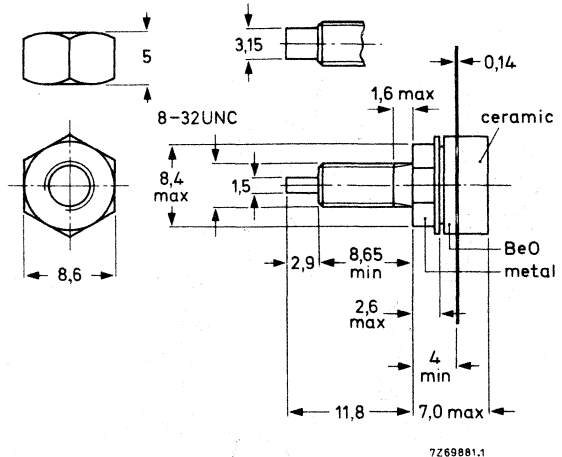
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w. class-B	13,5	175	28	> 9	> 60	$0,9 + j0,9$	$380 + j40$
c.w. class-B	12,5	175	28	typ. 9,5	typ. 70	—	—

MECHANICAL DATA

Fig. 1 SOT-120.



Dimensions in mm



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)

peak value

V_{CESM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 18 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 6 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 15 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 96 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

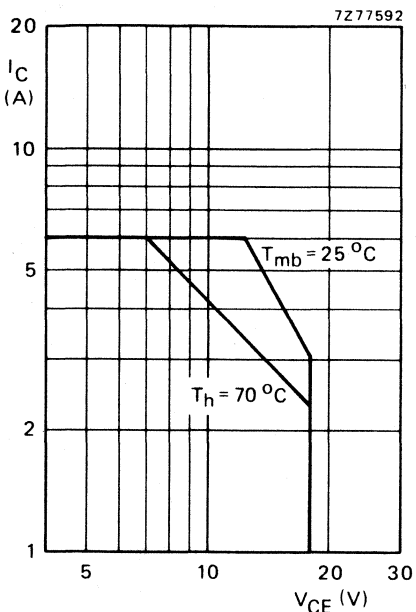


Fig. 2 D.C. SOAR.

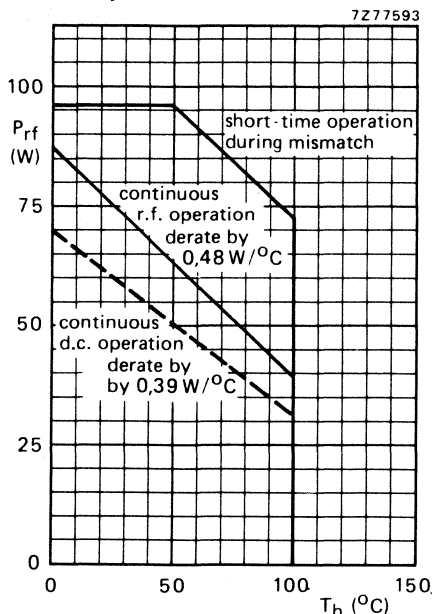


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f \geq 1$ MHz.

THERMAL RESISTANCE (dissipation = 25 W; $T_{mb} = 81$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb(dc)}$ = 2,4 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb(rf)}$ = 1,85 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,45 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 25\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 10\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $E_{SBO} > 8\text{ mJ}$ $E_{SBR} > 8\text{ mJ}$

D.C. current gain*

 $I_C = 3,5\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 80

Collector-emitter saturation voltage*

 $I_C = 10\text{ A}; I_B = 2\text{ A}$ V_{CEsat} typ. 1,8 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 3,5\text{ A}; V_{CB} = 13,5\text{ V}$ $-I_E = 10\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 850 MHz f_T typ. 700 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 13,5\text{ V}$ C_c typ. 92 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 13,5\text{ V}$ C_{re} typ. 58 pF

Collector-stud capacitance

 C_{cs} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

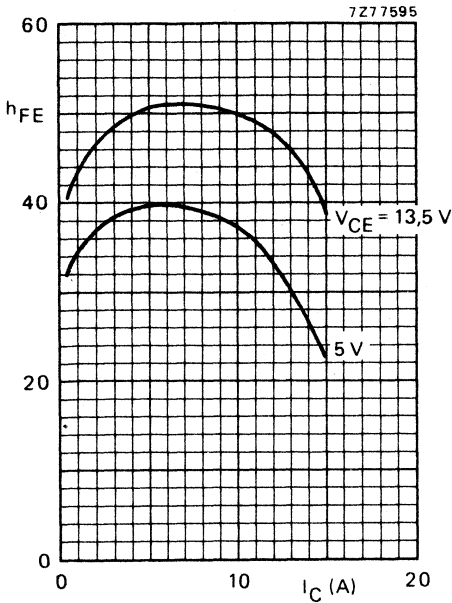


Fig. 4 Typical values; $T_j = 25$ °C.

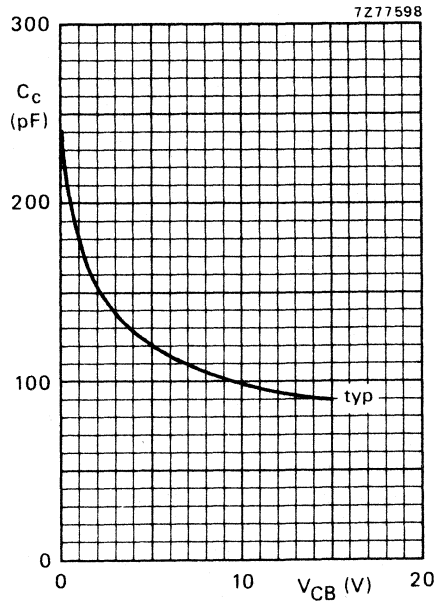


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

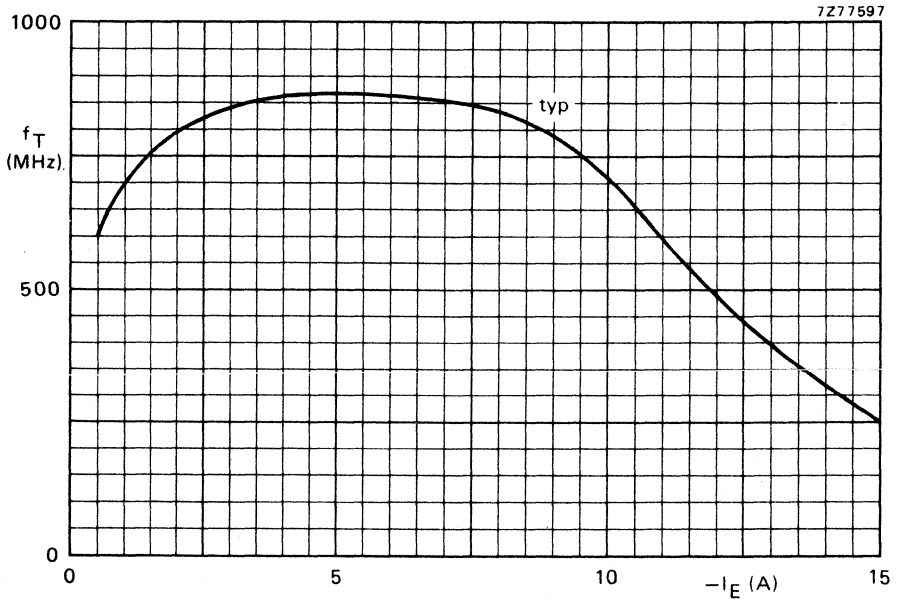


Fig. 6 $V_{CB} = 13.5$ V; $f = 100$ MHz; $T_j = 25$ °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{V}_L (mA/V)
175	13,5	28	< 3,5	> 9	< 3,45	> 60	$0,9 + j0,9$	$380 + j40$
175	12,5	28	typ. 3,15	typ. 9,5	typ. 3,2	typ. 70	—	—

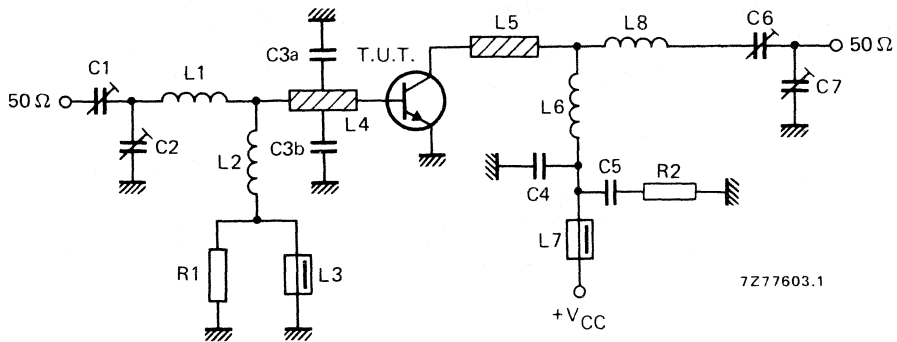


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6 = 7 to 100 pF film dielectric trimmer (cat. no. 2222 809 07015)

L1 = $\frac{1}{2}$ turn Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor.

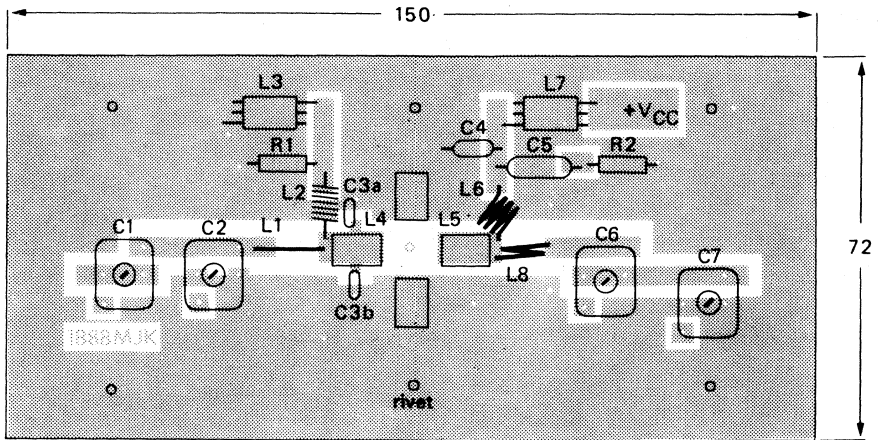
L6 = $3\frac{1}{2}$ turns closely wound enamelled Cu wire (1,6 mm) int. dia. 6,0 mm; leads 2 x 5 mm

L8 = 1 turn Cu wire (1,6 mm) int. dia. 6,0 mm; leads 2 x 5 mm

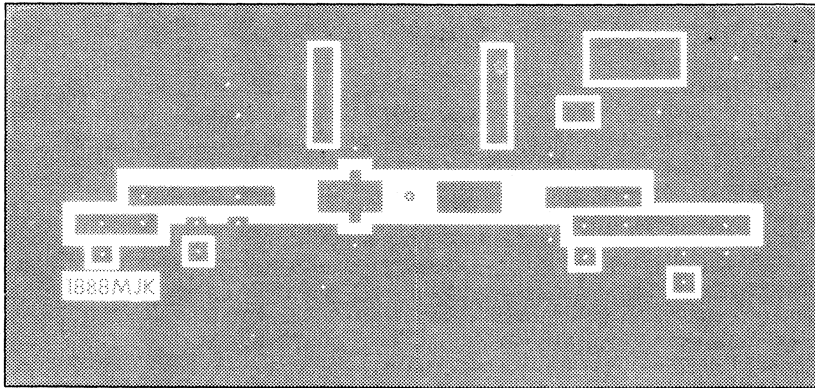
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness $\frac{1}{16}$ ".R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)



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7277574

Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

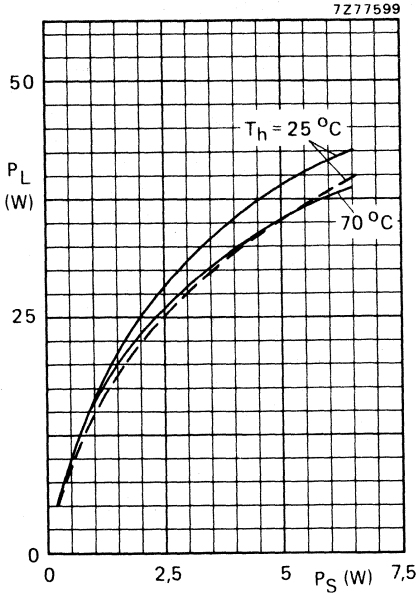


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

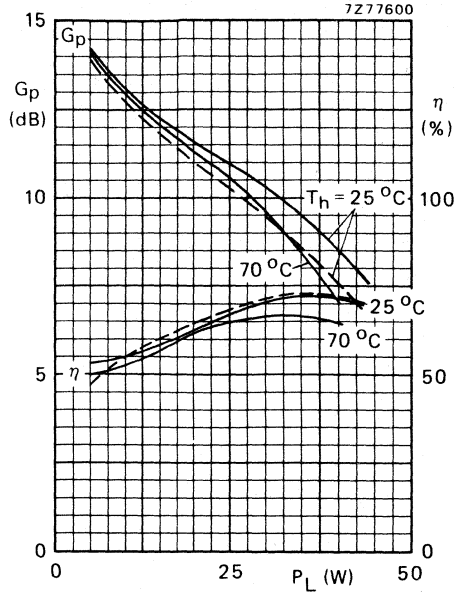


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

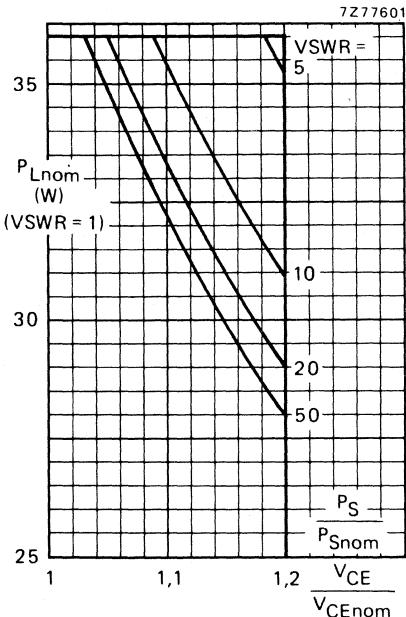


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,45 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$ (see page 5).

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

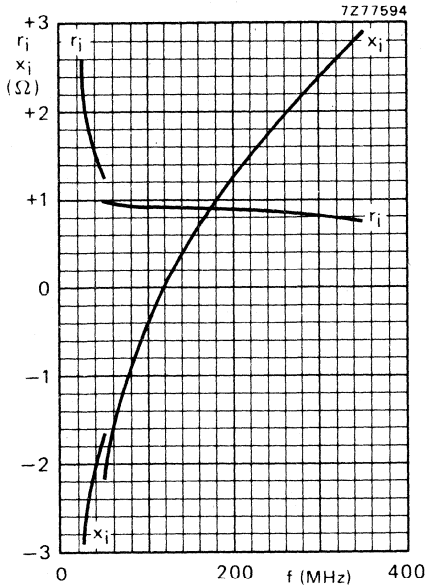


Fig. 12.

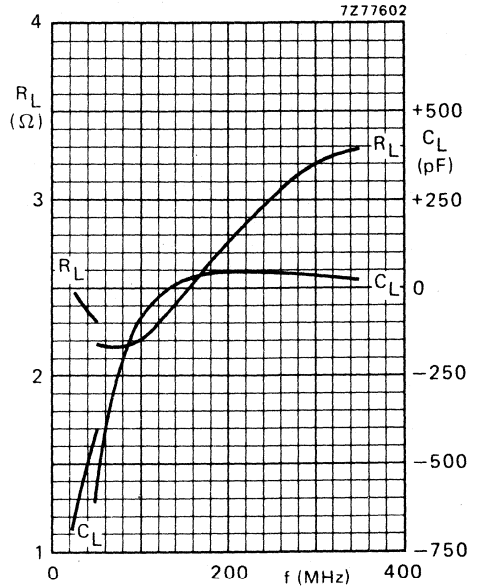
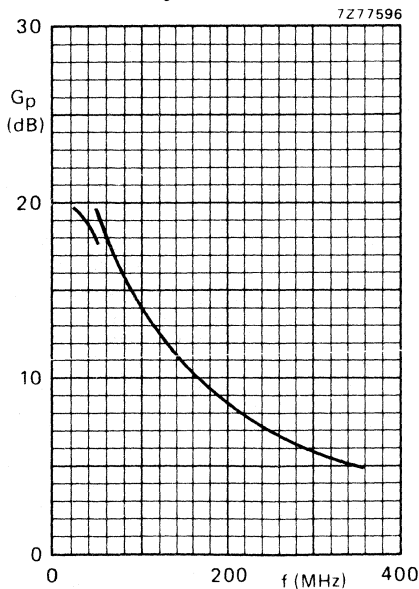


Fig. 13.



Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 13,5 \text{ V}$; $P_L = 28 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

Fig. 14.

DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

731BLY/A
(BLW32)

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in **linear u.h.f. amplifiers** for television transmitters and transposers. The **excellent d.c. dissipation properties** for class-A operation are obtained by means of diffused emitter ballasting resistors and a multi-base structure, providing an optimum temperature profile on the crystal area. The combination of optimum thermal design and the application of **gold sandwich metallization** realizes excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap.

QUICK REFERENCE DATA

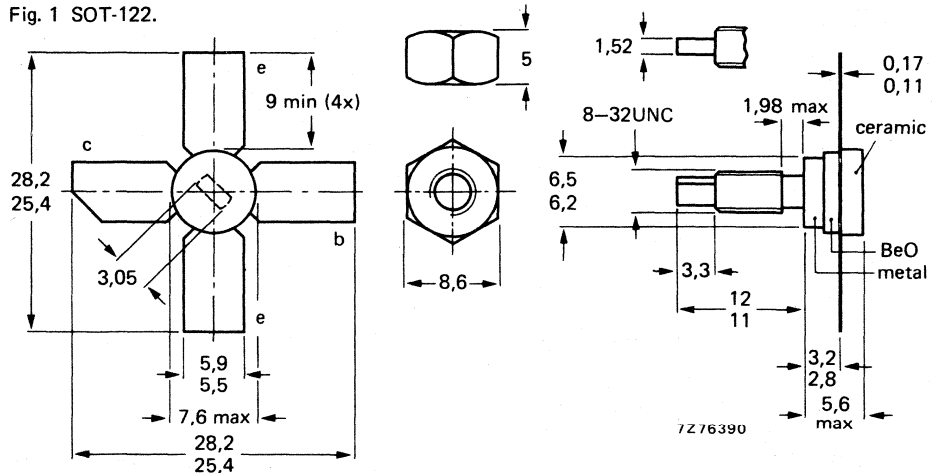
R.F. performance

mode of operation	f_{vision} MHz	V_{CE} V	I_{C} mA	T_{h} °C	d_{im}^* dB	$P_{\text{o sync}}^*$ W	G_{p} dB
class-A; linear amplifier	860	25	150	70	-60	> 0,5	> 11
	860	25	150	25	-60	typ. 0,63	typ. 12,2

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage
(peak value); $V_{BE} = 0$

open base

Emitter-base voltage (open collector)

Collector current

d.c. or average

(peak value); $f > 1$ MHz

→ Total power dissipation up to $T_{mb} = 25$ °C

Storage temperature

Operating junction temperature

V_{CESM} max. 50 V

V_{CEO} max. 30 V

V_{EBO} max. 4 V

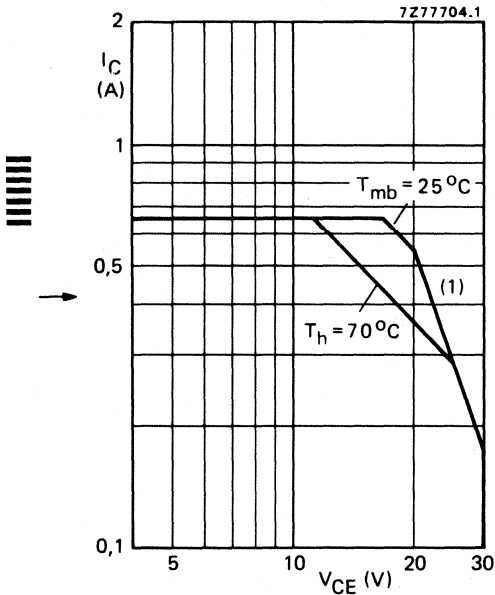
I_C max. 650 mA

I_{CM} max. 1000 mA

P_{tot} max. 10,8 W

T_{stg} -65 to +150 °C

T_j max. 200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

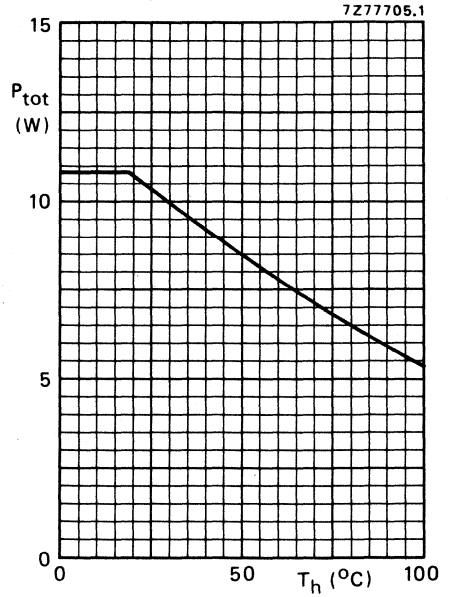


Fig. 3 Power derating curve vs. temperature.

→ **THERMAL RESISTANCE** (see Fig. 4)

From junction to mounting base

(dissipation = 3,75 W; $T_{mb} = 72,3$ °C; i.e. $T_h = 70$ °C)

From mounting base to heatsink

$R_{thj-mb} = 15,0$ °C/W

$R_{thmb-h} = 0,6$ °C/W

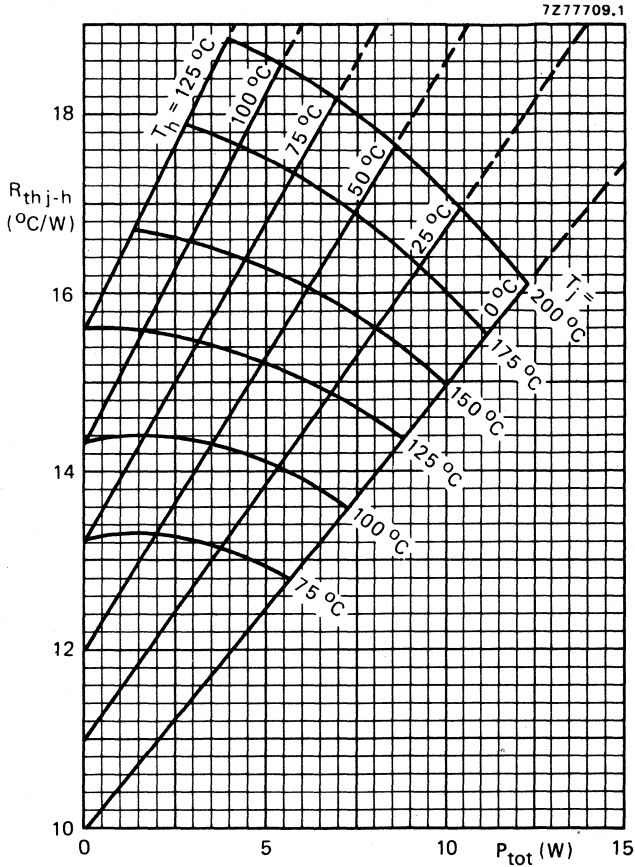


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{thmb-h} = 0,6^{\circ}C/W$).

Example

Nominal class-A operation: $V_{CE} = 25 V$; $I_C = 150 mA$; $T_h = 70^{\circ}C$.

Fig. 4 shows: R_{thj-h} max. $15,6^{\circ}C/W$
 T_j max. $130^{\circ}C$

Typical device: R_{thj-h} typ. $13,5^{\circ}C/W$
 T_j typ. $120^{\circ}C$

DEVELOPMENT SAMPLE DATA

731BLY/A (BLW32)

→ CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 2\text{ mA}$

open base; $I_C = 15\text{ mA}$

$V_{(BR)CES} > 50\text{ V}$

$V_{(BR)CEO} > 30\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 1\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 30\text{ V}$

$V_{BE} = 0; V_{CE} = 30\text{ V}; T_j = 175\text{ }^\circ\text{C}$

$I_{CES} < 0,5\text{ mA}$

$I_{CES} < 1,2\text{ mA}$

D.C. current gain *

$I_C = 150\text{ mA}; V_{CE} = 25\text{ V}$

$h_{FE} > 20$

typ. 40

$I_C = 150\text{ mA}; V_{CE} = 25\text{ V}; T_j = 175\text{ }^\circ\text{C}$

$h_{FE} < 120$

Collector-emitter saturation voltage *

$I_C = 300\text{ mA}; I_B = 30\text{ mA}$

V_{CEsat} typ. 500 mV

Transition frequency at $f = 500\text{ MHz}$ **

$-I_E = 150\text{ mA}; V_{CB} = 25\text{ V}$

$-I_E = 300\text{ mA}; V_{CB} = 25\text{ V}$

f_T typ. 3,5 GHz

f_T typ. 3,4 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 25\text{ V}$

C_c typ. 3,7 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 25\text{ V}$

C_{re} typ. 1,9 pF

Collector-stud capacitance

C_{cs} typ. 2 pF

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

DEVELOPMENT SAMPLE DATA

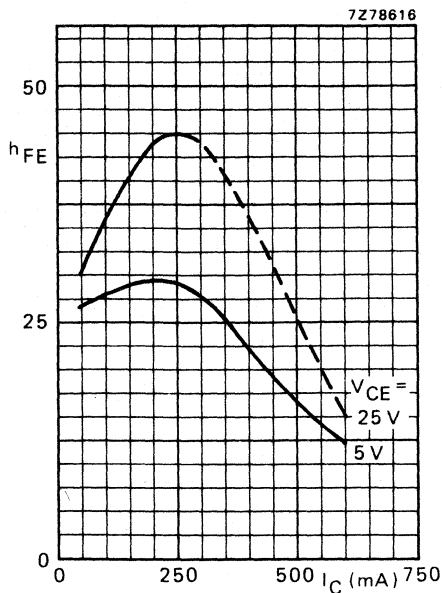


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

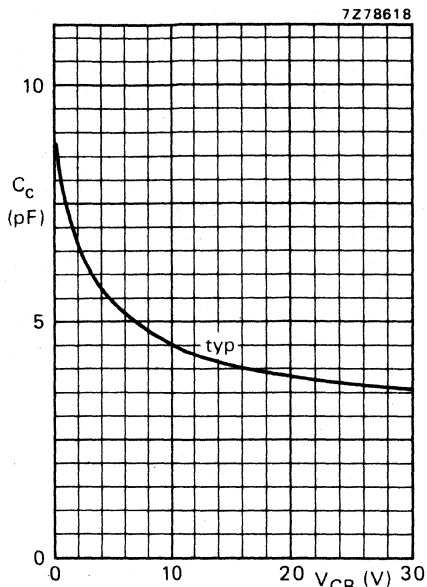


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

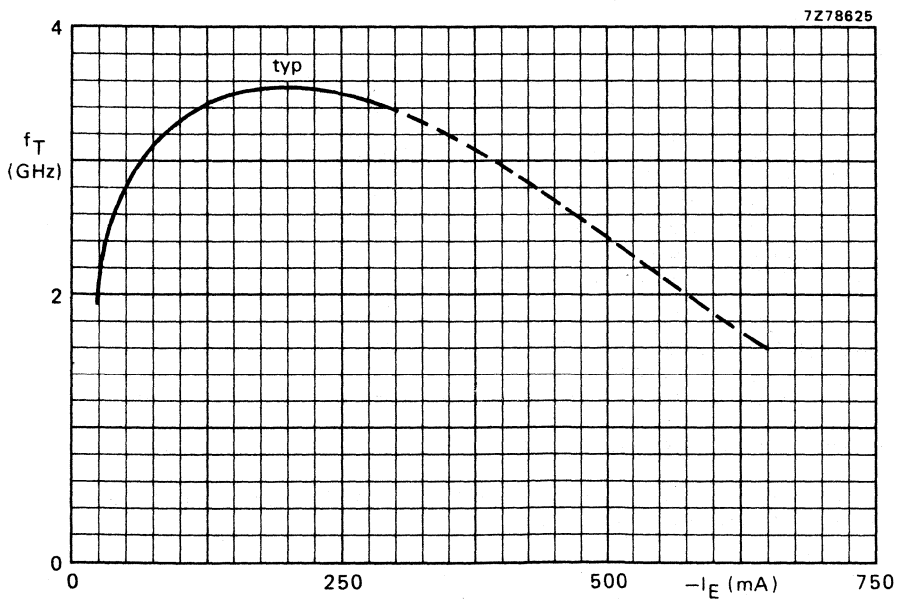


Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

→ APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	T_{h} ($^{\circ}\text{C}$)	dim (dB) *	P_{Osync} (W) *	G_{p} (dB)
860	25	150	70	-60	> 0,5	> 11
860	25	150	70	-60	typ. 0,58	typ. 12,2
860	25	150	25	-60	typ. 0,63	typ. 12,2

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

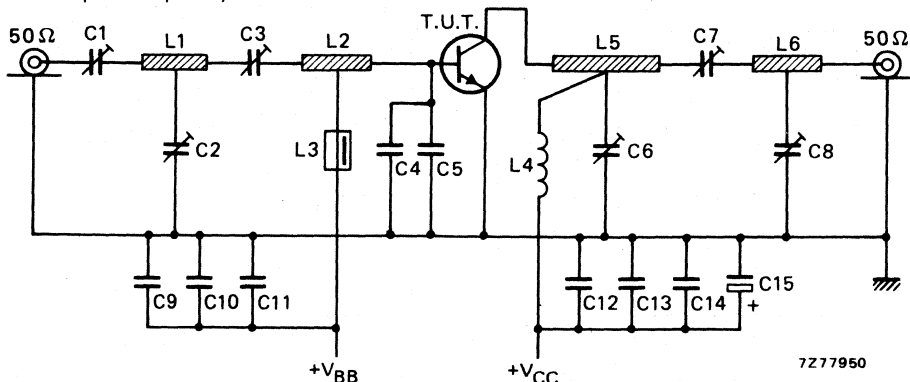


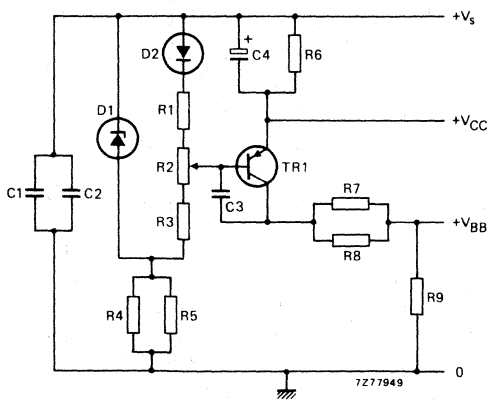
Fig. 8 Test circuit at $f_{\text{vision}} = 860$ MHz.

List of components:

- C1 = C3 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
- C2 = C6 = C8 = 1 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
- C4 = C5 = 3 pF chip capacitor
- C7 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
- C9 = C12 = 1 nF chip capacitor
- C10 = 100 nF polyester capacitor
- C11 = C13 = 470 nF polyester capacitor
- C14 = 10 nF polyester capacitor
- C15 = 3,3 $\mu\text{F}/40$ V solid aluminium electrolytic capacitor

- L1 = stripline (13,2 mm x 4,3 mm)
- L2 = stripline (15,2 mm x 4,3 mm)
- L3 = micro choke 0,47 μH (4322 057 04770)
- L4 = 4 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 5 mm
- L5 = stripline (37,0 mm x 4,3 mm)
- L6 = stripline (13,5 mm x 4,3 mm)

L1; L2; L5 and L6 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,5 mm.



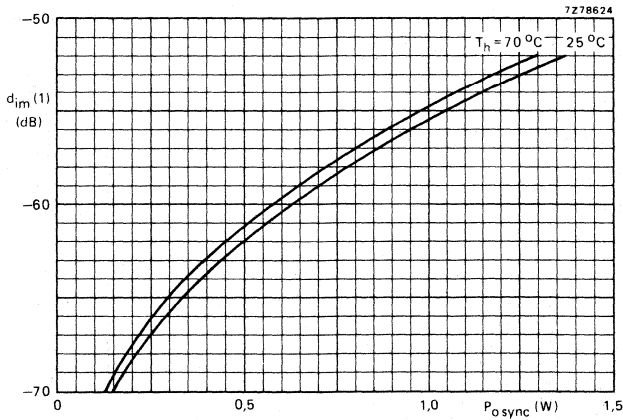
List of components:

C1 = C2 = C3 = 100 nF polyester capacitor
 C4 = 10 μF/25 V solid aluminium electrolytic capacitor

R1 = 150 Ω carbon resistor (0,25 W)
 R2 = 100 Ω carbon resistor (0,25 W)
 R3 = 82 Ω carbon resistor (0,25 W)
 R4 = R5 = 2,2 kΩ carbon resistor (0,25 W)
 R6 = 12 Ω carbon resistor (0,5 W)
 R7 = R8 = 820 Ω carbon resistor (0,5 W)
 R9 = 33 Ω carbon resistor (0,25 W)

D1 = BZY88-C3V3
 D2 = BY206
 TR1 = BD136

Fig. 9 Bias circuit for class-A linear amplifier at $f_{\text{vision}} = 860 \text{ MHz}$.



(1) Three-tone test method (vision carrier -8 dB , sound carrier -7 dB , sideband signal -16 dB), zero dB corresponds to peak sync level. Intermodulation distortion of input signal $\leq -75 \text{ dB}$.

Fig. 10 Intermodulation distortion as a function of output power. Typical values; $V_{CE} = 25 \text{ V}$; $I_C = 150 \text{ mA}$; $f_{\text{vision}} = 860 \text{ MHz}$.

Information for wide-band application from 470 to 860 MHz available on request.

DEVELOPMENT SAMPLE DATA

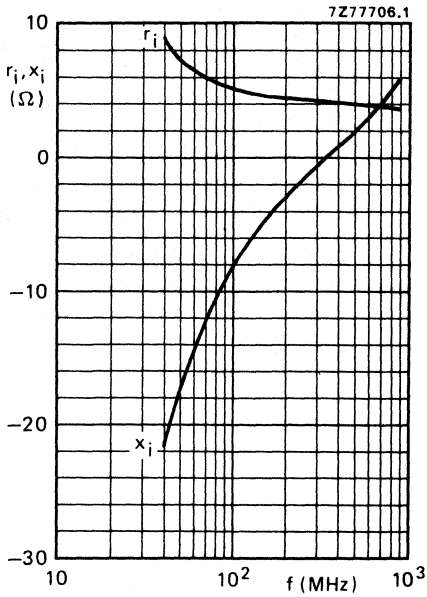


Fig. 11 Input impedance (series components).

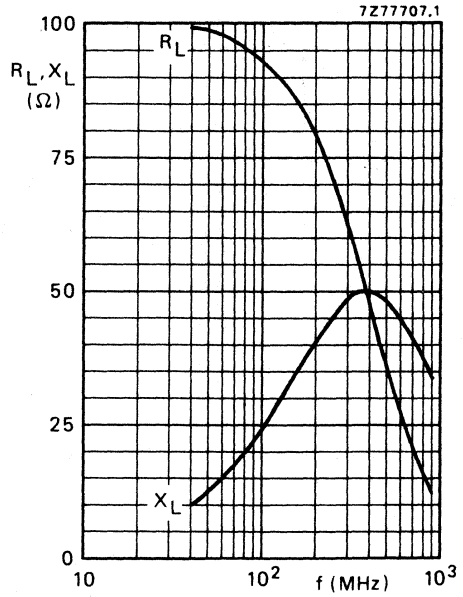


Fig. 12 Load impedance (series components).

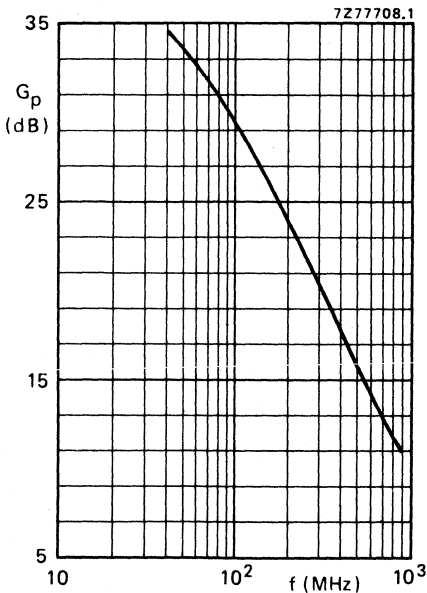


Fig. 13.

Conditions for Figs 11, 12 and 13:

Typical values; $V_{CE} = 25$ V; $I_C = 150$ mA;
 $T_h = 70$ °C.

Ruggedness

The BLW32 is capable of withstanding a load mismatch (VSWR = 50) under the following conditions:

$f = 860$ MHz; $V_{CE} = 25$ V; $I_C = 150$ mA;
 $T_h = 70$ °C and $P_L(AV) = 1$ W.

This holds for single-tone as well as for two-tone operation (vision and sound).

DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

732BLY/A
(BLW33)

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in **linear u.h.f. amplifiers** for television transmitters and transposers. The **excellent d.c. dissipation properties** for class-A operation are obtained by means of diffused emitter ballasting resistors and a multi-base structure, providing an optimum temperature profile on the crystal area. The combination of optimum thermal design and the application of **gold sandwich metallization** realizes excellent reliability properties.

The transistor has a 1/4" capstan envelope with ceramic cap.

QUICK REFERENCE DATA

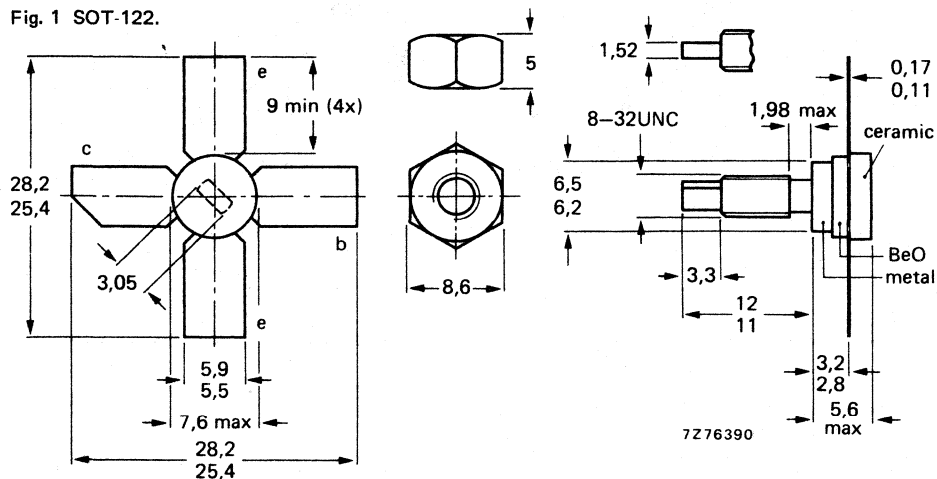
R.F. performance

mode of operation	f_{vision} MHz	V_{CE} V	I_{C} mA	T_{h} °C	d_{im}^* dB	$P_{\text{o sync}}^*$ W	G_{p} dB
class-A; linear amplifier	860	25	300	70	-60	> 1,0	> 10,0
	860	25	300	25	-60	typ. 1,15	typ. 10,5

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage
(peak value); $V_{BE} = 0$

V_{CESM} max. 50 V

open base

V_{CEO} max. 30 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

I_C max. 1,25 A

d.c. or average

I_{CM} max. 1,9 A

(peak value); $f > 1$ MHz

P_{tot} max. 19,3 W

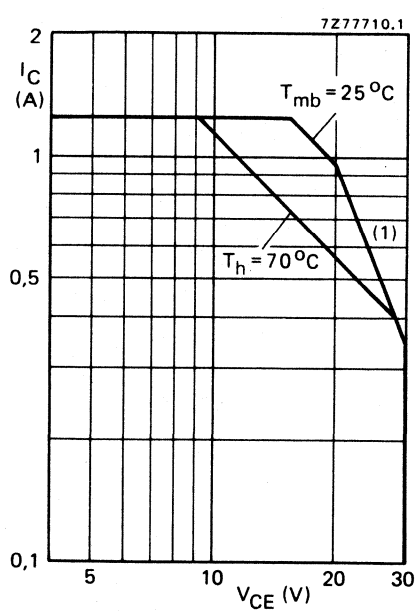
→ Total power dissipation up to $T_{mb} = 25$ °C

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

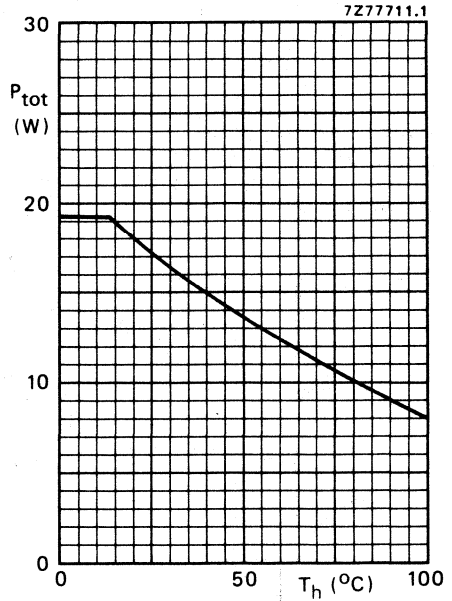


Fig. 3 Power derating curve vs. temperature.

→ **THERMAL RESISTANCE** (see Fig. 4)

From junction to mounting base

(dissipation = 7,5 W; $T_{mb} = 74,5$ °C; i.e. $T_h = 70$ °C)

$R_{th\ j-mb} = 10,1$ °C/W

From mounting base to heatsink

$R_{th\ mb-h} = 0,6$ °C/W

DEVELOPMENT SAMPLE DATA

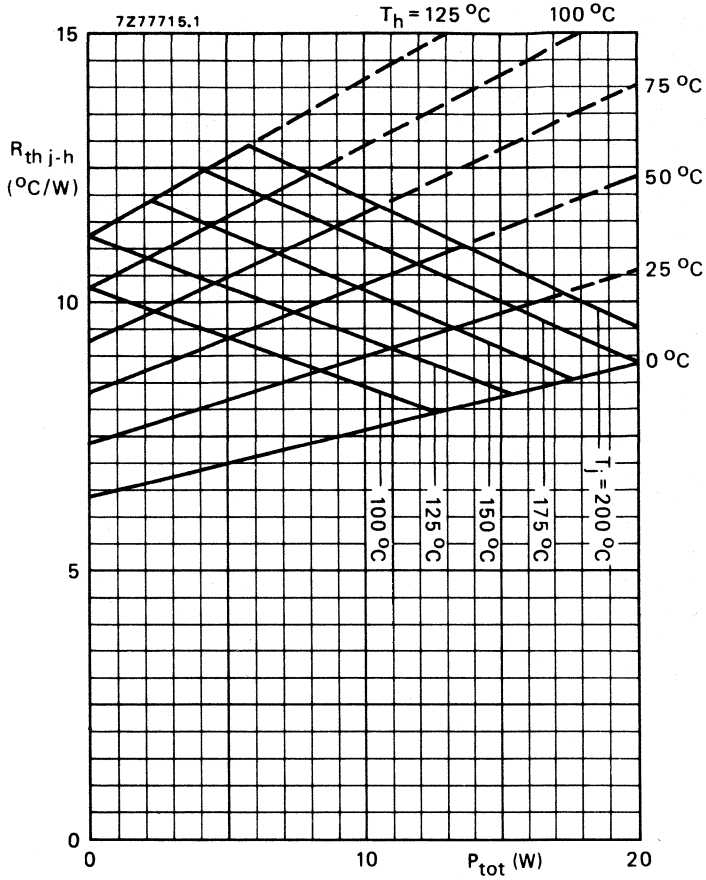


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,6^\circ\text{C/W}$).

Example

Nominal class-A operation: $V_{CE} = 25\text{ V}$; $I_C = 300\text{ mA}$; $T_h = 70^\circ\text{C}$.

Fig. 4 shows: $R_{th\ j-h}$ max. 10,7 $^\circ\text{C/W}$
 T_j max. 150 $^\circ\text{C}$

Typical device: $R_{th\ j-h}$ typ. 8,25 $^\circ\text{C/W}$
 T_j typ. 132 $^\circ\text{C}$

732BLY/A (BLW33)

→ CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 4\text{ mA}$

open base; $I_C = 30\text{ mA}$

$V_{(BR)CES} > 50\text{ V}$

$V_{(BR)CEO} > 30\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 2\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 30\text{ V}$

$V_{BE} = 0; V_{CE} = 30\text{ V}; T_j = 175\text{ }^\circ\text{C}$

$I_{CES} < 1,0\text{ mA}$

$I_{CES} < 2,5\text{ mA}$

D.C. current gain

$I_C = 300\text{ mA}; V_{CE} = 25\text{ V}$

$h_{FE} > 20$

typ. 40

$I_C = 300\text{ mA}; V_{CE} = 25\text{ V}; T_j = 175\text{ }^\circ\text{C}$

$h_{FE} < 120$

Collector-emitter saturation voltage *

$I_C = 600\text{ mA}; I_B = 60\text{ mA}$

V_{CEsat} typ. 450 mV

Transition frequency at $f = 500\text{ MHz}$ **

$-I_E = 300\text{ mA}; V_{CB} = 25\text{ V}$

$-I_E = 600\text{ mA}; V_{CB} = 25\text{ V}$

f_T typ. 3,4 GHz

f_T typ. 3,1 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 25\text{ V}$

C_c typ. 6,6 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 20\text{ mA}; V_{CE} = 25\text{ V}$

C_{re} typ. 3,5 pF

Collector-stud capacitance

C_{cs} typ. 2 pF

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

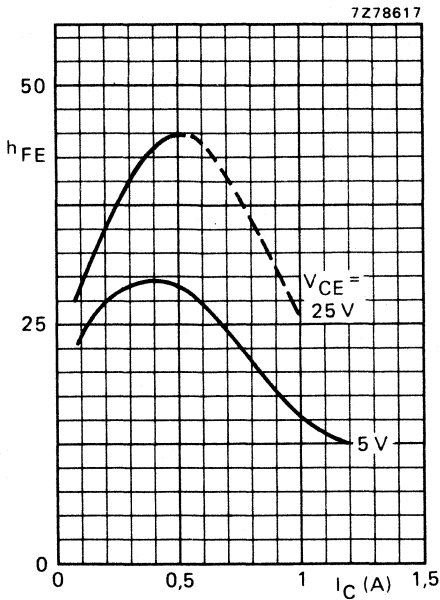


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

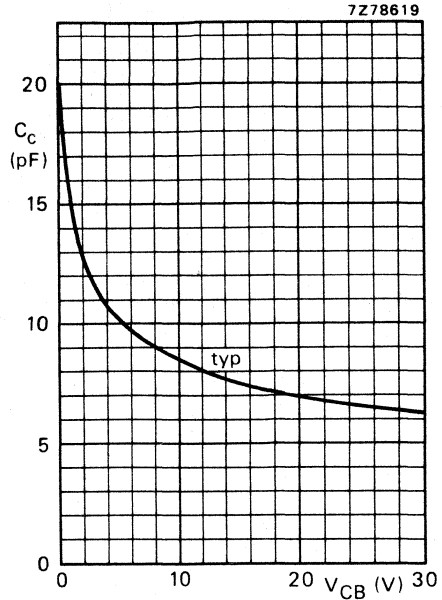


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

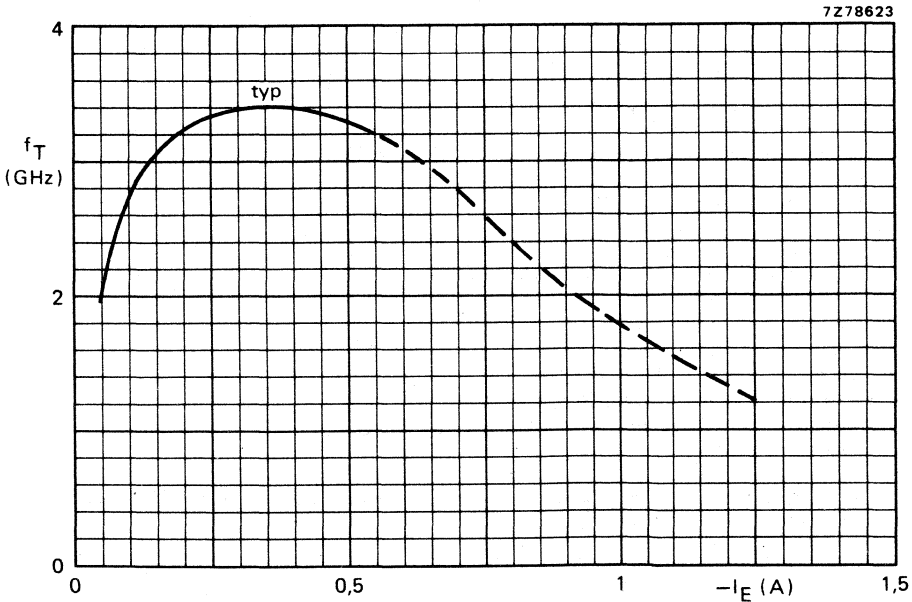


Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

DEVELOPMENT DATA



→ APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	T_{h} (°C)	d_{im} (dB) *	P_{Osync} (W) *	G_{p} (dB)
860	25	300	70	-60	> 1,0	> 10
860	25	300	70	-60	typ. 1,07	typ. 10,5
860	25	300	25	-60	typ. 1,15	typ. 10,5

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

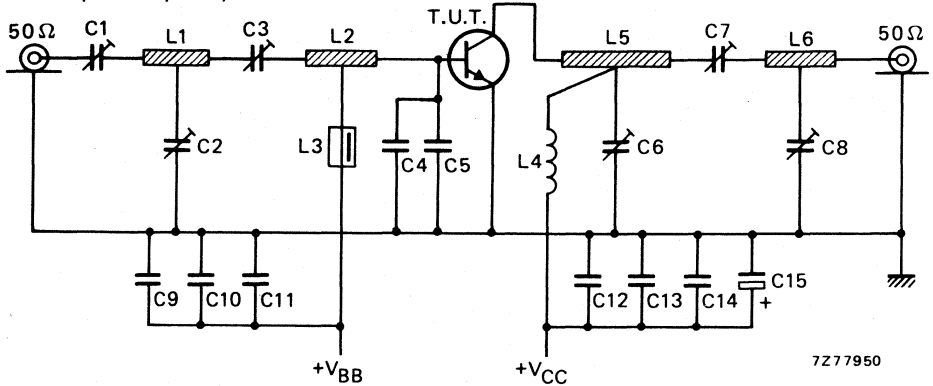


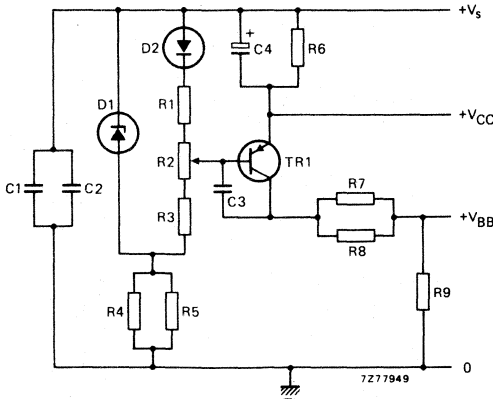
Fig. 8 Test circuit at $f_{\text{vision}} = 860$ MHz.

List of components:

- C1 = C3 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
- C2 = C6 = C8 = 1 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
- C4 = C5 = 3 pF chip capacitor
- C7 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
- C9 = C12 = 1 nF chip capacitor
- C10 = 100 nF polyester capacitor
- C11 = C13 = 470 nF polyester capacitor
- C14 = 10 nF polyester capacitor
- C15 = 3,3 μ F/40 V solid aluminium electrolytic capacitor

- L1 = stripline (13,2 mm x 4,3 mm)
- L2 = stripline (15,2 mm x 4,3 mm)
- L3 = micro choke 0,47 μ H (4322 057 04770)
- L4 = 4 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 5 mm
- L5 = stripline (37,0 mm x 4,3 mm)
- L6 = stripline (13,5 mm x 4,3 mm)

L1; L2; L5 and L6 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,5 mm.



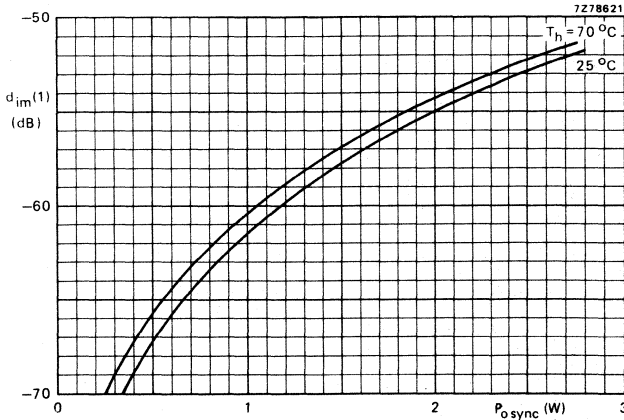
List of components:

C1 = C2 = C3 = 100 nF polyester capacitor
C4 = 10 μ F/25 V solid aluminium electrolytic capacitor

R1 = 150 Ω carbon resistor (0,25 W)
R2 = 100 Ω carbon resistor (0,25 W)
R3 = 82 Ω carbon resistor (0,25 W)
R4 = R5 = 2,2 k Ω carbon resistor (0,25 W)
R6 = 5,6 Ω carbon resistor (1 W)
R7 = R8 = 820 Ω carbon resistor (0,5 W)
R9 = 33 Ω carbon resistor (0,25 W)

D1 = BZY88-C3V3
D2 = BY206
TR1 = BD136

Fig. 9 Bias circuit for class-A linear amplifier at $f_{\text{vision}} = 860$ MHz.



(1) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level. Intermodulation distortion of input signal ≤ -75 dB.

Fig. 10 Intermodulation distortion as a function of output power.
Typical values; $V_{\text{CE}} = 25$ V; $I_{\text{C}} = 300$ mA; $f_{\text{vision}} = 860$ MHz.

Information for wide-band application from 470 to 860 MHz available on request.

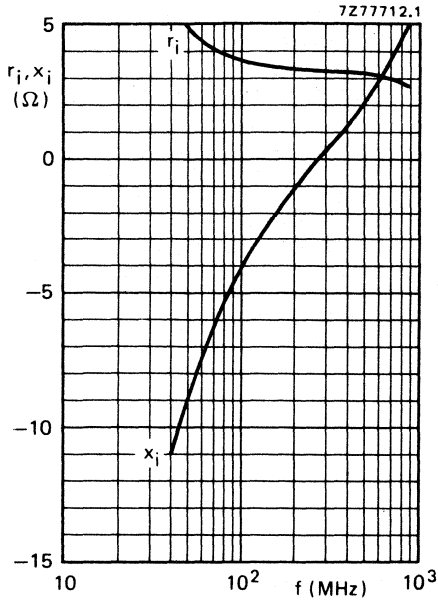


Fig. 11 Input impedance (series components).

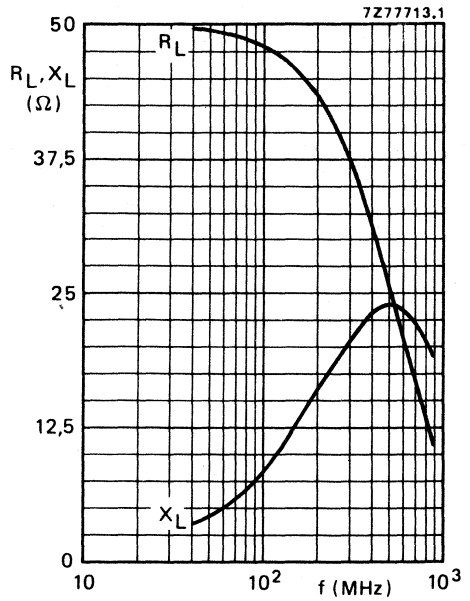


Fig. 12 Load impedance (series components).

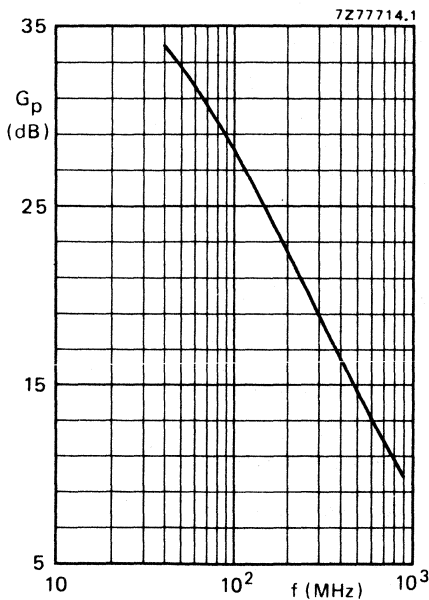


Fig. 13.

Conditions for Figs 11, 12 and 13:

Typical values; $V_{CE} = 25 \text{ V}$; $I_C = 300 \text{ mA}$;
 $T_h = 70 \text{ }^\circ\text{C}$.

Ruggedness

The BLW33 is capable of withstanding a load mismatch ($V_{SWR} = 50$) under the following conditions:

$f = 860 \text{ MHz}$; $V_{CE} = 25 \text{ V}$; $I_C = 300 \text{ mA}$;
 $T_h = 70 \text{ }^\circ\text{C}$ and $P_{L(AV)} = 2 \text{ W}$.

This holds for single-tone as well as for two-tone operation (vision and sound).

DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

733BLY/A
(BLW34)

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in **linear u.h.f. amplifiers** for television transmitters and transposers. The **excellent d.c. dissipation properties** for class-A operation are obtained by means of diffused emitter ballasting resistors and a multi-base structure, providing an optimum temperature profile on the crystal area. The combination of optimum thermal design and the application of **gold sandwich metallization** realizes excellent reliability properties.

The transistor has a 1/4" capstan envelope with ceramic cap.

QUICK REFERENCE DATA

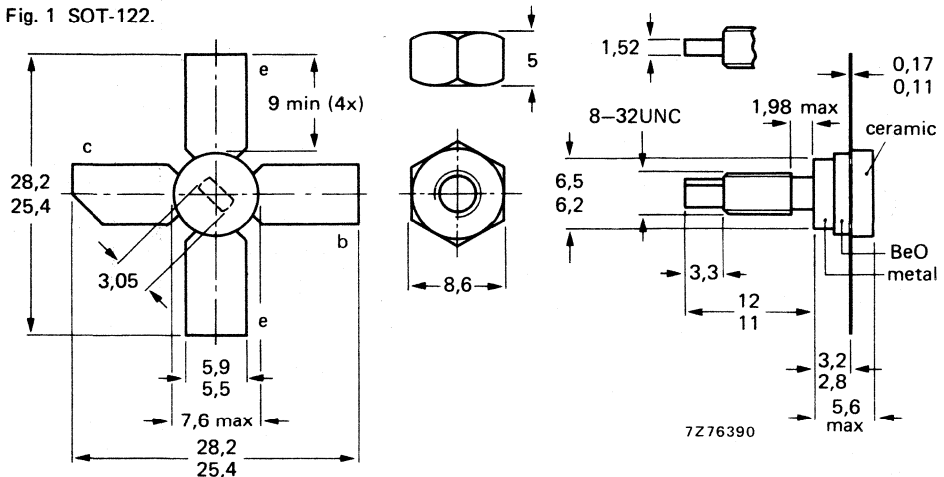
R.F. performance

mode of operation	f _{vision} MHz	V _{CE} V	I _C mA	T _h °C	d _{im} * dB	P _{o sync} * W	G _p dB
class-A; linear amplifier	860	25	600	70	-60	> 1,8	> 9
	860	25	600	25	-60	typ. 2,15	typ. 10,2

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage
(peak value); $V_{BE} = 0$

open base

Emitter-base voltage (open collector)

Collector current

d.c. or average

(peak value); $f > 1$ MHz

→ Total power dissipation at $T_{mb} = 25\text{ }^\circ\text{C}$

Storage temperature

Operating junction temperature

V_{CESM} max. 50 V

V_{CEO} max. 30 V

V_{EBO} max. 4 V

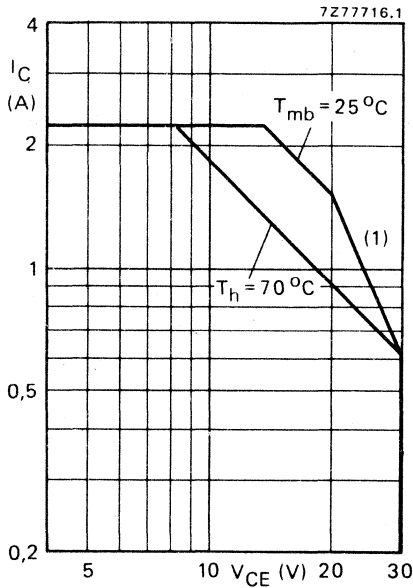
I_C max. 2,25 A

I_{CM} max. 3,5 A

P_{tot} max. 31 W

T_{stg} -65 to +150 $^\circ\text{C}$

T_j max. 200 $^\circ\text{C}$



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

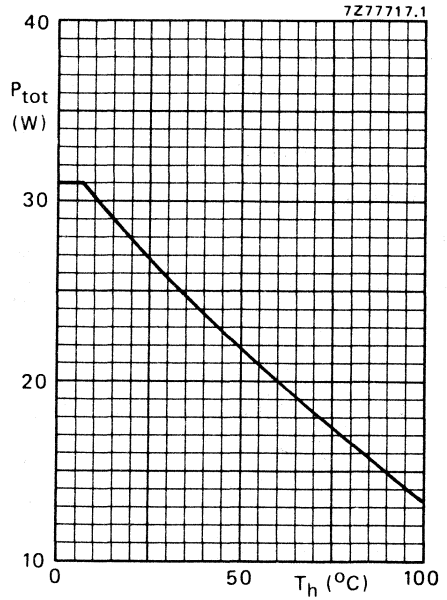


Fig. 3 Power derating curve vs. temperature.

→ **THERMAL RESISTANCE** (see Fig. 4)

From junction to mounting base

(dissipation = 15 W; $T_{mb} = 79\text{ }^\circ\text{C}$; i.e. $T_h = 70\text{ }^\circ\text{C}$)

From mounting base to heatsink

$R_{th\ j-mb} = 6,2\text{ }^\circ\text{C/W}$

$R_{th\ mb-h} = 0,6\text{ }^\circ\text{C/W}$

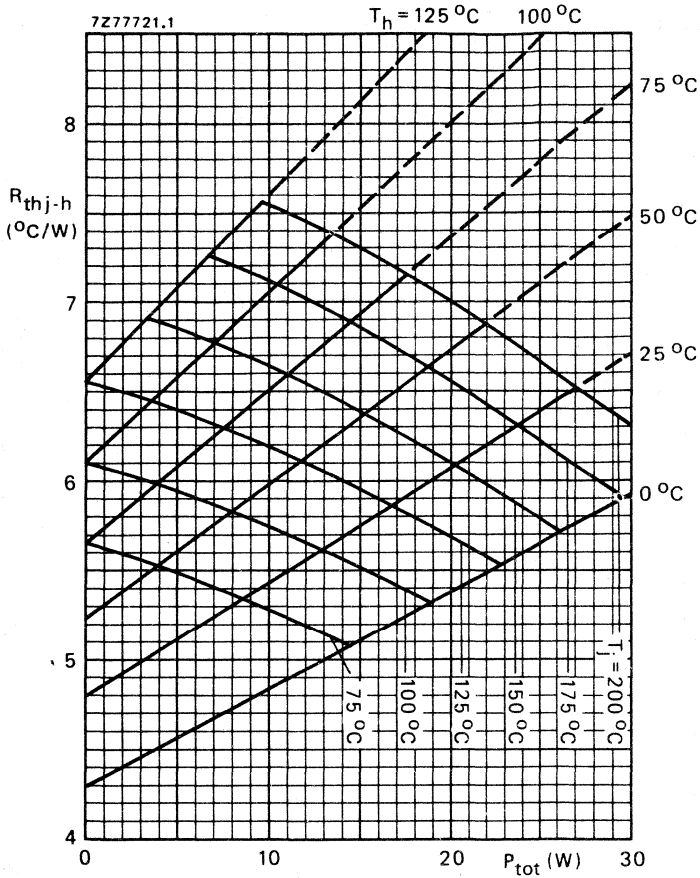


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,6^\circ\text{C/W}$).

Example

Nominal class-A operation: $V_{CE} = 25\text{ V}$; $I_C = 600\text{ mA}$; $T_h = 70^\circ\text{C}$.

Fig. 4 shows: R_{thj-h} max. $6,75^\circ\text{C/W}$
 T_j max. 170°C

Typical device: R_{thj-h} typ. $5,45^\circ\text{C/W}$
 T_j typ. 152°C

DEVELOPMENT I SAMPLE DATA

733BLY/A (BLW34)

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 8\text{ mA}$

open base; $I_C = 60\text{ mA}$

$V_{(BR)CES} > 50\text{ V}$

$V_{(BR)CEO} > 30\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 4\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 30\text{ V}$

$V_{BE} = 0; V_{CE} = 30\text{ V}; T_j = 175\text{ }^\circ\text{C}$

$I_{CES} < 2,0\text{ mA}$

$I_{CES} < 5,0\text{ mA}$

D.C. current gain

$I_C = 600\text{ mA}; V_{CE} = 25\text{ V}$

$h_{FE} > 20$

typ. 40

$I_C = 600\text{ mA}; V_{CE} = 25\text{ V}; T_j = 175\text{ }^\circ\text{C}$

$h_{FE} < 120$

Collector-emitter saturation voltage *

$I_C = 1,2\text{ A}; I_B = 0,12\text{ A}$

V_{CEsat} typ. 450 mV

Transition frequency at $f = 500\text{ MHz}$ **

$-I_E = 0,6\text{ A}; V_{CB} = 25\text{ V}$

$-I_E = 1,2\text{ A}; V_{CB} = 25\text{ V}$

f_T typ. 3,3 GHz

f_T typ. 3,0 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 25\text{ V}$

C_c typ. 13,5 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 40\text{ mA}; V_{CE} = 25\text{ V}$

C_{re} typ. 8,4 pF

Collector-stud capacitance

C_{cs} typ. 2 pF

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

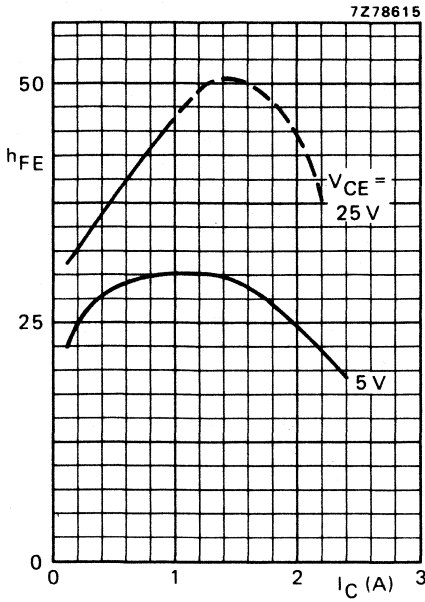


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

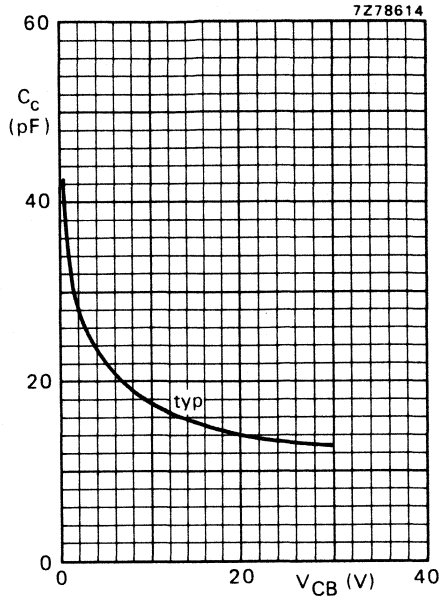


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

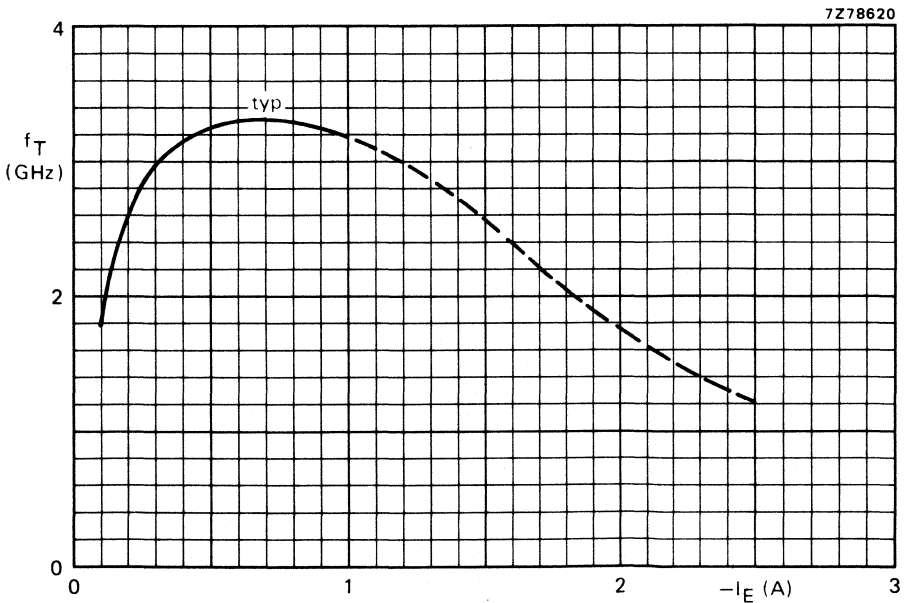


Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	T_{h} (°C)	d_{im} (dB) *	$P_{\text{O sync}}$ (W) *	G_{p} (dB)
860	25	600	70	-60	> 1,8	> 9
860	25	600	70	-60	typ. 1,9	typ. 10,2
860	25	600	25	-60	typ. 2,15	typ. 10,2

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

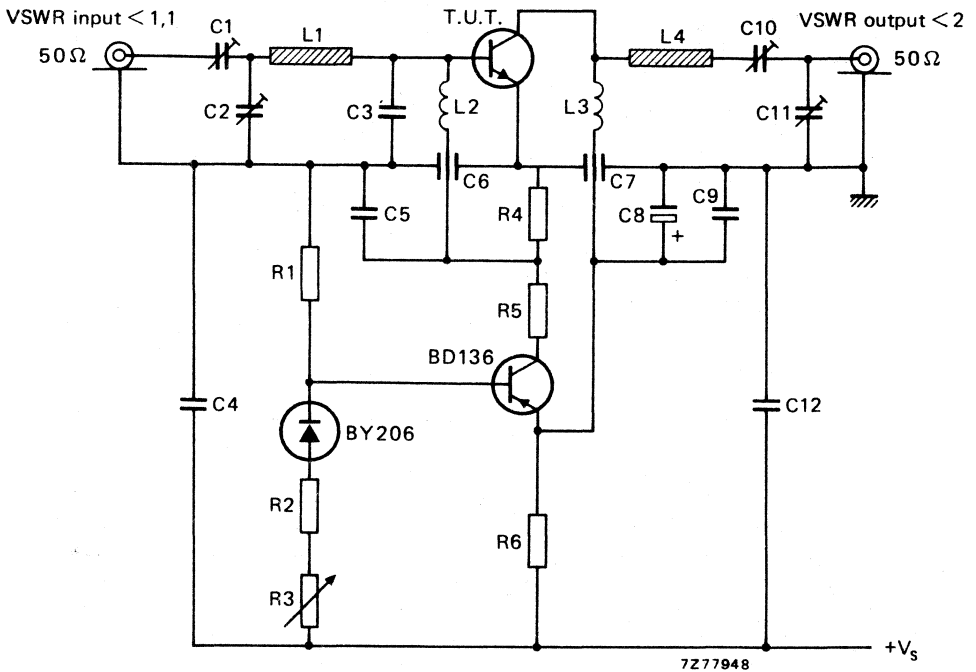


Fig. 8 Test circuit at $f_{\text{vision}} = 860$ MHz.

List of components:

- C1 = C2 = 1,4 pF to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C3 = 2 x 5,6 pF chip capacitors (in parallel)
- C4 = C5 = 100 nF polyester capacitor
- C6 = C7 = 1 nF feed-through capacitor
- C8 = 10 μF/40 V solid aluminium electrolytic capacitor
- C9 = 470 nF polyester capacitor
- C10 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
- C11 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
- C12 = 5,6 pF ceramic capacitor

List of components (continued):

R1 = 1,8 k Ω carbon resistor (0,5 W)

R2 = 150 Ω carbon resistor (0,25 W)

R3 = 100 Ω wirewound potentiometer (3 W)

R4 = 33 Ω carbon resistor (0,5 W)

R5 = 220 Ω carbon resistor (1 W)

R6 = 3 Ω ; parallel connection of 4 x 12 Ω carbon resistors (1 W each)

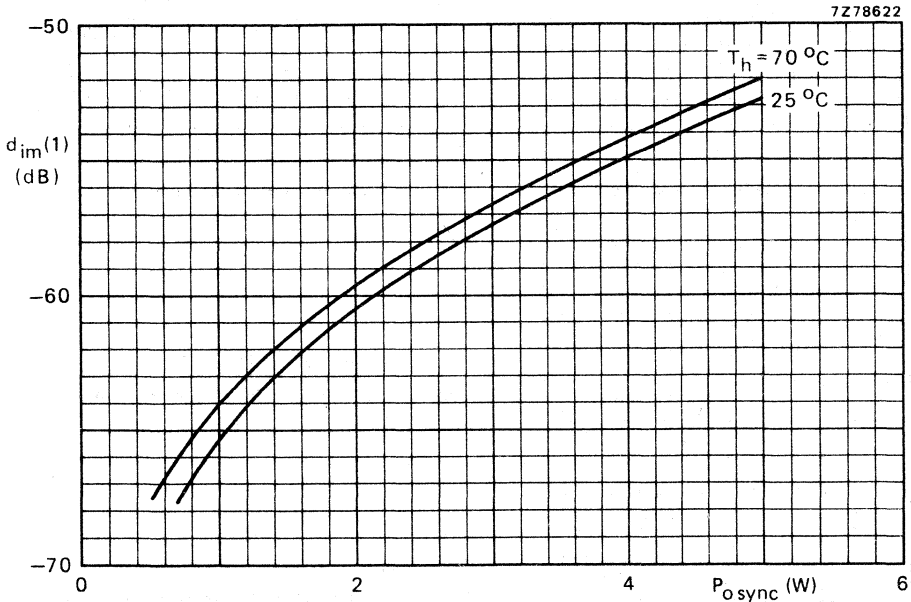
L1 = stripline (13,6 mm x 6,9 mm)

L2 = microchoke 0,47 μ H (cat. no. 4322 057 04770)

L3 = 1 turn Cu wire (1 mm); internal diameter 5,5 mm; leads 2 x 5 mm

L4 = stripline (40,8 mm x 6,9 mm)

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,5 mm.



(1) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level. Intermodulation distortion of input signal ≤ -75 dB.

Fig. 9 Intermodulation distortion as a function of output power.
Typical values; $V_{CE} = 25$ V; $I_C = 600$ mA; $f_{vision} = 860$ MHz.

Information for wide-band application from 470 to 860 MHz available on request.

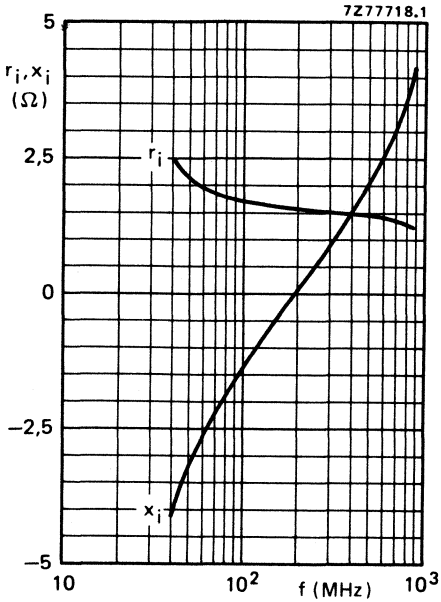


Fig. 10 Input impedance (series components).

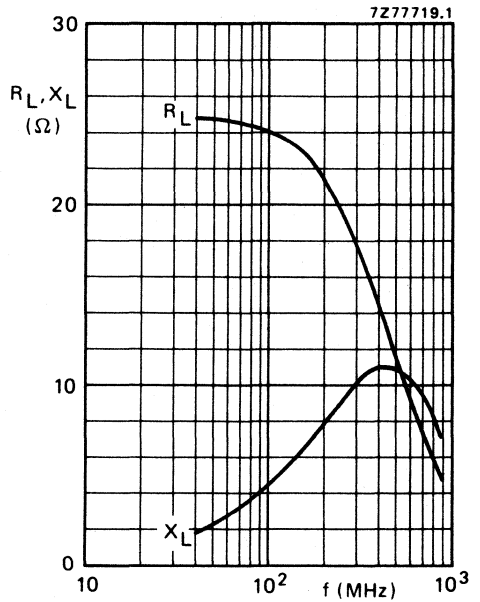


Fig. 11 Load impedance (series components).

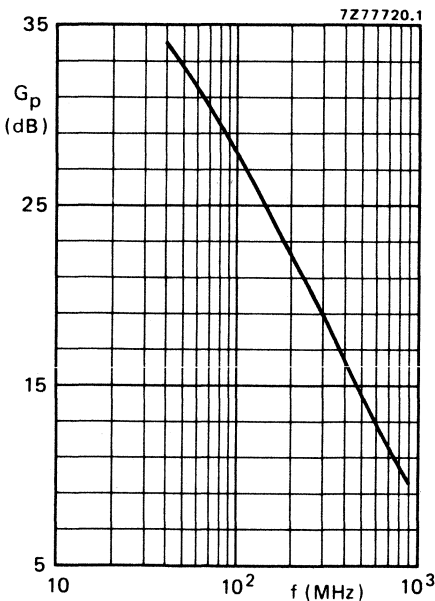


Fig. 12.

Conditions for Figs 10, 11 and 12:

Typical values; $V_{CE} = 25$ V; $I_C = 600$ mA;
 $T_h = 70$ °C.

Ruggedness

The BLW34 is capable of withstanding a load mismatch (VSWR = 50) under the following conditions:

$f = 860$ MHz; $V_{CE} = 25$ V; $I_C = 600$ mA;
 $T_h = 70$ °C and $P_{L(AV)} = 4$ W.

This holds for single-tone as well as for two-tone operation (vision and sound).

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a nominal supply voltage of 12,5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply over-voltage to 15 V. Matched h_{FE} groups are available on request.

It has a plastic encapsulated stripline package. All leads are isolated from the stud.

QUICK REFERENCE DATA

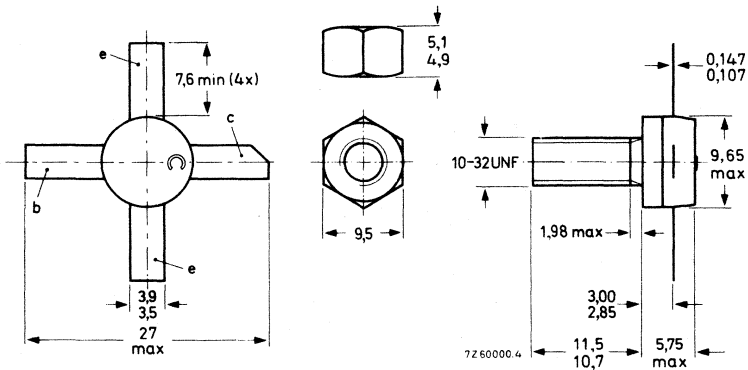
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V	d_3 dB
c.w. (class-B)	12,5	175	45	> 5,5	> 75	$1,1 + j1,4$	$310 + j95$	—
s.s.b. (class-AB)	12,5	1,6–28	3–30 (P.E.P.)	typ. 19,5	typ. 35	—	—	typ. -33

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 5,0 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

BLW60

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter)
peak value

V_{CBOM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 18 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Currents

Collector current (average)

$I_C(AV)$ max. 8 A

Collector current (peak value); $f \geq 1\text{MHz}$

I_{CM} max. 20 A

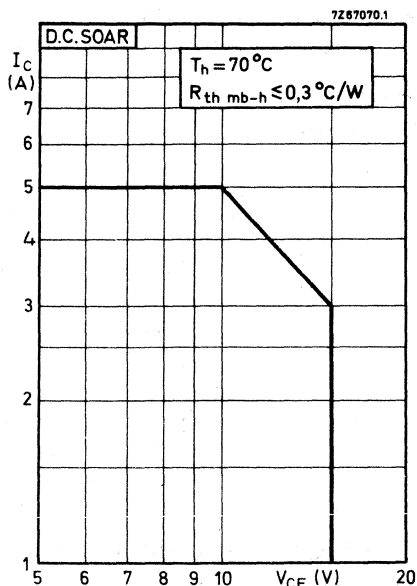
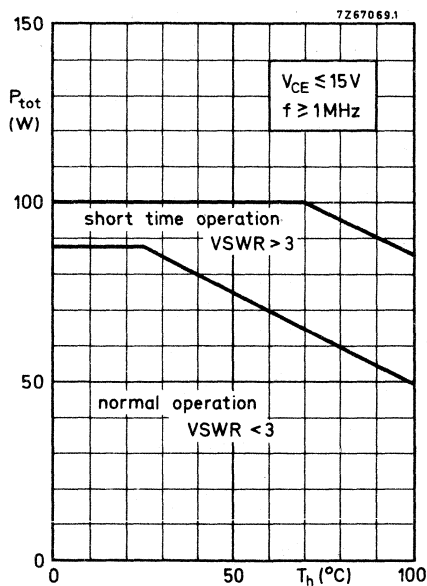
Power dissipation

Total power dissipation at $T_h = 70^\circ\text{C}$

$f \geq 1\text{MHz}$; $V_{CE} \leq 15\text{V}$; $R_{th\text{ mb-h}} \leq 0,3^\circ\text{C/W}$

Derate by $0,5\text{ W/}^\circ\text{C}$ for $50^\circ\text{C} \leq T_h \leq 100^\circ\text{C}$

P_{tot} max. 65 W



Temperature

Storage temperature

T_{stg} -65 to +200 $^\circ\text{C}$

CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specifiedBreakdown voltages

Collector-base voltage open emitter; $I_C = 100\text{ mA}$	$V_{(BR)CBO} >$	36 V
Collector-emitter voltage open base; $I_C = 100\text{ mA}$	$V_{(BR)CEO} >$	18 V
Emitter-base voltage open collector; $I_E = 25\text{ mA}$	$V_{(BR)EBO} >$	4 V

Transient energy $L = 25\text{ mH}; f = 50\text{ Hz}$

open base	E	>	8 mWs
$-V_{BE} = 1,5\text{ V}; R_{BE} = 33\ \Omega$	E	>	8 mWs

D.C. current gain

$I_C = 1\text{ A}; V_{CE} = 5\text{ V}$	h_{FE}	20 to 100
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D.C. current gain ratio of matched devices

$I_C = 1\text{ A}; V_{CE} = 5\text{ V}$	$h_{FE1}/h_{FE2} <$	1, 2
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Transition frequency

$I_C = 6\text{ A}; V_{CE} = 10\text{ V}$	f_T	typ.	550 MHz
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Collector capacitance at $f = 1\text{ MHz}$

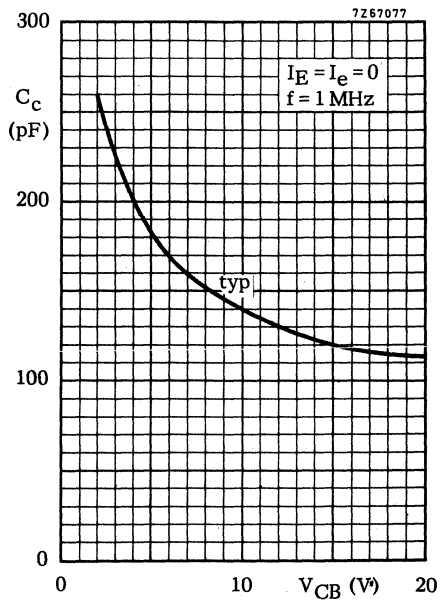
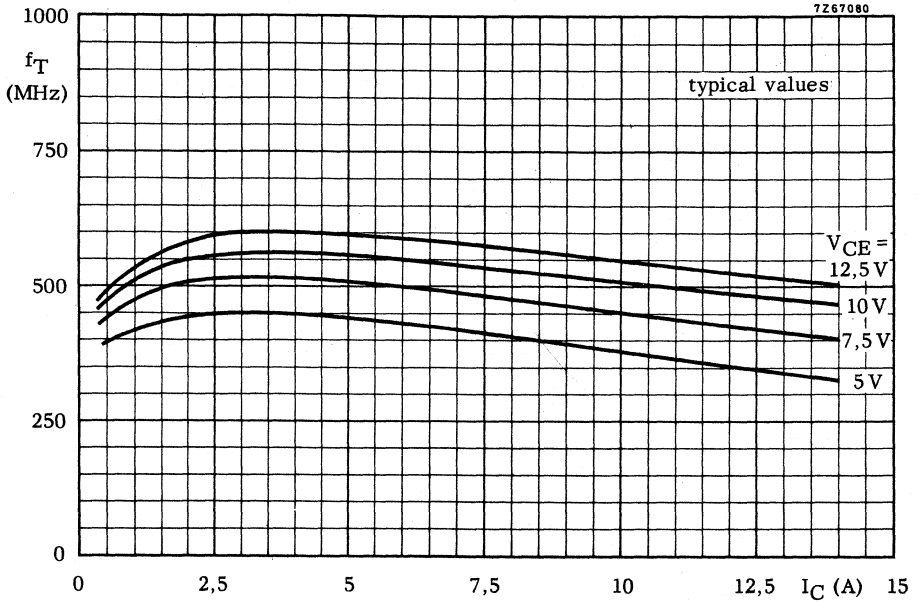
$I_E = I_e = 0; V_{CB} = 15\text{ V}$	C_c	typ.	120 pF
		<	160 pF

Feedback capacitance

$I_C = 200\text{ mA}; V_{CE} = 15\text{ V}$	C_{re}	typ.	80 pF
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Collector-stud capacitance

	C_{cs}	typ.	2 pF
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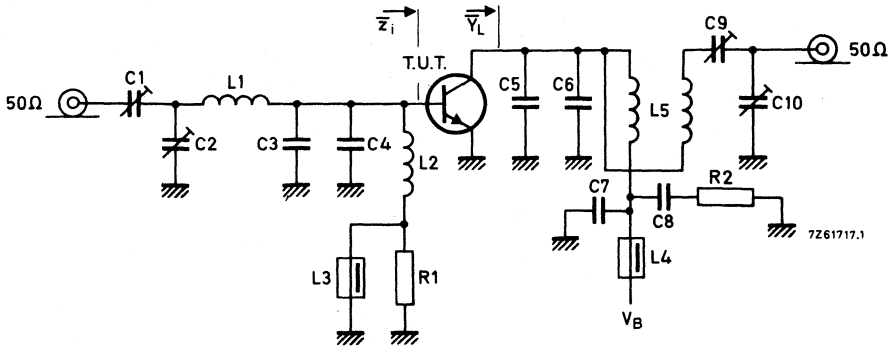
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class B circuit)

$f = 175 \text{ MHz}$; T_h up to $25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$.

V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
12,5	< 12,7	45	< 4,8	> 5,5	> 75	$1,1 + j1,4$	$310 + j95$

Test circuit for 175 MHz:



- C1 = 2 to 20 pF film dielectric trimmer
 C2 = 4 to 40 pF film dielectric trimmer
 C3 = C4 = C5 = C6 = 56 pF ceramic capacitor
 C7 = 100 pF ceramic capacitor
 C8 = 100 nF polyester capacitor
 C9 = 4 to 80 pF film dielectric trimmer
 C10 = 4 to 60 pF film dielectric trimmer

L1 = 1,5 turns enamelled Cu wire (1,5 mm); int. diam. 6 mm; length 4 mm;
leads 2 x 5 mm

L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. diam. 3 mm;
leads 2 x 5 mm

L3 = L4 = ferroxcube choke (code number 4312 020 36640)

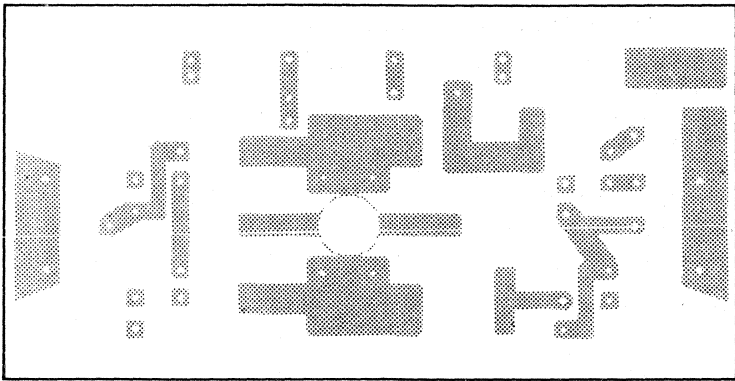
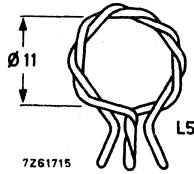
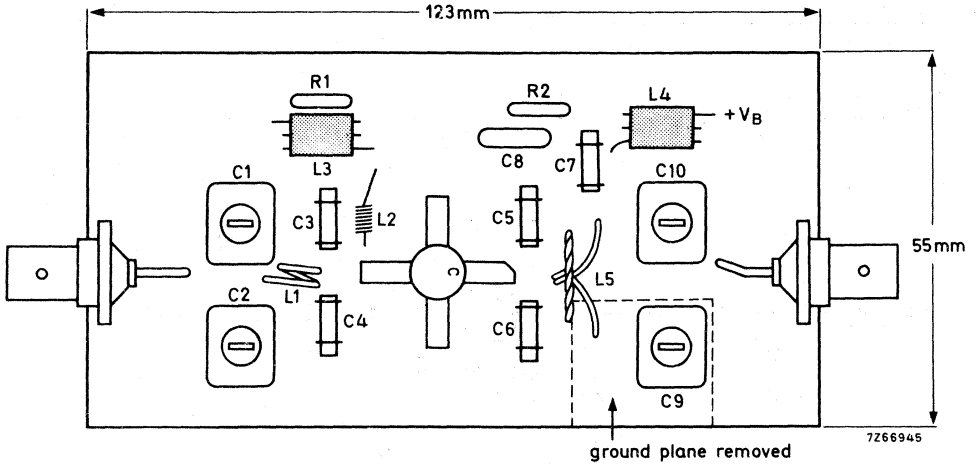
L5 = bifilar wound enamelled Cu wire (1,0 mm); see figure on page 6

R1 = 10 Ω carbon resistor

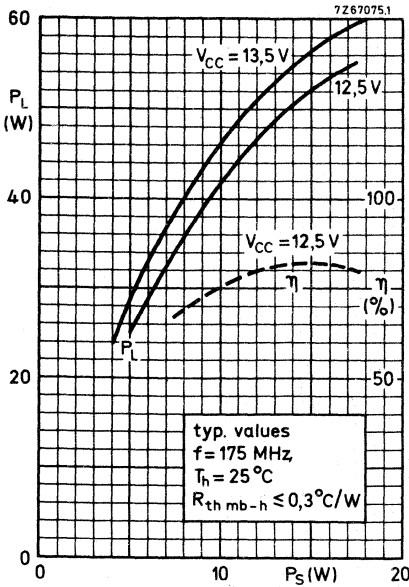
R2 = 4,7 Ω carbon resistor

Component lay-out for 175 MHz test circuit see page 6.

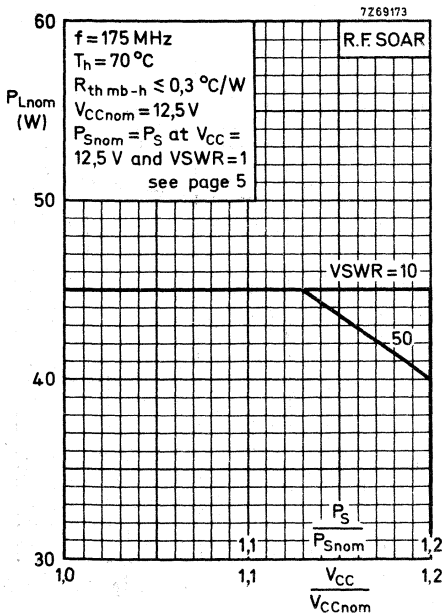
APPLICATION INFORMATION (continued)



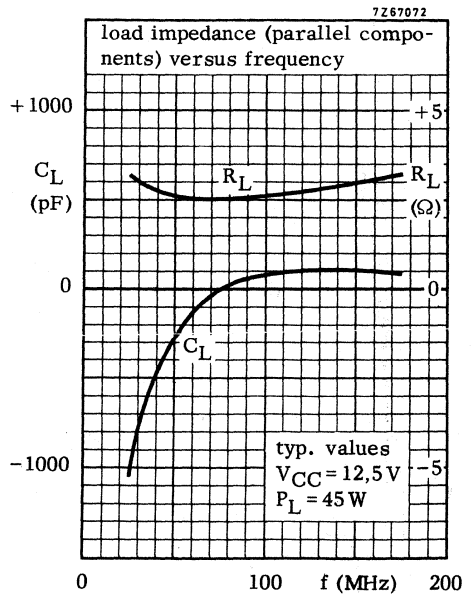
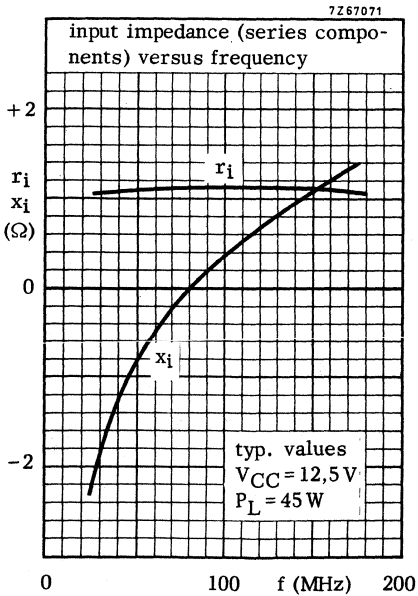
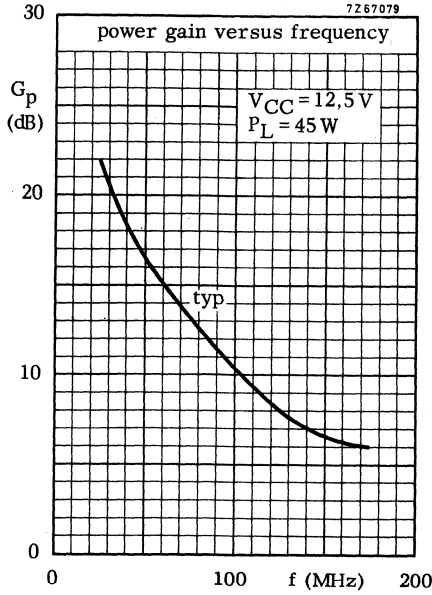
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



At $P_L = 45\text{ W}$ and $V_{CC} = 12,5\text{ V}$, the output power at heatsink temperatures between 25°C and 70°C relative to that at 25°C is diminished by $60\text{ mW}/^\circ\text{C}$.



The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power ($P_{L\text{ nom}}$) must be derated in accordance with the adjacent graph for safe operation at supply voltages other than nominal. The graph shows the allowable output power under nominal conditions as a function of the supply overvoltage ratio with VSWR as parameter. The graph applies to the situation in which the drive ($P_S/P_{S\text{ nom}}$) increases linearly with supply overvoltage ratio ($V_{CC}/V_{CC\text{ nom}}$).



APPLICATION INFORMATION (continued)

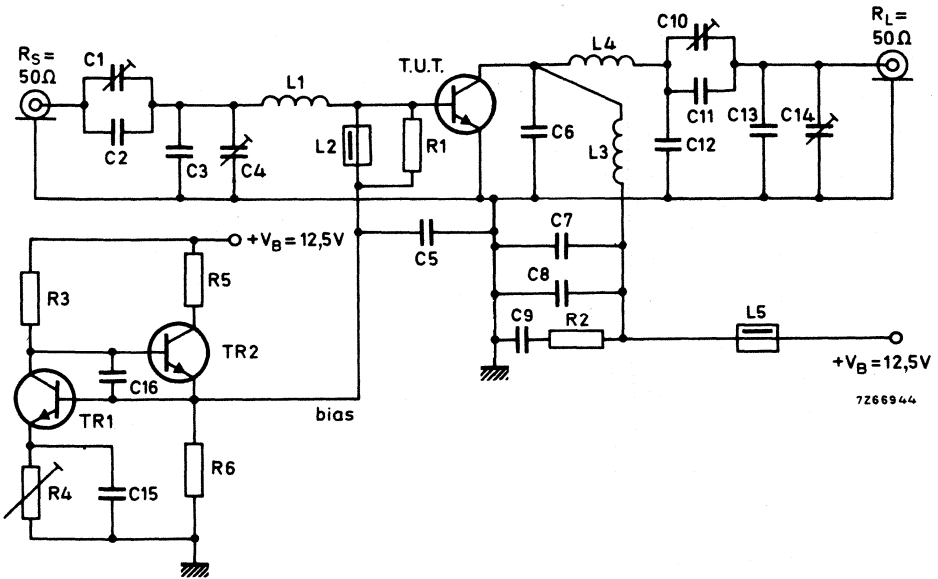
R.F. performance in s.s.b. class-AB operation

$V_{CE} = 12,5 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$

$f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_D dB	η_{dt} %	d_3 dB *	d_5 dB *	$I_{C(ZS)}$ mA
3 to 30 (P.E.P.)	typ. 19,5	typ. 35	typ. -33	typ. -36	25

Test circuit; s.s.b. class-AB.



List of components on page 10.

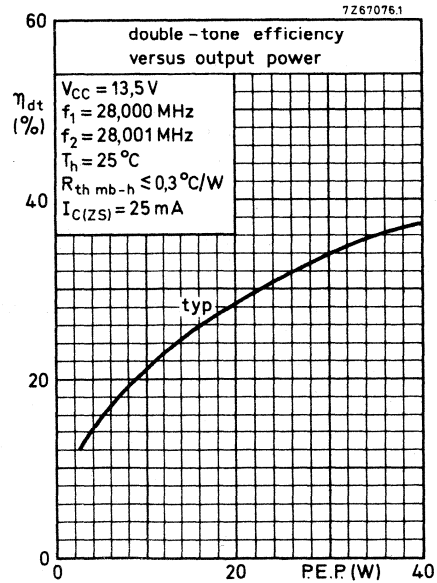
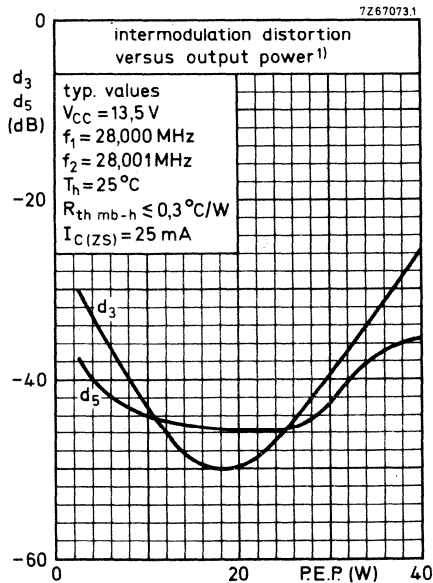
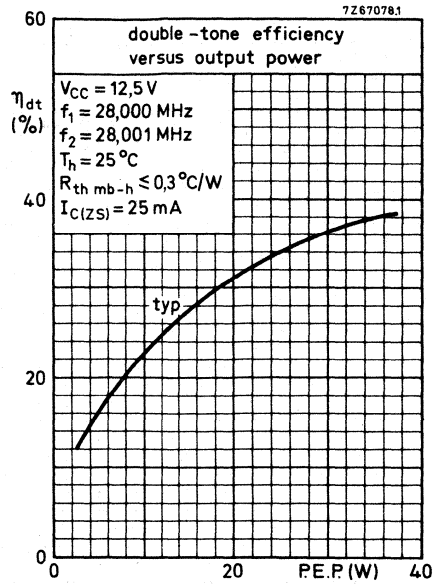
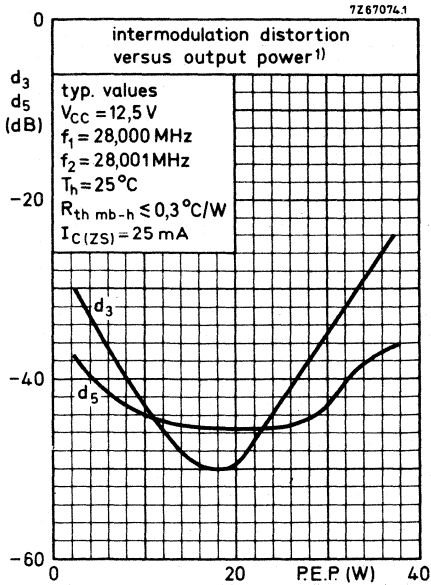
* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

List of components:

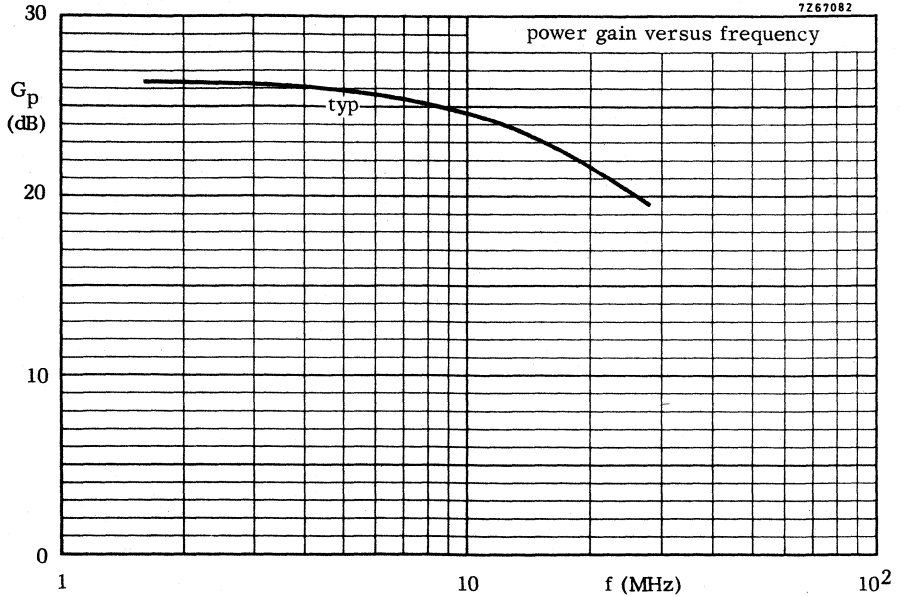
Tr1 = Tr2 = BD137

- C1 = 100 pF air dielectric capacitor (single insulated rotor)
C2 = 27 pF ceramic capacitor
C3 = 180 pF ceramic capacitor
C4 = 100 pF air dielectric capacitor (single non-insulated rotor)
C5 = C7 = 3,9 nF polyester capacitor ($\pm 10\%$)
C6 = 2 x 270 pF polystyrene capacitors in parallel
C8 = C15 = C16 = 100 nF polyester capacitor ($\pm 10\%$)
C9 = 2,2 μ F moulded metallized polyester capacitor
C10 = 2 x 385 pF film dielectric trimmers in parallel
C11 = 68 pF ceramic capacitor
C12 = 2 x 82 pF ceramic capacitors in parallel
C13 = 47 pF ceramic capacitor
C14 = 385 pF film dielectric trimmer
- L1 = 88 nH; 3 turns Cu wire (1,0 mm); internal diameter 9 mm; coil length 6,1 mm;
leads 2 x 5 mm
L2 = L5 = ferroxcube bead, grade 3B (code number 4312 020 36640)
L3 = 68 nH; 3 turns enamelled Cu wire (1,6 mm); internal diameter 8 mm;
coil length 8,3 mm; leads 2 x 5 mm
L4 = 96 nH; 3 turns enamelled Cu wire (1,6 mm); internal diameter 10 mm;
coil length 7,6 mm; leads 2 x 5 mm
- R1 = 27 Ω carbon resistor ($\pm 5\%$)
R2 = 4,7 Ω carbon resistor ($\pm 5\%$)
R3 = 1,5 k Ω carbon resistor ($\pm 5\%$)
R4 = 10 Ω wire-wound potentiometer (3 W)
R5 = 47 Ω wire-wound resistor (5,5 W)
R6 = 150 Ω carbon resistor ($\pm 5\%$)



1) Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

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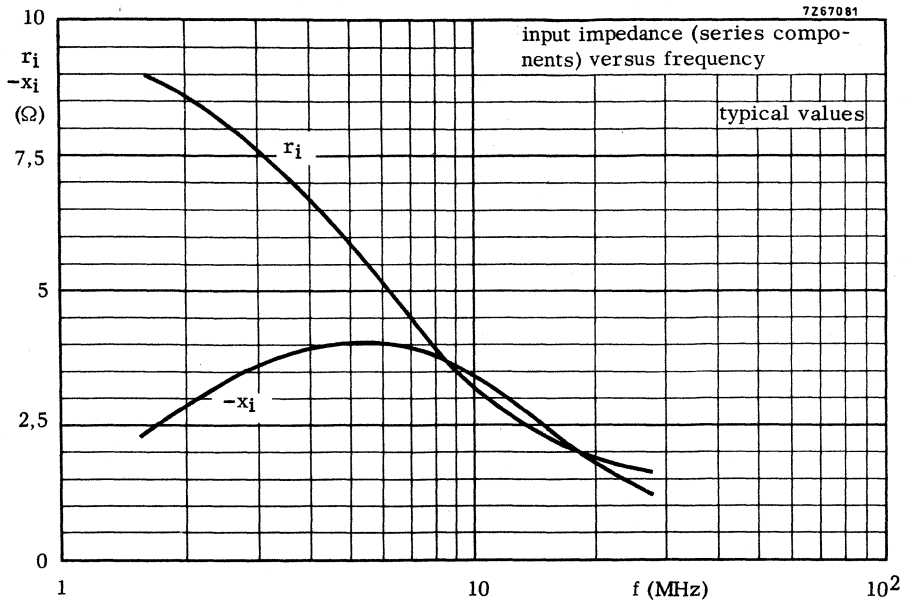
S.S.B. class AB operation

Conditions:

$P_L = 30 \text{ W (PEP)}$
 $V_{CC} = 12,5 \text{ V}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$
 $Z_L = 1,9 \Omega$

$P_L = 35 \text{ W (PEP)}$
 $V_{CC} = 13,5 \text{ V}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$
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The curve (both conditions) holds for an unneutralized amplifier.



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 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$
 $Z_L = 1,9 \Omega$

The curve (both conditions) holds for an unneutralized amplifier.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a nominal supply voltage of 12,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. Matched h_{FE} groups are available on request.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

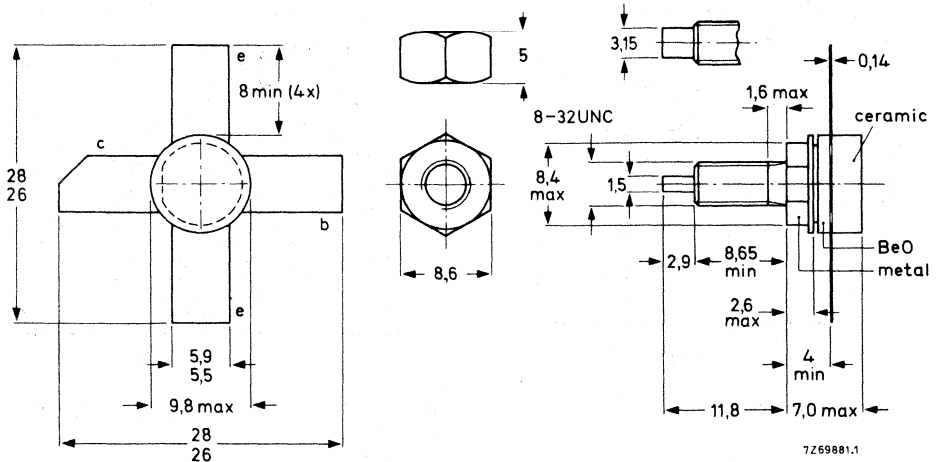
R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CC} V	f MHz	P_L W	G_D dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V	d ₃ dB
c.w. (class-B)	12,5	175	45	> 5,5	> 75	$1,1 + j1,4$	$310 + j95$	—
s.s.b. (class-AB)	12,5	1,6–28	3–30 (P.E.P.)	typ 19,5	typ 35	—	—	typ -33

MECHANICAL DATA

Dimensions in mm

SOT-120



Torque on nut: min 0,75 Nm
(7,5 kg cm)
max 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or
countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 18 V

Emitter-base voltage (open-collector)

V_{EBO} max. 4 V

Collector current (average)

$I_C(AV)$ max. 9 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 22 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 100 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

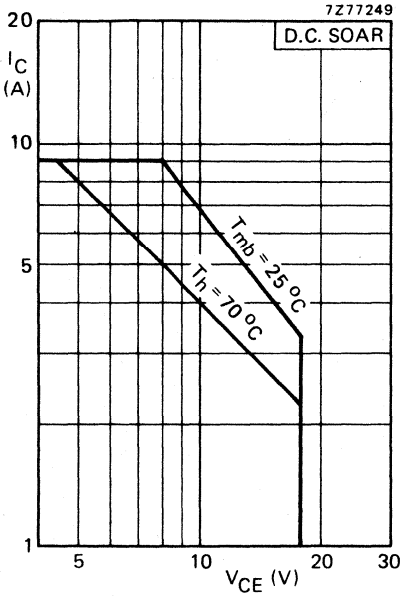


Fig. 2 D.C. SOAR.

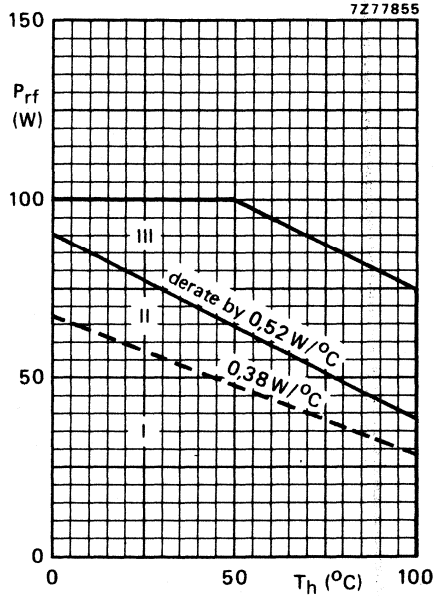


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16.5$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

→ **THERMAL RESISTANCE** (dissipation = 40 W; $T_{mb} = 88$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th j-mb(dc)}$ = 2,8 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th j-mb(rf)}$ = 2,05 °C/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,45 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Breakdown voltage

Collector-emitter voltage

 $V_{BE} = 0; I_C = 50\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter voltage

open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base voltage

open collector; $I_E = 25\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 15\text{ V}$ $I_{CES} < 25\text{ mA}$

Transient energy

 $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $-V_{BE} = 1,5\text{ V}; R_{BE} = 33\text{ }\Omega$ $E > 8\text{ mWs}$ $E > 8\text{ mWs}$

D.C. current gain *

 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ 50
10 to 80

D.C. current gain ratio of matched devices *

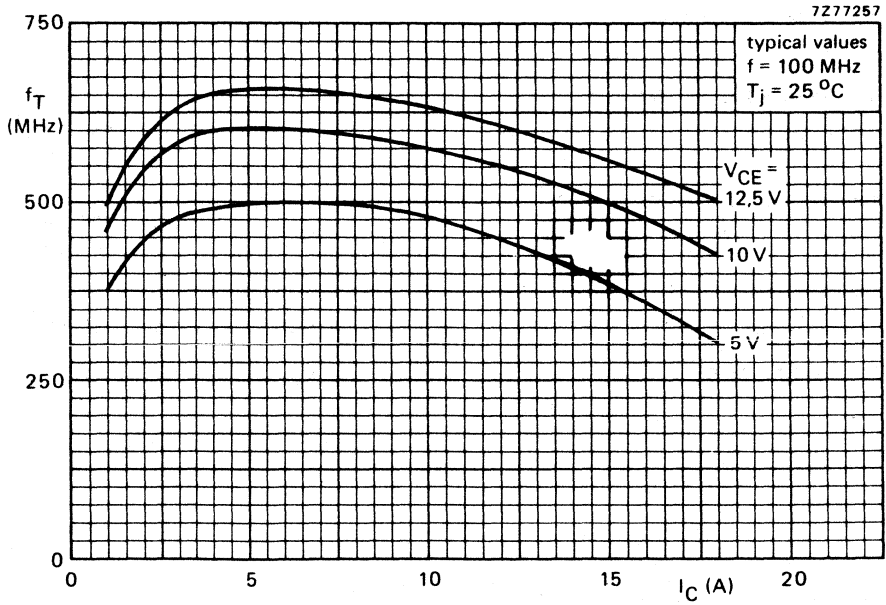
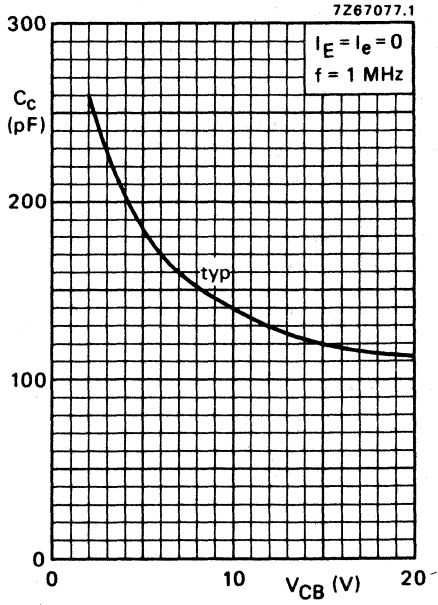
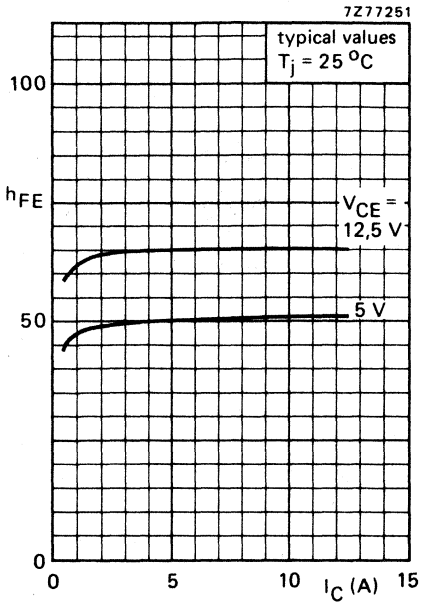
 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage *

 $I_C = 12,5\text{ A}; I_B = 2,5\text{ A}$ V_{CEsat} typ 1,5 VTransition frequency at $f = 100\text{ MHz}$ * $I_C = 4\text{ A}; V_{CE} = 12,5\text{ V}$ $I_C = 12,5\text{ A}; V_{CE} = 12,5\text{ V}$ f_T typ 650 MHz f_T typ 600 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_c typ 120 pF
< 160 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 200\text{ mA}; V_{CE} = 15\text{ V}$ C_{re} typ 80 pF

Collector-stud capacitance

 C_{cs} typ 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



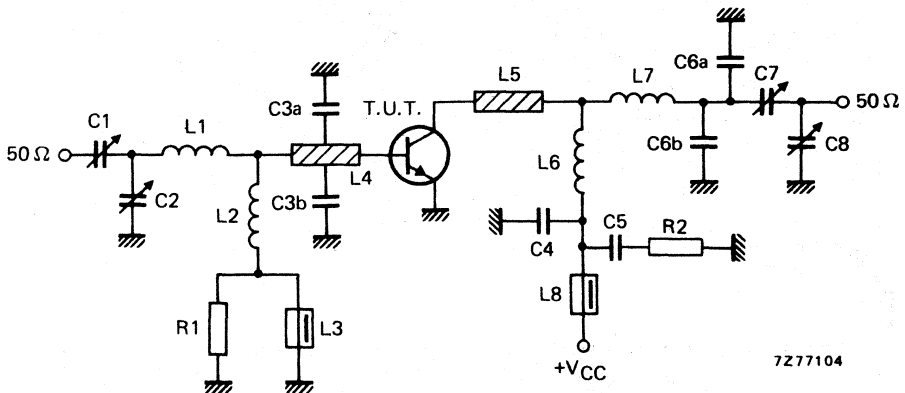
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V _{CC} (V)	P _L (W)	P _S (W)	G _p (dB)	I _C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	12,5	45	< 12,7	> 5,5	< 4,8	> 75	1,1 + j1,4	310 + j95
175	13,5	45	—	typ 6,0	—	typ 75	—	—

Test circuit for 175 MHz



7277104

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6a = C6b = 8,2 pF ceramic capacitor (500 V)

C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = L8 = Ferroxcube choke coil (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 6,0 mm; leads 2 x 5 mm

L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

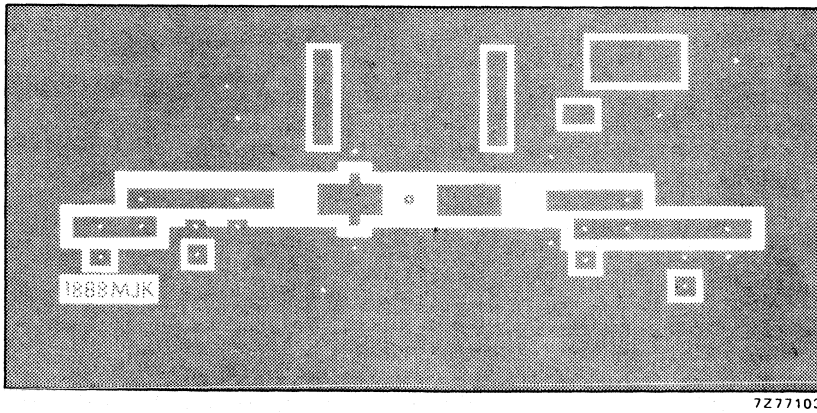
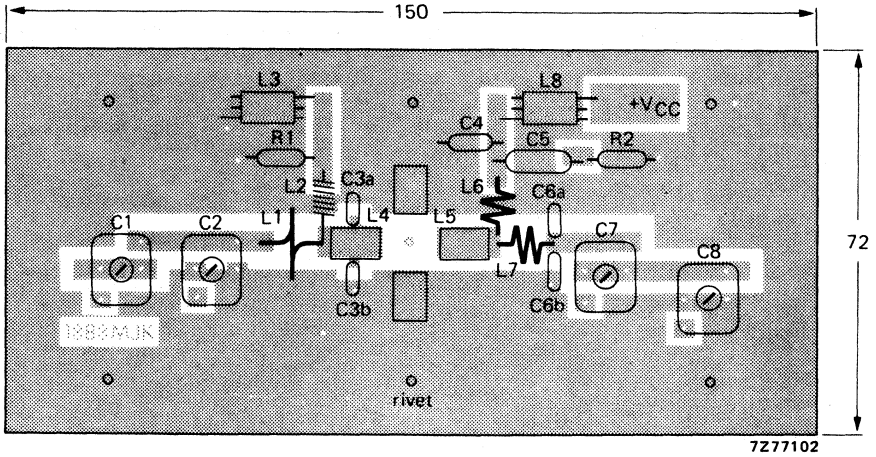
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω ($\pm 10\%$) carbon resistorR2 = 4,7 Ω ($\pm 5\%$) carbon resistor

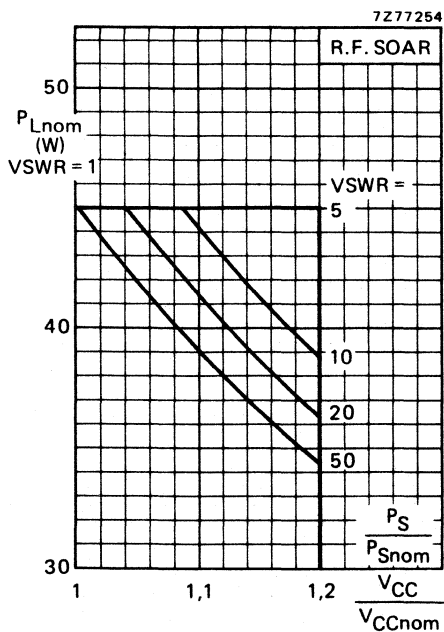
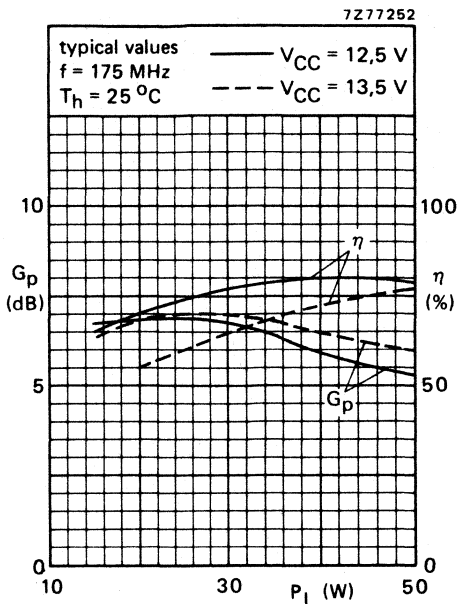
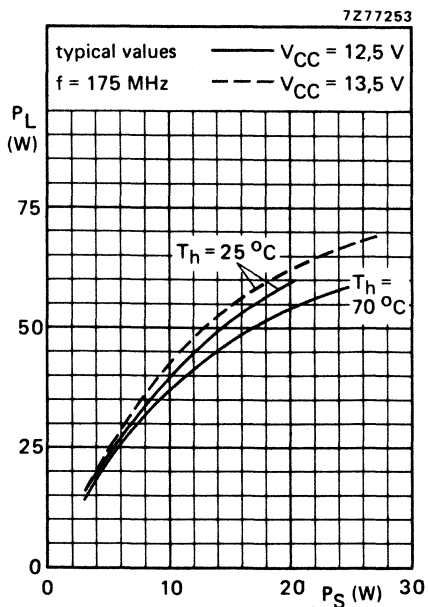
Component layout and printed-circuit board for 175 MHz test circuit on page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 175 MHz test circuit.



The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.



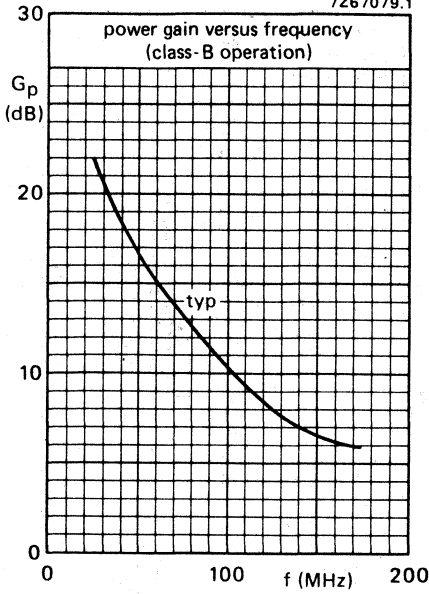
Conditions for R.F. SOAR

$f = 175 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,45 \text{ }^\circ\text{C/W}$
 $V_{CCnom} = 12,5 \text{ V or } 13,5 \text{ V}$
 $P_S = P_{Snom}$ at V_{CCnom} and $VSWR = 1$
 see page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

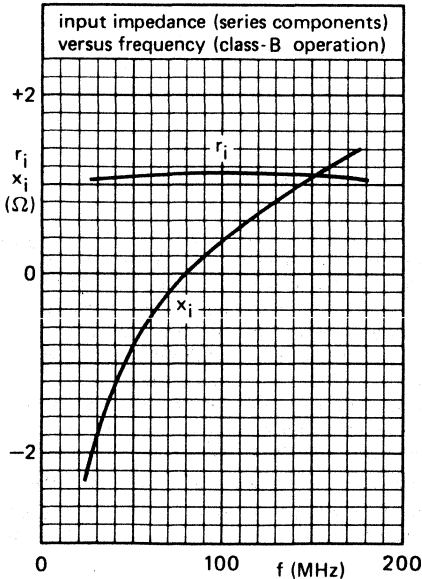
7267079.1



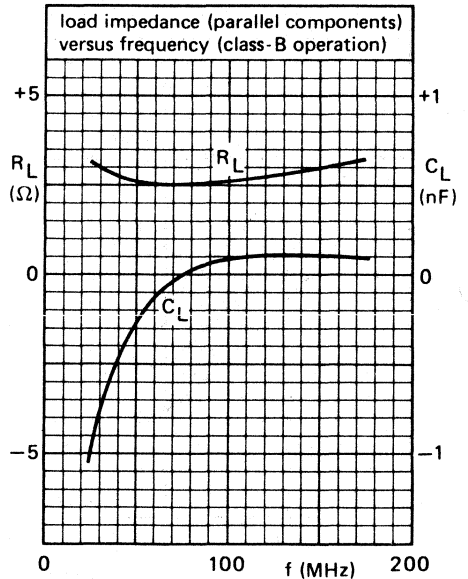
Measuring conditions for the graphs
on this page

$V_{CC} = 12.5 \text{ V}$
 $P_L = 45 \text{ W}$
 $T_h = 25 \text{ }^\circ\text{C}$
 typical values

7267071.1



7267072.1



APPLICATION INFORMATION (continued)

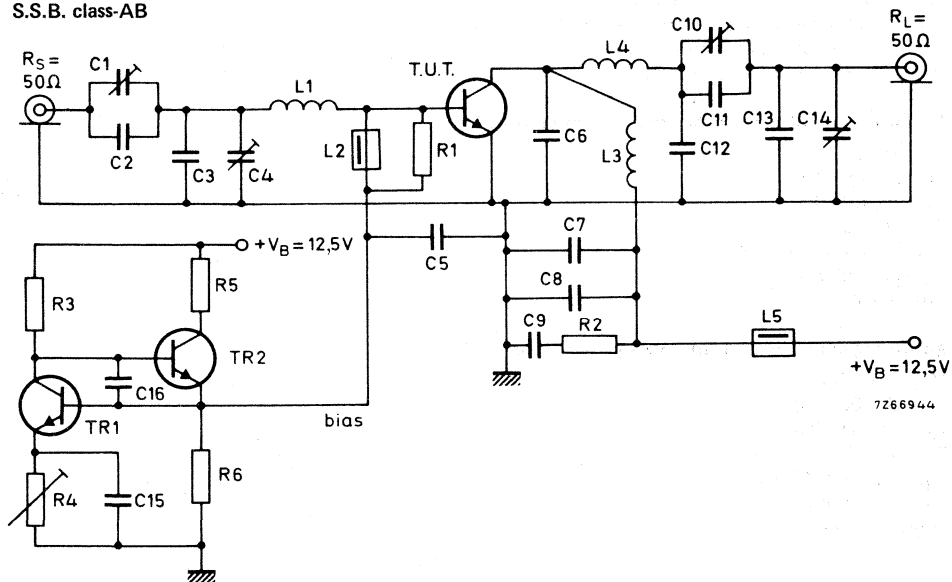
R.F. performance in s.s.b. class-AB operation

 $V_{CE} = 12,5 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,45 \text{ }^\circ\text{C/W}$
 $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} %	d_3 dB *	d_5 dB *	$I_C(ZS)$ mA
3 to 30 (P.E.P.)	typ 19,5	typ 35	typ -33	typ -36	25

Test circuit

S.S.B. class-AB



List of components:

TR1 = TR2 = BD137

C1 = 100 pF air dielectric trimmer (single insulated rotor type)

C2 = 27 pF ceramic capacitor

C3 = 180 pF ceramic capacitor

C4 = 100 pF air dielectric trimmer (single non-insulated rotor type)

C5 = C7 = 3,9 nF polyester capacitor

C6 = 2 x 270 pF polystyrene capacitors in parallel

C8 = C15 = C16 = 100 nF polyester capacitor

C9 = 2,2 μF moulded metallized polyester capacitor

C10 = 2 x 385 pF film dielectric trimmer

C11 = 68 pF ceramic capacitor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

List of components (continued)

C12 = 2 x 82 pF ceramic capacitors in parallel

C13 = 47 pF ceramic capacitor

C14 = 385 pF film dielectric trimmer

L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9 mm; length 6,1 mm; leads 2 x 5 mm

L2 = L5 = Ferroxcube choke coil (cat. no. 4312 020 36640)

L3 = 68 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 8 mm; length 8,3 mm; leads 2 x 5 mm

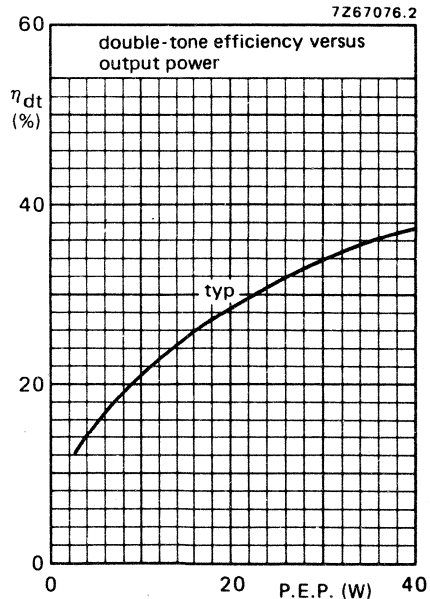
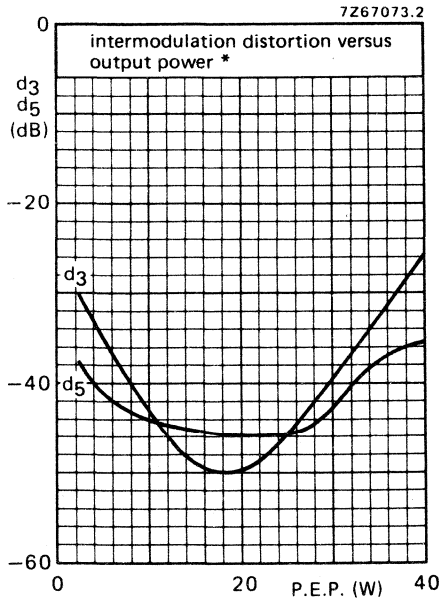
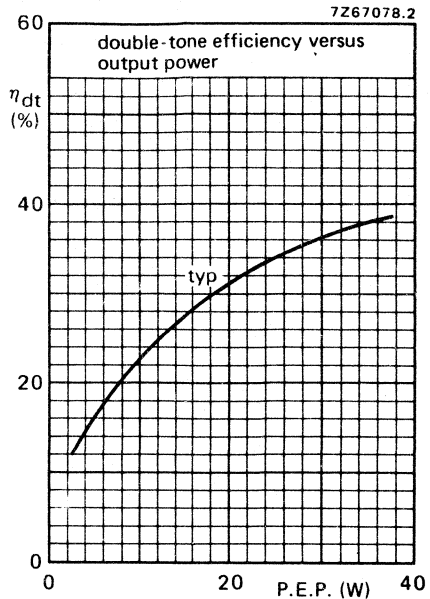
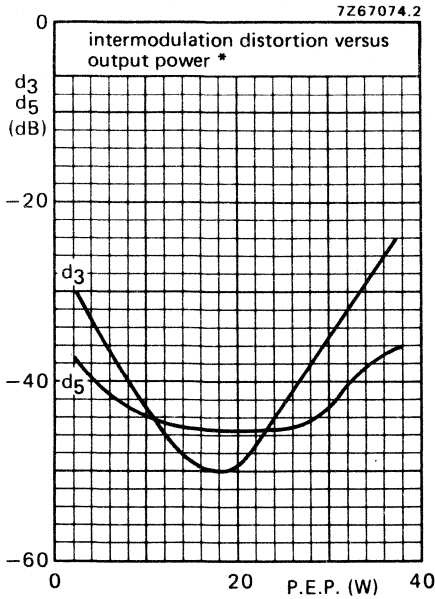
L4 = 96 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 7,6 mm; leads 2 x 5 mm

R1 = 27 Ω ($\pm 5\%$) carbon resistorR2 = 4,7 Ω ($\pm 5\%$) carbon resistorR3 = 1,5 k Ω ($\pm 5\%$) carbon resistorR4 = 10 Ω wirewound potentiometer (3 W)R5 = 47 Ω wirewound resistor (5,5 W)R6 = 150 Ω ($\pm 5\%$) carbon resistor**Measuring conditions for the upper graphs on page 11** $V_{CC} = 12,5 \text{ V}$ $f_1 = 28,000 \text{ MHz}$ $f_2 = 28,001 \text{ MHz}$ $T_h = 25 \text{ }^\circ\text{C}$ $R_{th \text{ mb-h}} \leq 0,45 \text{ }^\circ\text{C/W}$ $I_{C(ZS)} = 25 \text{ mA}$

typical values

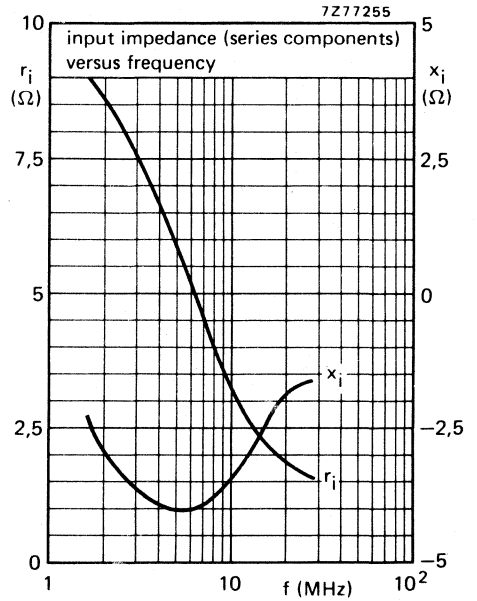
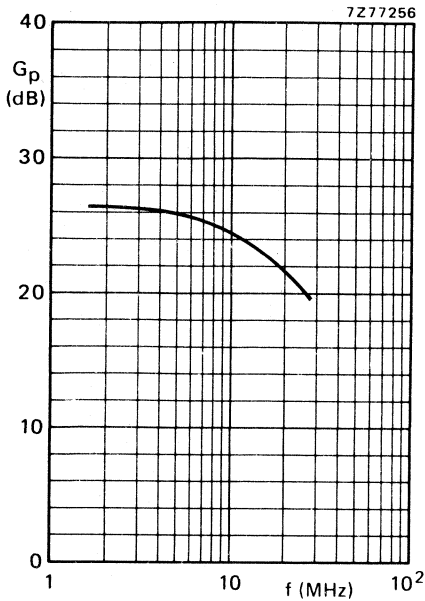
Measuring conditions for the lower graphs on page 11 $V_{CC} = 13,5 \text{ V}$ $f_1 = 28,000 \text{ MHz}$ $f_2 = 28,001 \text{ MHz}$ $T_h = 25 \text{ }^\circ\text{C}$ $R_{th \text{ mb-h}} \leq 0,45 \text{ }^\circ\text{C/W}$ $I_{C(ZS)} = 25 \text{ mA}$

typical values



* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.





S.S.B. class-AB operation

Conditions for the graphs above:

$V_{CC} = 12,5 \text{ V}$

$P_L = 30 \text{ W (P.E.P.)}$

$T_h = 25 \text{ }^\circ\text{C}$

$R_{th \text{ mb-h}} \leq 0,45 \text{ }^\circ\text{C/W}$

$I_{C(ZS)} = 25 \text{ mA}$

$Z_L = 1,9 \text{ } \Omega$

$V_{CC} = 13,5 \text{ V}$

$P_L = 35 \text{ W (P.E.P.)}$

$T_h = 25 \text{ }^\circ\text{C}$

$R_{th \text{ mb-h}} \leq 0,45 \text{ }^\circ\text{C/W}$

$I_{C(ZS)} = 25 \text{ mA}$

$Z_L = 1,9 \text{ } \Omega$

The typical curves (both conditions) hold for an unneutralized amplifier.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

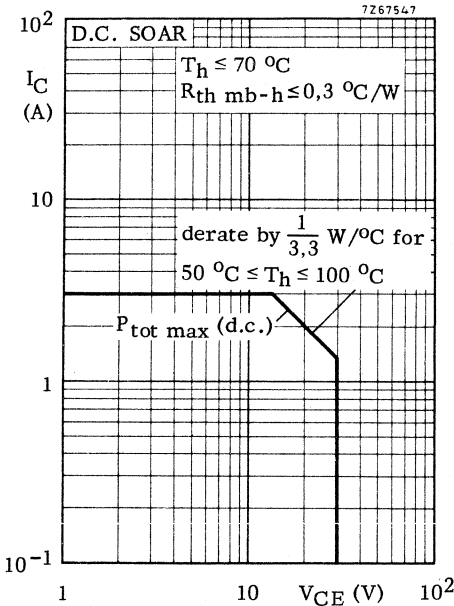
Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	60	V
Collector-emitter voltage ($R_{BE} = 10\Omega$) peak value	V_{CERM}	max.	60	V
Collector-emitter voltage (open base)	V_{CEO}	max.	32	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

Currents

Collector current (average)	$I_{C(AV)}$	max.	3,0	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	9,0	A

Power dissipation

D.C. power dissipation up to $T_h = 70\text{ }^\circ\text{C}$	P_{tot}	max.	40	W
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Temperatures

Storage temperature	T_{stg}	-65 to +200	$^\circ\text{C}$
Junction temperature	T_j	max. 200	$^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	3,0	$^\circ\text{C/W}$
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,3	$^\circ\text{C/W}$

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 50\text{ mA}$	$V_{(BR)CBO}$	>	60	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$, $I_C = 50\text{ mA}$	$V_{(BR)CER}$	>	60	V
Collector-emitter voltage open base, $I_C = 50\text{ mA}$	$V_{(BR)CEO}$	>	32	V
Emitter-base voltage open collector, $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	4	V

Transient energy

$L = 25\text{ mH}$; $f = 50\text{ Hz}$

open base	E	>	4,5	mWs
$-V_{BE} = 1,5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	4,5	mWs

D.C. current gain

$I_C = 1,0\text{ A}$; $V_{CE} = 5\text{ V}$	h_{FE}	>	25	
		typ.	40	

Transition frequency

$I_C = 4\text{ A}$; $V_{CE} = 25\text{ V}$	f_T	typ.	900	MHz
---	-------	------	-----	-----

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 30\text{ V}$	C_c	typ.	68	pF
		<	80	pF

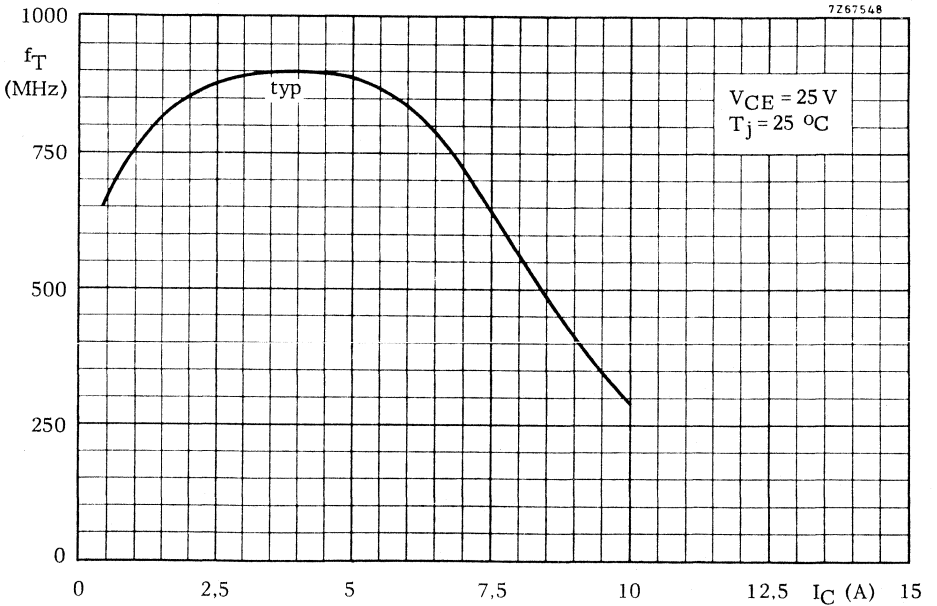
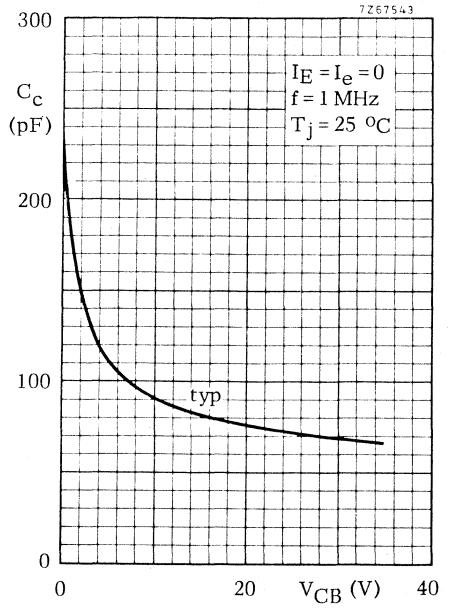
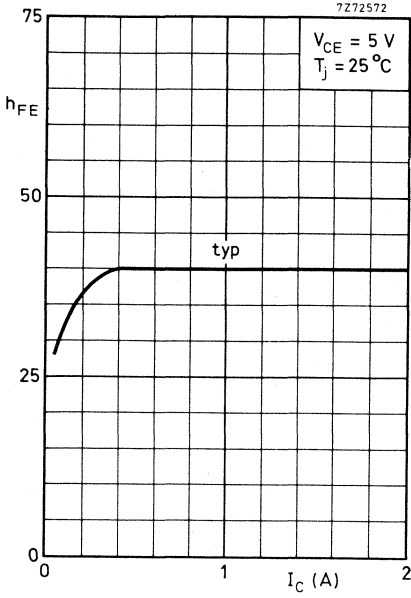
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 200\text{ mA}$; $V_{CE} = 30\text{ V}$	C_{re}	typ.	39	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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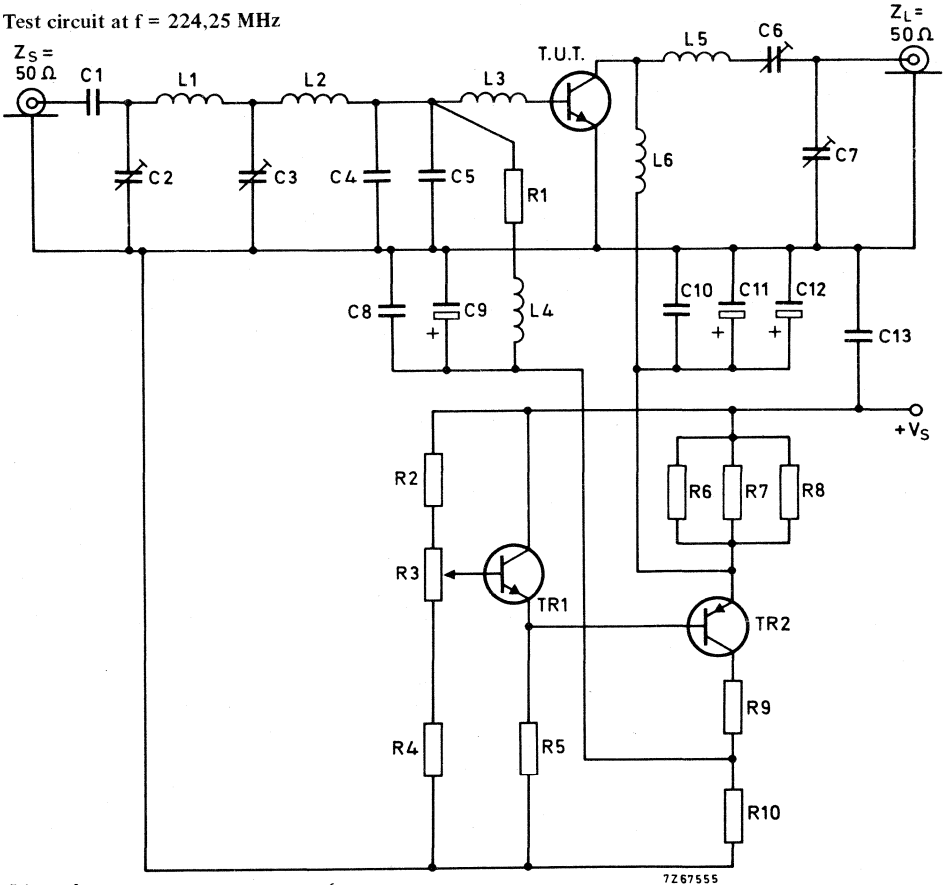


APPLICATION INFORMATION

dim *) (dB)	f _{vision} (MHz)	V _{CE} (V)	I _C (A)	G _p (dB)	P _{o sync} *) (W)	T _h (°C)	R _{th mb-h} (°C/W)
-55	224, 25	25	1, 6	> 9, 5	> 10, 0	70	≤ 0, 3
-52	224, 25	25	1, 6	> 9, 5	typ. 13, 5	70	≤ 0, 3

*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, side band signal -16 dB), zero dB corresponds to peak sync level.

Test circuit at f = 224,25 MHz



List of components: see page 6.

Component lay-out and printed circuit board for f = 224,25 MHz test circuit on page 7.

APPLICATION INFORMATION (continued)

List of components:

Tr 1 = BD135

Tr 2 = BD136

C1 = 330 pF chip capacitor

C2 = 4 to 40 pF film dielectric trimmer

C3 = 4 to 60 pF film dielectric trimmer

C4 = C5 = 82 pF chip capacitor, placed 5 mm from transistor edge

C6 = 4 to 100 pF film dielectric trimmer

C7 = 4 to 60 pF film dielectric trimmer

C8 = C10 = 820 pF chip capacitor

C9 = 47 μ F electrolytic capacitor 6,3 VC11 = 22 μ F electrolytic capacitor 40 VC12 = 47 μ F electrolytic capacitor 40 V

C13 = 100 nF polyester capacitor

L1 = 24,7 nH; 1,5 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 4,5 mm;
leads 2 x 5 mm.

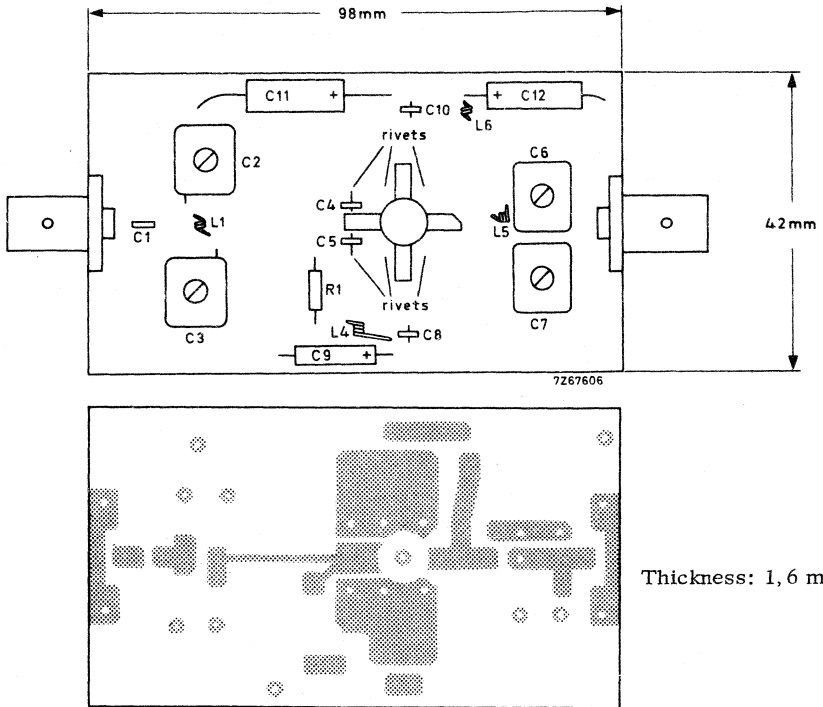
L2 = 8,3 nH formed by metallization on printed board.

L3 = formed by metallization on printed board.

L4 = 100 nH; 3,5 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 5,5 mm;
leads 2 x 5 mm.L5 = 22 nH; 1,5 turns closely wound enamelled Cu wire (1,6 mm); int. diam. 4,5 mm;
leads 2 x 8 mm.L6 = 36 nH; 1,5 turns closely wound enamelled Cu wire (1,6 mm); int. diam. 4,0 mm;
leads 2 x 10 mm.R1 = 4,7 Ω carbon resistorR2 = 330 Ω R3 = 470 Ω potentiometerR4 = 4,7 k Ω R5 = 2,7 k Ω R6 = R7 = R8 = 4,7 Ω (5,5 W)R9 = 180 Ω (5,5 W)R10 = 68 Ω

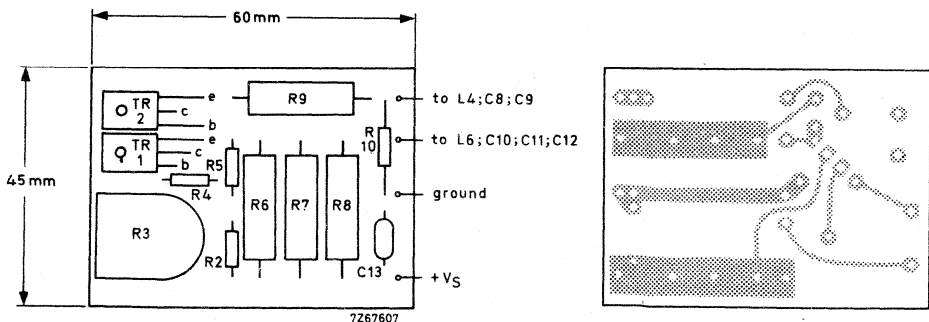
APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for $f = 224,25$ MHz test circuit.

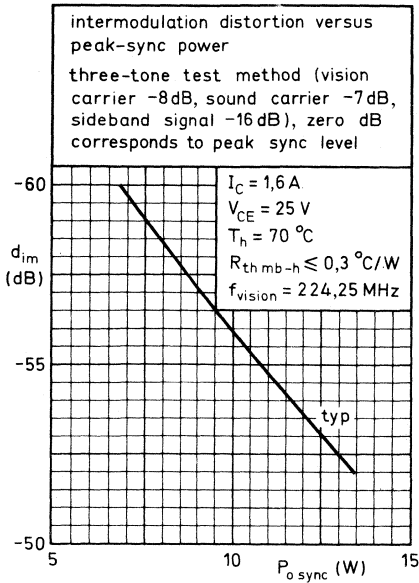


The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

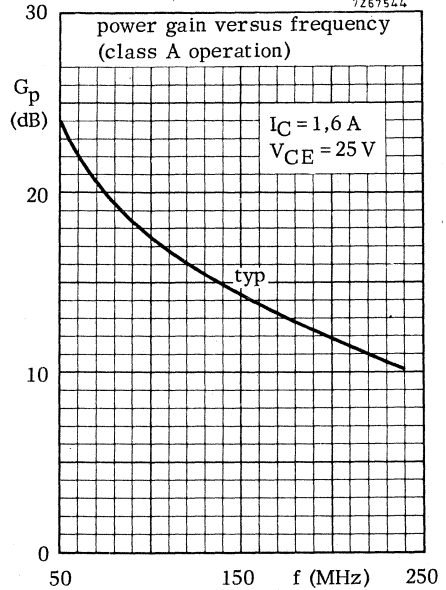
Component lay-out and printed circuit board for bias circuit.



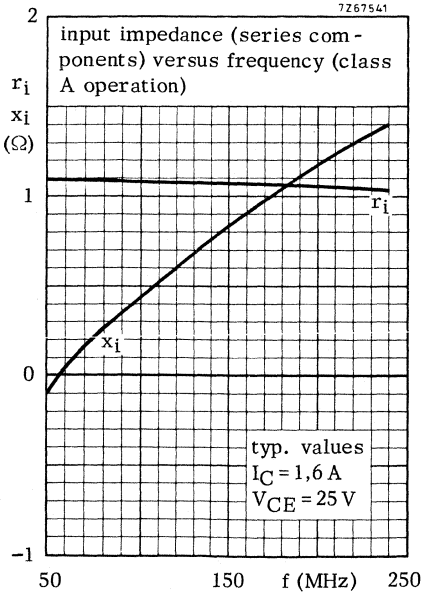
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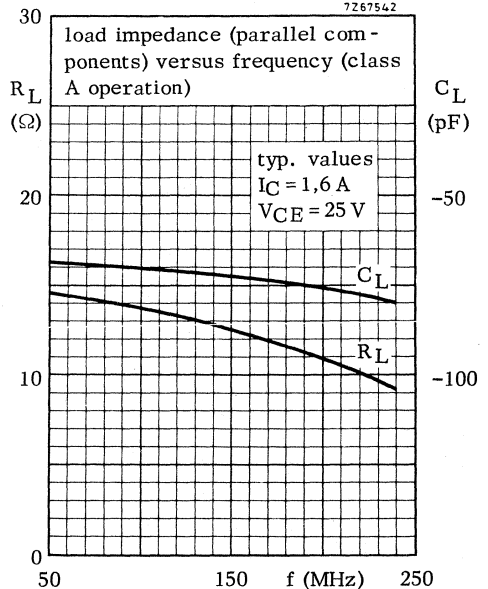
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7267542



TV TRANSPOSER TRANSISTOR FOR BAND III

N-P-N silicon planar epitaxial transistor assembled in a stripline package with a ceramic cap. All leads are isolated from the stud. Excellent d.c. dissipation properties have been obtained by means of internal emitter-ballasting resistors and gold metallization. Detailed information is presented for application of this device in preamplifiers for television transposers and transmitters in band III.

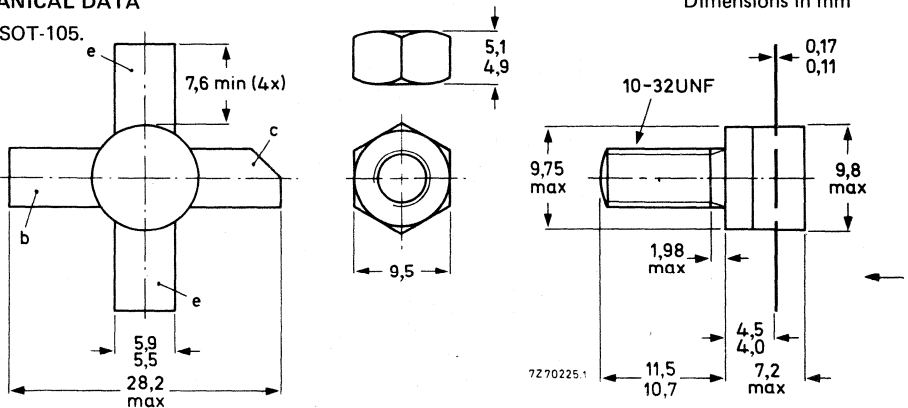
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V _{CBOM}	max.	60	V
Collector-emitter voltage (open base)	V _{CEO}	max.	32	V
Collector current (average)	I _{C(AV)}	max.	4	A
D.C. power dissipation at T _h = 70 °C	P _{tot}	max.	60	W
Thermal resistance from junction to mounting base	R _{th j-mb}	=	1,9	°C/W
Transition frequency	f _T	typ.	800	MHz
I _C = 6,0 A; V _{CE} = 25 V				
Output power at f _{vision} = 224,25 MHz *	P _{o sync}	>	14,0	W
I _C = 2,4 A; V _{CE} = 25 V; T _h = 70 °C; d _{im} = -55 dB				
I _C = 2,4 A; V _{CE} = 25 V; T _h = 70 °C; d _{im} = -52 dB	P _{o sync}	typ.	19,5	W
Power gain at f _{vision} = 224,25 MHz	G _p	>	8,0	dB
I _C = 2,4 A; V _{CE} = 25 V; T _h = 70 °C				

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Fig. 1 SOT-105.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 5,0 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

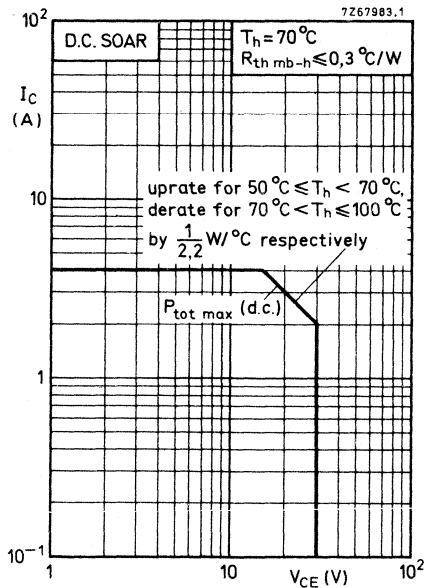
Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	60 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) peak value	V_{CERM}	max.	60 V
Collector-emitter voltage (open base)	V_{CEO}	max.	32 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V

Currents

Collector current (average)	$I_{C(AV)}$	max.	4,0 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	12,0 A

Power dissipation

D.C. power dissipation at $T_h = 70^\circ C$	P_{tot}	max.	60 W
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Temperatures

Storage temperature	T_{stg}	-65 to +125 $^\circ C$
Operating junction temperature	T_j	max. 200 $^\circ C$

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	1,9 $^\circ C/W$
From mounting base to heatsink	$R_{th mb-h}$	=	0,3 $^\circ C/W$

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 50\text{ mA}$	$V_{(BR)CBO}$	>	60	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$, $I_C = 50\text{ mA}$	$V_{(BR)CER}$	>	60	V
Collector-emitter voltage open base, $I_C = 50\text{ mA}$	$V_{(BR)CEO}$	>	32	V
Emitter-base voltage open collector, $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	4	V

Transient energy

$L = 25\text{ mH}$; $f = 50\text{ Hz}$

open base	E	>	8,0	mWs
$-V_{BE} = 1,5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	8,0	mWs

D.C. current gain

$I_C = 2,0\text{ A}$; $V_{CE} = 25\text{ V}$

h_{FE}	>	20
	typ.	45

Transition frequency

$I_C = 6,0\text{ A}$; $V_{CE} = 25\text{ V}$

f_T	typ.	800	MHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 30\text{ V}$

C_c	typ.	95	pF
	<	120	pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0,2\text{ A}$; $V_{CE} = 30\text{ V}$

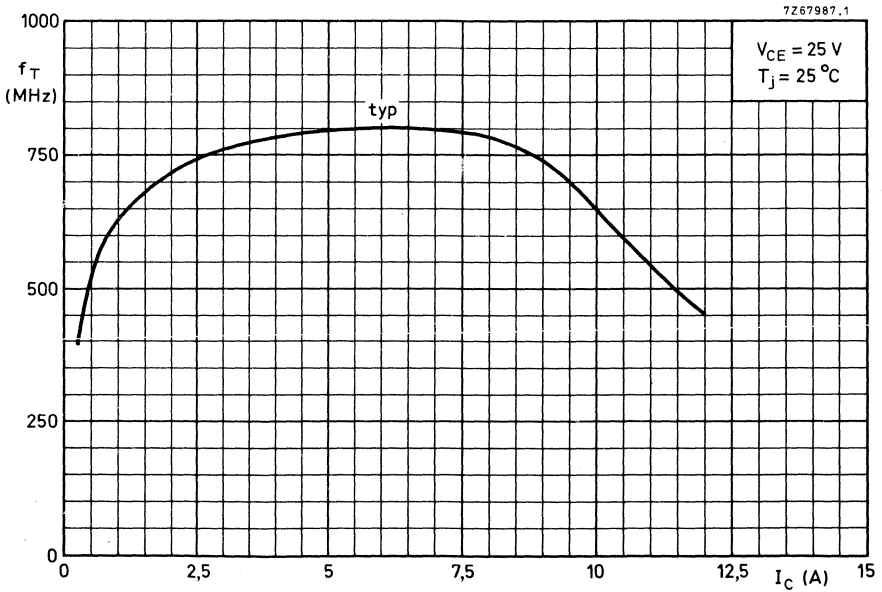
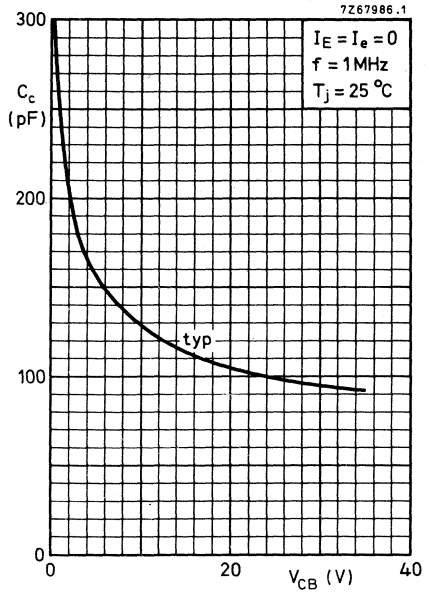
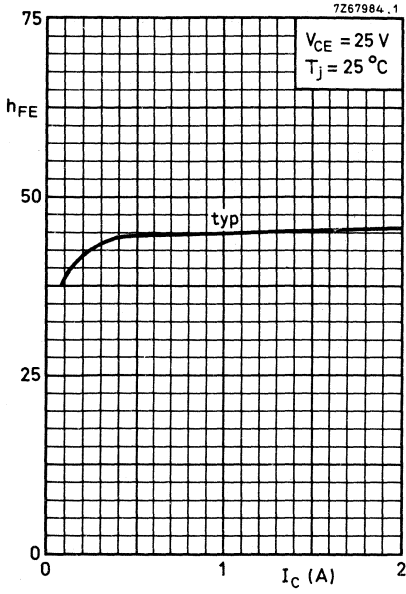
C_{re}	typ.	55	pF
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Collector-stud capacitance

C_{cs}	typ.	2	pF
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BLW75

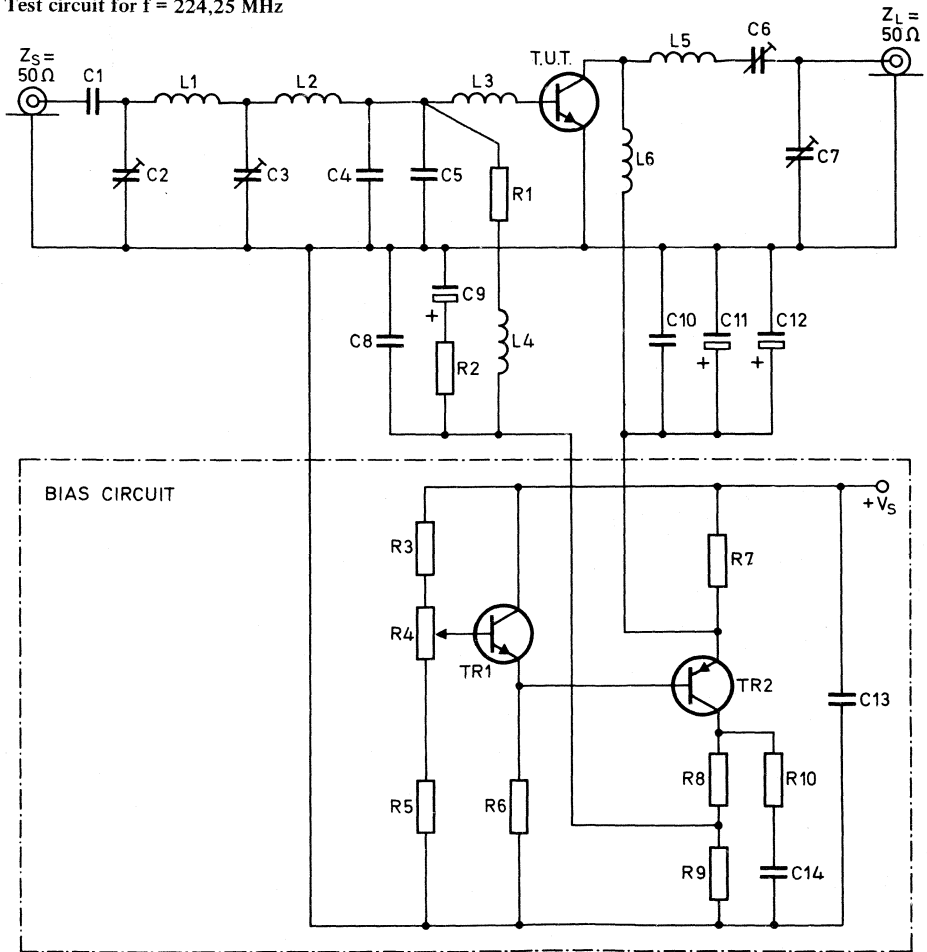


APPLICATION INFORMATION

$d_{im}^*)$ (dB)	f_{vision} (MHz)	V_{CE} (V)	I_C (A)	G_p (dB)	$P_o\ sync^*)$ (W)	T_h (°C)	$R_{th\ mb-h}$ (°C/W)
-55	224, 25	25	2, 4	> 8, 0	> 14, 0	70	≤ 0, 3
-52	224, 25	25	2, 4	> 8, 0	typ. 19, 5	70	≤ 0, 3

*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

Test circuit for $f = 224,25\text{ MHz}$



List of components: see page 6.

Component layout and printed-circuit board for $f = 224,25\text{ MHz}$ test circuit on page 7.

APPLICATION INFORMATION (continued)

List of components:

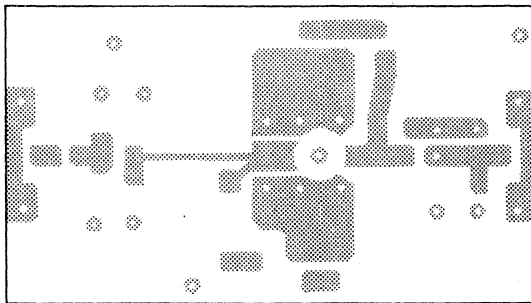
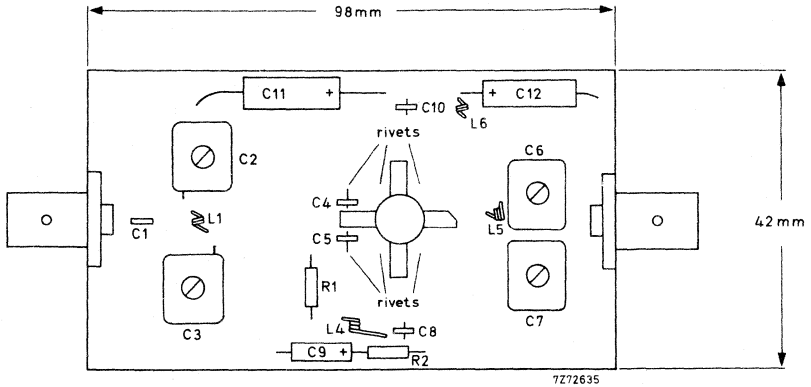
TR1 = BD135

TR2 = BD136

- C1 = 220 pF ceramic plate capacitor
C2 = 4 to 40 pF film dielectric trimmer
C3 = 5 to 60 pF film dielectric trimmer
C4 = C5 = 82 pF chip capacitor, placed 1 mm from transistor edge
C6 = 7 to 100 pF film dielectric trimmer
C7 = 4 to 40 pF film dielectric trimmer
C8 = C10 = 820 pF chip capacitor
C9 = 220 μ F electrolytic capacitor 10 V
C11 = 47 μ F electrolytic capacitor 40 V
C12 = 47 μ F electrolytic capacitor 40 V
C13 = 100 nF polyester capacitor
C14 = 33 nF polyester capacitor
- L1 = 24, 7 nH; 1, 5 turns closely wound enamelled Cu wire (0, 7 mm); int. dia. 4, 5 mm;
leads 2 x 5 mm.
L2 = 8, 3 nH formed by metallization on printed-circuit board
L3 = 0, 7 nH formed by metallization on printed-circuit board
L4 = 100 nH; 3, 5 turns closely wound enamelled Cu wire (0, 7 mm); int. dia. 5, 5 mm;
leads 2 x 5 mm.
L5 = 15, 0 nH; 1 turn enamelled Cu wire (1, 6 mm); int. dia. 4, 5 mm; leads 2 x 8 mm.
L6 = 26, 4 nH; 1, 5 turns closely wound enamelled Cu wire (1, 6 mm); int. dia. 5, 1 mm;
leads 2 x 10 mm.
- R1 = 4, 7 Ω carbon resistor
R2 = 15 Ω carbon resistor
R3 = 180 Ω carbon resistor (1 W)
R4 = 470 Ω potentiometer
R5 = 4, 7 k Ω carbon resistor
R6 = 2, 7 k Ω carbon resistor
R7 = 4 x 4, 7 Ω (2 W); in parallel
R8 = 150 Ω (5, 5 W)
R9 = 68 Ω carbon resistor (1 W)
R10 = 10 Ω carbon resistor

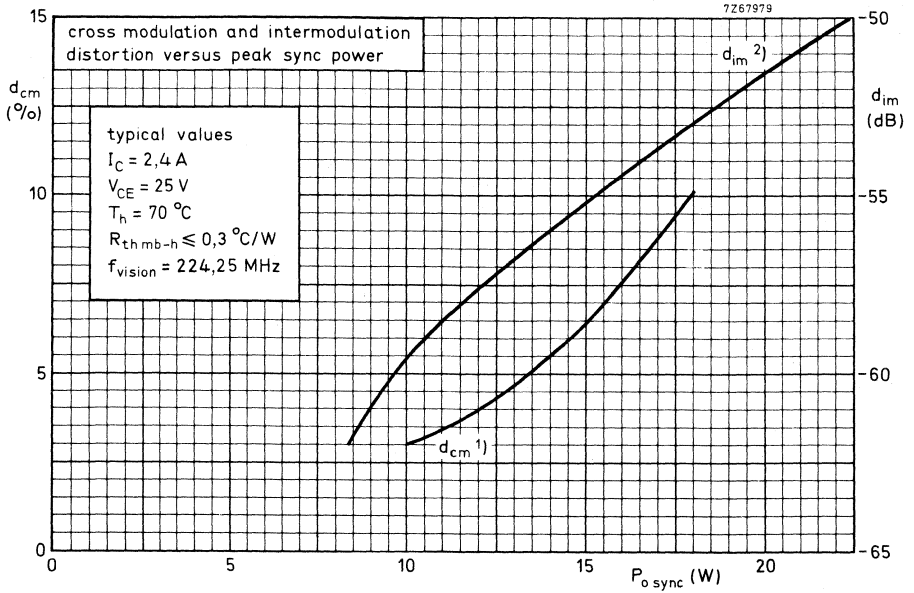
APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for $f = 224, 25$ MHz test circuit without bias circuit.



Thickness: 1,6 mm

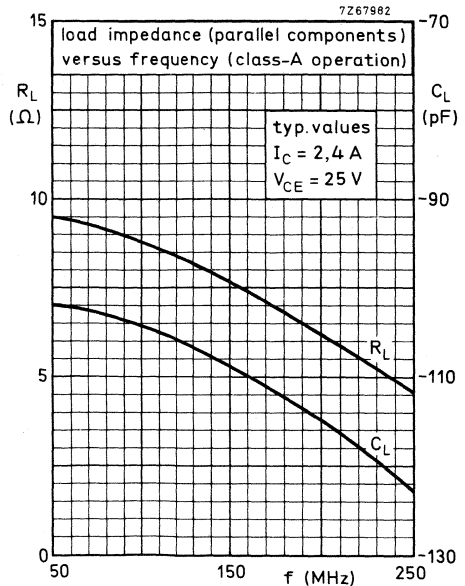
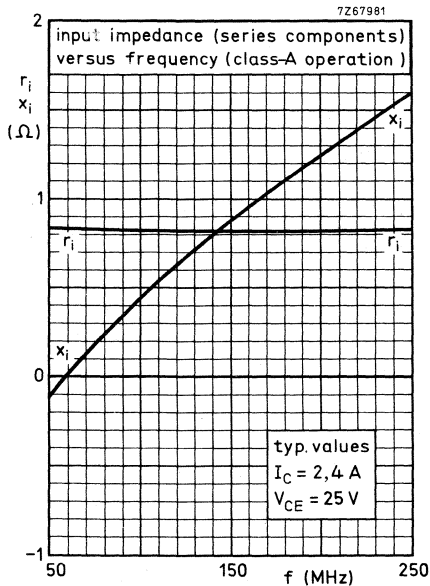
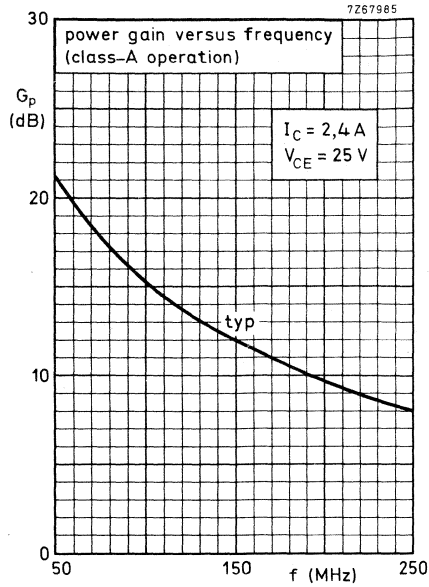
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



- 1) Two-tone test method (vision carrier 0 dB, sound carrier -7 dB), zero dB corresponds to peak sync level.
- 2) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

In the application information a collector-emitter voltage $V_{CE} = 25 \text{ V}$ and collector current $I_C = 2,4 \text{ A}$ are recommended.

If a higher collector voltage (within the limiting values) is used, precautions must be taken to ensure that the impedance presented to the collector circuit does not vary excessively with frequency. This is especially important in wideband circuits where a relatively wide variation of load impedance over the frequency band may be expected. Tuning of the output circuit at high level should be avoided or, if essential, it should be performed very carefully, otherwise very high load impedances may occur during which the maximum ratings of the transistor can be exceeded.



H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-AB or class-B operated high power transmitters in the h.f. and v.h.f. bands. The transistor presents excellent performance as a linear amplifier in the h.f. band. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Transistors are delivered in matched h_{FE} groups.

The transistor has a $\frac{1}{2}$ " flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	$I_C(ZS)$ A	f MHz	P_L W	G_p dB	η %	d_3 dB
s.s.b. (class-AB)	28	0,05	1,6–28	8–80 (P.E.P.)	> 13	> 35*	< -30
c.w. (class-B)	28	—	108	80	typ. 7,9	typ. 70	—

* At 80 W P.E.P.

MECHANICAL DATA

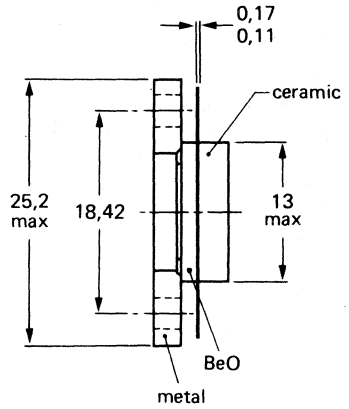
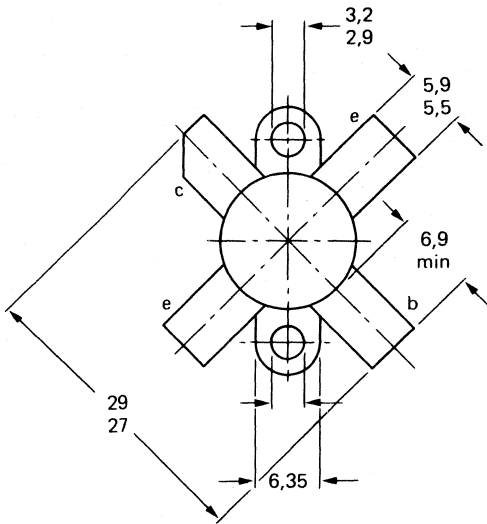
SOT-121A (see page 2)

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

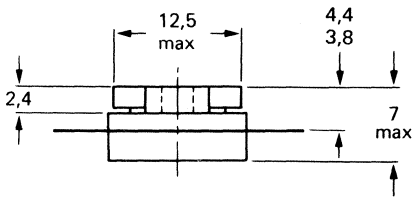
MECHANICAL DATA

Fig. 1 SOT-121A.

Dimensions in mm



7275334.1



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: raised cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)

peak value

V_{CESM} max. 70 V

Collector-emitter voltage (open base)

V_{CEO} max. 35 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_C(AV)$ max. 8 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 20 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 140 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

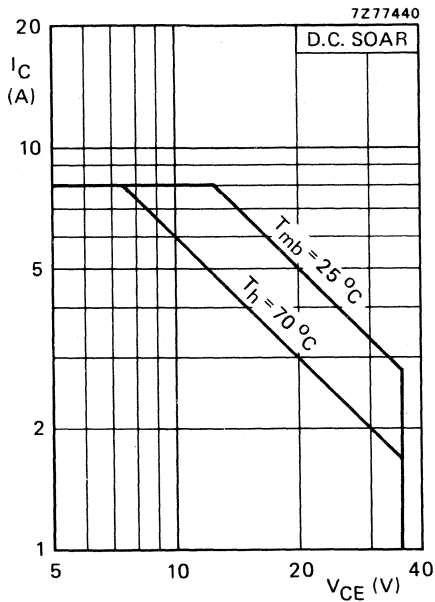


Fig. 2 D.C. SOAR.

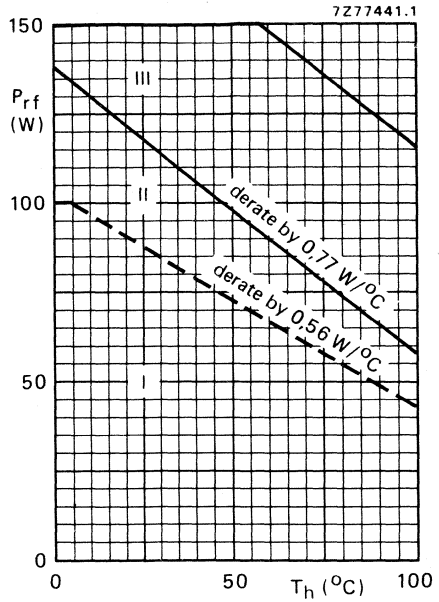


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 60 W; $T_{mb} = 82$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb(dc)}$ = 1,92 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb(rf)}$ = 1,33 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,2 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 50\text{ mA}$ $V_{(BR)CES} > 70\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 35\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 35\text{ V}$ $I_{CES} < 10\text{ mA}$

D.C. current gain*

 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE} \quad 15\text{ to }80$

D.C. current gain ratio of matched devices*

 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage*

 $I_C = 12,5\text{ A}; I_B = 2,5\text{ A}$ $V_{CEsat} \quad \text{typ. } 2,5\text{ V}$ Transition frequency at $f = 100\text{ MHz}$ * $-I_E = 4\text{ A}; V_{CB} = 28\text{ V}$ $f_T \quad \text{typ. } 315\text{ MHz}$ $-I_E = 12,5\text{ A}; V_{CB} = 28\text{ V}$ $f_T \quad \text{typ. } 305\text{ MHz}$ Collector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ $C_c \quad \text{typ. } 125\text{ pF}$ Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 28\text{ V}$ $C_{re} \quad \text{typ. } 85\text{ pF}$

Collector-flange capacitance

 $C_{cf} \quad \text{typ. } 3\text{ pF}$ * Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

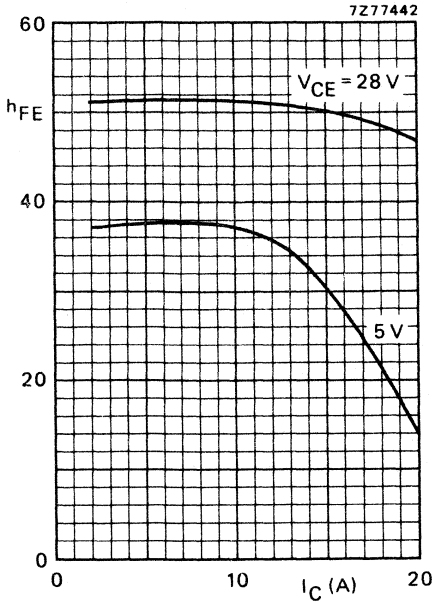


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

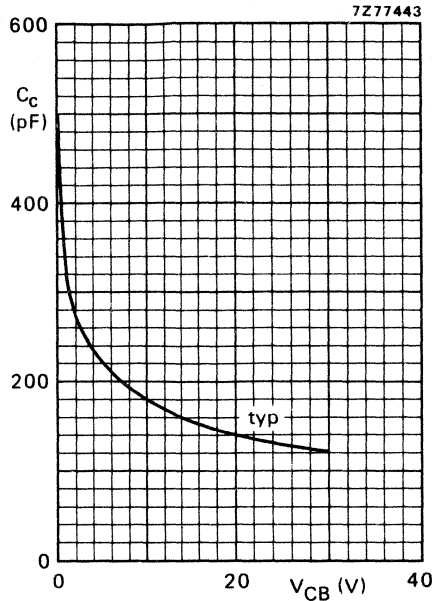


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

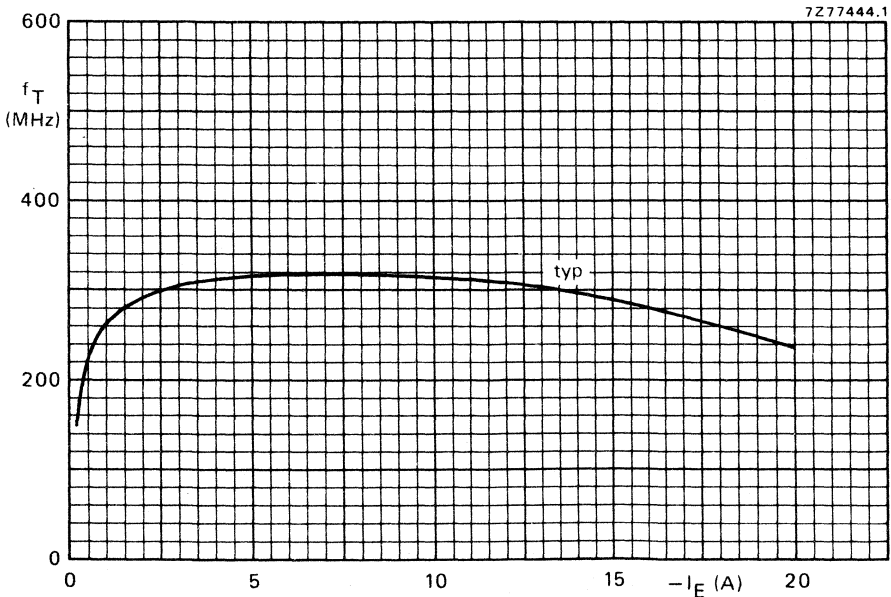


Fig. 6 $V_{CB} = 28\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

$V_{CE} = 28 \text{ V}$; $T_h = 25 \text{ }^\circ\text{C}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} (%) at 80 W P.E.P.	I_C (A)	d_3 dB	d_5 dB	I_C (ZS) A
8 to 80 (P.E.P.)	> 13	> 35	< 4,1	< -30	< -30	0,05

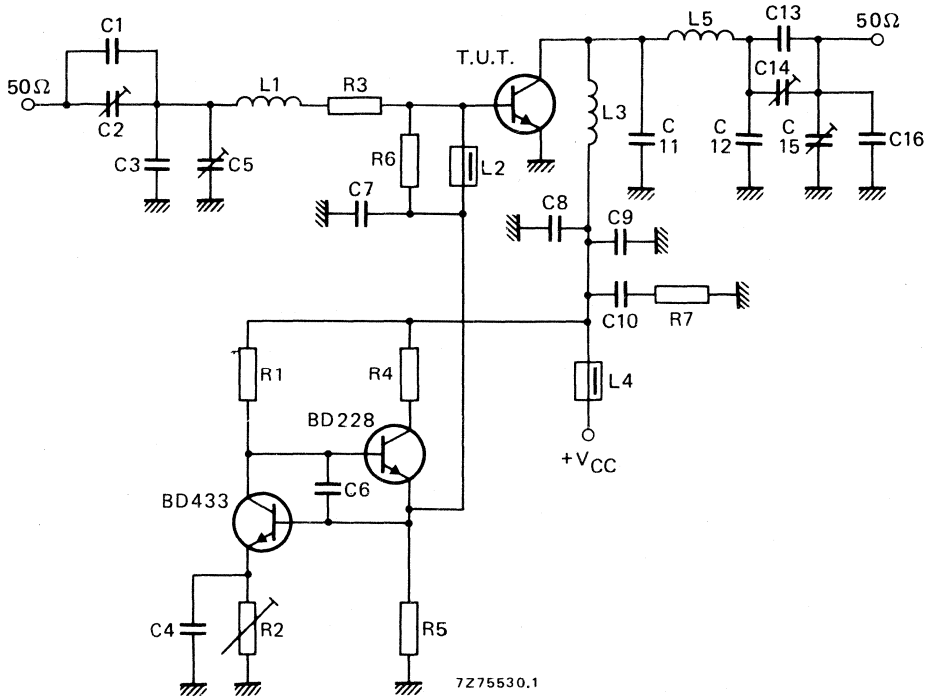


Fig. 7 Test circuit; s.s.b. class-AB.

List of components:

- C1 = 27 pF ceramic capacitor (500 V)
- C2 = 100 pF air dielectric trimmer (single insulated rotor type)
- C3 = 100 pF polystyrene capacitor
- C4 = C6 = C9 = 100 nF polyester capacitor
- C5 = 280 pF air dielectric trimmer (single non-insulated rotor type)
- C7 = C8 = 3,9 nF ceramic capacitor
- C10 = 2,2 μF moulded metallized polyester capacitor
- C11 = 180 pF polystyrene capacitor
- C12 = 2 x 68 pF ceramic capacitors in parallel (500 V)
- C13 = 120 pF polystyrene capacitor

C14 = C15 = 280 pF air dielectric trimmer (single insulated rotor type)
 C16 = 56 pF ceramic capacitor (500 V)

L1 = 108 nH; 4 turns Cu wire (1,6 mm); int. dia. 8,7 mm; length 11,2 mm; leads 2 x 7 mm

L2 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = 88 nH; 3 turns Cu wire (1,6 mm); int. dia. 8,0 mm; length 8,0 mm; leads 2 x 7 mm

L5 = 120 nH; 4 turns Cu wire (1,6 mm); int. dia. 9,3 mm; length 11,2 mm; leads 2 x 7 mm

R1 = 1,5 k Ω (\pm 5%) carbon resistor (0,5 W)

R2 = 10 Ω wirewound potentiometer (3 W)

R3 = 0,9 Ω ; parallel connection of 2 x 1,8 Ω carbon resistors (\pm 5%; 0,5 W each)

R4 = 60 Ω ; parallel connection of 2 x 120 Ω wirewound resistors (5,5 W each)

R5 = 56 Ω (\pm 5%) carbon resistor (0,5 W)

R6 = 33 Ω (\pm 5%) carbon resistor (0,5 W)

R7 = 4,7 Ω (\pm 5%) carbon resistor (0,5 W)

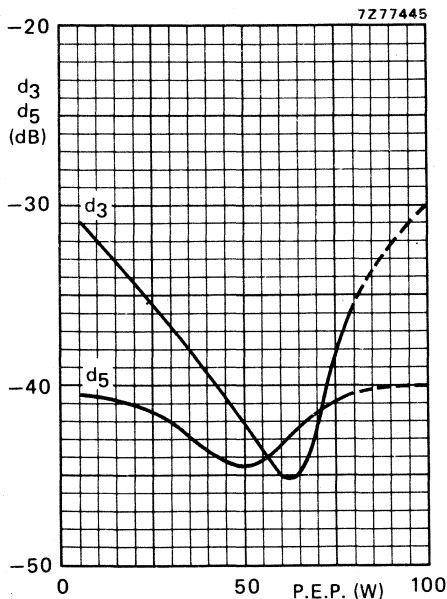


Fig. 8 Intermodulation distortion as a function of output power.*

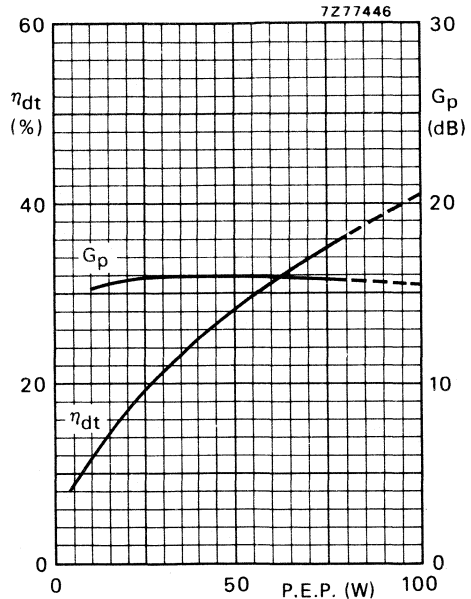


Fig. 9 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 8 and 9:

V_{CE} = 28 V; I_{C(ZS)} = 50 mA; f₁ = 28,000 MHz; f₂ = 28,001 MHz; T_h = 25 °C; typical values.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

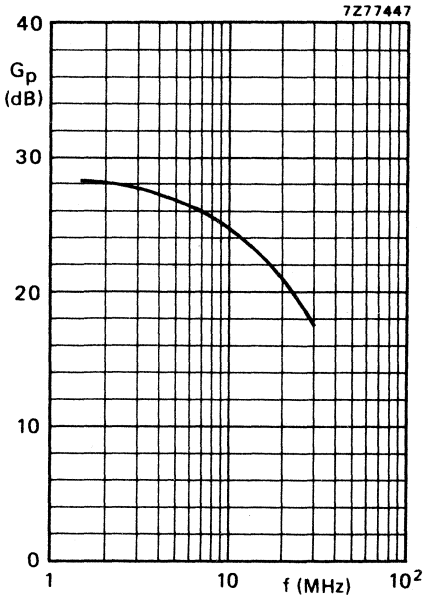


Fig. 10 Power gain as a function of frequency.

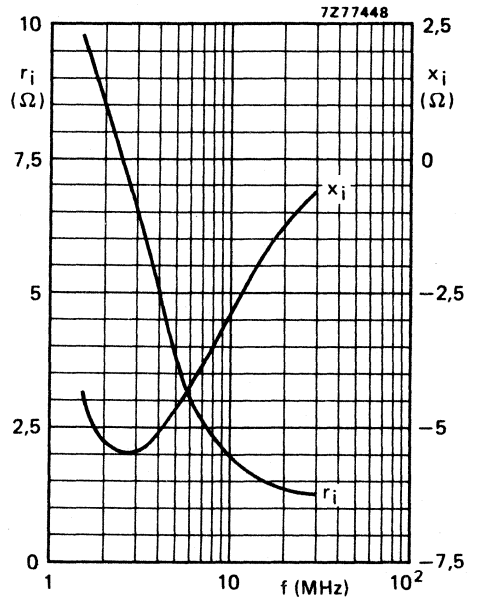


Fig. 11 Input impedance (series components) as a function of frequency.

Figs 10 and 11 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.
 Conditions:
 $V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $P_L = 80 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 3,9 \text{ } \Omega$.

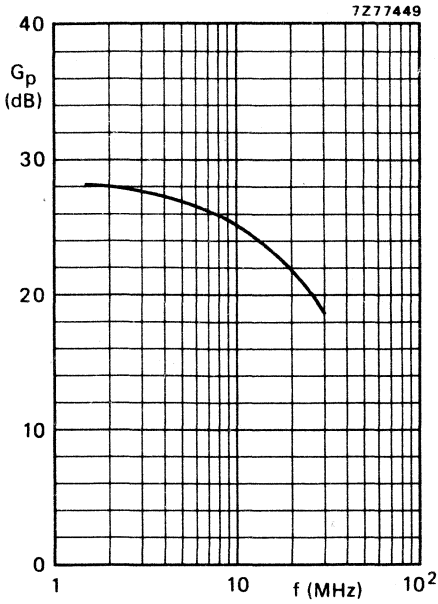


Fig. 12 Power gain as a function of frequency.

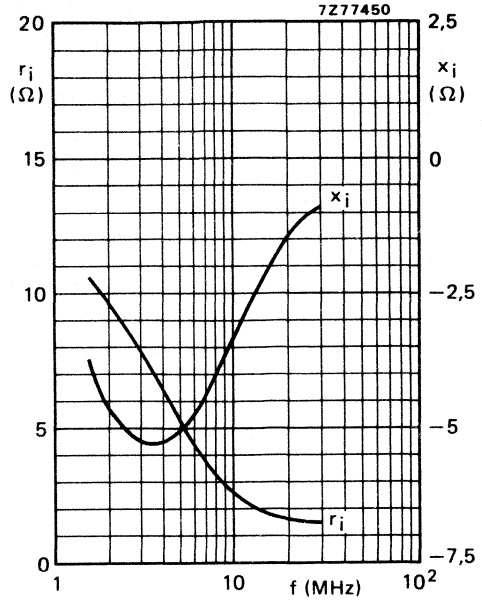


Fig. 13 Input impedance (series components) as a function of frequency.

Figs 12 and 13 are typical curves and hold for a push-pull amplifier with cross-neutralization in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $P_L = 80 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 3,9 \text{ } \Omega$; neutralizing capacitor: 68 pF .

APPLICATION INFORMATION (continued)

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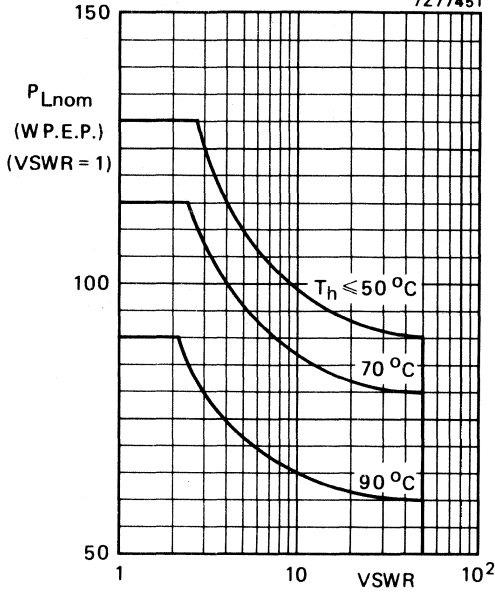


Fig. 14 R.F. SOAR; s.s.b. class-AB operation; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz; $V_{CE} = 28$ V; $R_{th\text{ mb-h}} = 0,2$ $^\circ\text{C/W}$. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.



R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
108	28	80	typ. 13	typ. 7,9	typ. 4,1	typ. 70	$0,85 + j1,0$	$174 - j40$

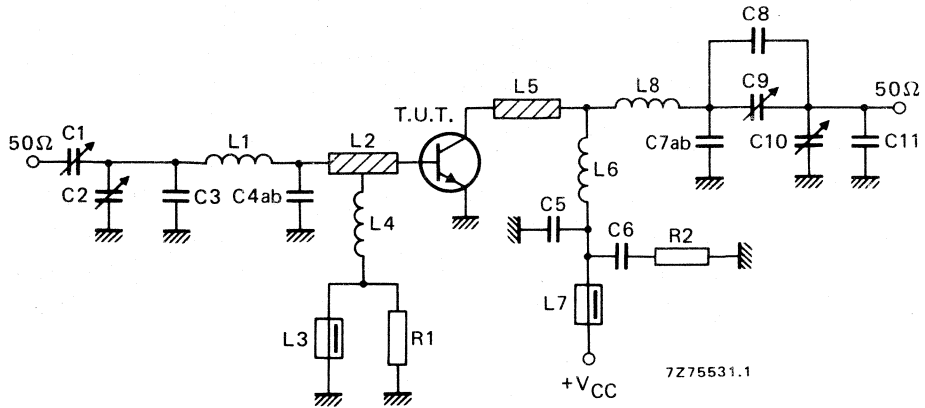


Fig. 15 Test circuit; c.w. class-B.

List of components:

C1 = C9 = C10 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 22 pF ceramic capacitor (500 V)

C4ab = 2 x 82 pF ceramic capacitors in parallel (500 V)

C5 = 270 pF polystyrene capacitor

C6 = 100 nF polyester capacitor

C7a = 8,2 pF ceramic capacitor (500 V)

C7b = 10 pF ceramic capacitor (500 V)

C8 = 5,6 pF ceramic capacitor (500 V)

C11 = 10 pF ceramic capacitor (500 V)

L1 = 21 nH; 2 turns Cu wire (1,0 mm); int. dia. 4,0 mm; length 3,5 mm; leads 2 x 5 mm

L2 = L5 = 2,4 nH; strip (12 mm x 6 mm); tap for L4 at 6 mm from transistor

L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L6 = 49 nH; 2 turns Cu wire (1,6 mm); int. dia. 9,0 mm; length 4,7 mm; leads 2 x 5 mm

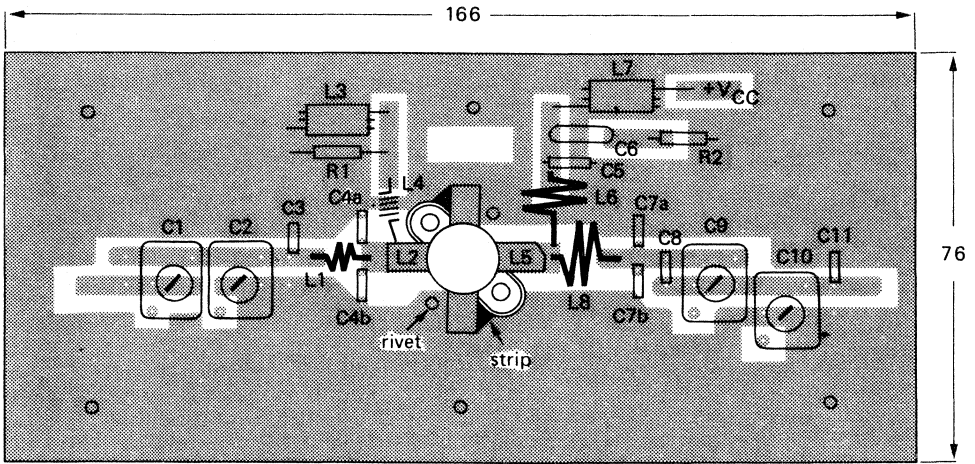
L8 = 56 nH; 2 turns Cu wire (1,6 mm); int. dia. 10,0 mm; length 4,5 mm; leads 2 x 5 mm

L2 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric.

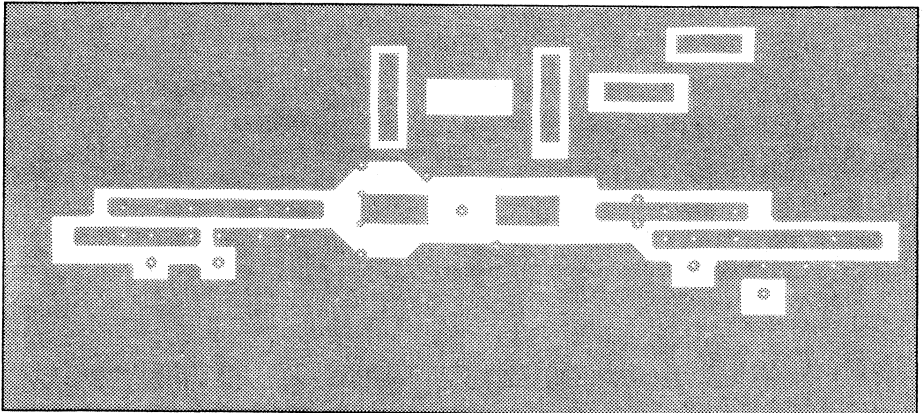
R1 = R2 = 10 Ω ($\pm 10\%$) carbon resistor

Component layout and printed-circuit board for 108 MHz test circuit are shown in Fig. 16.

APPLICATION INFORMATION (continued)



7Z78091.1



7Z78092

Fig. 16 Component layout and printed-circuit board for 108 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

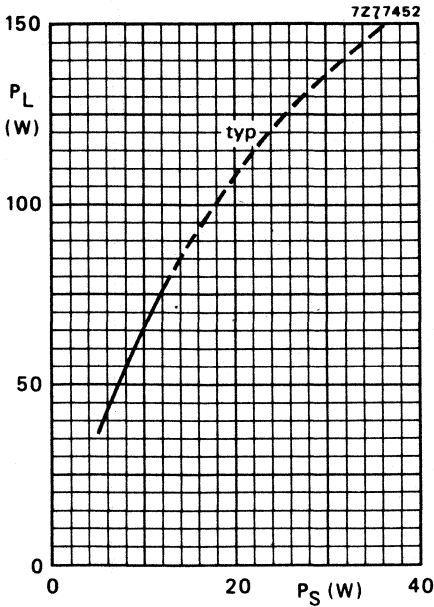


Fig. 17 $V_{CE} = 28$ V; $f = 108$ MHz; $T_h = 25$ °C.

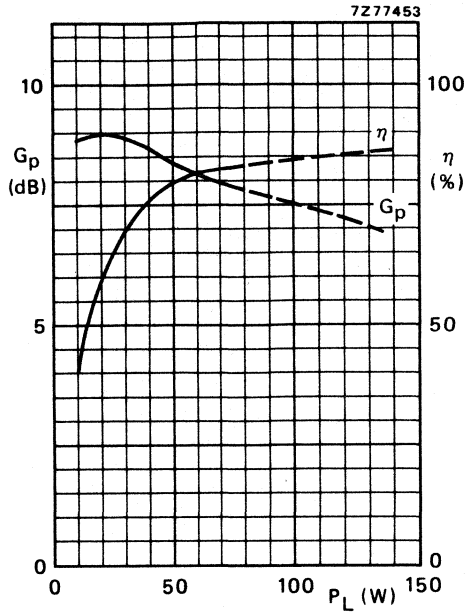


Fig. 18 $V_{CE} = 28$ V; $f = 108$ MHz; $T_h = 25$ °C; typical values.

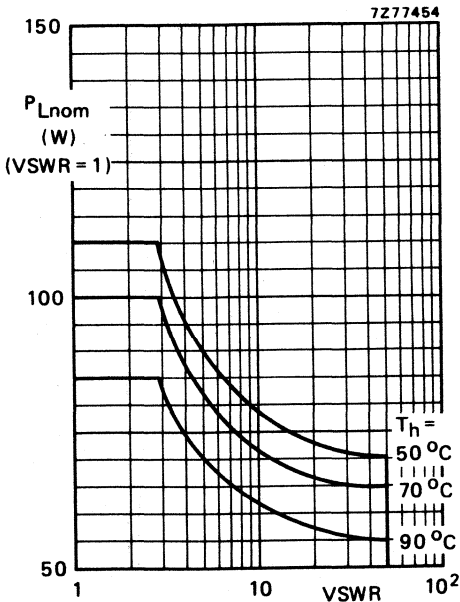


Fig. 19 R.F. SOAR; c.w. class-B operation; $f = 108$ MHz; $V_{CE} = 28$ V; $R_{th\ mb-h} = 0,2$ °C/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

APPLICATION INFORMATION (continued)

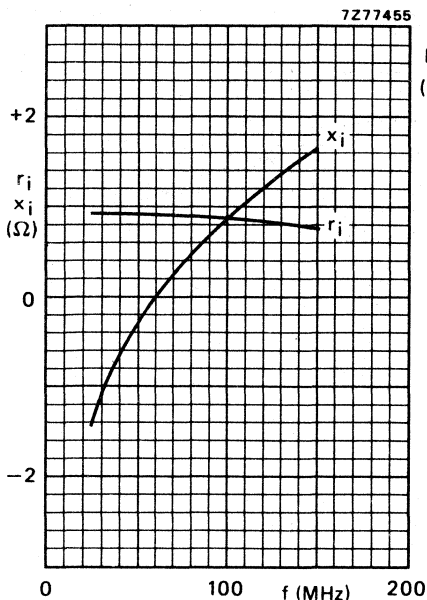


Fig. 20 $V_{CE} = 28 \text{ V}$; $P_L = 80 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$ typical values.

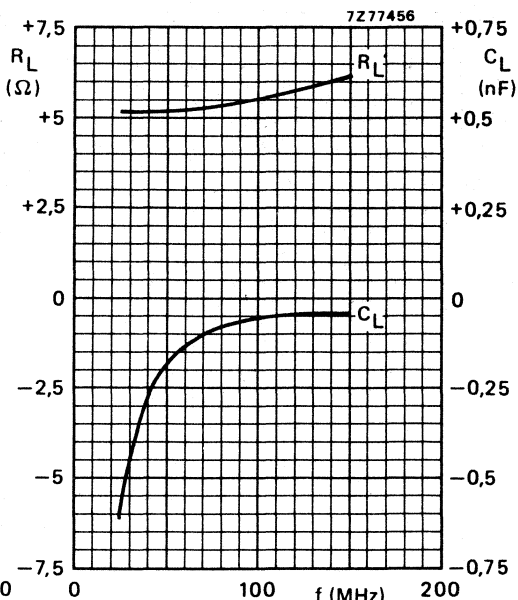


Fig. 21 $V_{CE} = 28 \text{ V}$; $P_L = 80 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; typical values.

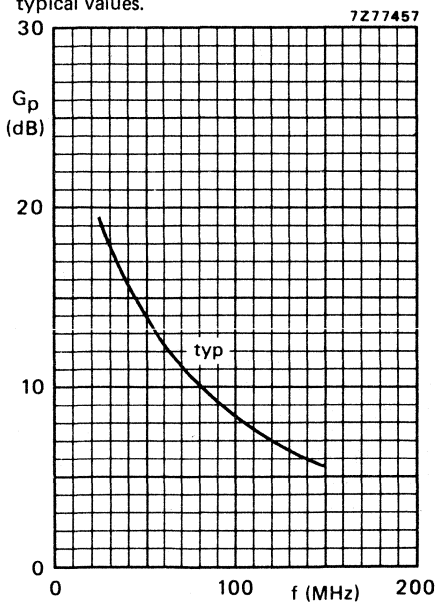


Fig. 22 $V_{CE} = 28 \text{ V}$; $P_L = 80 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-AB or class-B operated high power transmitters in the h.f. and v.h.f. bands. The transistor presents excellent performance as a linear amplifier in the h.f. band. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Transistors are delivered in matched h_{FE} groups.

The transistor has a $\frac{1}{2}$ " flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	$I_{C(ZS)}$ A	f MHz	P_L W	G_p dB	η %	d_3 dB
s.s.b. (class-AB)	28	0,1	1,6–28	15–130 (P.E.P.)	> 12	> 37,5*	< -30
c.w. (class-B)	28	—	87,5	130	typ. 7,5	typ. 75	—

* At 130 W P.E.P.

MECHANICAL DATA

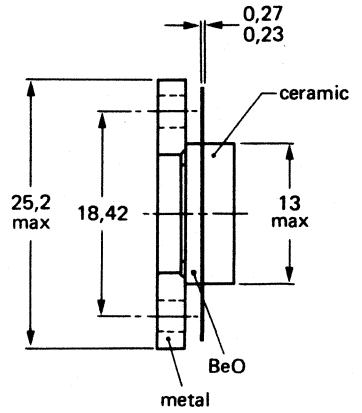
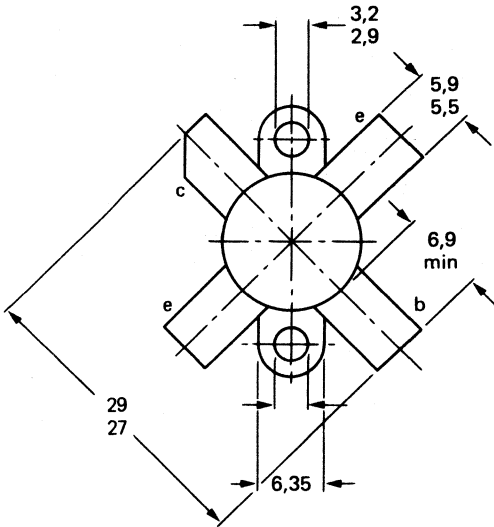
SOT-121B (see page 2)

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

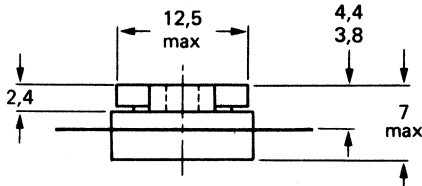
MECHANICAL DATA

Fig. 1 SOT-121B.

Dimensions in mm



7275533.1



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: raised cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 70 V

Collector-emitter voltage (open base)

V_{CEO} max. 35 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_C(AV)$ max. 12 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 30 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25^\circ\text{C}$

P_{rf} max. 245 W

Storage temperature

T_{stg} -65 to $+150^\circ\text{C}$

Operating junction temperature

T_j max. 200°C

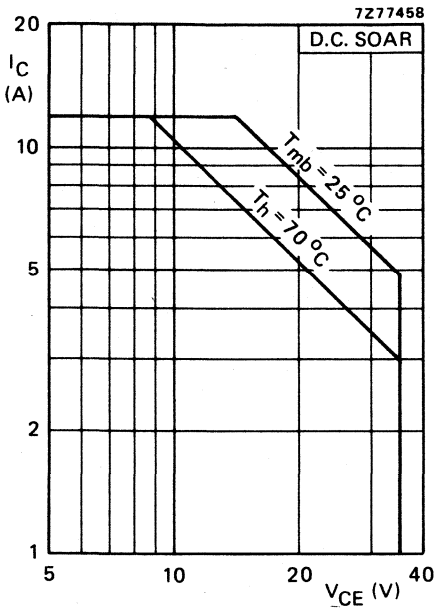


Fig. 2 D.C. SOAR.

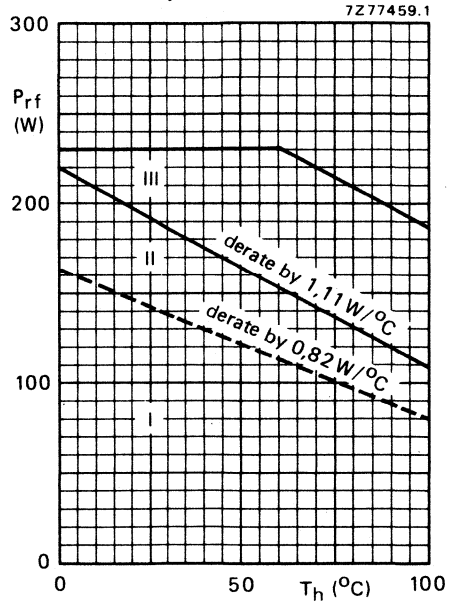


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 100 W; $T_{mb} = 90^\circ\text{C}$, i.e. $T_h = 70^\circ\text{C}$)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb(dc)}$ = 1,03 $^\circ\text{C/W}$

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb(rf)}$ = 0,71 $^\circ\text{C/W}$

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,2 $^\circ\text{C/W}$

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage
 $V_{BE} = 0; I_C = 50\text{ mA}$

$V_{(BR)CES} > 70\text{ V}$

Collector-emitter breakdown voltage
 open base; $I_C = 100\text{ mA}$

$V_{(BR)CEO} > 35\text{ V}$

Emitter-base breakdown voltage
 open collector; $I_E = 20\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 35\text{ V}$

$I_{CES} < 20\text{ mA}$

D.C. current gain*
 $I_C = 7\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE} \quad 15\text{ to }80$

D.C. current gain ratio of matched devices*
 $I_C = 7\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage*
 $I_C = 20\text{ A}; I_B = 4\text{ A}$

$V_{CEsat} \text{ typ. } 2\text{ V}$

Transition frequency at $f = 100\text{ MHz}$ *
 $-I_E = 7\text{ A}; V_{CB} = 28\text{ V}$
 $-I_E = 20\text{ A}; V_{CB} = 28\text{ V}$

$f_T \text{ typ. } 320\text{ MHz}$
 $f_T \text{ typ. } 300\text{ MHz}$

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = I_e = 0; V_{CB} = 28\text{ V}$

$C_c \text{ typ. } 255\text{ pF}$

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$

$C_{re} \text{ typ. } 175\text{ pF}$

Collector-flange capacitance

$C_{cf} \text{ typ. } 3\text{ pF}$

* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

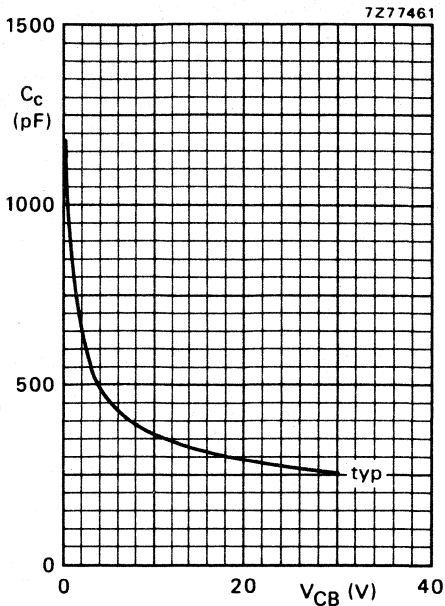
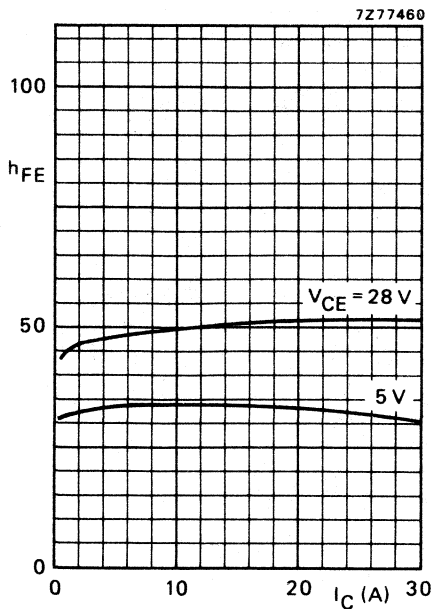


Fig. 4 Typical values; $T_j = 25^\circ\text{C}$.

Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

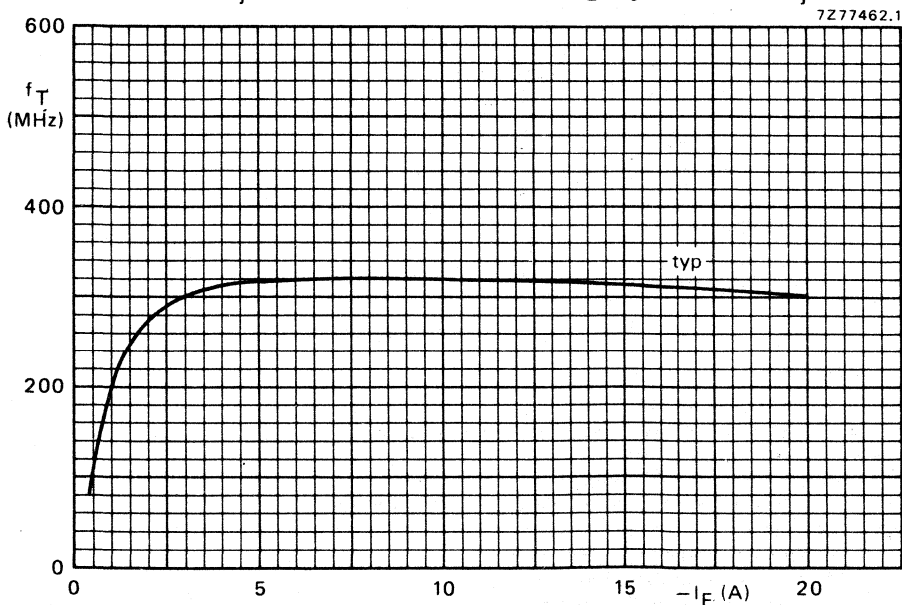


Fig. 6 $V_{CB} = 28\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25^\circ\text{C}$.



APPLICATION INFORMATION

R. F. performance in s.s.b. class-AB operation (linear power amplifier)

$V_{CE} = 28 \text{ V}$; $T_h = 25 \text{ }^\circ\text{C}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} (%) at 130 W P.E.P.	I_C (A)	d_3 dB	d_5 dB	I_C (ZS) A
15 to 130 (P.E.P.)	> 12	> 37,5	< 6,2	< -30	< -30	0,1

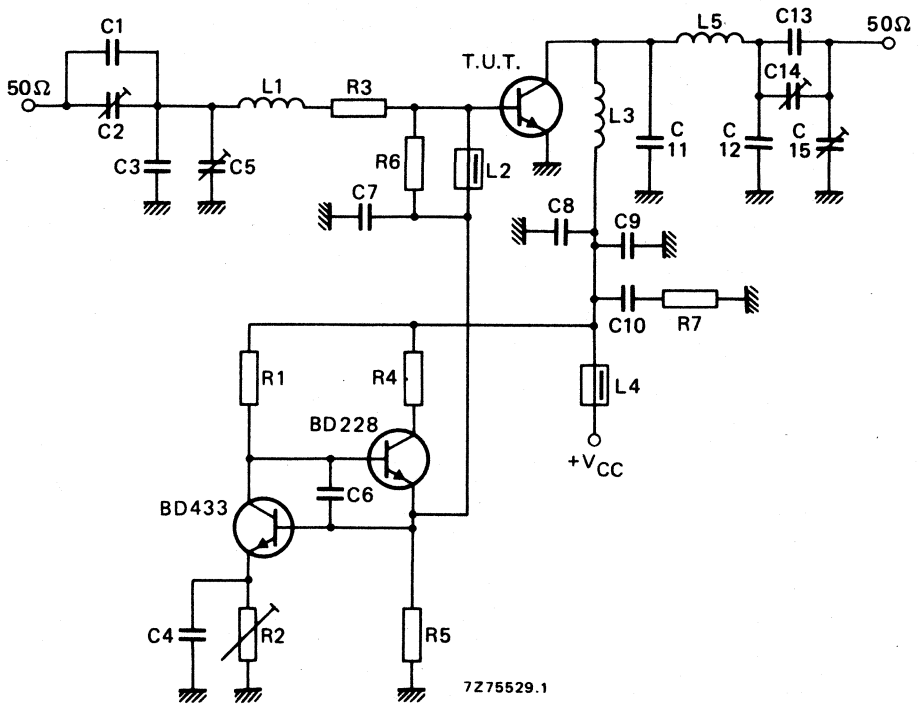


Fig. 7 Test circuit; s.s.b. class-AB.

List of components:

- C1 = 27 pF ceramic capacitor (500 V)
- C2 = 100 pF air dielectric trimmer (single insulated rotor type)
- C3 = 180 pF polystyrene capacitor
- C4 = C6 = C9 = 100 nF polyester capacitor
- C5 = 100 pF air dielectric trimmer (single non-insulated rotor type)
- C7 = C8 = 3,9 nF ceramic capacitor
- C10 = 2,2 μF moulded metallized polyester capacitor
- C11 = 2 x 180 pF polyester capacitors in parallel
- C12 = 3 x 56 pF and 33 pF ceramic capacitors in parallel (500 V)
- C13 = 4 x 56 pF and 68 pF ceramic capacitors in parallel (500 V)

- C14 = 360 pF air dielectric trimmer (single insulated rotor type)
- C15 = 360 pF air dielectric trimmer (single non-insulated rotor type)
- L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9,0 mm; length 6,1 mm; leads 2 x 7 mm
- L2 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
- L3 = L5 = 80 nH; 2,5 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 10,0 mm; leads 2 x 7 mm
- R1 = 470 Ω wirewound resistor (5,5 W)
- R2 = 4,7 Ω wirewound potentiometer (3 W)
- R3 = 0,55 Ω; parallel connection of 4 x 2,2 Ω carbon resistors (± 5%; 0,5 W each)
- R4 = 45 Ω; parallel connection of 4 x 180 Ω wirewound resistors (5,5 W each)
- R5 = 56 Ω (± 5%) carbon resistor (0,5 W)
- R6 = 27 Ω (± 5%) carbon resistor (0,5 W)
- R7 = 4,7 Ω (± 5%) carbon resistor (0,5 W)

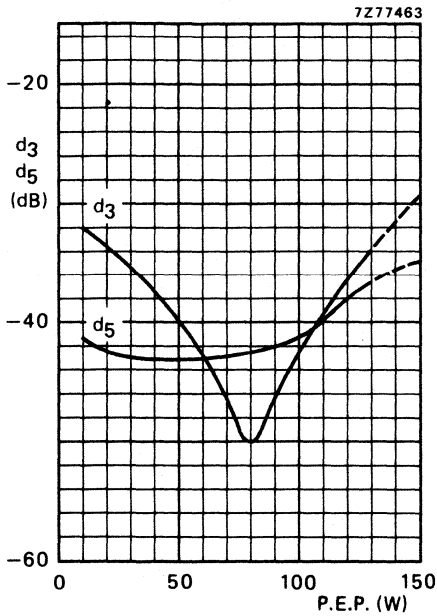


Fig. 8 Intermodulation distortion as a function of output power.*

Conditions for Figs 8 and 9:

V_{CE} = 28 V; I_{C(ZS)} = 100 mA; f₁ = 28,000 MHz; f₂ = 28,001 MHz; T_h = 25 °C; typical values.

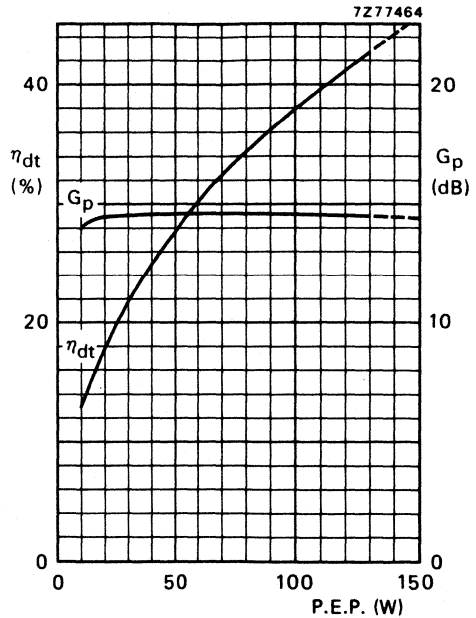


Fig. 9 Double-tone efficiency and power gain as a function of output power.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

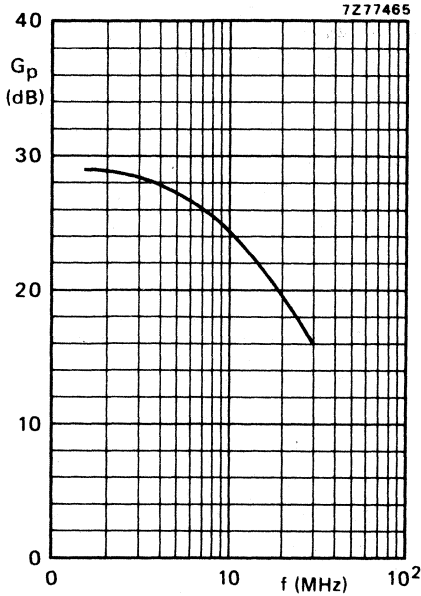


Fig. 10 Power gain as a function of frequency.

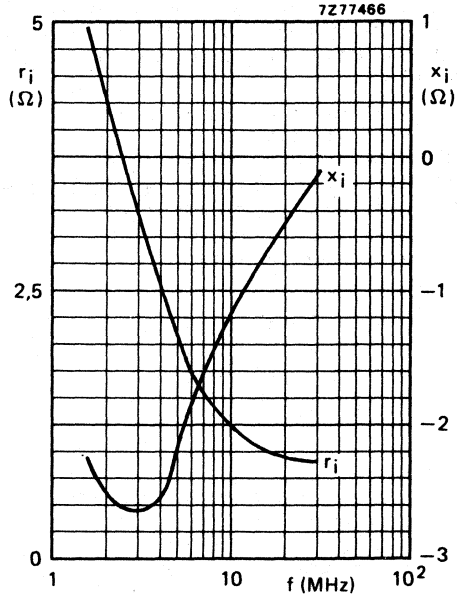


Fig. 11 Input impedance (series components) as a function of frequency.

Figs 10 and 11 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 100 \text{ mA}$; $P_L = 130 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 2,5 \text{ } \Omega$.

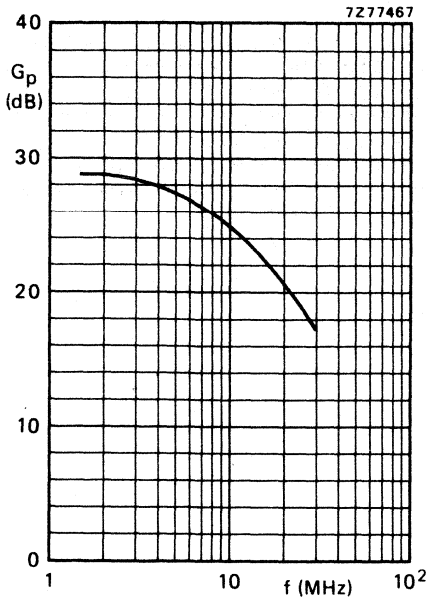


Fig. 12 Power gain as a function of frequency.

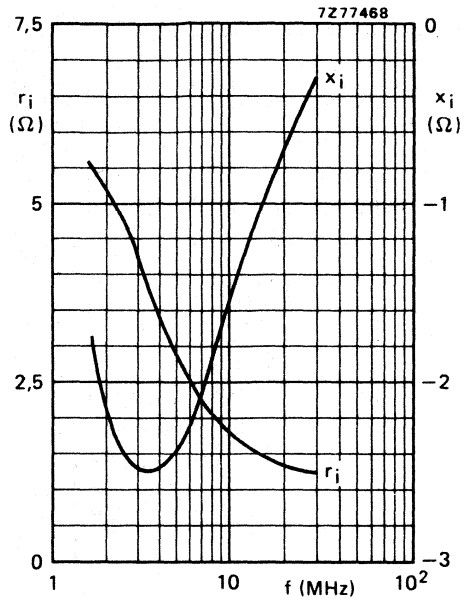


Fig. 13 Input impedance (series components) as a function of frequency.

Figs 12 and 13 are typical curves and hold for a push-pull amplifier with cross-neutralization in s.s.b class-AB operation.

Conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 100 \text{ mA}$; $P_L = 130 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 2,5 \text{ } \Omega$; neutralizing capacitor: 150 pF .

APPLICATION INFORMATION (continued)

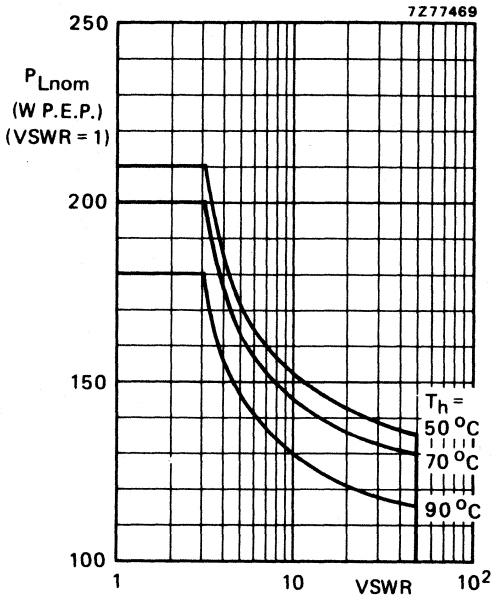


Fig. 14 R.F. SOAR; s.s.b. class-AB operation; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz; $V_{CE} = 28$ V; $R_{th\ mb-h} = 0,2$ $^\circ\text{C}/\text{W}$.
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	$V_{CE}(V)$	$P_L(W)$	$P_S(W)$	$G_p(dB)$	$I_C(A)$	$\eta(\%)$	$\bar{z}_i(\Omega)$	$\bar{Y}_L(mA/V)$
87,5	28	130	typ. 23,2	typ. 7,5	typ. 6,2	typ. 75	$0,62 + j0,73$	$273 - j42$

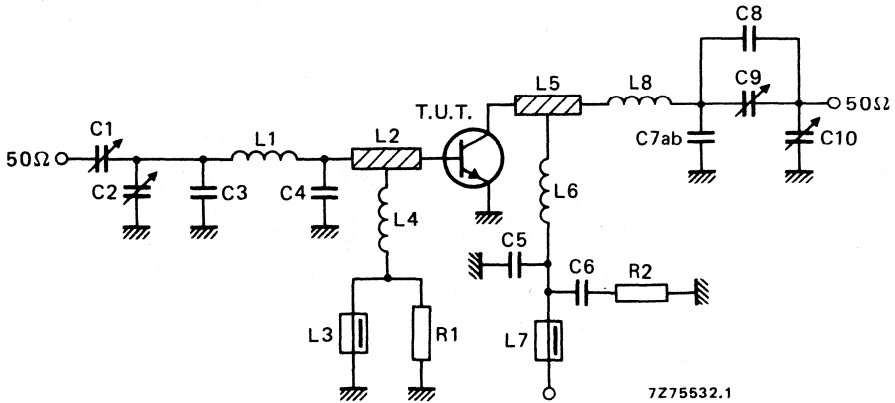


Fig. 15 Test circuit; c.w. class-B.

List of components:

C1 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C2 = C9 = C10 = 7 to 100 pF film dielectric trimmer (cat. no. 2222 809 07015)

C3 = C8 = 22 pF ceramic capacitor (500 V)

C4 = 4 x 82 pF ceramic capacitors in parallel (500 V)

C5 = 390 pF polystyrene capacitor

C6 = 220 nF polyester capacitor

C7a = 2 x 10 pF ceramic capacitors in parallel (500 V)

C7b = 2 x 8,2 pF ceramic capacitors in parallel (500 V)

L1 = 25 nH; 2 turns Cu wire (1,6 mm); int. dia. 5,0 mm; length 4,6 mm; leads 2 x 5 mm

L2 = L5 = 2,4 nH; strip (12 mm x 6 mm); tap for L4 and L6 at 5 mm from transistor

L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L6 = 46 nH; 2 turns Cu wire (2,0 mm); int. dia. 9,0 mm; length 6,0 mm; leads 2 x 5 mm

L8 = 44 nH; 2 turns Cu wire (2,0 mm); int. dia. 9,0 mm; length 6,7 mm; leads 2 x 5 mm

L2 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric.

R1 = 10 Ω ($\pm 10\%$) carbon resistorR2 = 4,7 Ω ($\pm 10\%$) carbon resistor

Component layout and printed-circuit board for 87,5 MHz test circuit are shown in Fig. 16.

APPLICATION INFORMATION (continued)

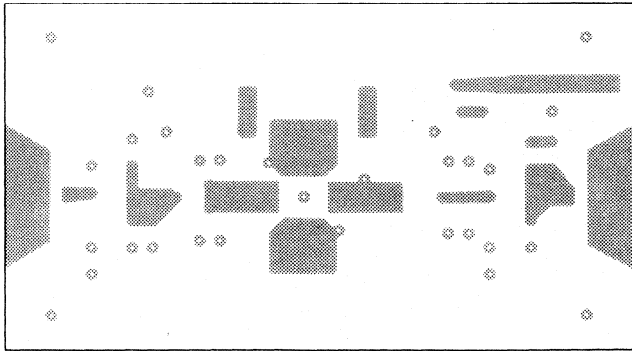
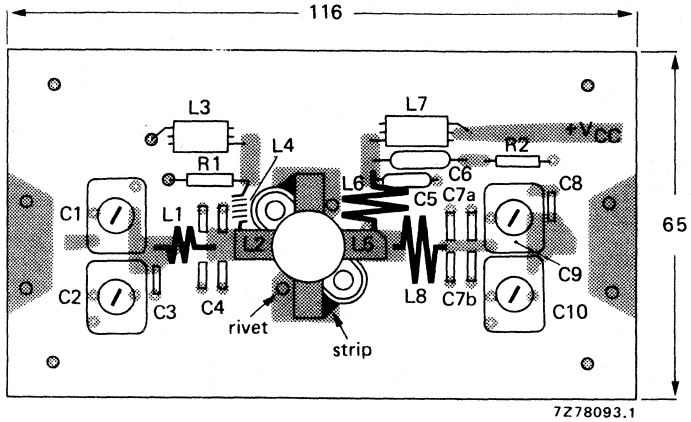


Fig. 16 Component layout and printed-circuit board for 87,5 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

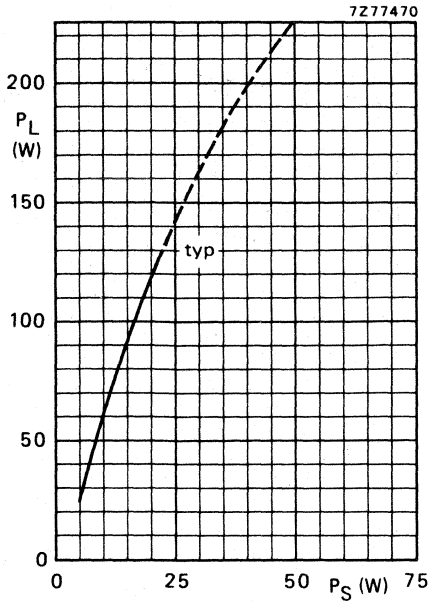


Fig. 17 $V_{CE} = 28$ V; $f = 87,5$ MHz; $T_h = 25$ °C.

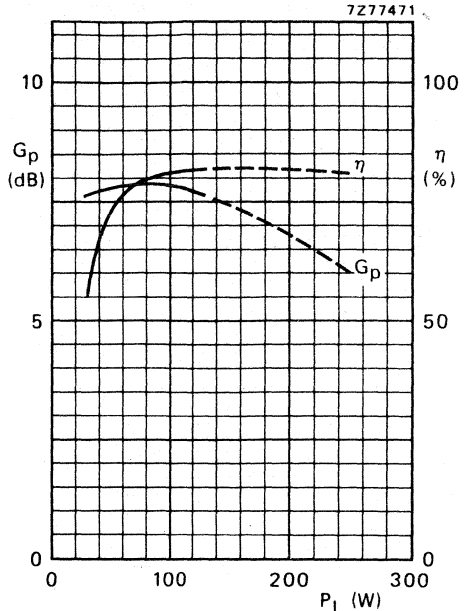


Fig. 18 $V_{CE} = 28$ V; $f = 87,5$ MHz; $T_h = 25$ °C; typical values.

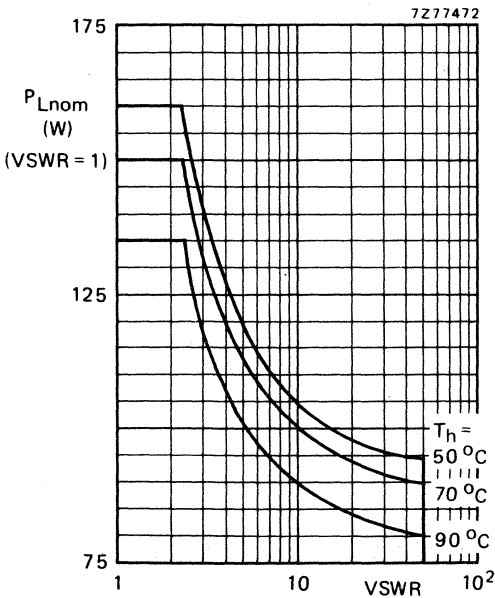


Fig. 19 R.F. SOAR; c.w. class-B operation; $f = 87,5$ MHz; $V_{CE} = 28$ V; $R_{th\ mb-h} = 0,2$ °C/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

APPLICATION INFORMATION (continued)

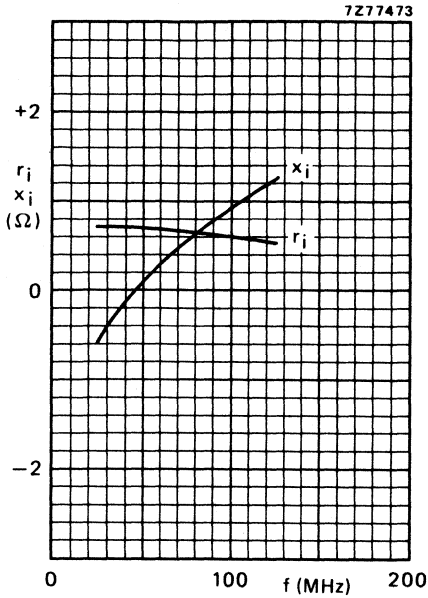


Fig. 20 $V_{CE} = 28$ V; $P_L = 130$ W; $T_h = 25$ °C; typical values.

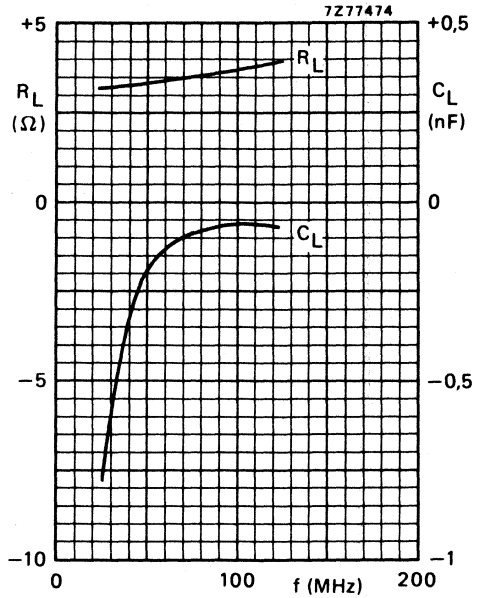


Fig. 21 $V_{CE} = 28$ V; $P_L = 130$ W; $T_h = 25$ °C; typical values.

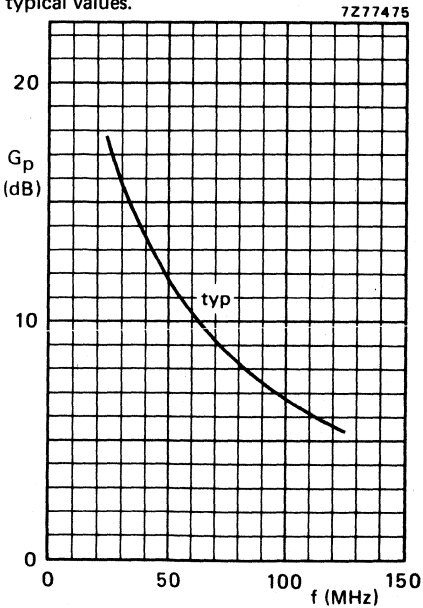


Fig. 22 $V_{CE} = 28$ V; $P_L = 130$ W; $T_h = 25$ °C.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, AB or B operated mobile, industrial and military transmitters in the h.f. and v.h.f. bands. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 1/2" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	P_S W	G_p dB	η %	d_3 dB
c.w. (class-B)	28	150	100	< 25	> 6	> 70	—
s.s.b. (class-A; $I_C = 3\text{ A}$)	26	28	35 (P.E.P.)	typ. 0,4	typ. 19,5	—	typ. -40

MECHANICAL DATA

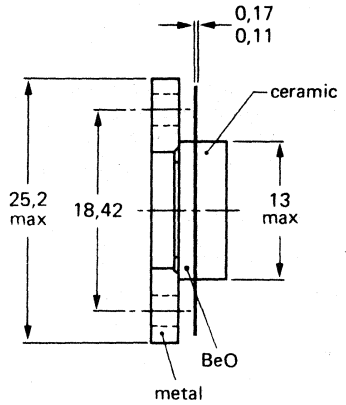
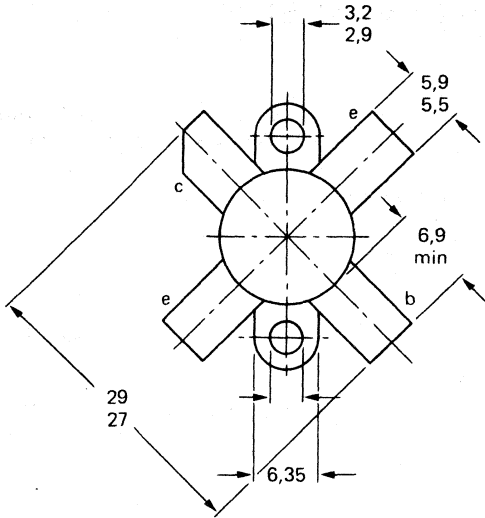
SOT-121A (see page 2)

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

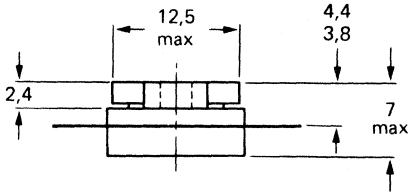
MECHANICAL DATA

Fig. 1 SOT-121A.

Dimensions in mm



7Z75334.1



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: raised cheese-head 4-40UNC/2A

Heatsink compound must be applied sparingly and evenly.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM} max.	70 V
Collector-emitter voltage (open base)	V_{CEO} max.	35 V
Emitter-base voltage (open collector)	V_{EBO} max.	4 V
Collector current (average)	$I_{C(AV)}$ max.	10 A
Collector current (peak value); $f > 1$ MHz	I_{CM} max.	25 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf} max.	160 W
Storage temperature	T_{stg}	-65 to +150 °C
Operating junction temperature	T_j max.	200 °C

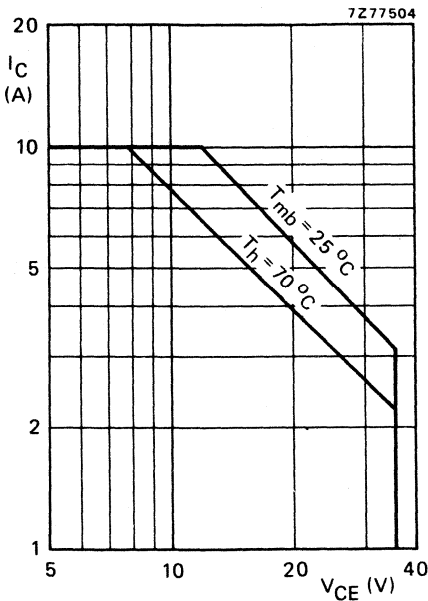


Fig. 2 D.C. SOAR.

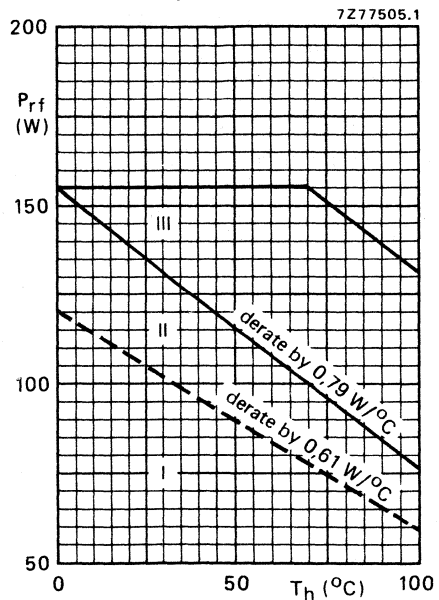


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 80 W; $T_{mb} = 86$ °C; i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th j-mb(dc)}$	= 1,45 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th j-mb(rf)}$	= 1,06 °C/W
From mounting base to heatsink	$R_{th mb-h}$	= 0,2 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 50\text{ mA}$ $V_{(BR)CES} > 70\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 35\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 5\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 35\text{ V}$ $I_{CES} < 5\text{ mA}$

D.C. current gain*

 $I_C = 5\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE} \quad 20\text{ to }85$

Collector-emitter saturation voltage

 $I_C = 15\text{ A}; I_B = 3\text{ A}$ $V_{CEsat} \quad \text{typ. } 2\text{ V}$ Transition frequency at $f = 100\text{ MHz}^*$ $-I_E = 5\text{ A}; V_{CB} = 28\text{ V}$ $f_T \quad \text{typ. } 370\text{ MHz}$ $-I_E = 15\text{ A}; V_{CB} = 28\text{ V}$ $f_T \quad \text{typ. } 350\text{ MHz}$ Collector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ $C_C \quad \text{typ. } 155\text{ pF}$ Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$ $C_{re} \quad \text{typ. } 102\text{ pF}$

Collector-flange capacitance

 $C_{cf} \quad \text{typ. } 3\text{ pF}$ * Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

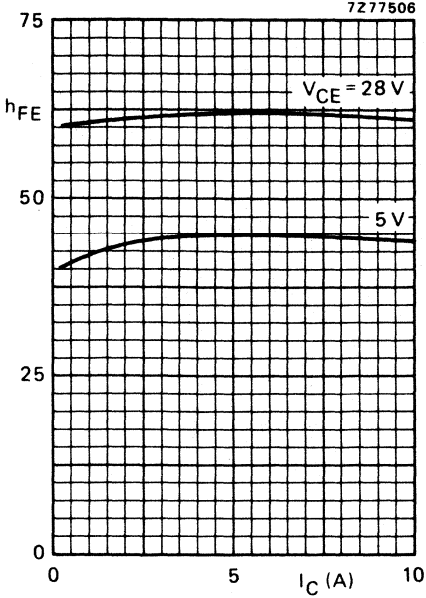


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

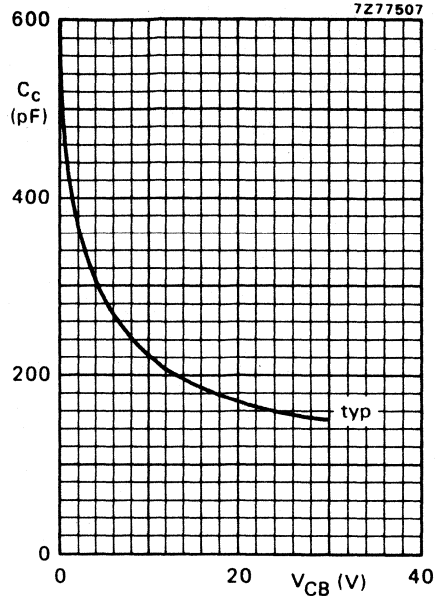


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

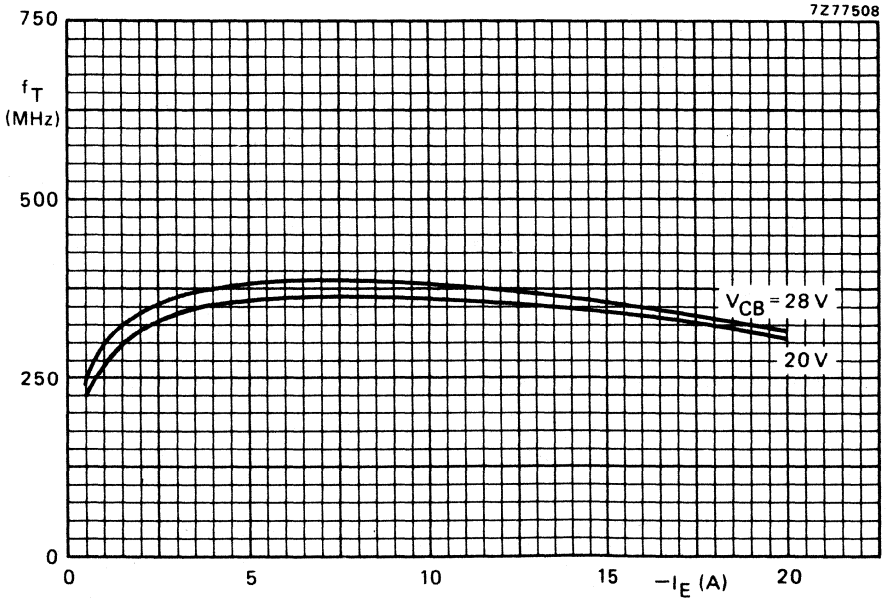


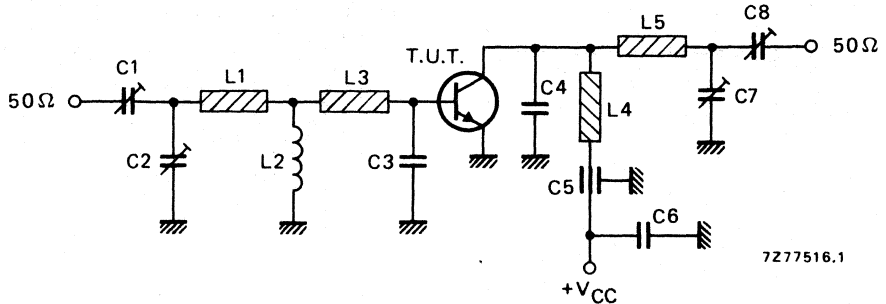
Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.



APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit); $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_D (W)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
150	28	100	≤ 25	≥ 70	$0,73 + j1,35$	$225 - j35$

Fig. 7 Test circuit; c.w. class-B; $f = 150\text{ MHz}$.

List of components:

- C1 = C2 = C7 = C8 = 5 to 100 pF film dielectric trimmer
- C3 = 203 pF; 2 x 82 pF and 39 pF ceramic capacitors in parallel (500 V)
- C4 = 39 pF ceramic capacitor (500 V)
- C5 = 1 nF feed-through capacitor
- C6 = 100 nF polyester capacitor

L1 = strip (30 mm x 8 mm); bent to form inverted 'U' shape with top 15 mm above heatsink, and bottom 5 mm above heatsink

L2 = 1 μH r.f. choke

L3 = strip; shape as shown in Fig. 8; 5 mm above heatsink

L4 = strip (40 mm x 8 mm); bent in form $\text{—}\text{—}\text{—}$, 25 mm at 15 mm above heatsink, 5 mm at 5 mm above heatsink

L5 = strip (75 mm long; width 8 mm); 5 mm above base

L1, L3, L4, and L5 are copper strips with a thickness of 0,6 mm.

Heatsink: aluminium; 0,9 $^\circ\text{C/W}$

At $P_L = 100\text{ W}$ and $V_{CE} = 28\text{ V}$, the output power at heatsink temperatures between 25 $^\circ\text{C}$ and 90 $^\circ\text{C}$ relative to that at 25 $^\circ\text{C}$ is diminished by typ. 0,12 W/ $^\circ\text{C}$.

Component layout on an aluminium heatsink for 150 MHz test circuit is shown in Fig. 8.

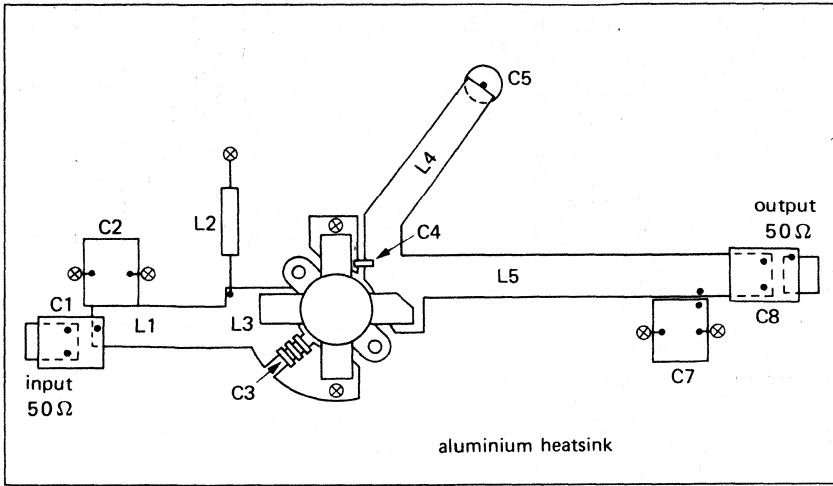


Fig. 8 Component layout on an aluminium heatsink for 150 MHz test circuit. ⊗ Earthing bolts.



APPLICATION INFORMATION (continued)

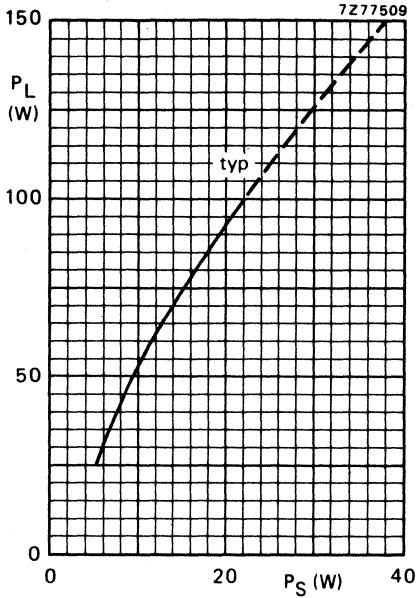


Fig. 9 $V_{CE} = 28 \text{ V}$; $f = 150 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$.

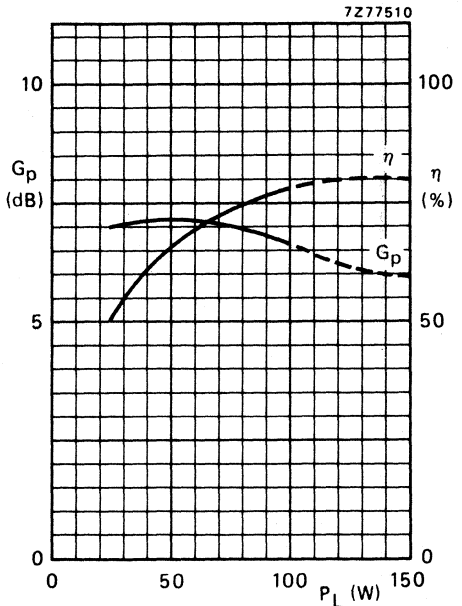


Fig. 10 $V_{CE} = 28 \text{ V}$; $f = 150 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; typical values.

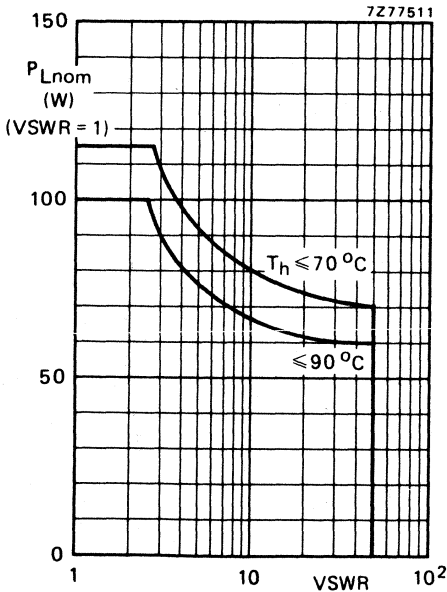


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 150 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $R_{th \text{ mb-h}} = 0,2 \text{ }^\circ\text{C/W}$. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

OPERATING NOTE Below 50 MHz a base-emitter resistor of $4,7 \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

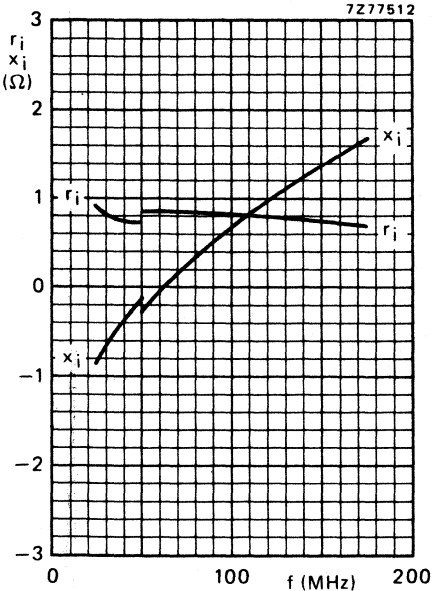


Fig. 12.

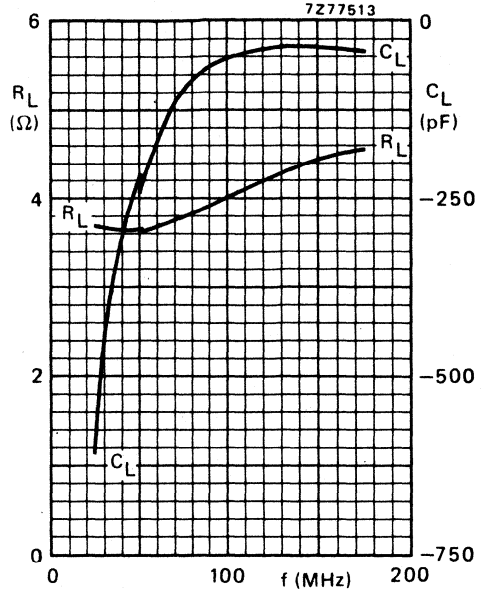
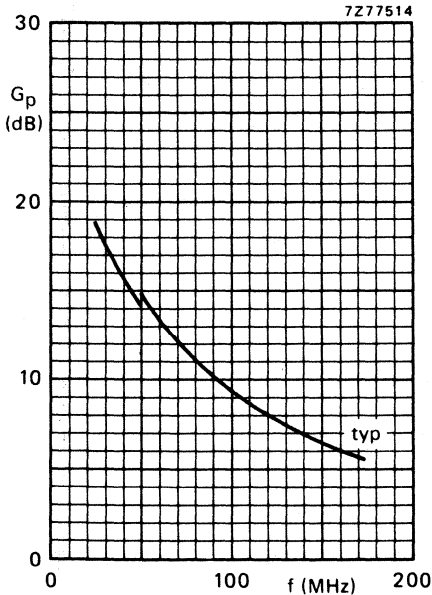


Fig. 13.



Conditions for Figs 12, 13 and 14:
 $V_{CE} = 28 \text{ V}$; $P_L = 100 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$;
 typical values.

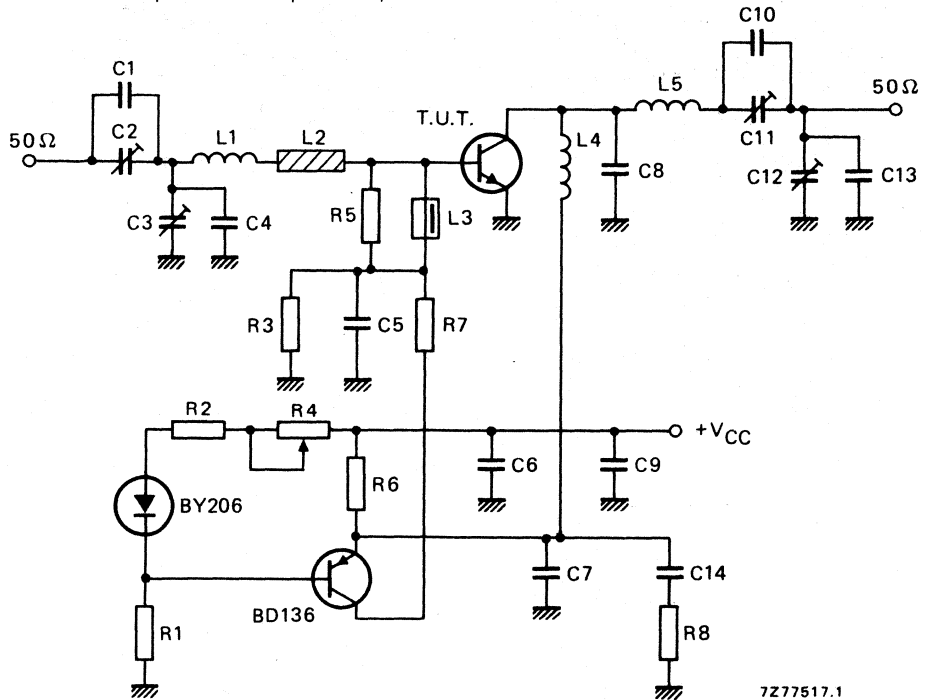
Fig. 14.

APPLICATION INFORMATION (continued)

R.F. performance in s.s.b. class-A operation

→ $V_{CE} = 26 \text{ V}$; $T_h = 40 \text{ }^\circ\text{C}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	I_C A	d_3 dB
35 (P.E.P.)	typ. 19,5	3	typ. -40

Fig. 15 Test circuit; s.s.b. class-A; $f = 28 \text{ MHz}$.

List of components:

- C1 = 33 pF ceramic capacitor (500 V)
- C2 = 100 pF air dielectric trimmer (single insulated rotor type)
- C3 = 280 pF air dielectric trimmer (single non-insulated rotor type)
- C4 = 180 pF polystyrene capacitor
- C5 = C6 = C7 = 3,9 nF ceramic capacitor
- C8 = 2 x 33 pF ceramic capacitors in parallel (500 V)
- C9 = 330 nF polyester capacitor
- C10 = 82 pF ceramic capacitor (500 V)
- C11 = 100 pF air dielectric trimmer (single insulated rotor type)
- C12 = 180 pF air dielectric trimmer (single non-insulated rotor type)
- C13 = 150 pF polystyrene capacitor
- C14 = 390 nF polyester capacitor

List of components in Fig. 15 (continued):

L1 = 72 nH; 3 turns Cu wire (1,0 mm); int. dia. 7 mm; length 4,8 mm; leads 2 x 5 mm

L2 = Cu strip (28 mm x 5 mm x 0,2 mm); 18 mm at 3 mm above printed-circuit board

L3 = Ferroxcube choke coil (cat. no. 4312 020 36640)

L4 = 297 nH; 6 turns Cu wire (1,5 mm); int. dia. 12 mm; length 16 mm; leads 2 x 5 mm

L5 = 331 nH; 7 turns Cu wire (1,5 mm); int. dia. 12 mm; length 20,8 mm; leads 2 x 5 mm

R1 = 1,5 k Ω (\pm 5%) carbon resistor (0,5 W)

R2 = 100 Ω (\pm 5%) carbon resistor (0,5 W)

R3 = 68 Ω (\pm 5%) carbon resistor (0,5 W)

R4 = 100 Ω wirewound potentiometer (1 W)

R5 = 33 Ω (\pm 5%) carbon resistor (0,5 W)

R6 = 0,68 Ω (\pm 10%) wirewound resistor (7 W)

R7 = 120 Ω wirewound resistor (8 W)

R8 = 10 Ω (\pm 10%) carbon resistor (0,5 W)

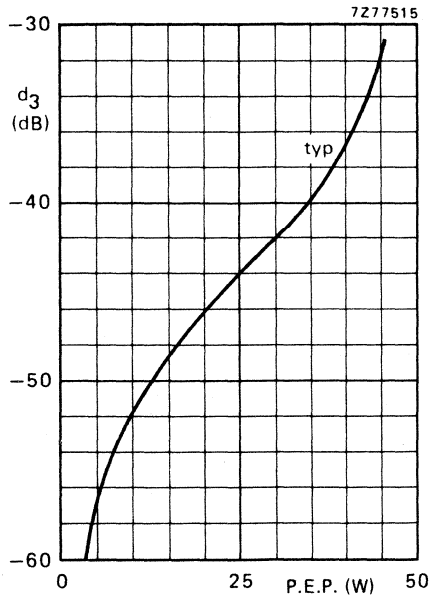


Fig. 16 Intermodulation distortion as a function of output power; $V_{CE} = 26$ V; $I_C = 3$ A; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz; $T_h = 40$ °C.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for nominal supply voltages up to 13,5 V. The resistance stabilization of the transistor provides protection against device damage at severe load mismatch conditions. The transistor is housed in a ¼" capstan envelope with a ceramic cap.

QUICK REFERENCE DATA

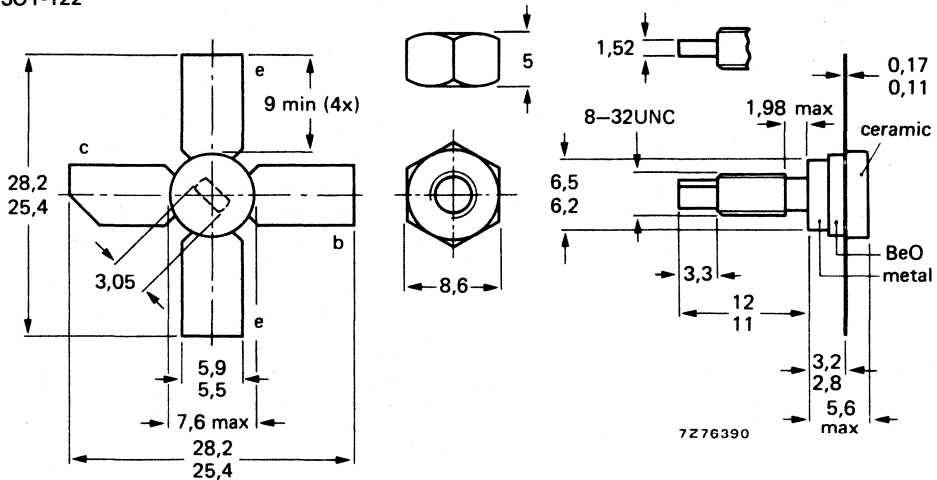
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	12,5	470	2	> 9,0	> 60	$3,5 + j0,4$	$28 - j38$
c.w.	12,5	175	2	typ 13,5	typ 60	$4,2 - j3,4$	$25 - j24$

MECHANICAL DATA

Dimensions in mm

SOT-122



Torque on nut: min 0,75 Nm
(7,5 kg cm)
max 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

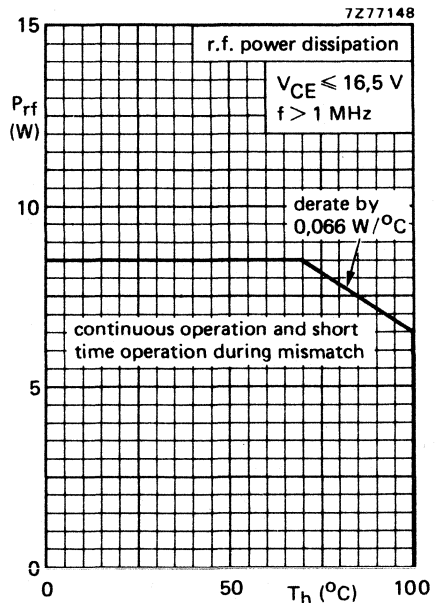
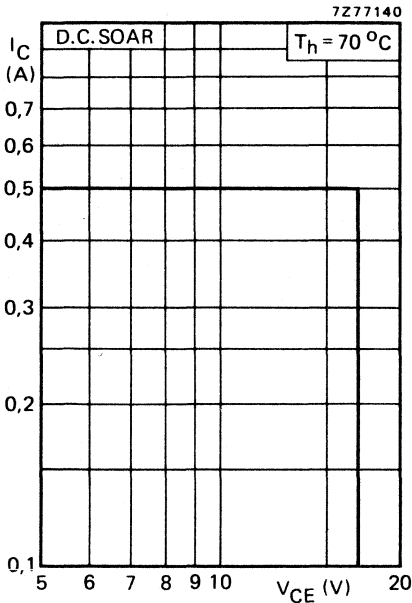
Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max	36 V
Collector-emitter voltage (open base)	V_{CEO}	max	17 V
Emitter-base voltage (open collector)	V_{EBO}	max	4 V

Currents

Collector current (d.c.)	I_C	max	0,5 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max	1,5 A

Power dissipation

Total power dissipation (d.c. and r.f.) up to $T_h = 70^\circ\text{C}$	P_{tot}	max	8,5 W
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Temperatures

Storage temperature	T_{stg}	-65 to +150 °C
Operating junction temperature	T_j	max 200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	14,5 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Breakdown voltages

Collector-emitter voltage

 $V_{BE} = 0; I_C = 5\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter voltage

open base; $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 17\text{ V}$

Emitter-base voltage

open collector; $I_E = 2\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 17\text{ V}$ $I_{CES} < 2\text{ mA}$

D.C. current gain *

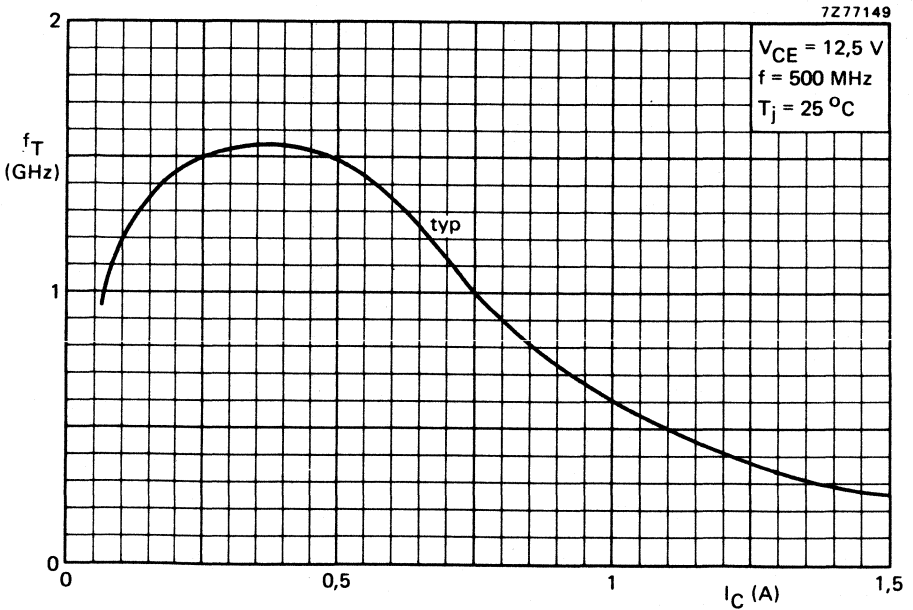
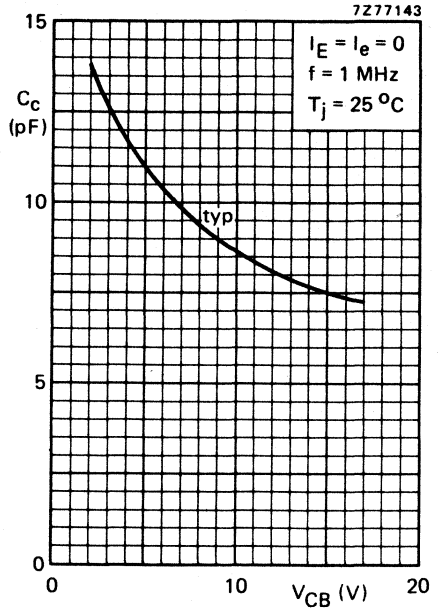
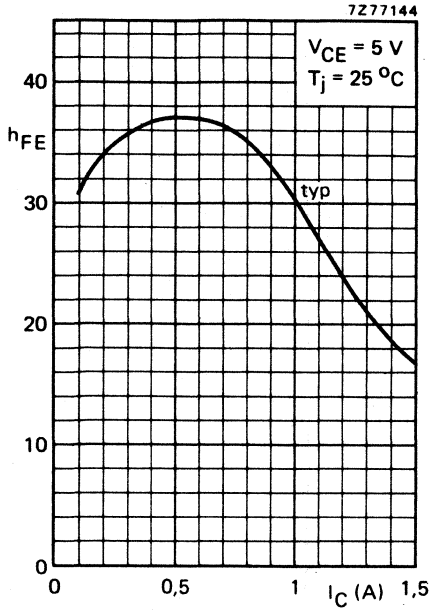
 $I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$ $h_{FE} > \text{typ } 10, 35$

Collector-emitter saturation voltage *

 $I_C = 750\text{ mA}; I_B = 150\text{ mA}$ $V_{CEsat} \text{ typ } 0,6\text{ V}$ Transition frequency at $f = 500\text{ MHz}$ * $I_C = 250\text{ mA}; V_{CE} = 12,5\text{ V}$ $f_T \text{ typ } 1,5\text{ GHz}$ $I_C = 750\text{ mA}; V_{CE} = 12,5\text{ V}$ $f_T \text{ typ } 1,0\text{ GHz}$ Collector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 12,5\text{ V}$ $C_C \text{ typ } 8\text{ pF}$ Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 20\text{ mA}; V_{CE} = 12,5\text{ V}$ $C_{re} \text{ typ } 3,6\text{ pF}$

Collector-stud capacitance

 $C_{cs} \text{ typ } 2\text{ pF}$ * Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



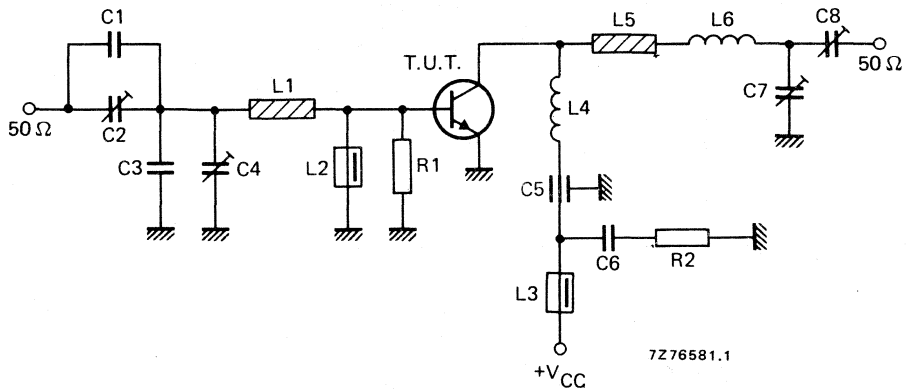
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
470	12,5	2	< 0,25 >	9,0	< 0,27 >	60	$3,5 + j0,4$	$28 - j38$
470	13,5	2	—	typ 10,5	—	typ 70	—	—
175	12,5	2	—	typ 13,5	—	typ 60	$4,2 - j3,4$	$25 - j24$

Test circuit for 470 MHz



List of components:

C1 = 2,2 pF ($\pm 0,25$ pF) ceramic capacitor

C2 = C4 = C7 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C3 = 3,3 pF ($\pm 0,25$ pF) ceramic capacitor

C5 = 100 pF ceramic feed-through capacitor

C6 = 100 nF polyester capacitor

C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

L1 = stripline (35,6 mm x 6,0 mm)

L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = 178 nH; 4 turns Cu wire (1 mm); int. dia. 6 mm; length 7 mm; leads 2 x 5 mm

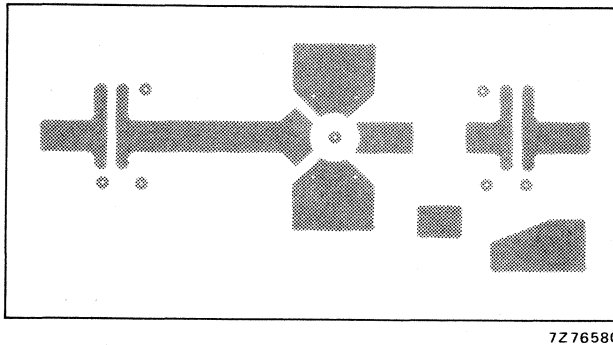
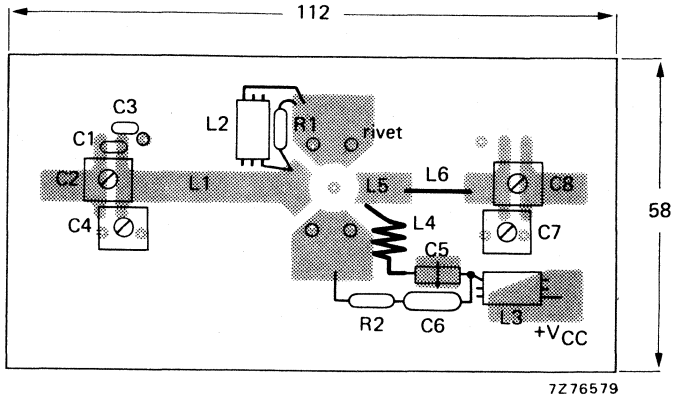
L5 = stripline (10,0 mm x 6,0 mm)

L6 = 28 nH; $\frac{1}{2}$ turn Cu wire (1 mm); int. dia. 10 mmL1 and L5 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".R1 = 100 Ω ($\pm 5\%$) carbon resistorR2 = 10 Ω ($\pm 5\%$) carbon resistor

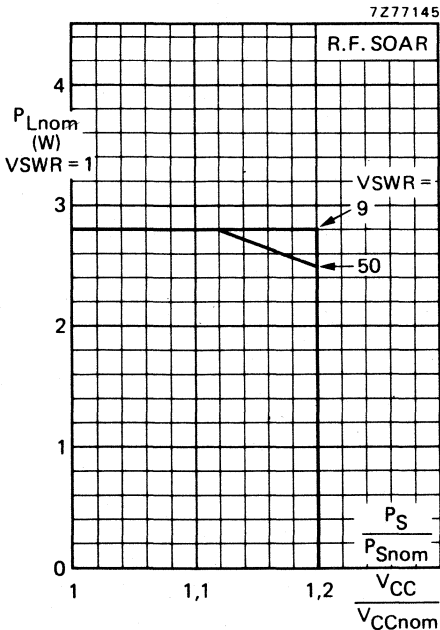
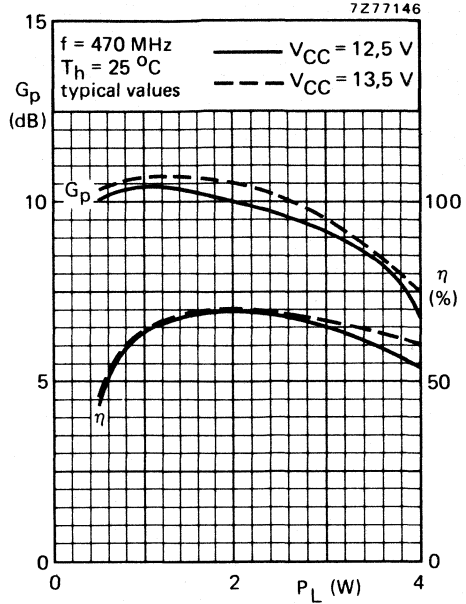
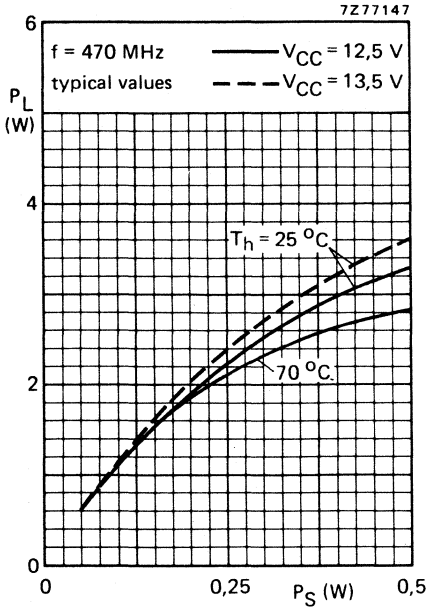
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.



The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



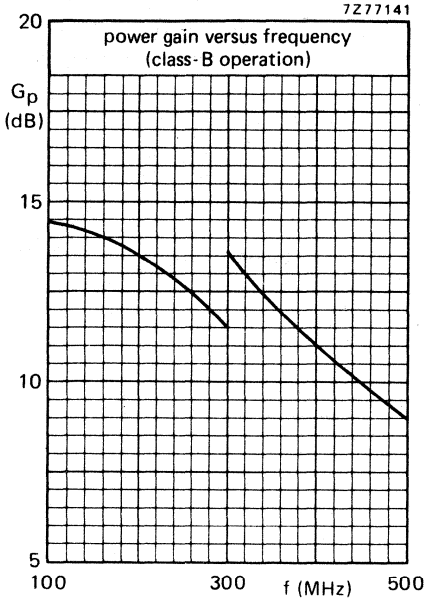
Conditions for R.F. SOAR

- $f = 470 \text{ MHz}$
- $T_h = 70 \text{ }^\circ\text{C}$
- $R_{th \text{ mb-h}} = 0,6 \text{ }^\circ\text{C/W}$
- $V_{CCnom} = 12,5 \text{ V or } 13,5 \text{ V}$
- $P_S = P_{Snom}$ at V_{CCnom} and $V_{SWR} = 1$
- see page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($V_{SWR} = 1$), as a function of the expected supply over-voltage ratio, with V_{SWR} as parameter.

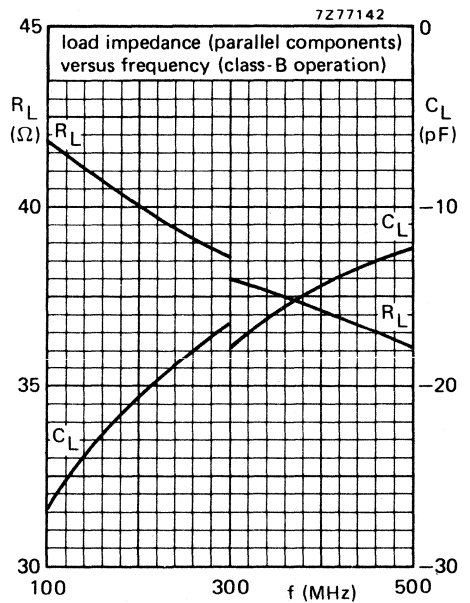
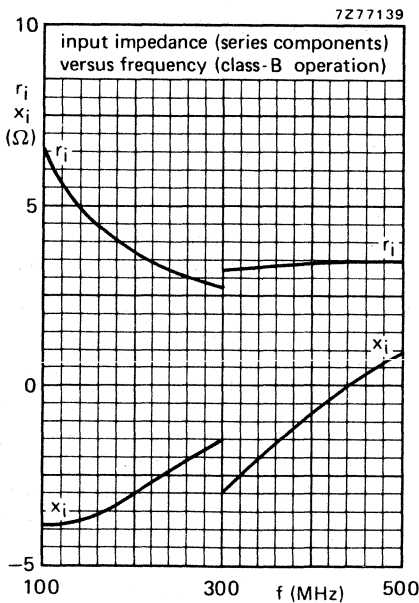
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 300 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.



Measuring conditions for the graphs on this page

$V_{CC} = 12,5\ V$
 $P_L = 2\ W$
 $T_h = 25\ ^\circ C$
 typical values



U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for nominal supply voltages up to 13,5 V.

The resistance stabilization of the transistor provides protection against device damage at severe load mismatch conditions.

The transistor is housed in a ¼" capstan envelope with a ceramic cap.

QUICK REFERENCE DATA

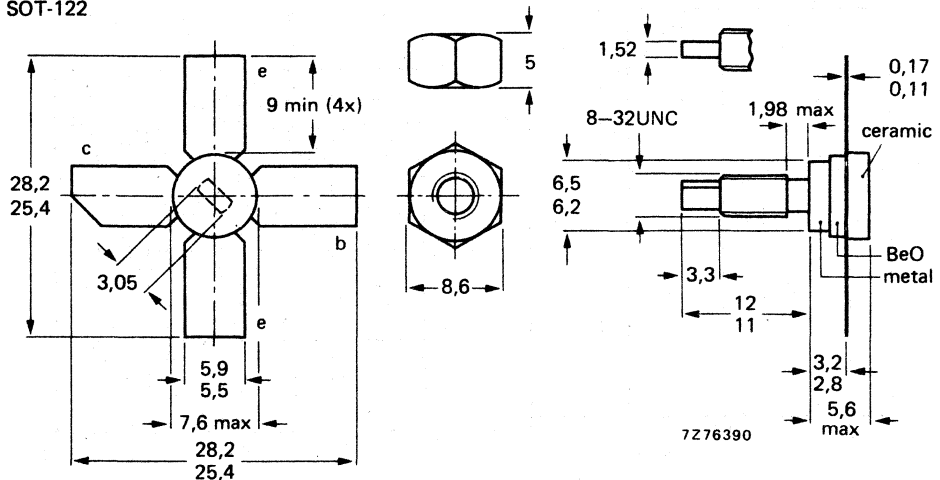
R.F. performance up to $T_H = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{V}_L mA/V
c.w.	12,5	470	4	> 8,0	> 60	$2,1 + j2,3$	57 - j56
c.w.	12,5	175	4	typ 15,0	typ 60	$2,0 - j2,2$	51 - j48

MECHANICAL DATA

Dimensions in mm

SOT-122



Torque on nut: min 0,75 Nm
(7,5 kg cm)
max 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max 36 V

Collector-emitter voltage (open base)

V_{CEO} max 17 V

Emitter-base voltage (open collector)

V_{EBO} max 4 V

Currents

Collector current (d.c.)

I_C max 1 A

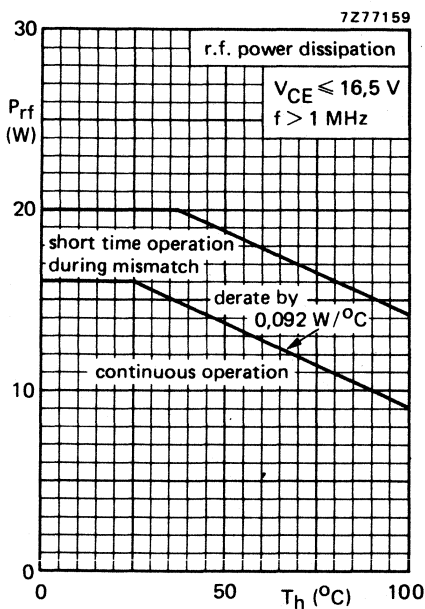
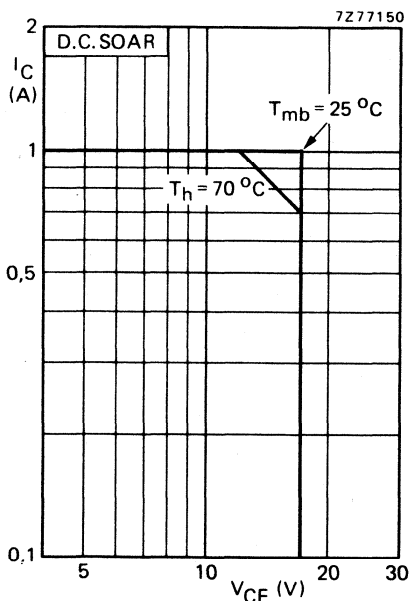
Collector current (peak value); $f > 1$ MHz

I_{CM} max 3 A

Power dissipation

Total power dissipation (d.c. and r.f.) up to $T_{mb} = 25^\circ\text{C}$

P_{tot} max 17 W



Temperatures

Storage temperature

T_{stg} -65 to $+150^\circ\text{C}$

Operating junction temperature

T_j max 200°C

THERMAL RESISTANCE

From junction to mounting base

$R_{th\ j-mb} = 10,3^\circ\text{C/W}$

From mounting base to heatsink

$R_{th\ mb-h} = 0,6^\circ\text{C/W}$

CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ **Breakdown voltages**

Collector-emitter voltage

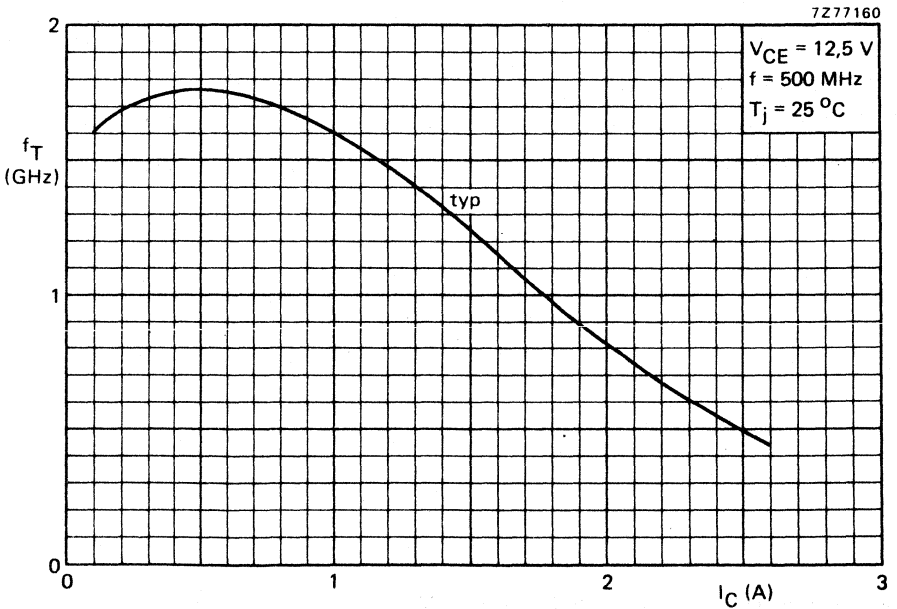
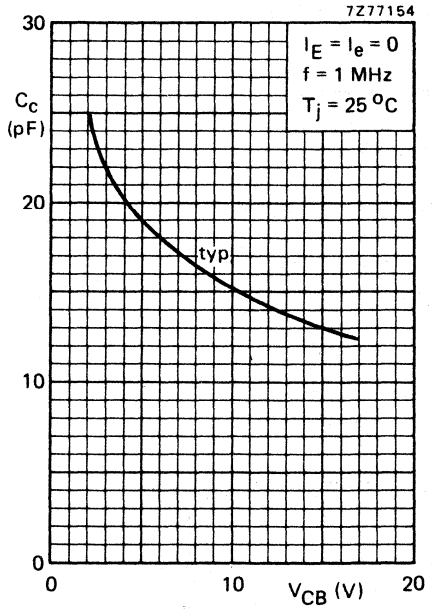
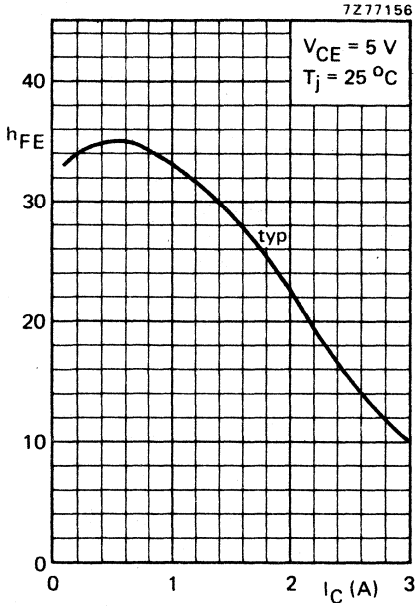
 $V_{BE} = 0; I_C = 10\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter voltage

open base; $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 17\text{ V}$

Emitter-base voltage

open collector; $I_E = 4\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$ **Collector cut-off current** $V_{BE} = 0; V_{CE} = 17\text{ V}$ $I_{CES} < 4\text{ mA}$ **D.C. current gain *** $I_C = 0,5\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE} > \text{typ } 10$
 35 **Collector-emitter saturation voltage *** $I_C = 1,5\text{ A}; I_B = 0,3\text{ A}$ $V_{CEsat} \text{ typ } 0,75\text{ V}$ **Transition frequency at $f = 500\text{ MHz}$ *** $I_C = 0,5\text{ A}; V_{CE} = 12,5\text{ V}$ $f_T \text{ typ } 1,75\text{ GHz}$ $I_C = 1,5\text{ A}; V_{CE} = 12,5\text{ V}$ $f_T \text{ typ } 1,25\text{ GHz}$ **Collector capacitance at $f = 1\text{ MHz}$** $I_E = I_e = 0; V_{CB} = 12,5\text{ V}$ $C_C \text{ typ } 14\text{ pF}$ **Feedback capacitance at $f = 1\text{ MHz}$** $I_C = 40\text{ mA}; V_{CE} = 12,5\text{ V}$ $C_{re} \text{ typ } 7,1\text{ pF}$ **Collector-stud capacitance** $C_{Cs} \text{ typ } 2\text{ pF}$ * Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



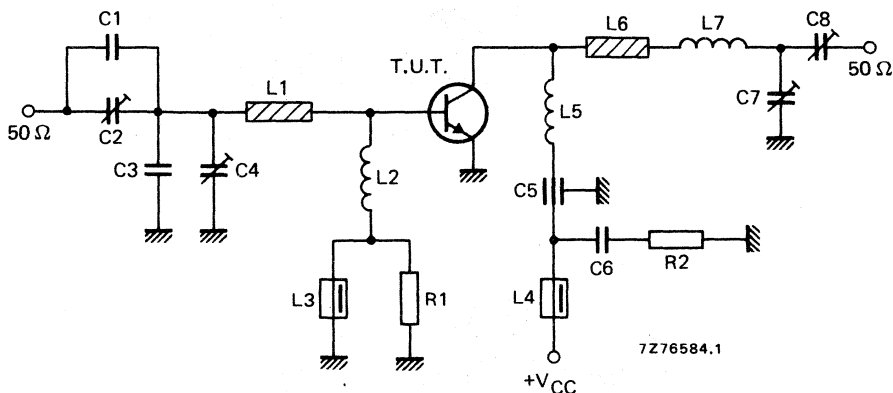
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit).

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
470	12,5	4	< 0,63 >	8,0	< 0,53 >	> 60	2,1 + j2,3	57 - j56
470	13,5	4	—	typ 9,5	—	typ 65	—	—
175	12,5	4	—	typ 15,0	—	typ 60	2,0 - j2,2	51 - j48

Test circuit for 470 MHz



List of components:

C1 = 2,2 pF ($\pm 0,25$ pF) ceramic capacitor

C2 = C7 = C8 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C3 = 5,6 pF ($\pm 0,25$ pF) ceramic capacitor

C4 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C5 = 100 pF ceramic feed-through capacitor

C6 = 100 nF polyester capacitor

L1 = stripline (22,5 mm \times 6,0 mm)L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; leads 2 \times 5 mm

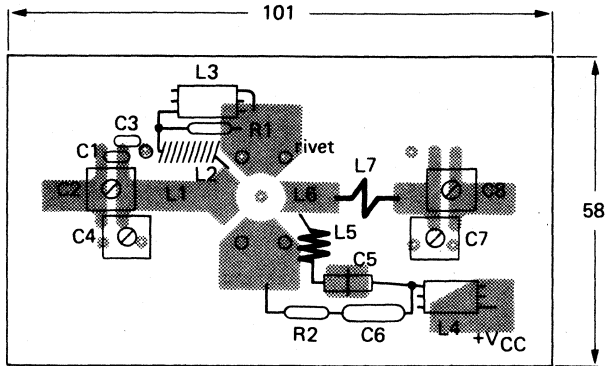
L3 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L5 = 51 nH; 3,5 turns Cu wire (1 mm); int. dia. 6 mm; coil length 7 mm; leads 2 \times 5 mmL6 = stripline (10,0 mm \times 6,0 mm)L7 = 15 nH; 1 turn Cu wire (1 mm); int. dia. 5 mm; leads 2 \times 5 mmL1 and L6 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".R1 = R2 = 10 Ω ($\pm 5\%$) carbon resistor

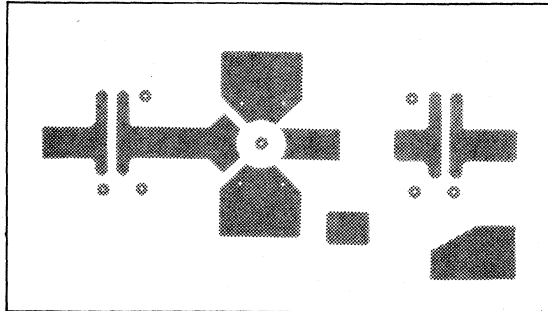
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

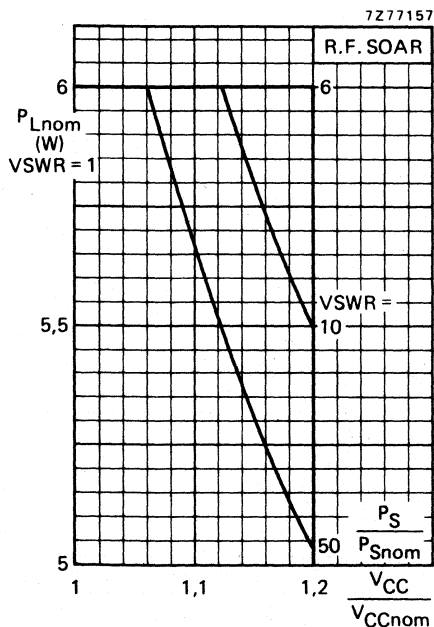
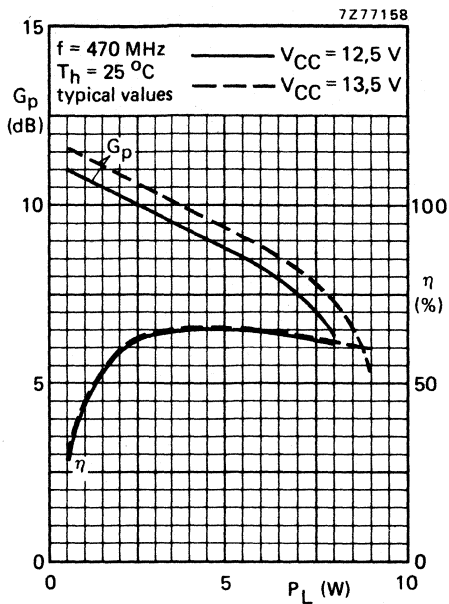
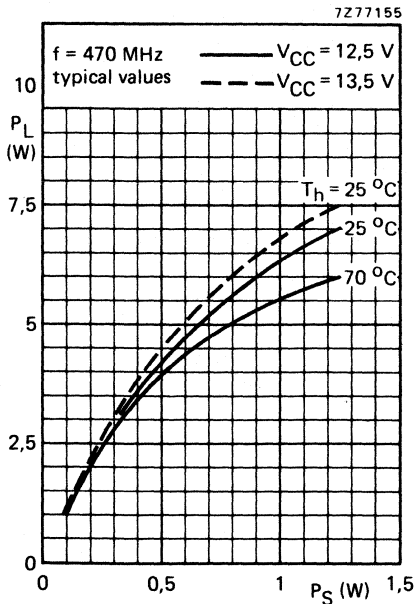
Component layout and printed-circuit board for 470 MHz test circuit.



7Z76582



The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



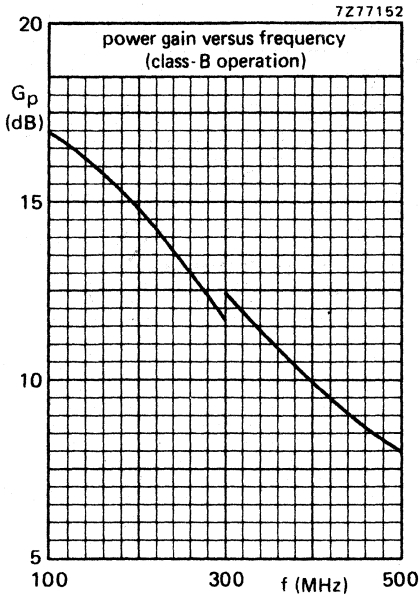
Conditions for R.F. SOAR

$f = 470 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,6 \text{ }^\circ\text{C/W}$
 $V_{CCnom} = 12,5 \text{ V or } 13,5 \text{ V}$
 $P_S = P_{Snom}$ at V_{CCnom} and $VSWR = 1$
 see page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio, with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 300 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.



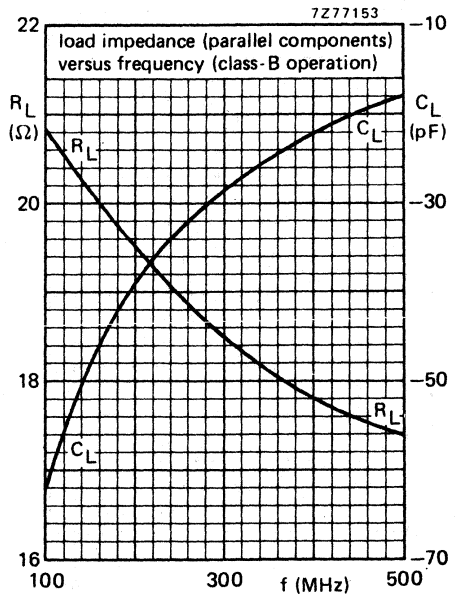
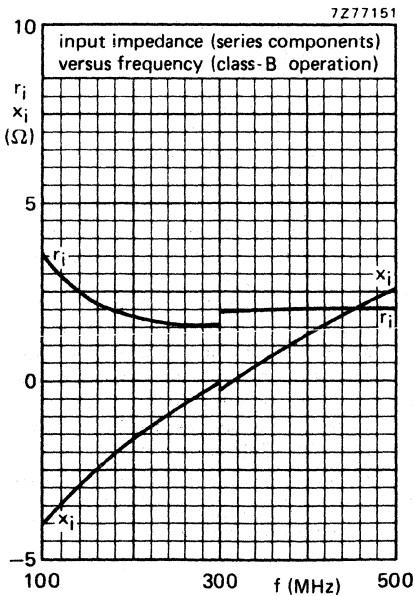
Measuring conditions for the graphs on this page

$V_{CC} = 12,5\ V$

$P_L = 4\ W$

$T_h = 25\ ^\circ C$

typical values



U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for nominal supply voltages up to 13,5 V.

The resistance stabilization of the transistor provides protection against device damage at severe load mismatch conditions.

The transistor is housed in a ¼" capstan envelope with a ceramic cap.

QUICK REFERENCE DATA

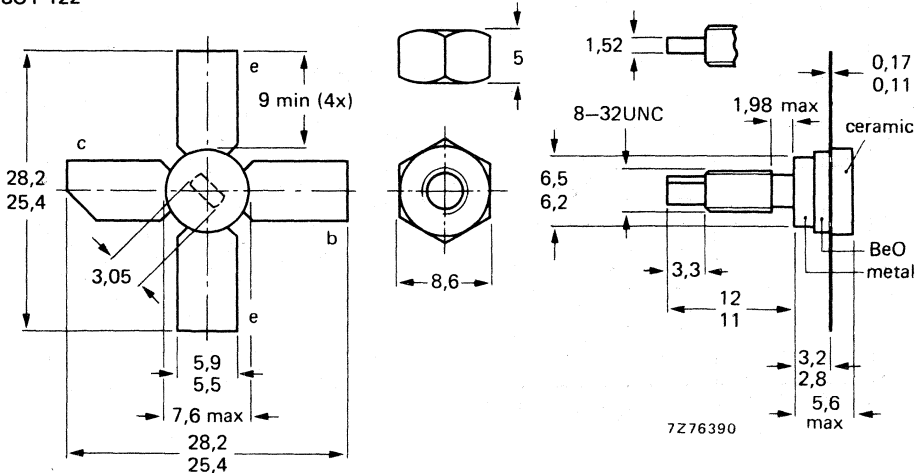
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	12,5	470	10	> 6,0	> 60	$1,3 + j2,5$	$150 - j66$
c.w.	12,5	175	10	typ 13,5	typ 60	$1,2 - j0,6$	$140 - j80$

MECHANICAL DATA

Dimensions in mm

SOT-122



Torque on nut: min 0,75 Nm
(7,5 kg cm)
max 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

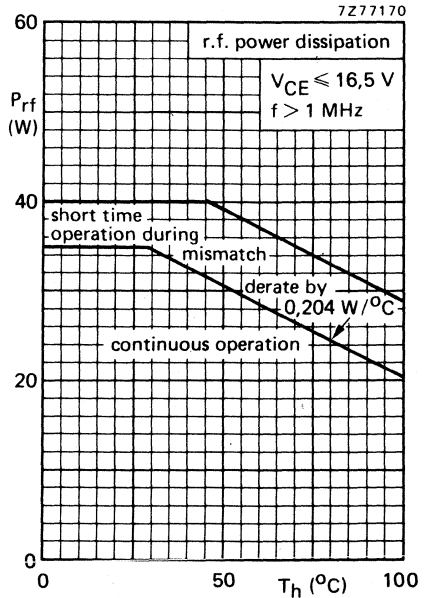
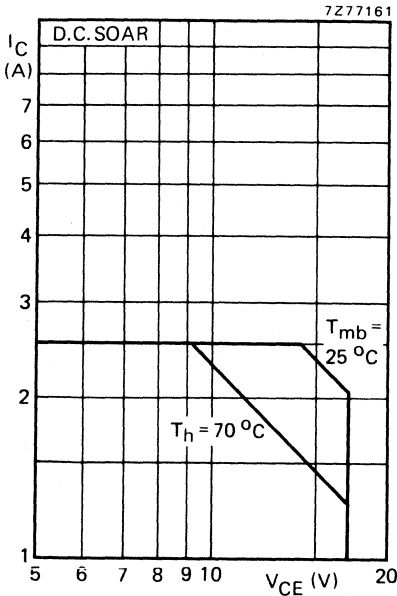
Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max	36 V
Collector-emitter voltage (open base)	V_{CEO}	max	17 V
Emitter-base voltage (open collector)	V_{EBO}	max	4 V

Currents

Collector current (d.c. or average)	I_C	max	2,5 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max	7,5 A

Power dissipation

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{tot}	max	40 W
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Temperatures

Storage temperature	T_{stg}	-65 to +150 °C
Operating junction temperature	T_j	max 200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	4,3 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Breakdown voltages

Collector-emitter voltage

 $V_{BE} = 0; I_C = 25\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter voltage

open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 17\text{ V}$

Emitter-base voltage

open collector; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 17\text{ V}$ $I_{CES} < 10\text{ mA}$

D.C. current gain *

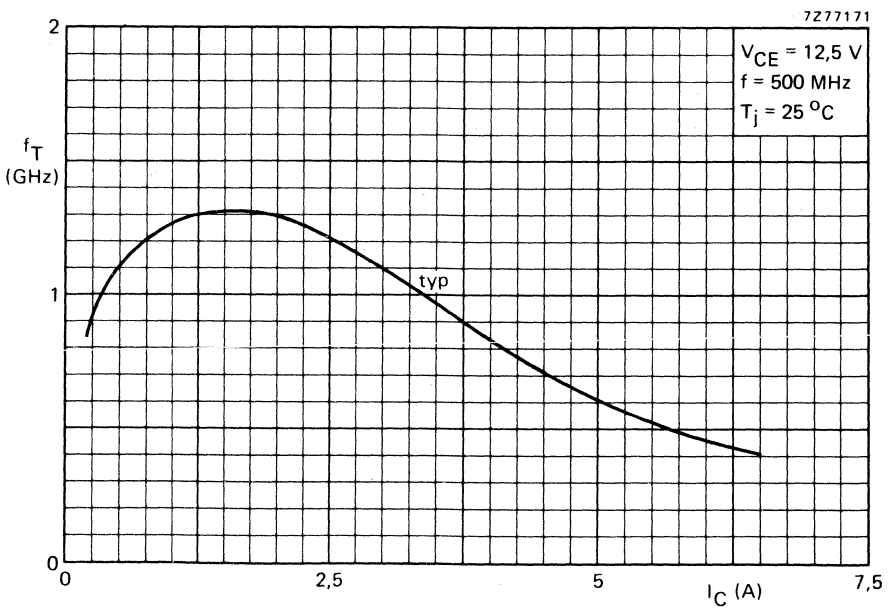
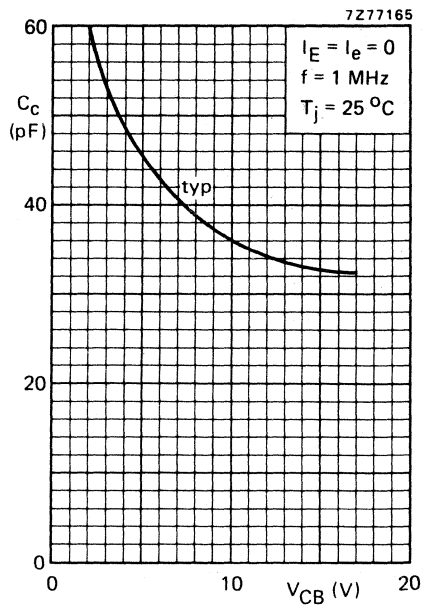
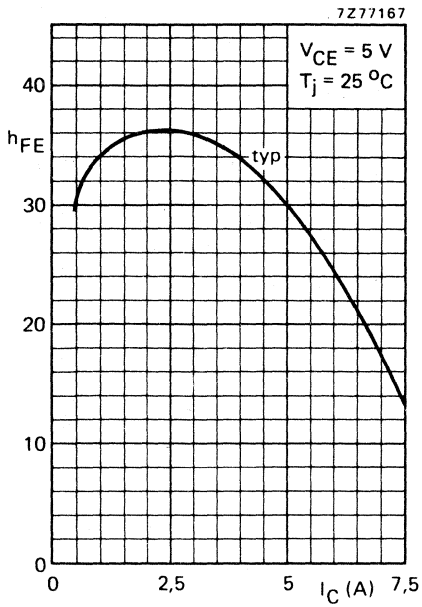
 $I_C = 1,25\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE} > \text{typ } 35$

Collector-emitter saturation voltage *

 $I_C = 3,75\text{ A}; I_B = 0,75\text{ A}$ $V_{CEsat} \text{ typ } 0,75\text{ V}$ Transition frequency at $f = 500\text{ MHz}$ * $I_C = 1,25\text{ A}; V_{CE} = 12,5\text{ V}$ $f_T \text{ typ } 1,3\text{ GHz}$ $I_C = 3,75\text{ A}; V_{CE} = 12,5\text{ V}$ $f_T \text{ typ } 0,9\text{ GHz}$ Collector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 12,5\text{ V}$ $C_c \text{ typ } 34\text{ pF}$ Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 12,5\text{ V}$ $C_{re} \text{ typ } 18\text{ pF}$

Collector-stud capacitance

 $C_{cs} \text{ typ } 2\text{ pF}$ * Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



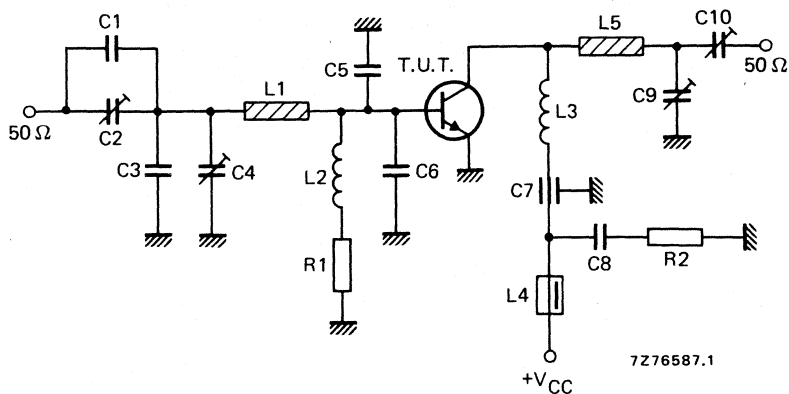
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
470	12,5	10	< 2,5	> 6,0	< 1,33	> 60	$1,3 + j2,5$	$150 - j66$
470	13,5	10	typ 1,9	typ 7,2	—	typ 75	—	—
175	12,5	10	typ 0,45	typ 13,5	—	typ 60	$1,2 - j0,6$	$140 - j80$

Test circuit for 470 MHz



List of components:

C1 = 2,2 pF ($\pm 0,25$ pF) ceramic capacitor

C2 = C9 = C10 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

C3 = 3,9 pF ($\pm 0,25$ pF) ceramic capacitor

C4 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C5 = C6 = 15 pF ceramic chip capacitor (cat. no. 2222 851 13159)

C7 = 100 pF ceramic feed-through capacitor

C8 = 100 nF polyester capacitor

L1 = stripline (27,9 mm x 6,0 mm)

L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. = 4 mm; leads 2 x 5 mm

L3 = 17 nH; 1½ turns enamelled Cu wire (1 mm); spacing 1 mm; int. dia. = 6 mm; leads 2 x 5 mm

L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

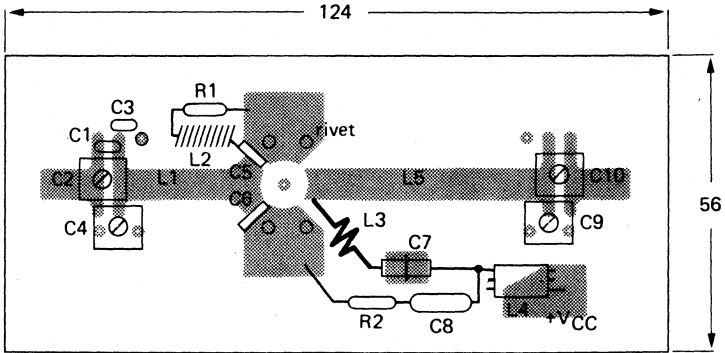
L5 = stripline (45,8 mm x 6,0 mm)

L1 and L5 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".R1 = 1 Ω ($\pm 5\%$) carbon resistorR2 = 10 Ω ($\pm 5\%$) carbon resistor

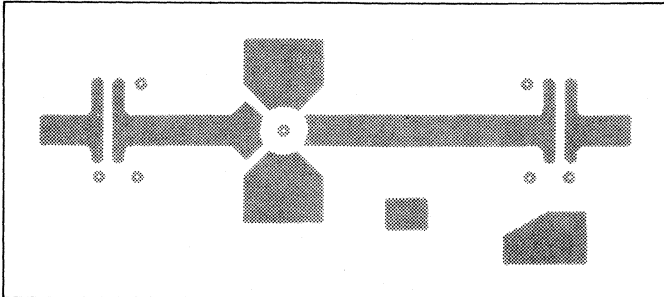
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.

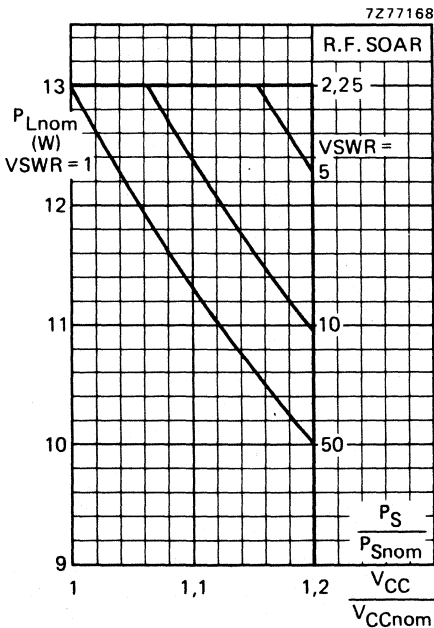
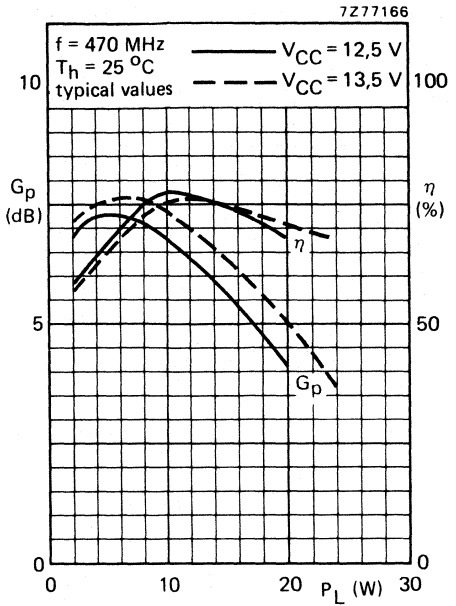
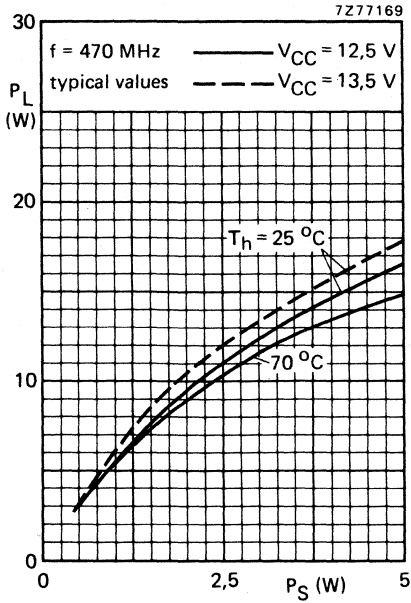


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7276586

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



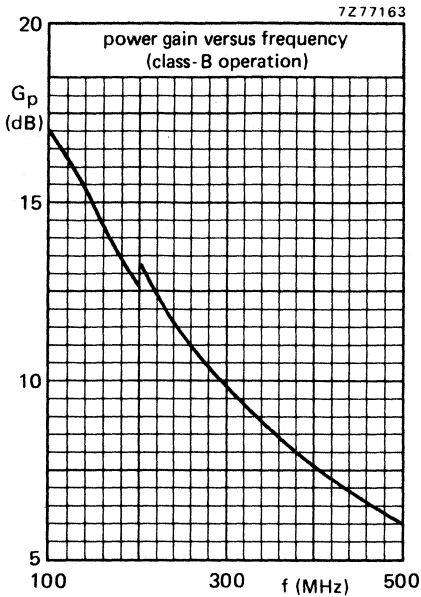
Measuring conditions for R.F. SOAR

$f = 470 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,6 \text{ }^\circ\text{C/W}$
 $V_{CCnom} = 12,5 \text{ V or } 13,5 \text{ V}$
 $P_S = P_{Snom}$ at V_{CCnom} and $V_{SWR} = 1$
 see page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($V_{SWR} = 1$), as a function of the expected supply over-voltage ratio, with V_{SWR} as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 200 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.



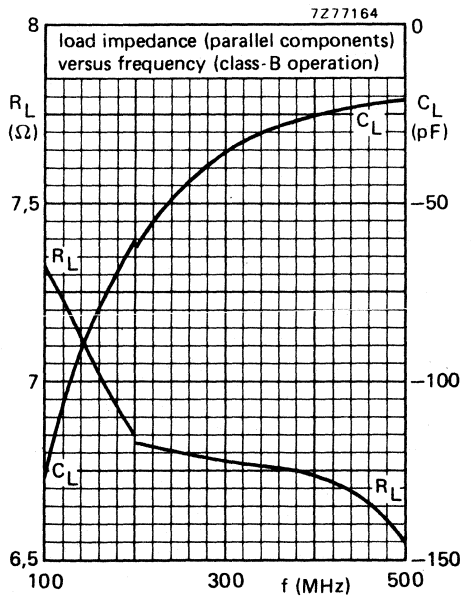
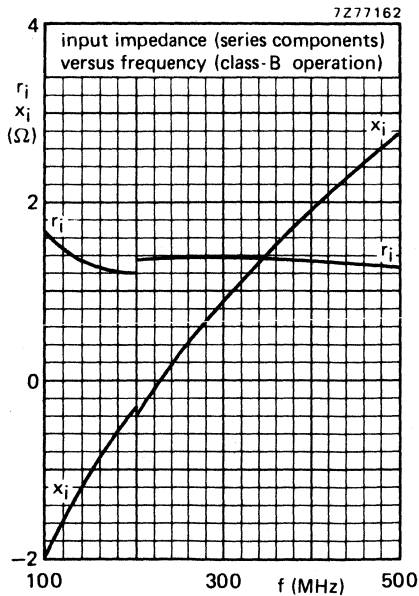
Measuring conditions for the graphs on this page

$V_{CC} = 12,5\ V$

$P_L = 10\ W$

$T_h = 25\ ^\circ C$

typical values



U.H.F. POWER TRANSISTOR

Internally matched n-p-n silicon planar epitaxial transistor intended for use in **high-power wide-band** and **semi-wide-band u.h.f. amplifiers** with a nominal supply voltage of 12,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. Diffused emitter-ballasting resistors and the application of a **gold sandwich metallization** give optimum features of ruggedness and reliability.

The transistor is especially suited as **add-on-final stage** for low-power modules.

The transistor has a ½" 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	12,5	470	30	> 5	> 60	1,4 + j3,0	250 + j200
c.w.	13,5	470	30	typ. 6,1	typ. 65	—	—

MECHANICAL DATA

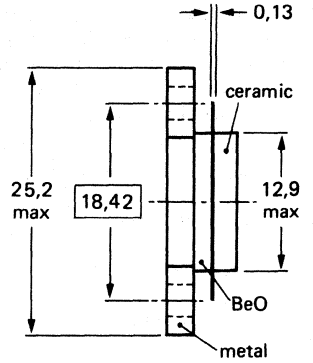
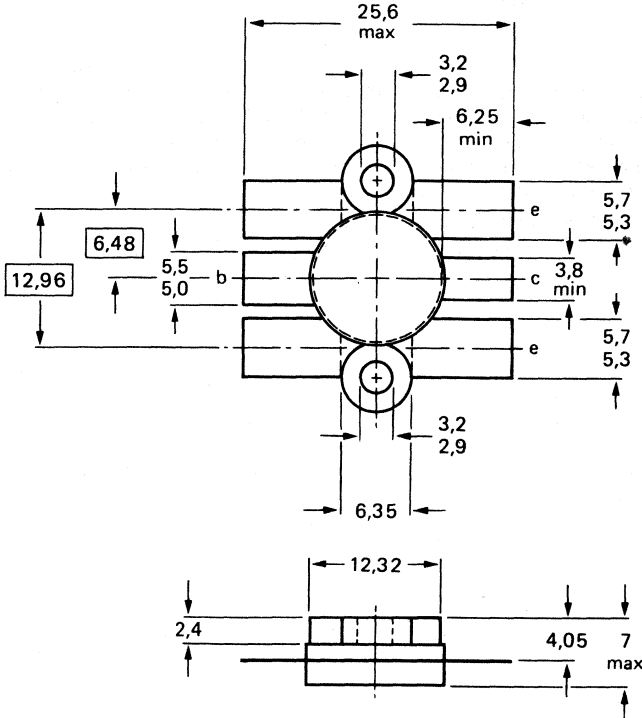
SOT-119 (see page 2).

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 SOT-119.

Dimensions in mm



7277385.2

Torque on screw: min. 0,6 Nm (6 kg cm)
 max. 0,75 Nm (7,5 kg cm)

Recommended screw: raised cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	17 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	7 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	18 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	100 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

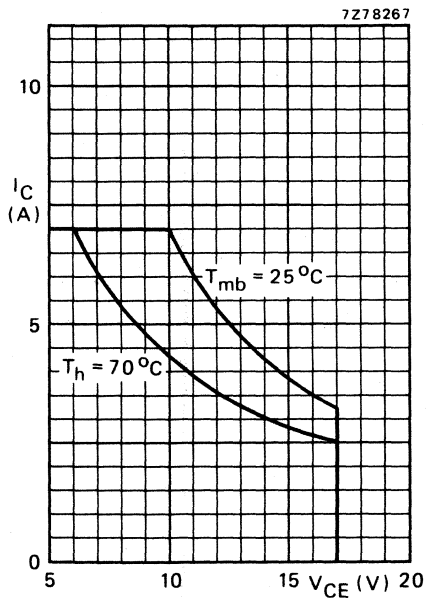


Fig. 2 D.C. SOAR.

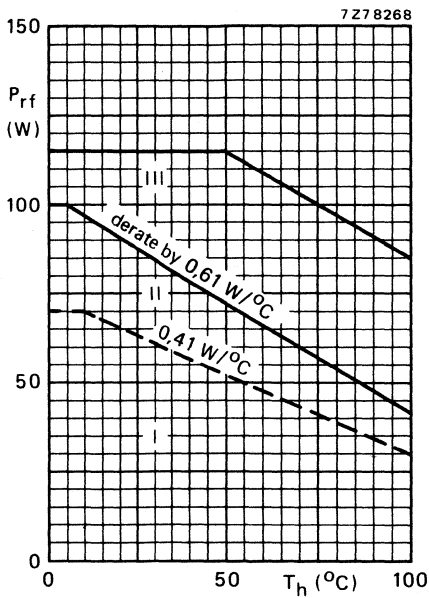


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 40 W; $T_{mb} = 78$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j-mb(dc)}$	=	2,8 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	1,95 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,2 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 50\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 17\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 20\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 17\text{ V}$ $I_{CES} < 20\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $E_{SBO} > 4,5\text{ mJ}$ $E_{SBR} > 4,5\text{ mJ}$

D.C. current gain *

 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 80

Collector-emitter saturation voltage *

 $I_C = 12\text{ A}; I_B = 2,4\text{ A}$ V_{CEsat} typ. 1,4 VTransition frequency at $f = 500\text{ MHz}$ * $-I_E = 4\text{ A}; V_{CB} = 12,5\text{ V}$ $-I_E = 12\text{ A}; V_{CB} = 12,5\text{ V}$ f_T typ. 2,2 GHz f_T typ. 1,5 GHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 12,5\text{ V}$ C_c typ. 88 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 200\text{ mA}; V_{CE} = 12,5\text{ V}$ C_{re} typ. 56 pF

Collector-flange capacitance

 C_{cf} typ. 3 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

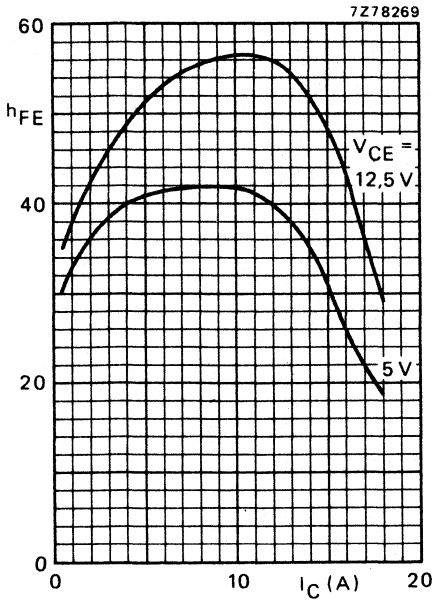


Fig. 4 Typical values; $T_j = 25$ °C.

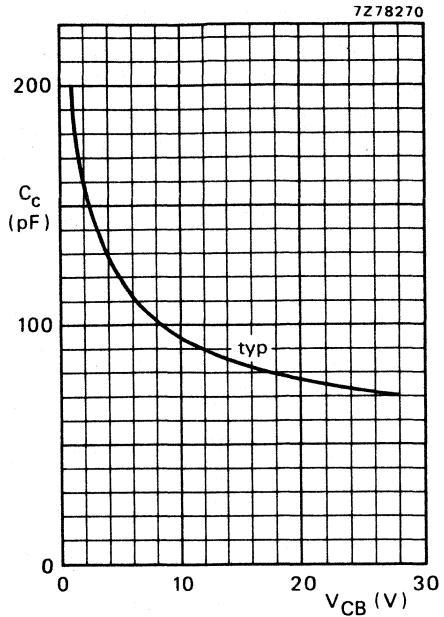


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

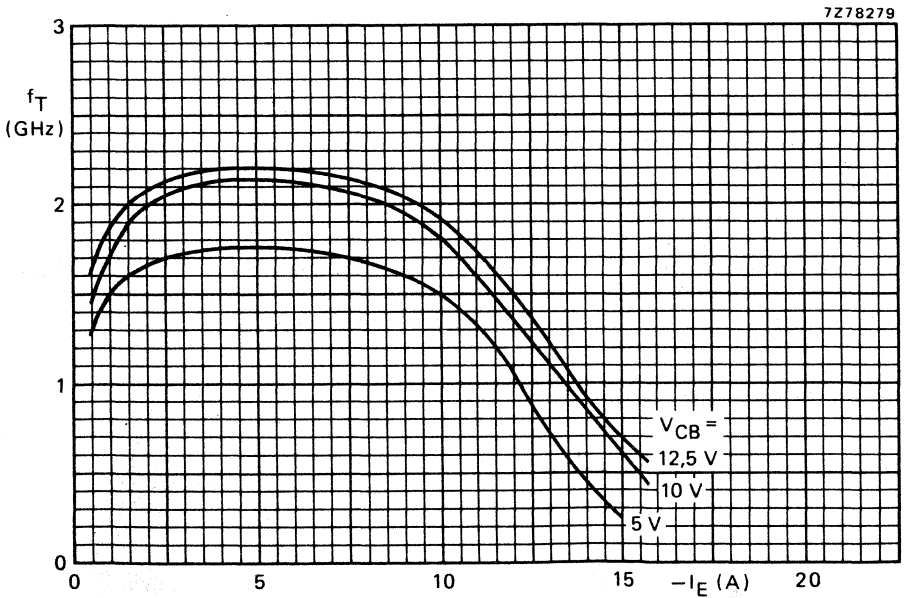


Fig. 6 Typical values; $f = 500$ MHz; $T_j = 25$ °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
470	12,5	30	< 9,5	> 5	< 4	> 60	$1,4 + j3,0$	$250 + j200$
470	13,5	30	—	typ. 6,1	—	typ. 65	—	—

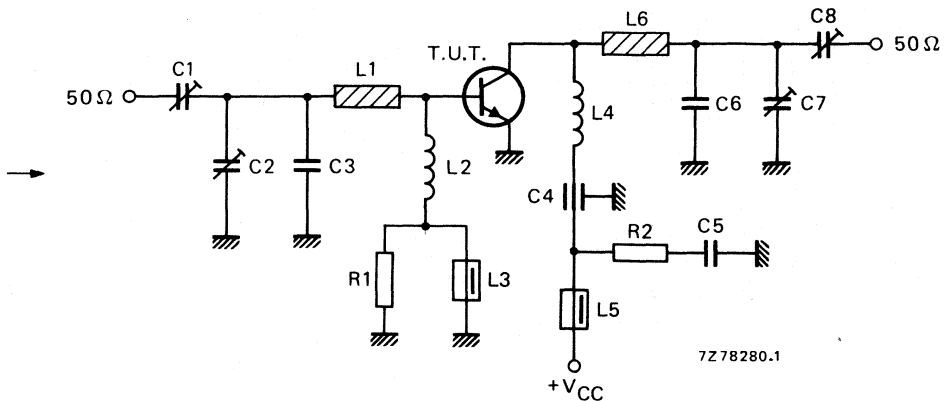


Fig. 7 Test circuit; c.w. class-B.

→ List of components:

C1 = C2 = C7 = C8 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = C6 = 3,9 pF ceramic capacitor (500 V)

C4 = 100 pF feed-through capacitor

C5 = 100 nF polyester capacitor

L1 = stripline (24,0 mm x 6,7 mm)

L2 = 10 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 4 mm

L3 = 2 turns enamelled Cu wire (0,6 mm); Ferroxcube tube core, grade 3B5 (cat. no. 4313 020 15170)

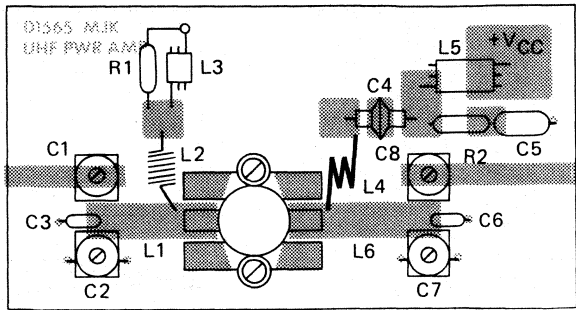
L4 = 12,6 nH; 2,5 turns enamelled Cu wire (0,7 mm); int. dia. 4 mm; length 3 mm

L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

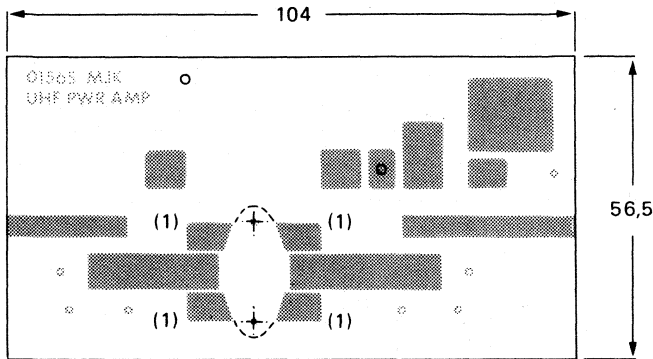
L6 = stripline (28,4 mm x 6,7 mm)

L1 and L6 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".R1 = R2 = 10 Ω carbon resistor

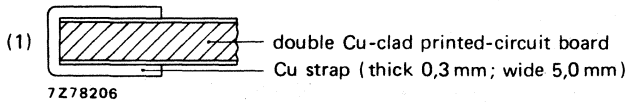
Component layout and printed-circuit board for 470 MHz test circuit are shown in Fig. 8.



7Z78204.1



7Z78205.1



7Z78206

Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

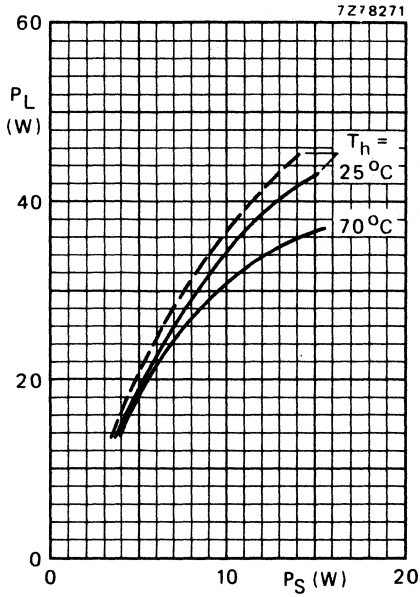


Fig. 9.

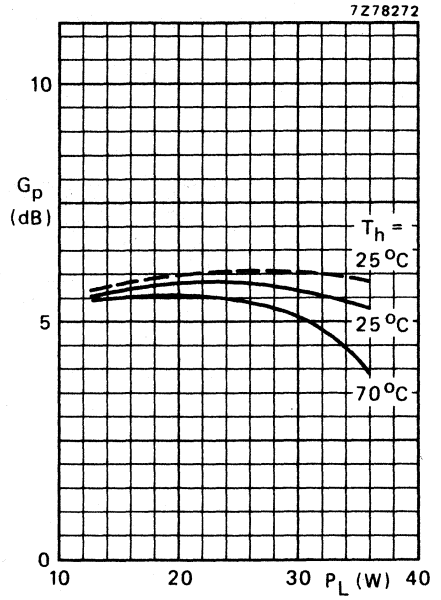


Fig. 10.

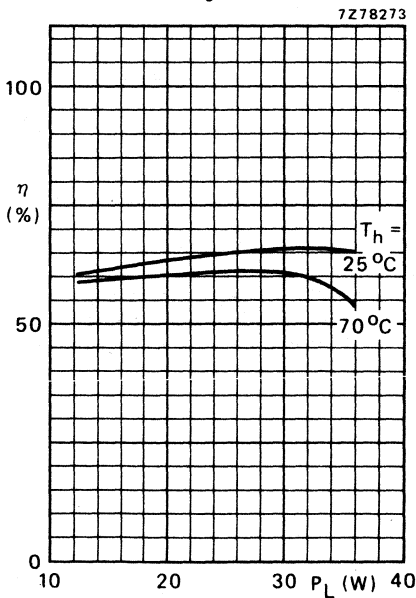


Fig. 11.

Conditions for Figs 9, 10 and 11:

Typical values; $f = 470$ MHz;

— $V_{CE} = 12,5$ V; --- $V_{CE} = 13,5$ V.

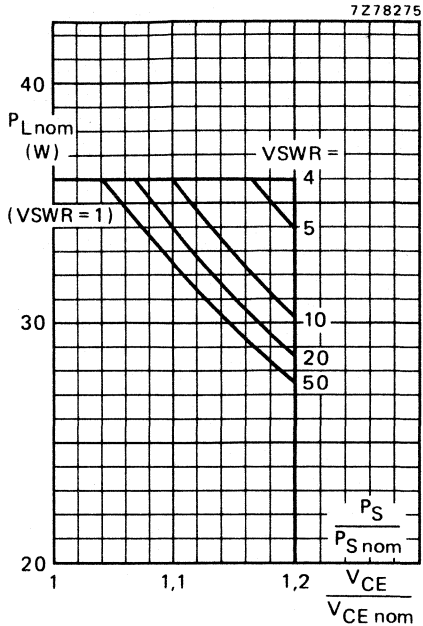
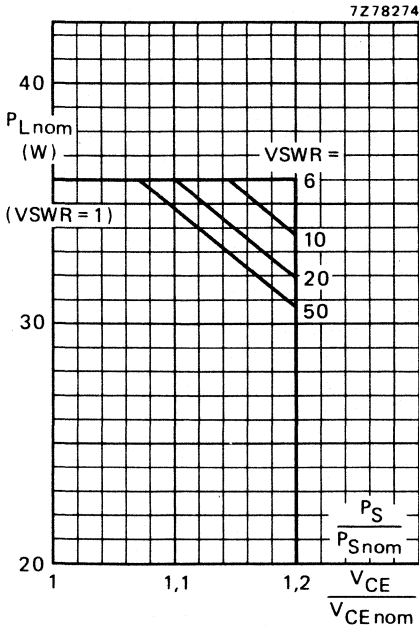


Fig. 12 R.F. SOAR (short-time operation during mismatch); $f = 470 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

Fig. 13 R.F. SOAR (short-time operation during mismatch); $f = 470 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

Note to Figs 12 and 13:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

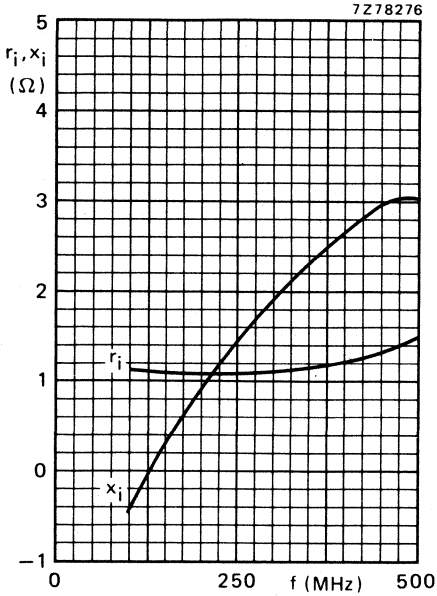


Fig. 14 Input impedance (series components).

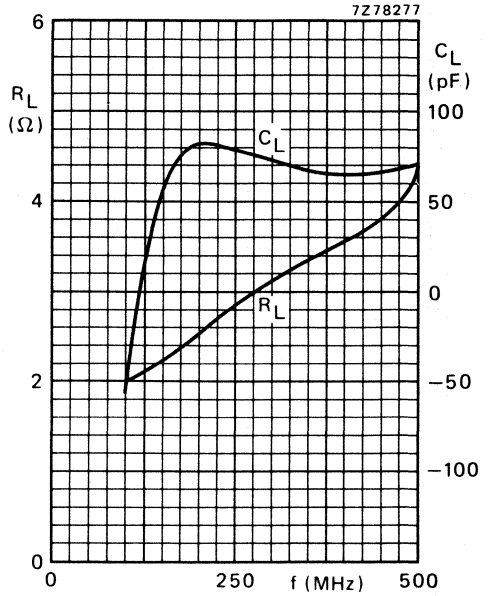


Fig. 15 Load impedance (parallel components).

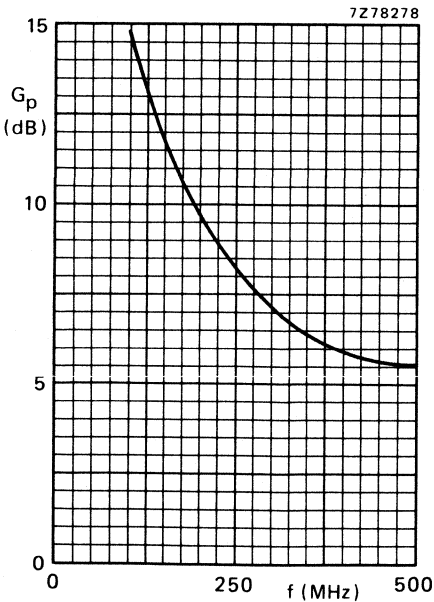


Fig. 16.

Conditions for Figs 14, 15 and 16:
 Typical values; $V_{CE} = 12,5$ V; $P_L = 30$ W;
 $T_h = 25$ °C.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in transmitting amplifiers operating in the h.f. and v.h.f. bands, with a nominal supply voltage of 28 V. The transistor is specified for s.s.b. applications as linear amplifier in class-A and AB. The device is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

Matched h_{FE} groups are available on request.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

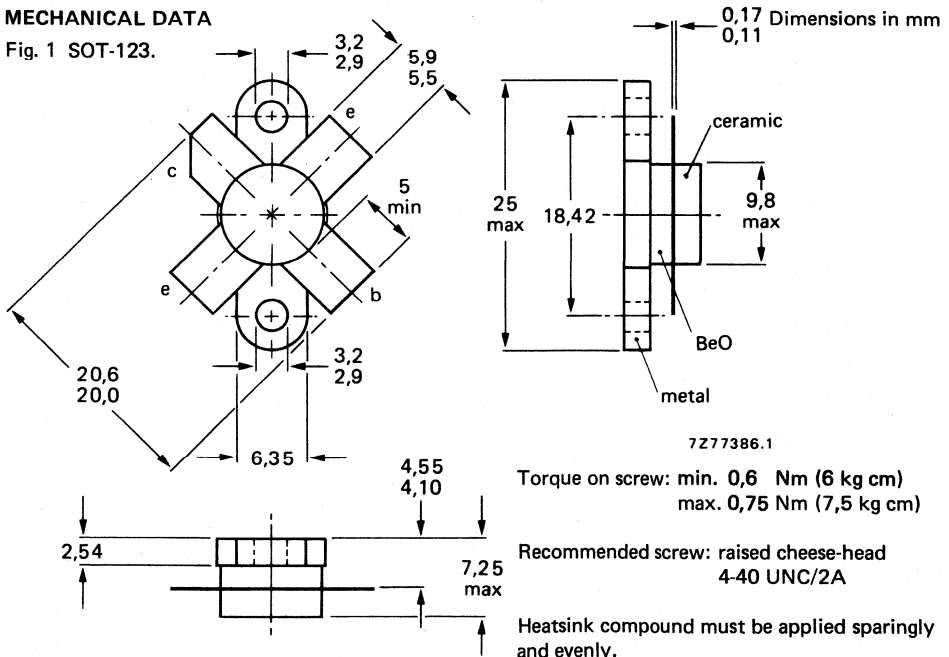
QUICK REFERENCE DATA

R.F. performance

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_{dt} %	I_C A	d_3 dB	T_h °C
s.s.b. (class-A)	26	1,6 - 28	0 - 10 (P.E.P.)	> 20	-	1,35	< -40	70
s.s.b. (class-AB)	28	1,6 - 28	3 - 30 (P.E.P.)	typ. 21	typ. 40	typ. 1,34	typ. -30	25

MECHANICAL DATA

Fig. 1 SOT-123.



CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)

peak value

V_{CESM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open-collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 3 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 9 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 76 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

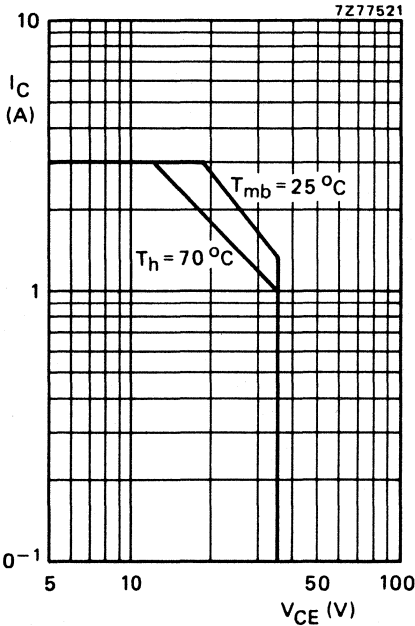


Fig. 2 D.C. SOAR.

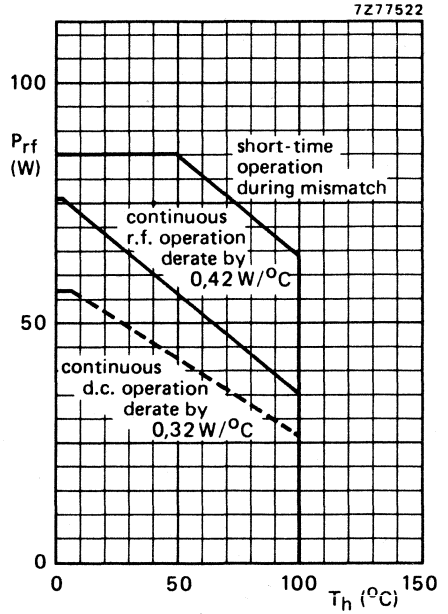


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

THERMAL RESISTANCE (dissipation = 35 W; $T_{mb} = 80$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th j-mb(dc)}$ = 3,15 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th j-mb(rf)}$ = 2,35 °C/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,3 °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 10\text{ mA}$

$V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 50\text{ mA}$

$V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 36\text{ V}$

$I_{CES} < 4\text{ mA}$

Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

$R_{BE} = 10\ \Omega$

$E_{SBO} > 8\text{ mJ}$

$E_{SBR} > 8\text{ mJ}$

D.C. current gain*

$I_C = 1,25\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 50
10 to 100

D.C. current gain ratio of matched devices*

$I_C = 1,25\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage*

$I_C = 3,75\text{ A}; I_B = 0,75\text{ A}$

V_{CEsat} typ. 1,5 V

Transition frequency at $f = 100\text{ MHz}$ *

$-I_E = 1,25\text{ A}; V_{CB} = 28\text{ V}$

$-I_E = 3,75\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 530 MHz

f_T typ. 530 MHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

C_c typ. 50 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$

C_{re} typ. 31 pF

Collector-flange capacitance

C_{cf} typ. 2 pF

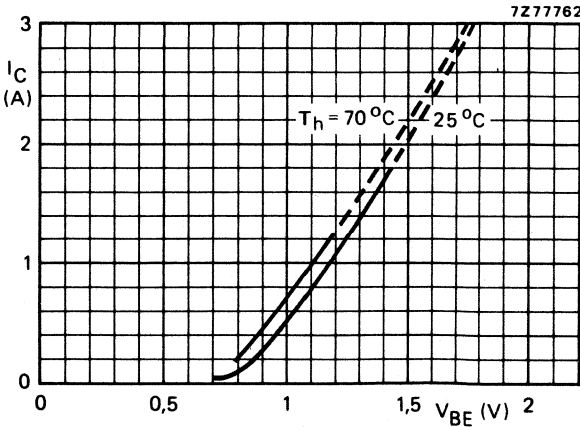


Fig. 4 Typical values; $V_{CE} = 28\text{ V}$.

* Measured under pulse conditions: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

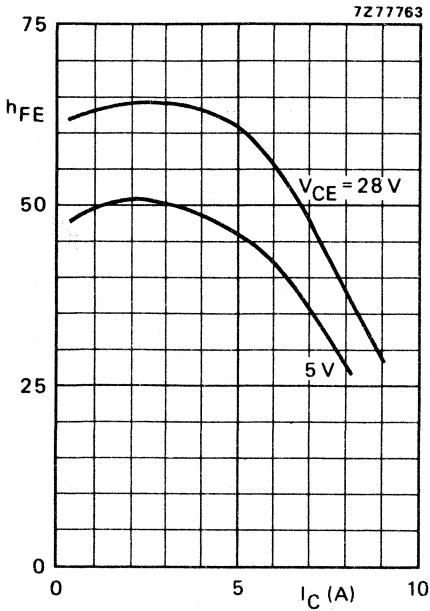


Fig. 5 Typical values; $T_j = 25^\circ\text{C}$.

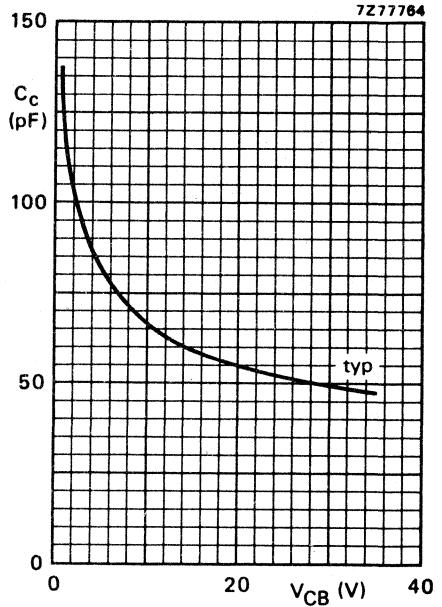


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

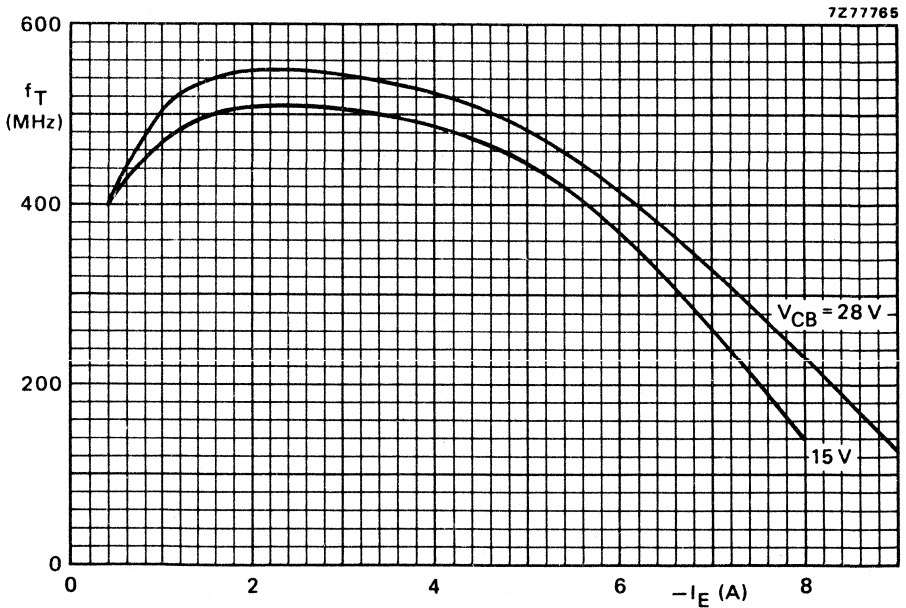


Fig. 7 Typical values; $f = 100\text{ MHz}$; $T_j = 25^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

$V_{CE} = 26 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	I_C A	d_3 dB*	d_5 dB*	T_h $^{\circ}\text{C}$
> 10 (P.E.P.)	> 20	1,35	-40	< -40	70
typ. 11 (P.E.P.)					
typ. 12 (P.E.P.)	typ. 24	1,35	-40	< -40	25

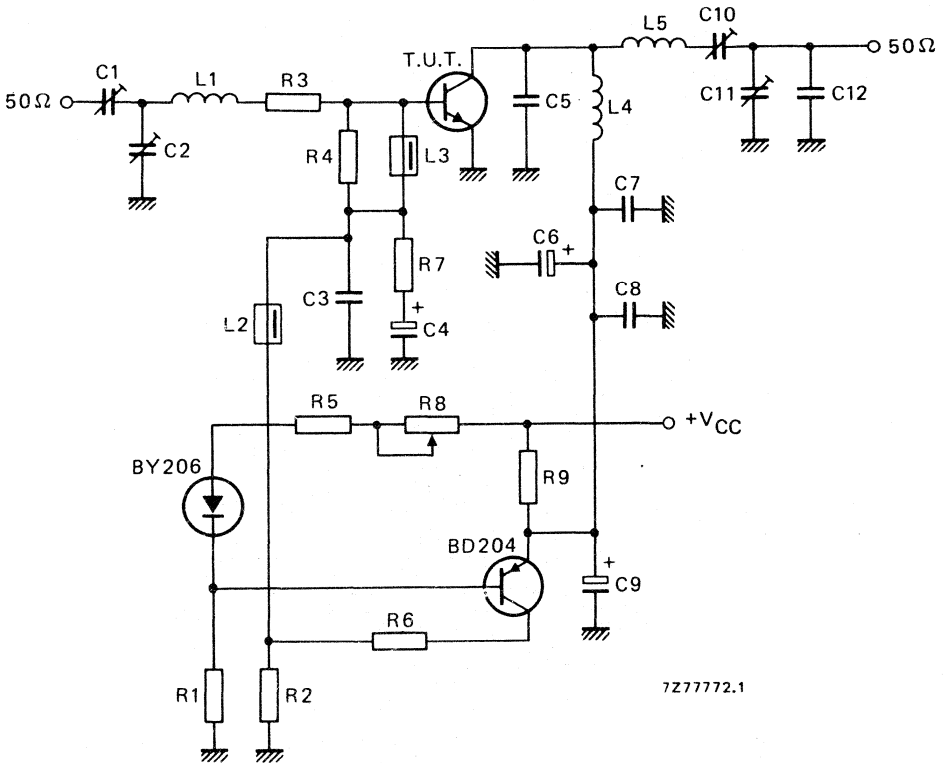


Fig. 8 Test circuit; s.s.b. class-A.

List of components on page 6.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

List of components in Fig. 8:

- C1 = C2 = 10 to 780 pF film dielectric trimmer
- C3 = 22 nF ceramic capacitor (63 V)
- C4 = 47 μ F/10 V electrolytic capacitor
- C5 = 56 pF ceramic capacitor (500 V)
- C6 = 47 μ F/35 V electrolytic capacitor
- C7 = C8 = 220 nF polyester capacitor
- C9 = 10 μ F/35 V electrolytic capacitor
- C10 = C11 = 7 to 100 pF film dielectric trimmer
- C12 = 82 pF ceramic capacitor (500 V)

- L1 = 3 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads to 2 x 5 mm
- L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
- L4 = 11 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm
- L5 = 14 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

- R1 = 600 Ω ; parallel connection of 2 x 1,2 k Ω carbon resistors ($\pm 5\%$; 0,5 W each)
- R2 = 15 Ω carbon resistor ($\pm 5\%$; 0,25 W)
- R3 = 1,2 Ω ; parallel connection of 4 x 4,7 Ω carbon resistors ($\pm 5\%$; 0,125 W each)
- R4 = 33 Ω carbon resistor ($\pm 5\%$; 0,25 W)
- R5 = 18 Ω carbon resistor ($\pm 5\%$; 0,25 W)
- R6 = 120 Ω wirewound resistor ($\pm 5\%$; 5,5 W)
- R7 = 1 Ω carbon resistor ($\pm 5\%$; 0,125 W)
- R8 = 47 Ω wirewound potentiometer (3 W)
- R9 = 1,57 Ω ; parallel connection of 3 x 4,7 Ω wirewound resistors ($\pm 5\%$; 5,5 W each)

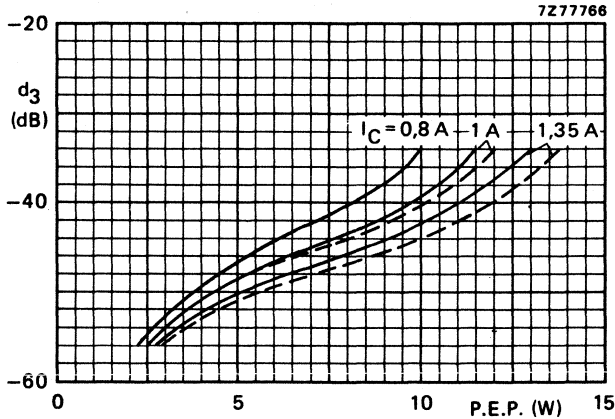


Fig. 9 Intermodulation distortion as a function of output power. Typical values; $V_{CE} = 26$ V; — $T_h = 70$ °C; - - - $T_h = 25$ °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

$V_{CE} = 28 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} (%) at 30 W P.E.P.	I_C (A)	d_3 dB*	d_5 dB*	$I_C(ZS)$ mA	T_h $^{\circ}\text{C}$
3 to 30 (P.E.P.)	typ. 21	typ. 40	typ. 1,34	typ. -30	< -30	25	25
3 to 25 (P.E.P.)	typ. 21	—	—	typ. -30	< -30	25	70

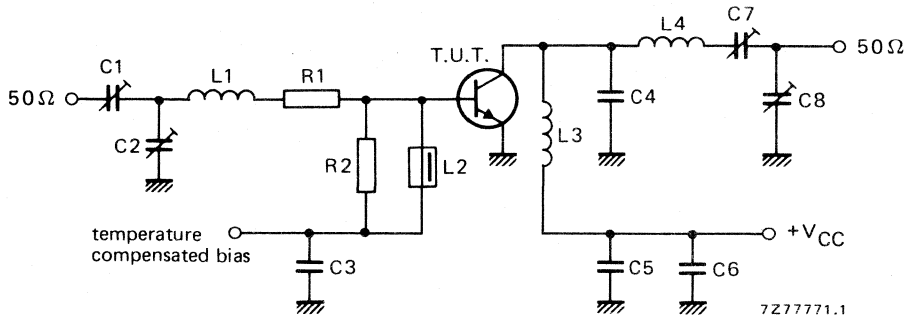


Fig. 10 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = C5 = C6 = 220 nF polyester capacitor

C4 = 56 pF ceramic capacitor (500 V)

C7 = C8 = 15 to 575 pF film dielectric trimmer

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm

L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm

L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors

R2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

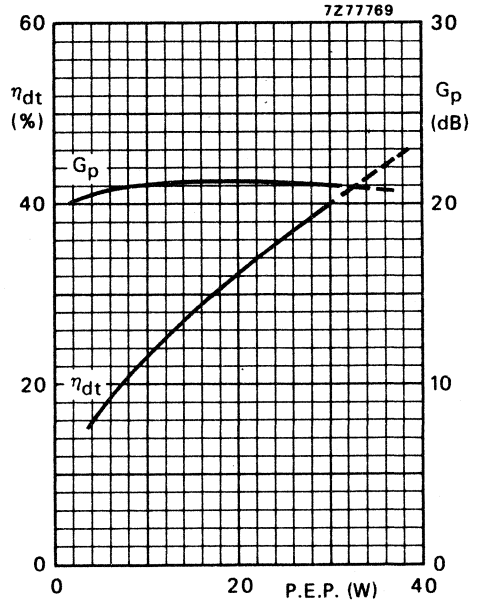
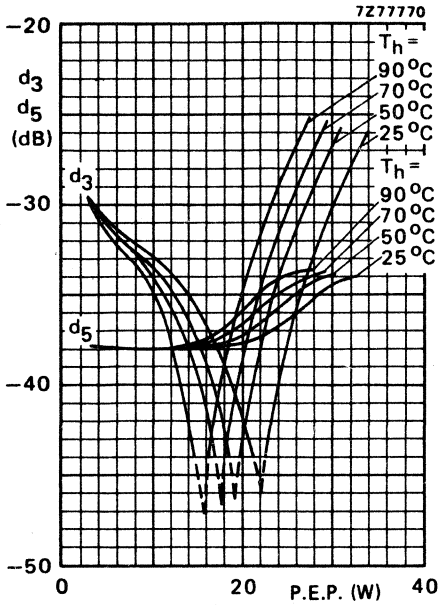


Fig. 11 Intermodulation distortion as a function of output power.*

Fig. 12 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 11:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 25 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; typical values.

Conditions for Fig. 12:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 25 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25^\circ\text{C}$; typical values.

* See note on page 7.

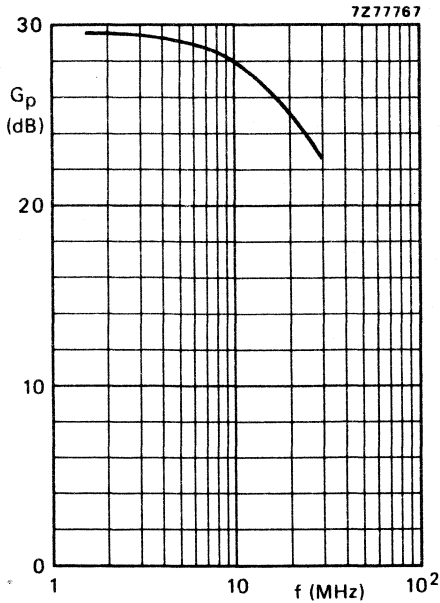


Fig. 13 Power gain as a function of frequency.

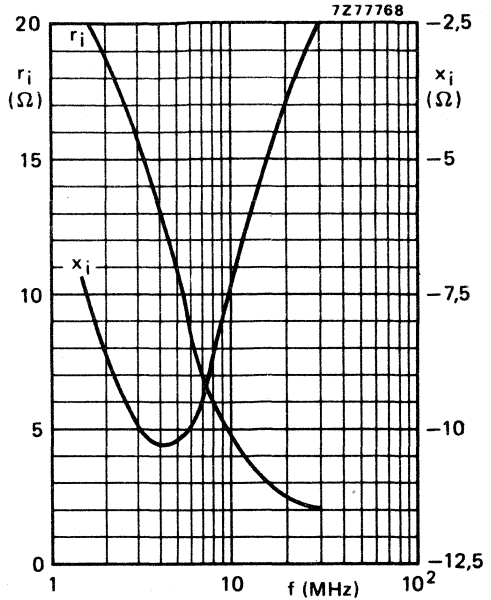


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 25 \text{ mA}$; $P_L = 30 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 9,5 \text{ } \Omega$.

Ruggedness in s.s.b. operation

The BLW83 is capable of withstanding a load mismatch ($V_{SWR} = 50$) under the following conditions: $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $T_h = 70 \text{ }^\circ\text{C}$ and $P_{Lnom} = 35 \text{ W}$ (P.E.P.).

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

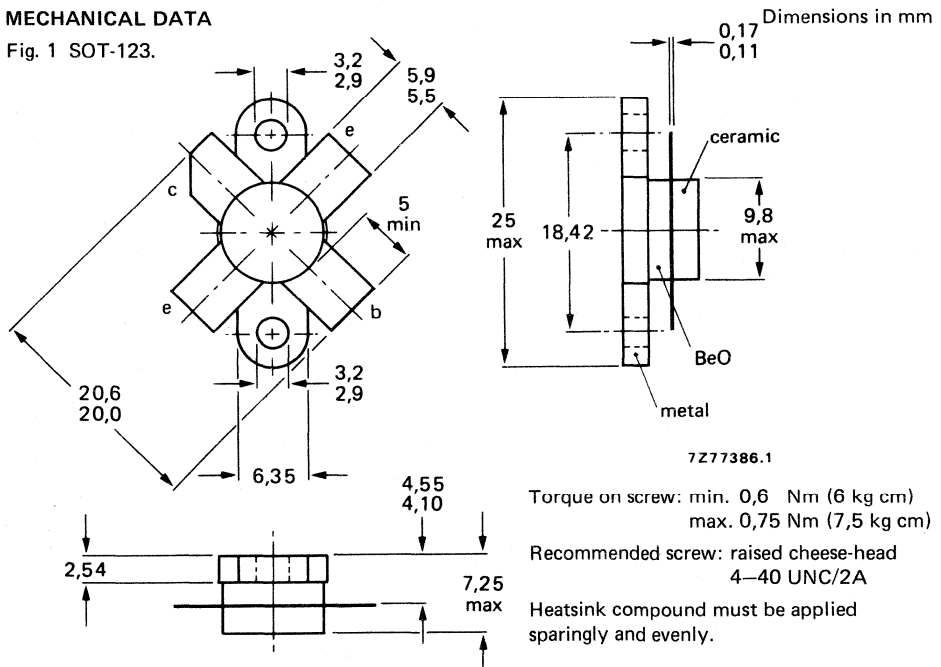
QUICK REFERENCE DATA

R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	28	175	25	> 9	> 60	$1,0 + j1,2$	$59 - j54$

MECHANICAL DATA

Fig. 1 SOT-123.



CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)

peak value

V_{CESM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_C(AV)$ max. 3 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 9 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 76 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

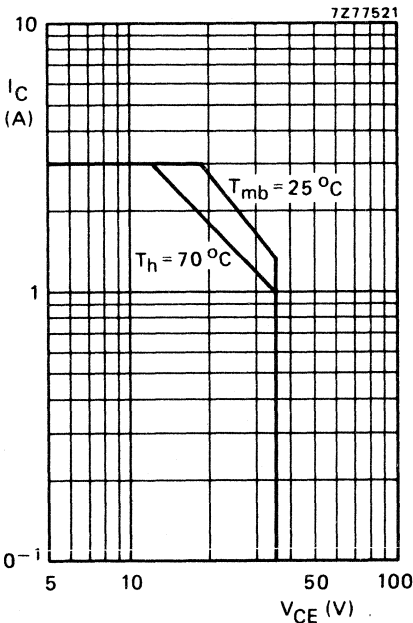


Fig. 2 D.C. SOAR.

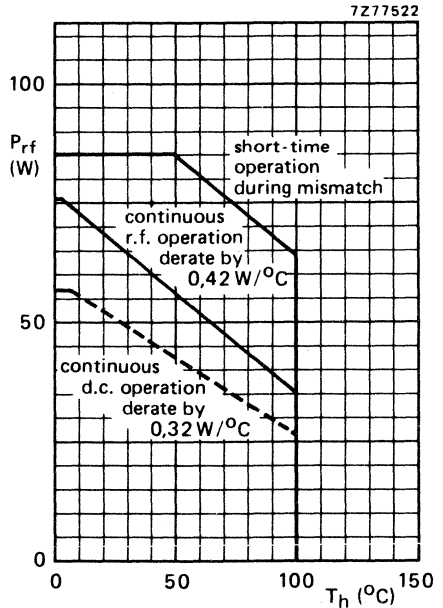


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

THERMAL RESISTANCE (dissipation = 20 W; $T_{mb} = 76$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb\ (dc)}$ = 3,0 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb\ (rf)}$ = 2,25 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 10\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 36\text{ V}$ $I_{CES} < 4\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $ESBO > 8\text{ mJ}$ $ESBR > 8\text{ mJ}$

D.C. current gain *

 $I_C = 1,25\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 45
10 to 100

Collector-emitter saturation voltage *

 $I_C = 3,75\text{ A}; I_B = 0,75\text{ A}$ V_{CEsat} typ. 1,5 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 1,25\text{ A}; V_{CB} = 28\text{ V}$ $-I_E = 3,75\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 650 MHz f_T typ. 650 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ C_c typ. 45 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$ C_{re} typ. 28 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

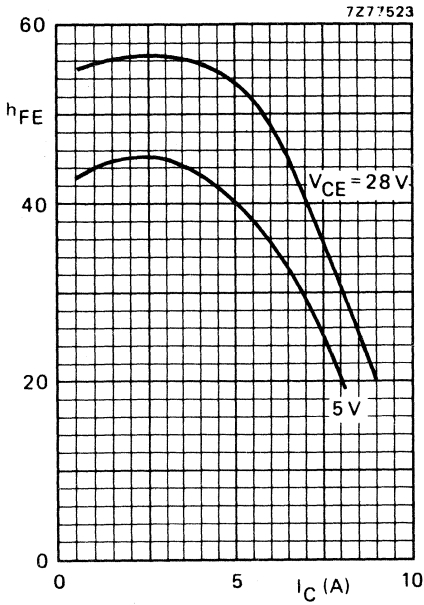


Fig. 4 Typical values; $T_j = 25^\circ\text{C}$.

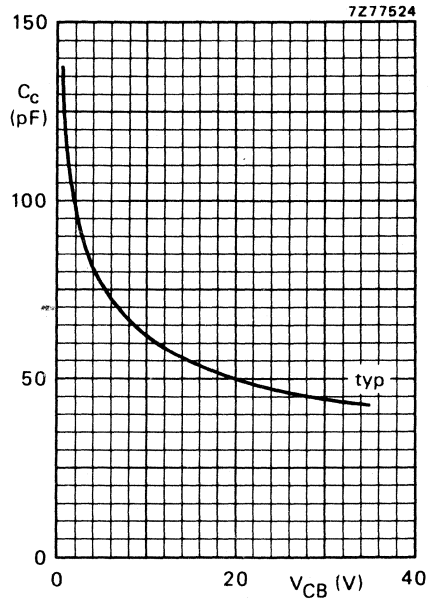


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

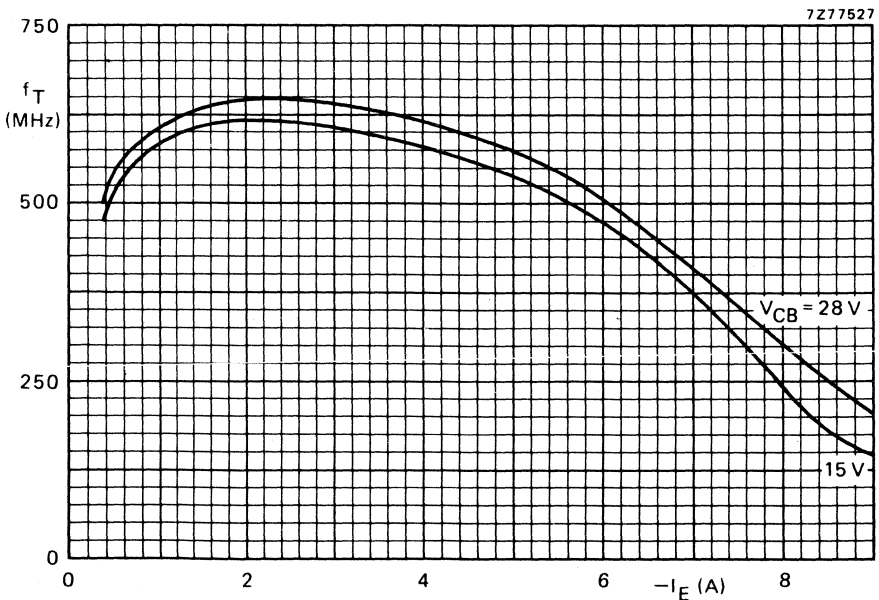


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{V}_L (mA/V)
175	28	25	< 3,15	> 9	< 1,49	> 60	$1,0 + j1,2$	$59 - j54$

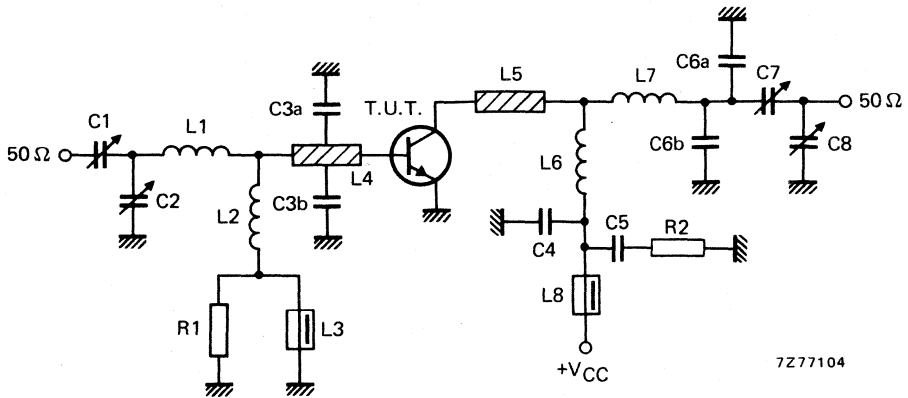


Fig. 7 Test circuit; c.w. class-B.

List of components

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF ($\pm 10\%$) polyester capacitor

C6a = 2,2 pF ceramic capacitor (500 V)

C6b = 1,8 pF ceramic capacitor (500 V)

C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 14 nH; 1 turn enamelled Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 80 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; length 8,0 mm; leads 2 x 5 mm

L7 = 62 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω ($\pm 10\%$) carbon resistor (0,25 W)

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)

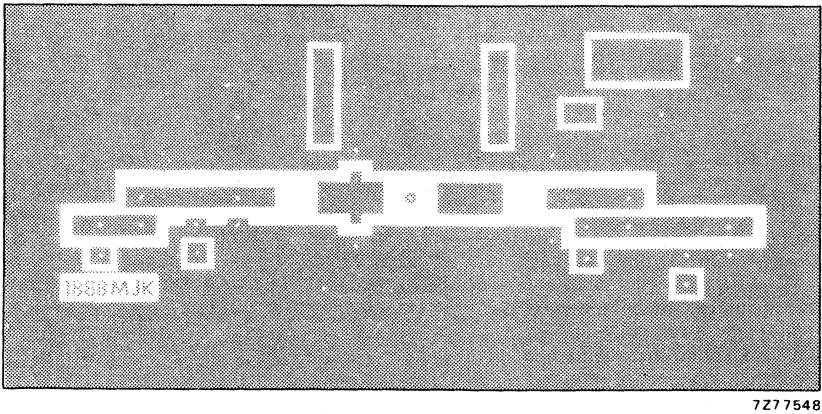
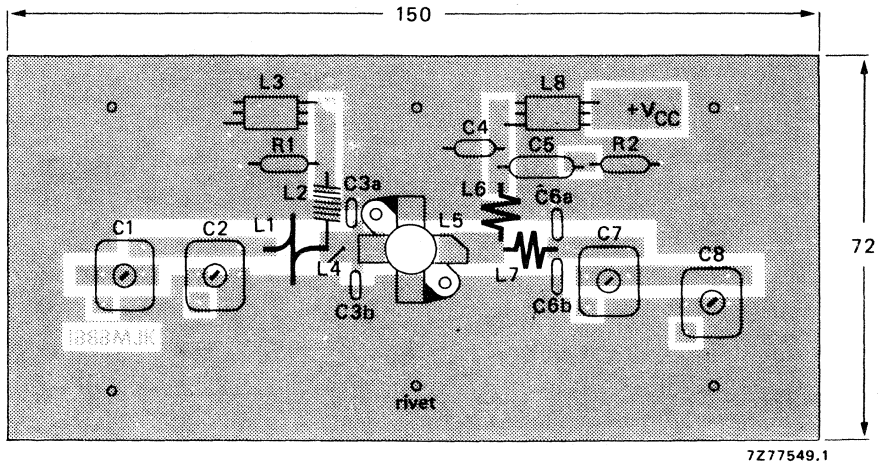


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

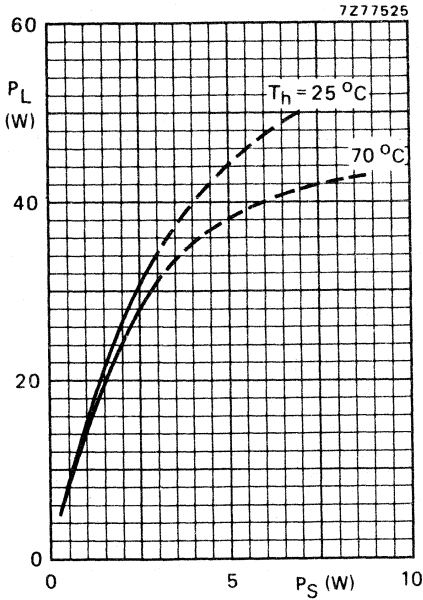


Fig. 9 $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$; typical values.

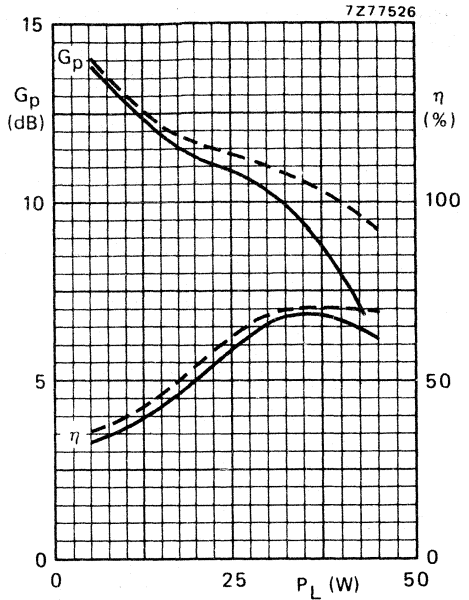


Fig. 10 $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$; typical values; --- $T_h = 25^\circ\text{C}$; — $T_h = 70^\circ\text{C}$.

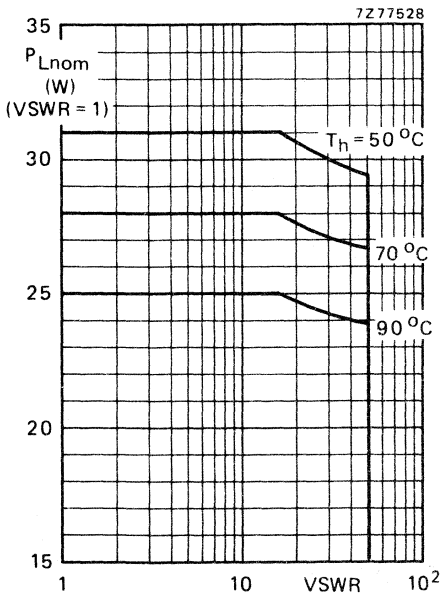


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175\text{ MHz}$; $V_{CE} = 28\text{ V}$; $R_{th\text{ mb-h}} = 0,3^\circ\text{C/W}$.

The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

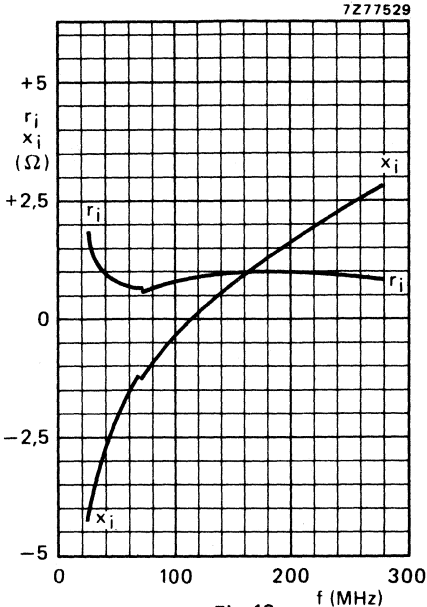


Fig. 12.

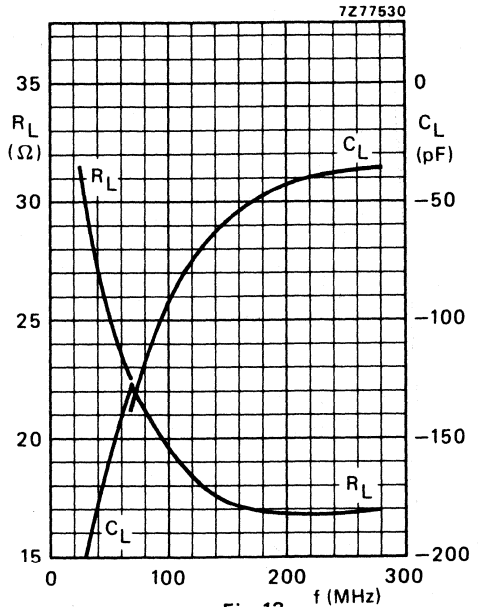
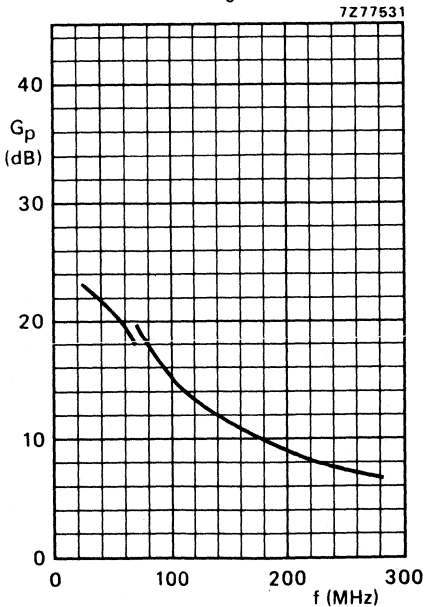


Fig. 13.



Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 28$ V; $P_L = 25$ W;
 $T_h = 25$ °C.

Fig. 14.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile h.f. and v.h.f. transmitters with a nominal supply voltage of 12,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. Matched h_{FE} groups are available on request.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

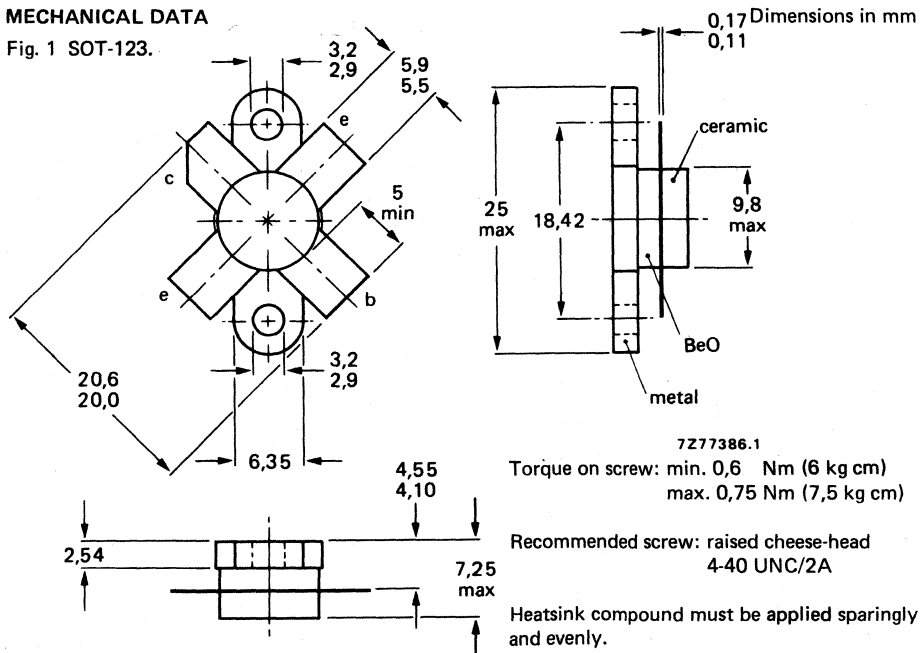
QUICK REFERENCE DATA

R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V	d_3 dB
c.w. (class-B)	12,5	175	45	> 5	> 75	$1,2 + j1,4$	$320 + j150$	—
s.s.b. (class-AB)	12,5	1,6–28	3–30 (P.E.P.)	typ. 19,5	typ. 35	—	—	typ. –33

MECHANICAL DATA

Fig. 1 SOT-123.



CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 18 V

Emitter-base voltage (open-collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 9 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 22 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 105 W

Storage temperature

T_{stg} - 65 to +150 °C

Operating junction temperature

T_j max. 200 °C

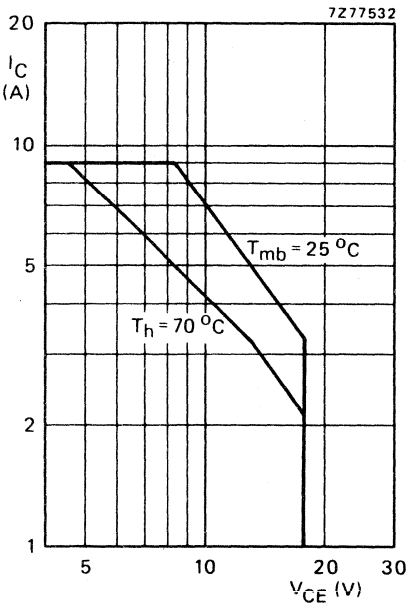


Fig. 2 D.C. SOAR.

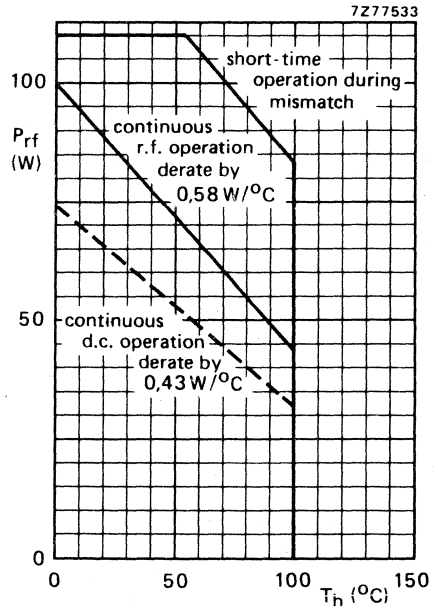


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f \geq 1$ MHz.

THERMAL RESISTANCE (dissipation = 30 W; $T_{mb} = 79$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th j-mb(dc)}$ = 2,5 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th j-mb(rf)}$ = 1,8 °C/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,3 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 50\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 25\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 25\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $E_{SBO} > 8\text{ mJ}$ $E_{SBR} > 8\text{ mJ}$

D.C. current gain*

 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 50
10 to 80

D.C. current gain ratio of matched devices*

 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage*

 $I_C = 12,5\text{ A}; I_B = 2,5\text{ A}$ V_{CEsat} typ. 1,5 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 4\text{ A}; V_{CB} = 12,5\text{ V}$ $-I_E = 12,5\text{ A}; V_{CB} = 12,5\text{ V}$ f_T typ. 650 MHz f_T typ. 600 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_C typ. 120 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 200\text{ mA}; V_{CE} = 15\text{ V}$ C_{re} typ. 82 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

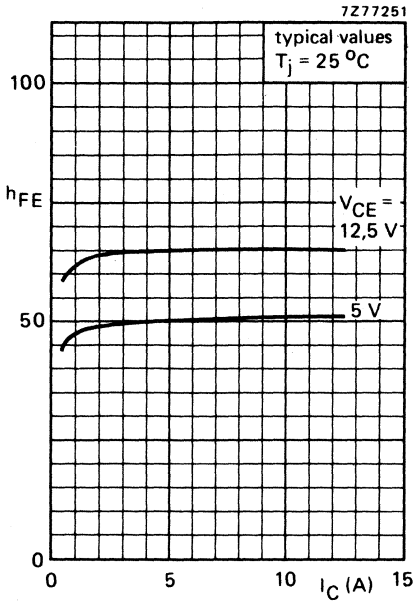


Fig. 4.

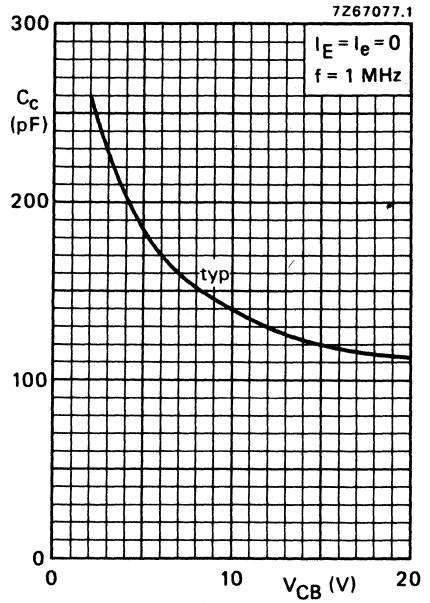


Fig. 5 $T_j = 25^\circ\text{C}$.

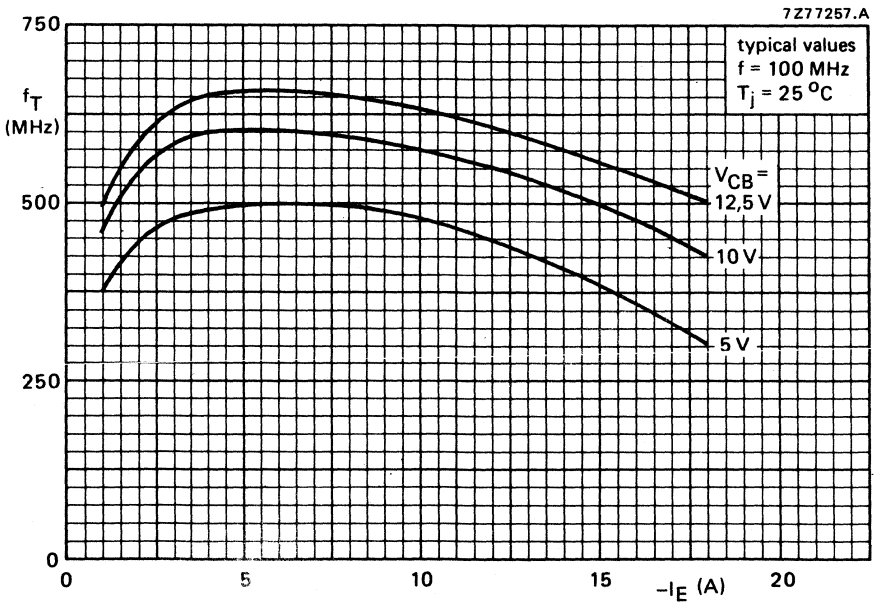


Fig. 6.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{V}_L (mA/V)
175	12,5	45	< 14,2	> 5	< 4,8	> 75	$1,2 + j1,4$	$320 + j150$
175	13,5	45	—	typ. 6,0	—	typ. 75	—	—

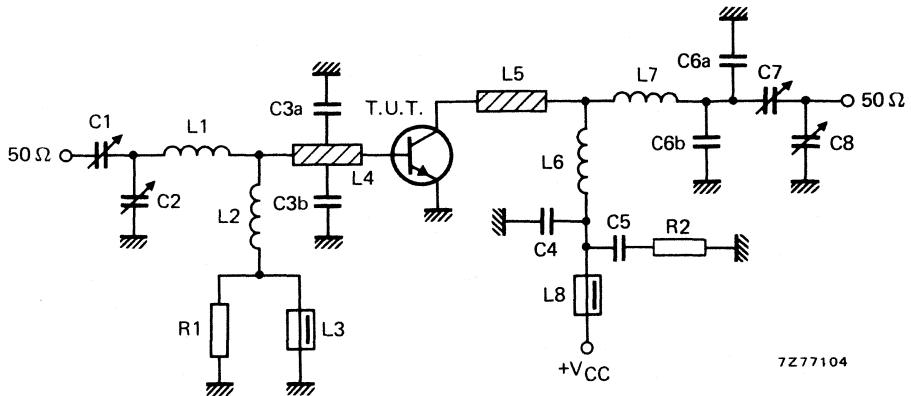


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

C6a = C6b = 8,2 pF ceramic capacitor (500 V)

C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 6,0 mm; leads 2 x 5 mm

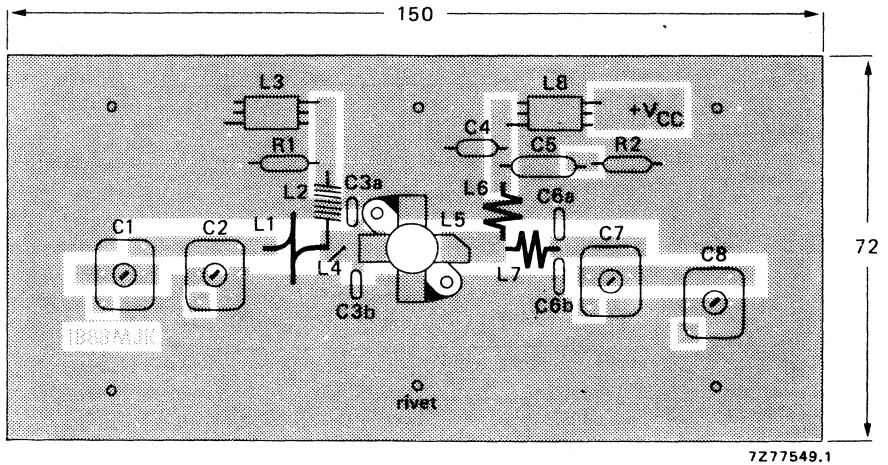
L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

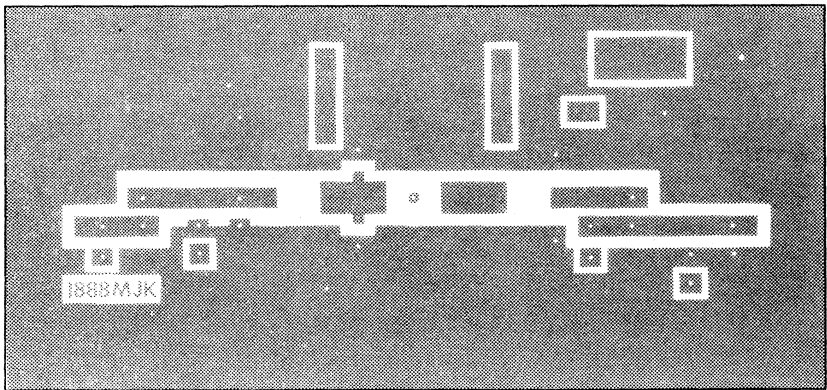
R1 = 10 Ω ($\pm 10\%$) carbon resistor (0,25 W)R2 = 4,7 Ω ($\pm 5\%$) carbon resistor (0,25 W)

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)



7277549.1



7277548

Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

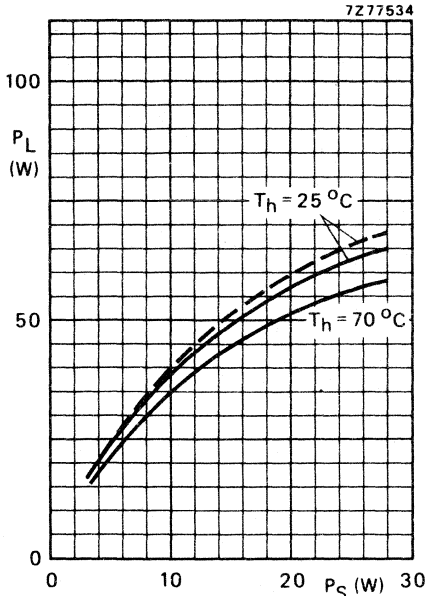


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 12,5 \text{ V}$; - - - $V_{CE} = 13,5 \text{ V}$.

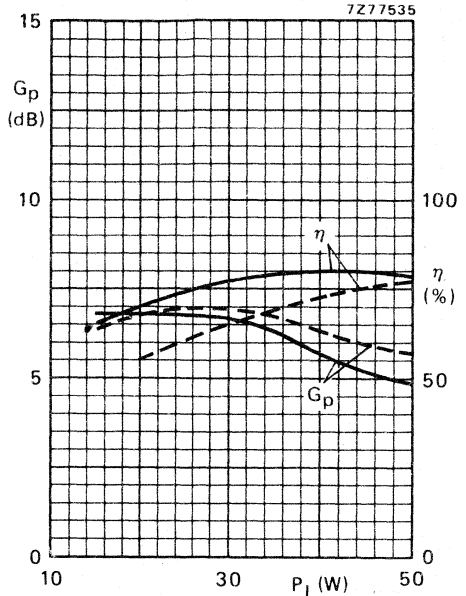


Fig. 10 Typical values; $f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$;
 — $V_{CE} = 12,5 \text{ V}$; - - - $V_{CE} = 13,5 \text{ V}$.

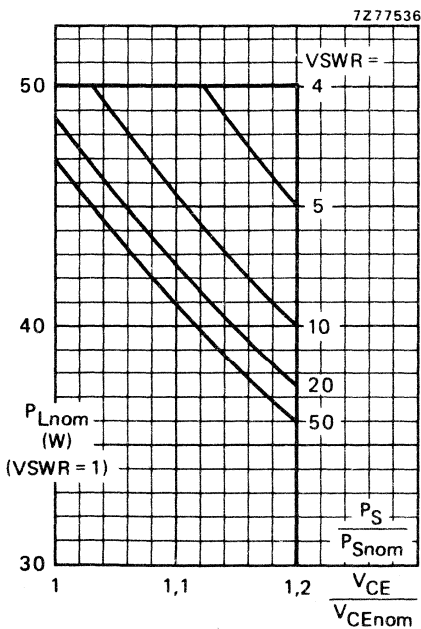


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,3 \text{ }^\circ\text{C/W}$; $V_{CE \text{ nom}} = 12,5 \text{ V}$ or $13,5 \text{ V}$;
 $P_S = P_{S \text{ nom}}$ at $V_{CE \text{ nom}}$ and $V_{SWR} = 1$ (see page 5).

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($V_{SWR} = 1$), as a function of the expected supply over-voltage ratio with V_{SWR} as parameter.

The graph applies to the situation in which the drive ($P_S/P_{S \text{ nom}}$) increases linearly with supply over-voltage ratio.

APPLICATION INFORMATION (continued)

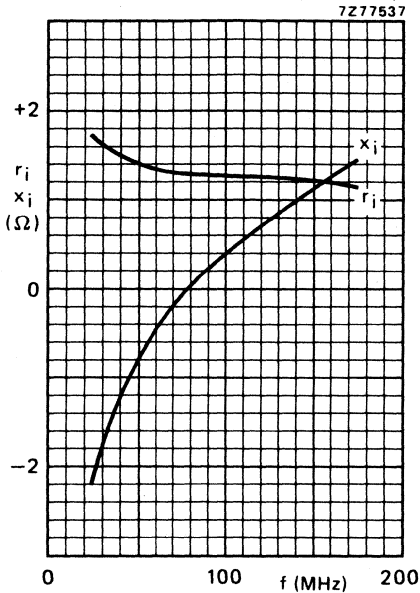


Fig. 12.

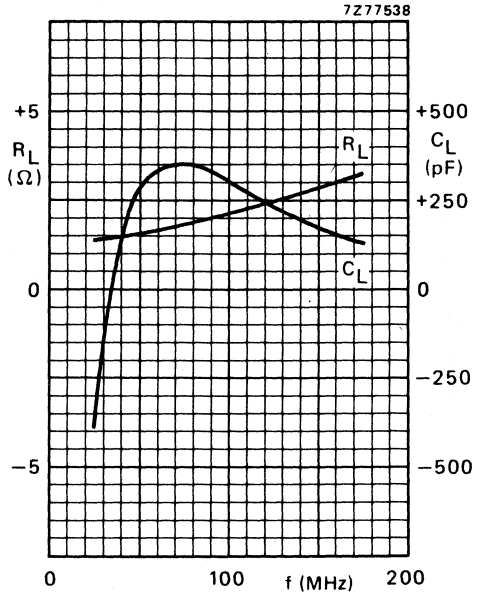


Fig. 13.

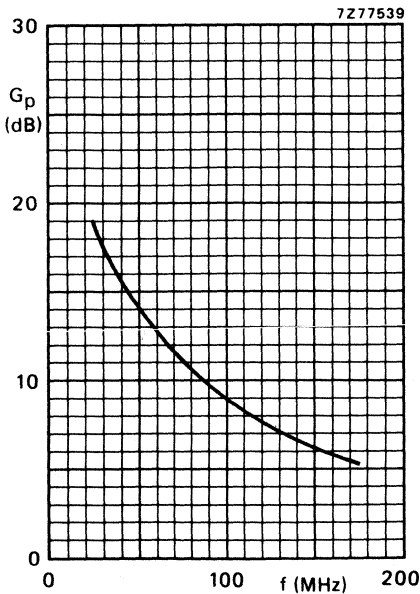


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 12,5 \text{ V}$; $P_L = 45 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

R.F. performance in s.s.b. class-AB operation

$V_{CE} = 12,5 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$
 $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} %	d_3 dB*	d_5 dB*	$I_{C(ZS)}$ mA
3 to 30 (P.E.P.)	typ. 19,5	typ. 35	typ. -33	typ. -36	25

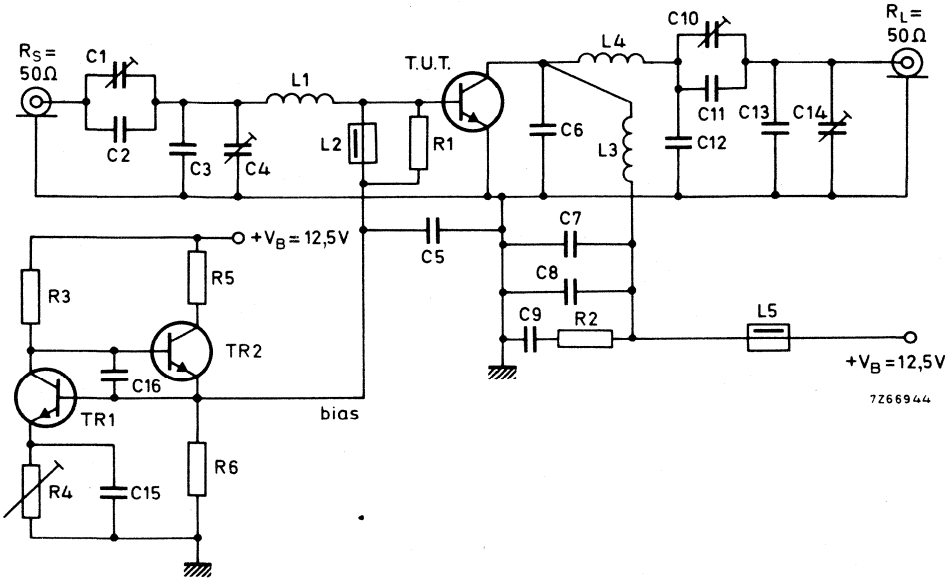


Fig. 15 Test circuit; s.s.b. class-AB.

List of components:

TR1 = TR2 = BD137

C1 = 100 pF air dielectric trimmer (single insulated rotor type)

C2 = 27 pF ceramic capacitor (500 V)

C3 = 180 pF polystyrene capacitor

C4 = 100 pF air dielectric trimmer (single non-insulated rotor type)

C5 = C7 = 3,9 nF polyester capacitor

C6 = 2 x 270 pF polystyrene capacitors in parallel

C8 = C15 = C16 = 100 nF polyester capacitor

C9 = 2,2 μF moulded metallized polyester capacitor

C10 = 2 x 385 pF (sections in parallel) film dielectric trimmer

C11 = 68 pF ceramic capacitor (500 V)

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

List of components (continued)

C12 = 2 x 82 pF ceramic capacitors in parallel (500 V)

C13 = 47 pF ceramic capacitor (500 V)

C14 = 385 pF film dielectric trimmer

L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9 mm; length 6,1 mm; leads 2 x 5 mm

L2 = L5 = Ferrocube choke coil (cat. no. 4312 020 36640)

L3 = 68 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 8 mm; length 8,3 mm; leads 2 x 5 mm

L4 = 96 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 7,6 mm; leads 2 x 5 mm

R1 = 27 Ω (±5%) carbon resistor (0,5 W)

R2 = 4,7 Ω (±5%) carbon resistor (0,25 W)

R3 = 1,5 kΩ (±5%) carbon resistor (0,5 W)

R4 = 10 Ω wirewound potentiometer (3 W)

R5 = 47 Ω wirewound resistor (5,5 W)

R6 = 150 Ω (±5%) carbon resistor (0,25 W)

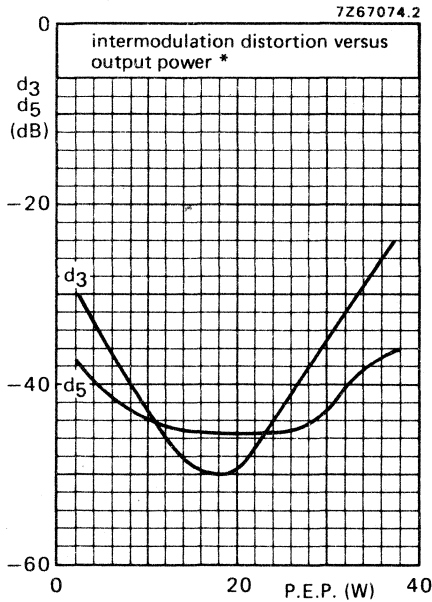


Fig. 16.

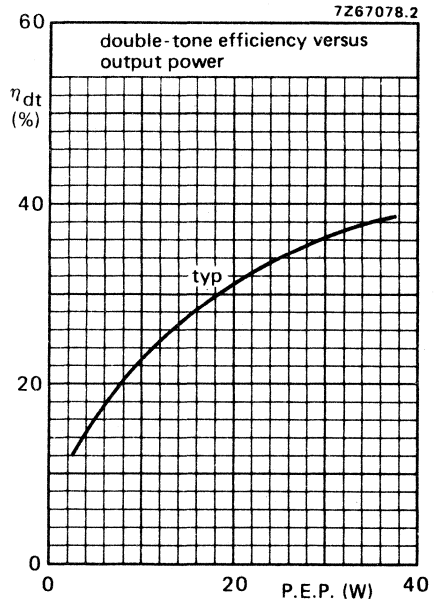


Fig. 17.

Conditions for Figs 16 and 17:

$V_{CE} = 12,5 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$; $I_{C(ZS)} = 25 \text{ mA}$; typical values.

* See page 11.

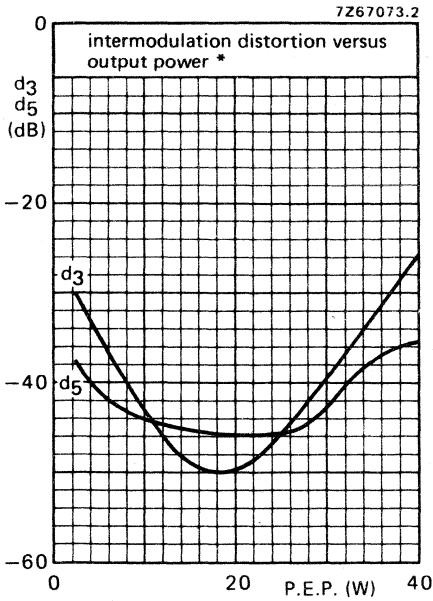


Fig. 18.

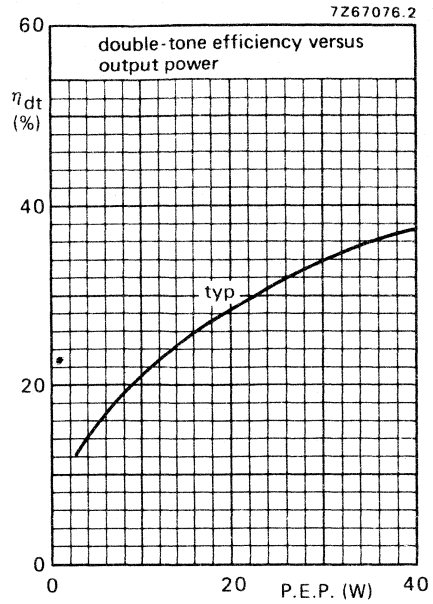


Fig. 19.

Conditions for Figs 18 and 19:

$V_{CE} = 13,5 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$; $I_{C(ZS)} = 25 \text{ mA}$;
typical values.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

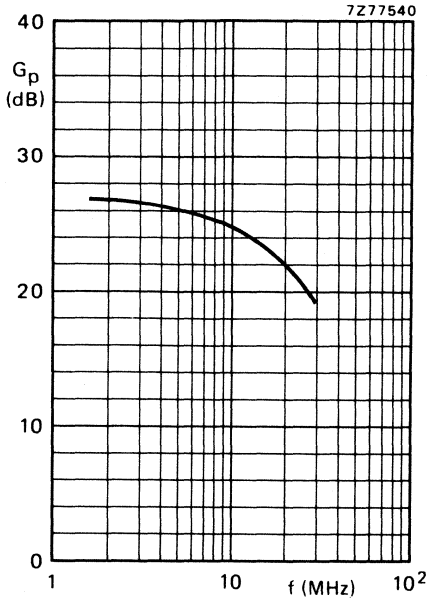


Fig. 20 Power gain as a function of frequency.

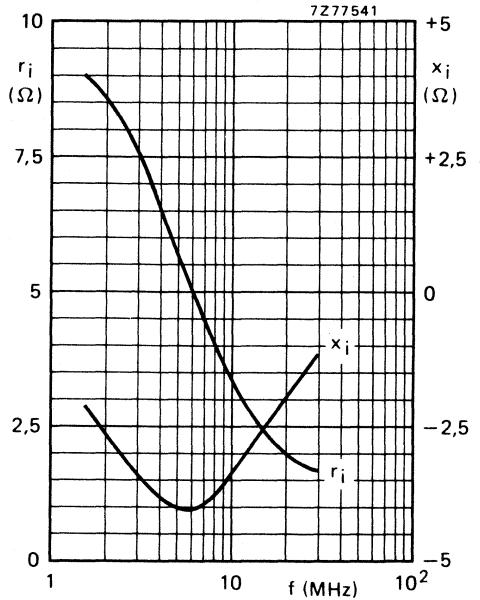


Fig. 21 Input impedance (series components) as a function of frequency.

Fig. 20 and 21 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 12,5 \text{ V}$
 $P_L = 30 \text{ W (P.E.P.)}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $Z_L = 1,8 \text{ } \Omega$

$V_{CE} = 13,5 \text{ V}$
 $P_L = 35 \text{ W (P.E.P.)}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{C/W}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $Z_L = 1,8 \text{ } \Omega$

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, AB and B operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Matched h_{FE} groups are available on request. It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

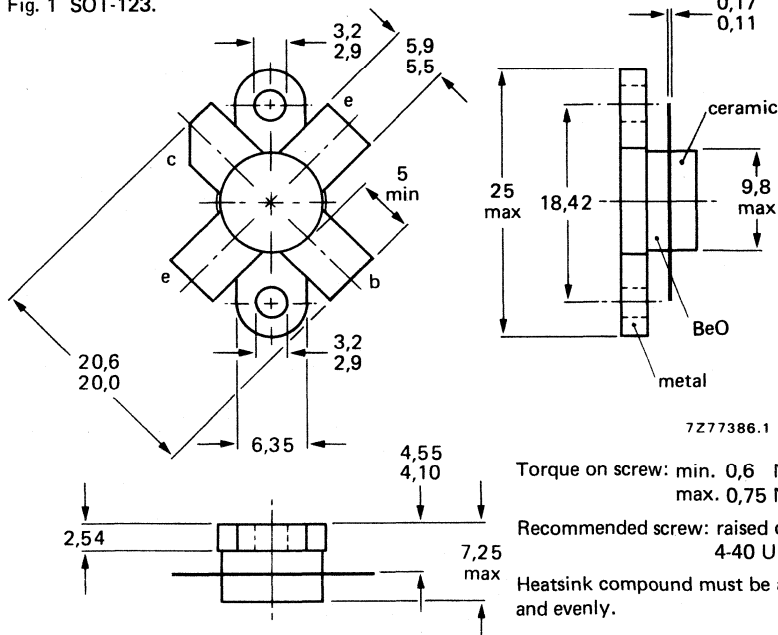
R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V	d_3 dB
c.w. (class-B)	28	175	45	> 7,5	> 70	$0,7 + j1,3$	$110 - j62$	-
s.s.b. (class-AB)	28	1,6 - 28	5-47,5(P.E.P.)	typ. 19	typ. 45	-	-	typ. -30
s.s.b. (class-A)	26	1,6 - 28	17(P.E.P.)	typ. 22	-	-	-	typ. -42

MECHANICAL DATA

Fig. 1 SOT-123.

Dimensions in mm



CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open-collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 4 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 12 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 105 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

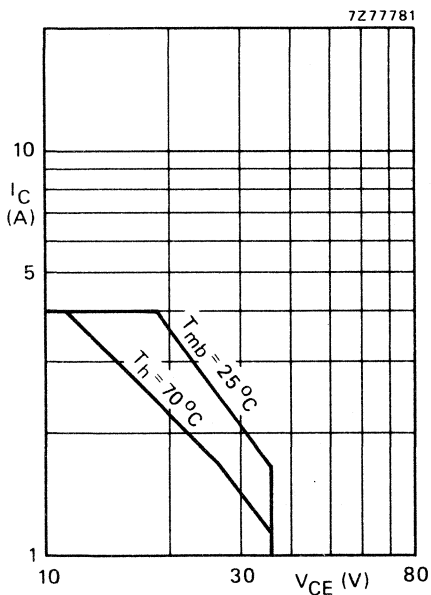


Fig. 2 D.C. SOAR.

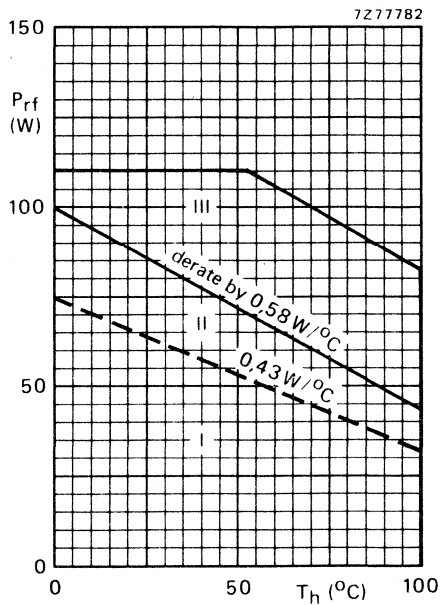


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 45 W; $T_{mb} = 83,5$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th j-mb(dc)}$ = 2,65 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th j-mb(rf)}$ = 1,95 °C/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,3 °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 25\text{ mA}$

$V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$

$V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 36\text{ V}$

$I_{CES} < 10\text{ mA}$

Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

$E_{SBO} > 8\text{ mJ}$

$R_{BE} = 10\text{ }\Omega$

$E_{SBR} > 8\text{ mJ}$

D.C. current gain*

$I_C = 2,5\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 45
10 to 80

D.C. current gain ratio of matched devices*

$I_C = 2,5\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage*

$I_C = 7,5\text{ A}; I_B = 1,5\text{ A}$

V_{CEsat} typ. 1,5 V

Transition frequency at $f = 100\text{ MHz}$ *

$-I_E = 2,5\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 570 MHz

$-I_E = 7,5\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 570 MHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

C_C typ. 82 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$

C_{re} typ. 54 pF

Collector-flange capacitance

C_{cf} typ. 2 pF

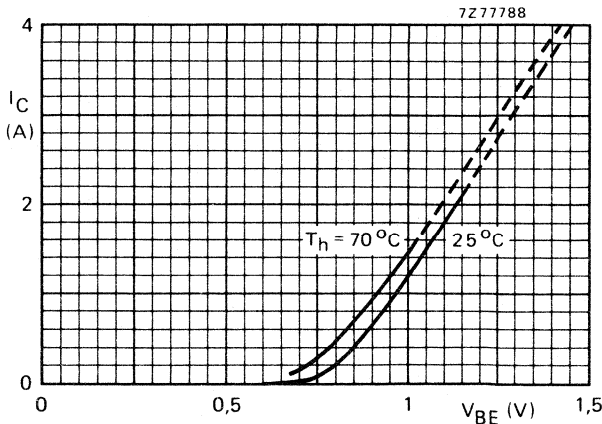


Fig. 4 Typical values; $V_{CE} = 28\text{ V}$.

* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

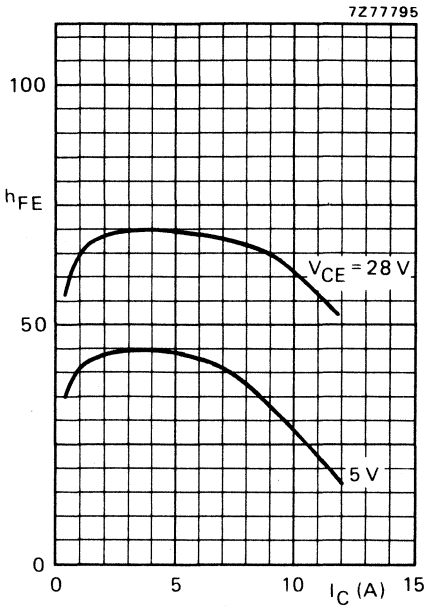


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

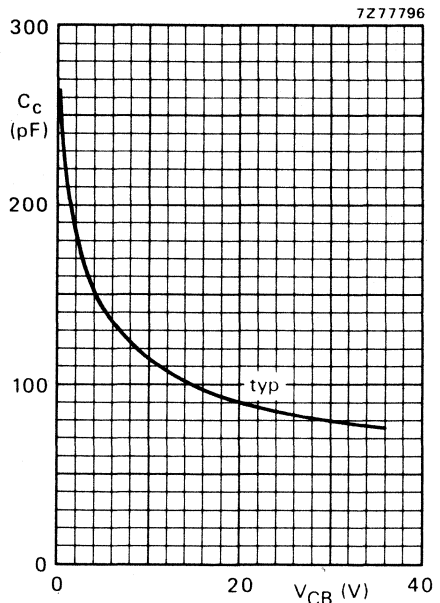


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

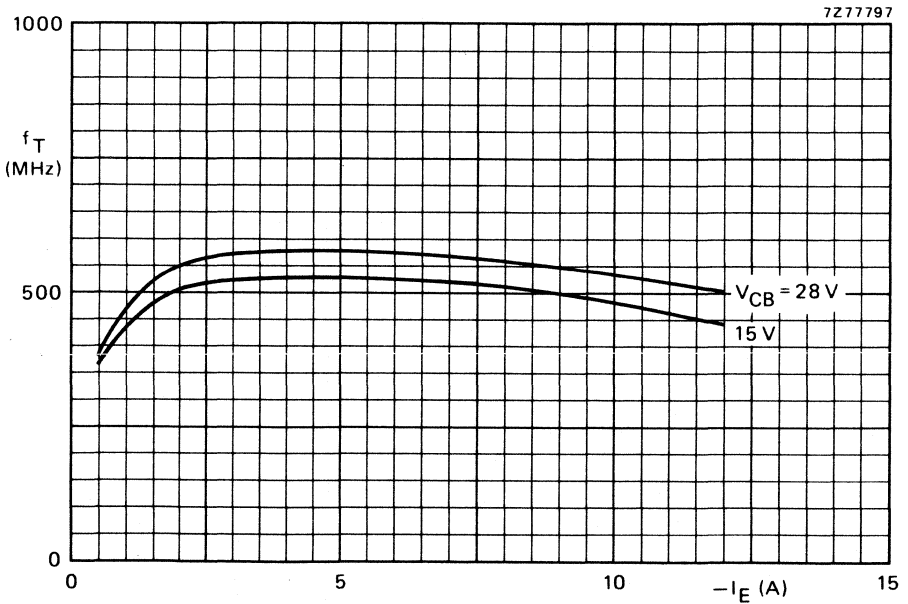


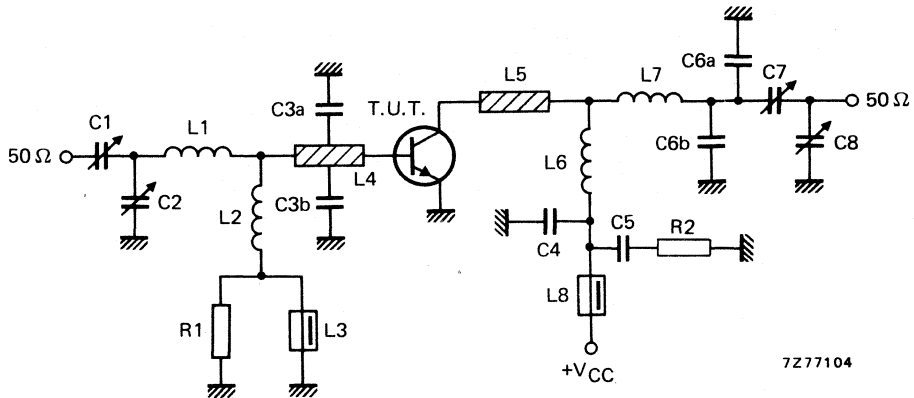
Fig. 7 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	28	45	< 8	> 7,5	< 2,47	> 70	$0,7 + j1,3$	$110 - j62$



7277104

Fig. 8 Test circuit; c.w. class-B.

List of components:

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6a = 2,2 pF ceramic capacitor (500 V)

C6b = 1,8 pF ceramic capacitor (500 V)

C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 14 nH; 1 turn Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 80 nH; 3 turns Cu wire (1,6 mm); int. dia. 9,0 mm; length 8,0 mm; leads 2 x 5 mm

L7 = 62 nH; 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 9.

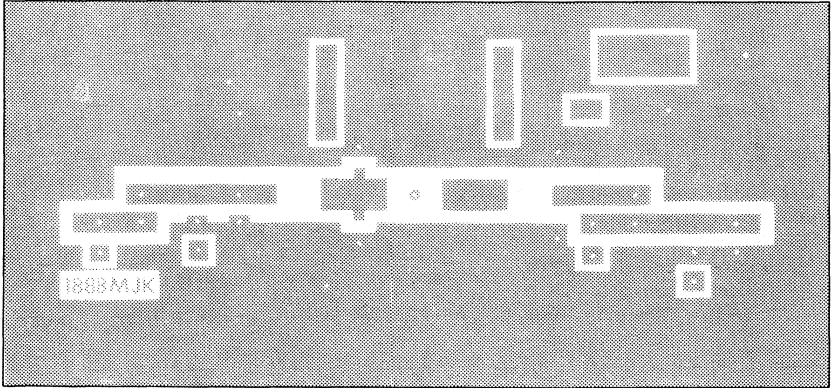
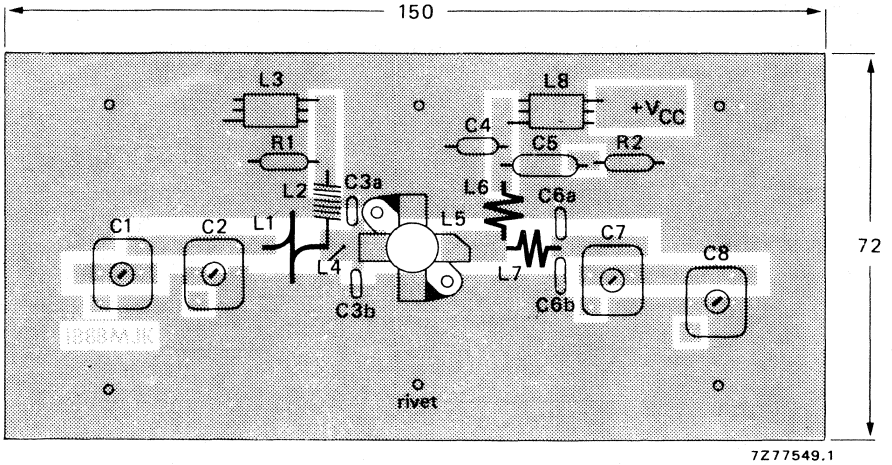


Fig. 9 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

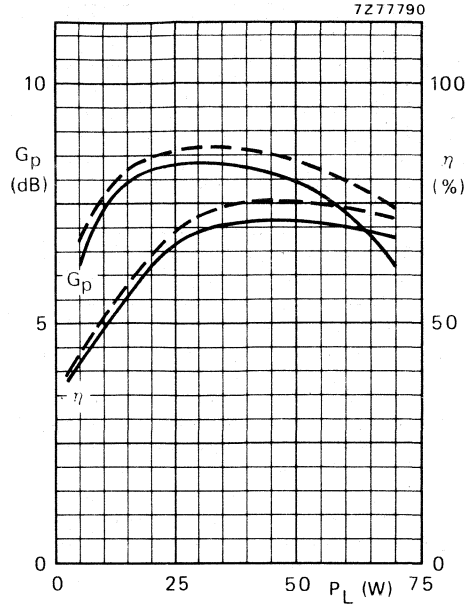
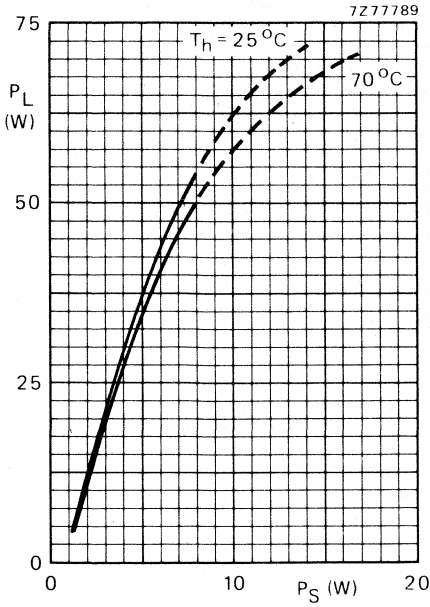


Fig. 10 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

Fig. 11 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$; --- $T_h = 25^\circ\text{C}$; — $T_h = 70^\circ\text{C}$.

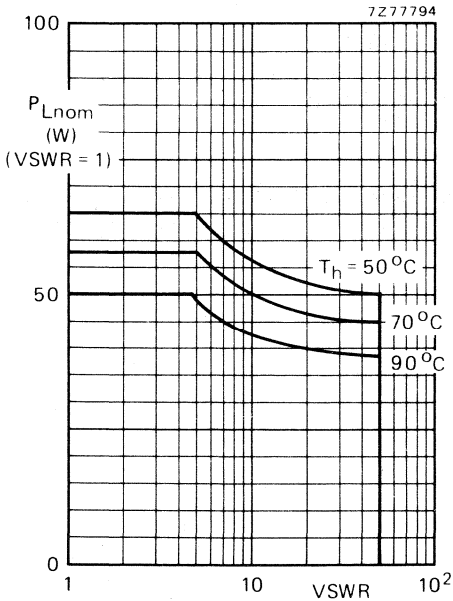


Fig. 12 R.F. SOAR; c.w. class-B operation; $f = 175\text{ MHz}$; $V_{CE} = 28\text{ V}$; $R_{th\text{mb-h}} = 0,3^\circ\text{C/W}$. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

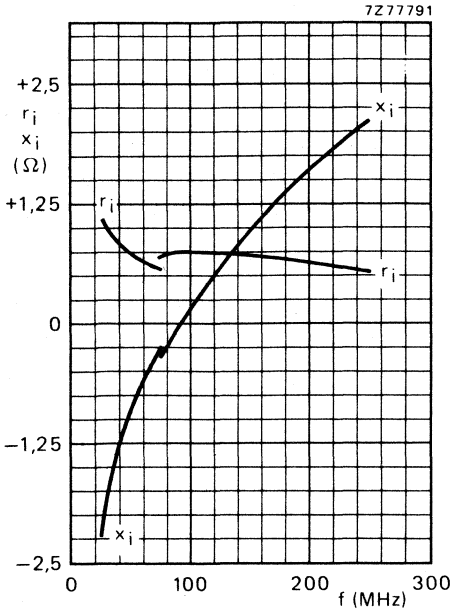


Fig. 13 Input impedance (series components).

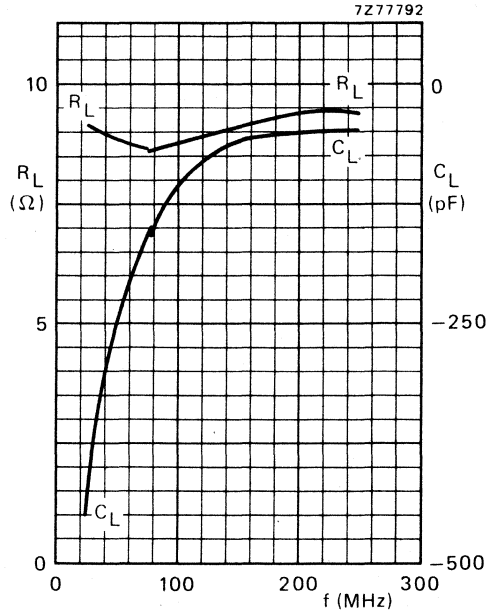


Fig. 14 Load impedance (parallel components).

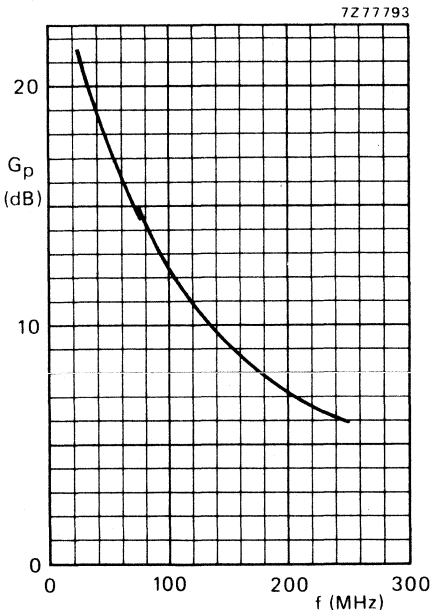


Fig. 15 Power gain versus frequency.

OPERATING NOTE

Below 75 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

Conditions for Figs 13; 14 and 15.

Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 45 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

 $V_{CE} = 28 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} (%) at 47,5 W (P.E.P.)	I_C (A)	d_3 dB*	d_5 dB*	$I_C(ZS)$ mA	T_h °C
5 to 47,5 (P.E.P.)	typ. 19	typ. 45	typ. 1,9	typ. -30	< -30	50	25
5 to 42,5 (P.E.P.)	typ. 19	—	—	typ. -30	< -30	50	70

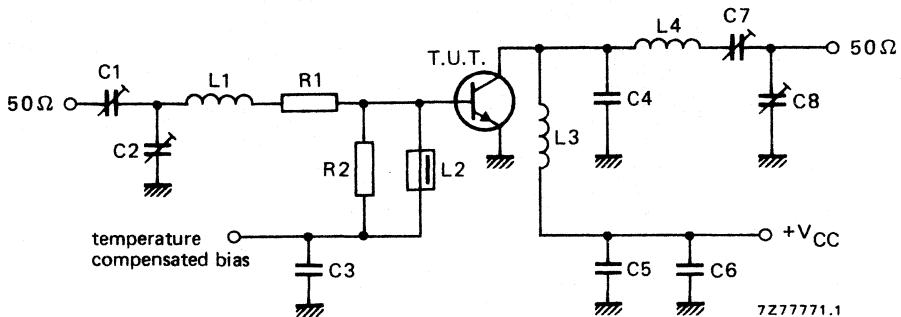


Fig. 16 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = C5 = C6 = 220 nF polyester capacitor

C4 = 56 pF ceramic capacitor (500 V)

C7 = C8 = 15 to 575 pF film dielectric trimmer

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm

L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm

L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω ; parallel connection of 4 x 4,7 Ω carbon resistorsR2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

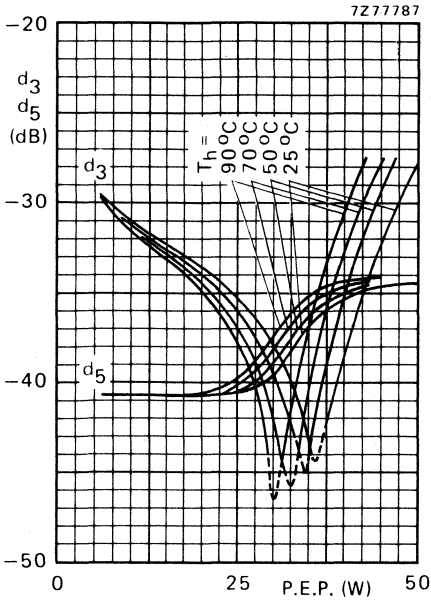


Fig. 17 Intermodulation distortion as a function of output power.*

Conditions for Fig. 17:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; typical values.

Conditions for Fig. 18:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25^\circ\text{C}$; typical values.

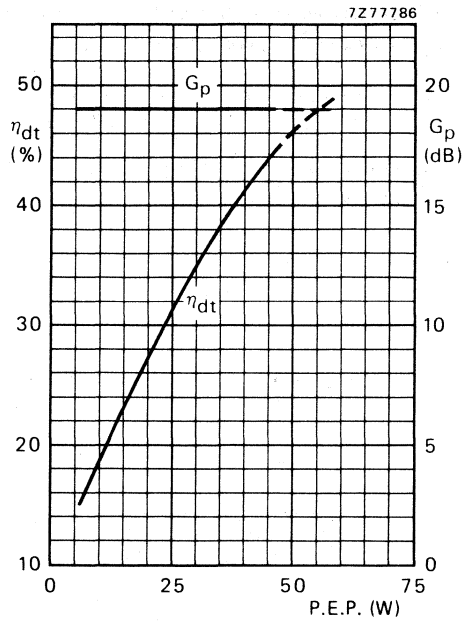


Fig. 18 Double-tone efficiency and power gain as a function of output power.

* See note on page 9.

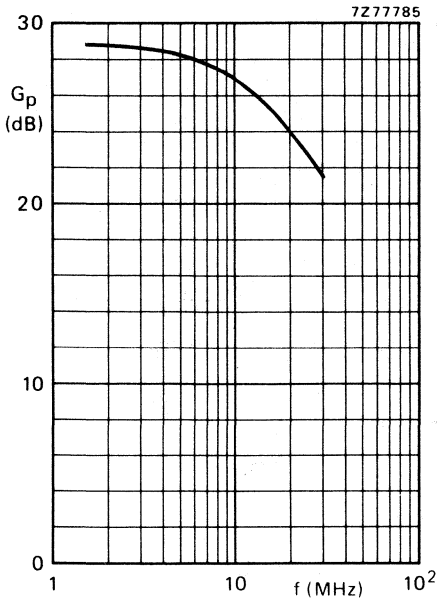


Fig. 19 Power gain as a function of frequency.

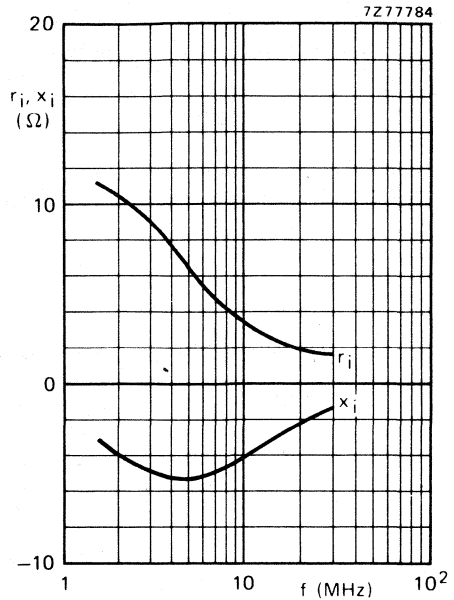


Fig. 20 Input impedance (series components) as a function of frequency.

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $P_L = 47,5 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 6,4 \text{ } \Omega$.

Ruggedness in s.s.b. operation

The BLW86 is capable of withstanding a load mismatch ($VSWR = 50$) under the following conditions: class-AB operation; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $T_h = 70 \text{ }^\circ\text{C}$ and $P_{Lnom} = 50 \text{ W P.E.P.}$

R.F. performance in s.s.b. class-A operation (linear power amplifier)

$V_{CE} = 26 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	I_C A	d_3 dB*	d_5 dB*	T_h °C
17 (P.E.P.)	typ. 22	1,7	typ. -40	< -40	70
17 (P.E.P.)	typ. 22	1,7	typ. -42	< -40	25

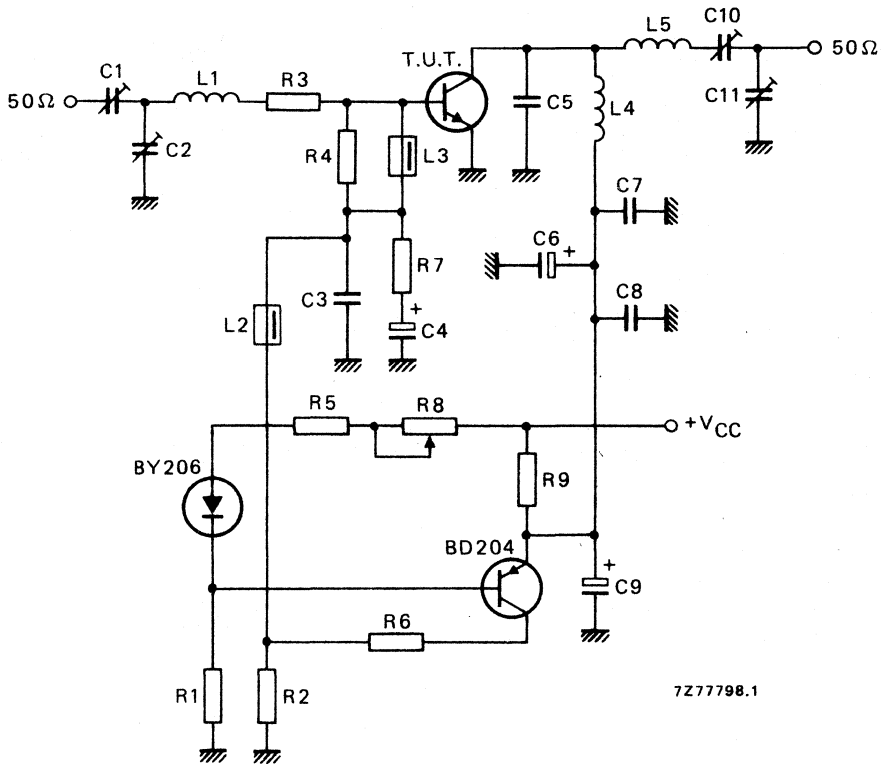


Fig. 21 Test circuit; s.s.b. class-A.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

List of components in Fig. 21:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = 22 nF ceramic capacitor (63 V)

C4 = 47 μ F/10 V electrolytic capacitor

C5 = 56 pF ceramic capacitor (500 V)

C6 = 47 μ F/35 V electrolytic capacitor

C7 = C8 = 220 nF polyester capacitor

C9 = 10 μ F/35 V electrolytic capacitor

C10 = 10 to 210 pF film dielectric trimmer

C11 = 15 to 575 pF film dielectric trimmer

L1 = 3 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = 11 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

L5 = 14 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

R1 = 600 Ω ; parallel connection of 2 x 1,2 k Ω carbon resistors ($\pm 5\%$; 0,5 W each)

R2 = 15 Ω carbon resistor ($\pm 5\%$; 0,25 W)

R3 = 1,2 Ω ; parallel connection of 4 x 4,7 Ω carbon resistors ($\pm 5\%$; 0,125 W each)

R4 = 33 Ω carbon resistor ($\pm 5\%$; 0,25 W)

R5 = 18 Ω carbon resistor ($\pm 5\%$; 0,25 W)

R6 = 120 Ω wirewound resistor ($\pm 5\%$; 5,5 W)

R7 = 1 Ω carbon resistor ($\pm 5\%$; 0,125 W)

R8 = 47 Ω wirewound potentiometer (3 W)

R9 = 1,57 Ω ; parallel connection of 3 x 4,7 Ω wirewound resistors ($\pm 5\%$; 5,5 W each)

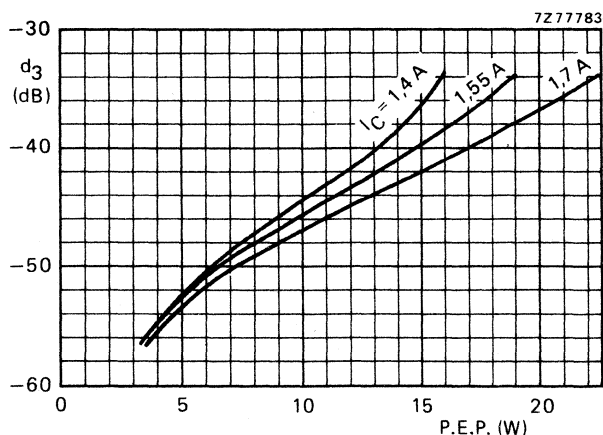


Fig. 22 Intermodulation distortion as a function of output power.
Typical values; $V_{CE} = 26$ V; $T_h = 70$ $^{\circ}$ C; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

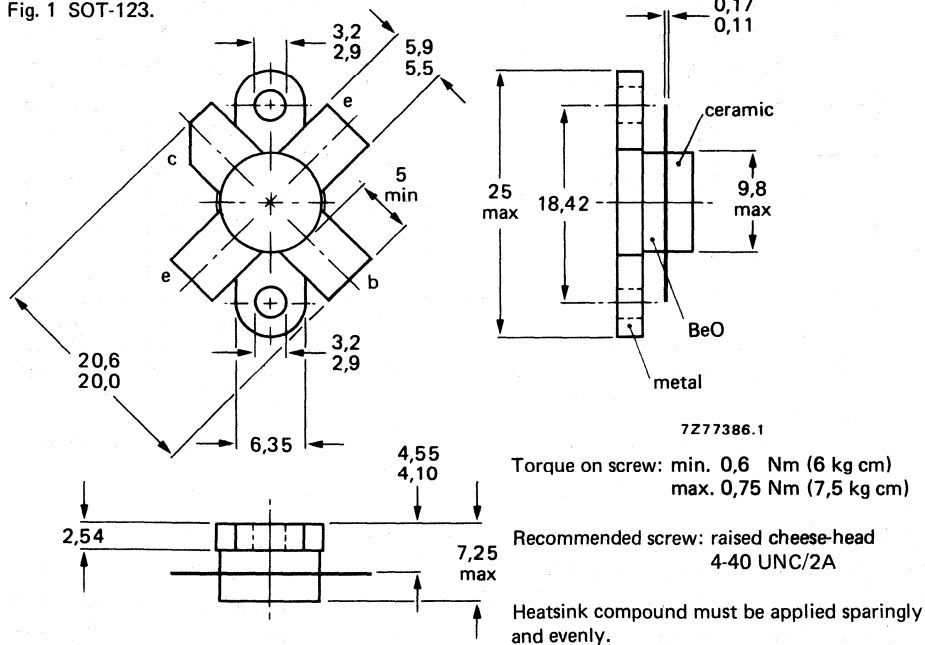
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	13,5	175	25	> 6	> 70	$1,6 + j1,4$	$210 + j5,5$

MECHANICAL DATA

Fig. 1 SOT-123.

Dimensions in mm



CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	6 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	12 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	76 W
Storage temperature	T_{stg}	- 65 to + 150	°C
Operating junction temperature	T_j	max.	200 °C

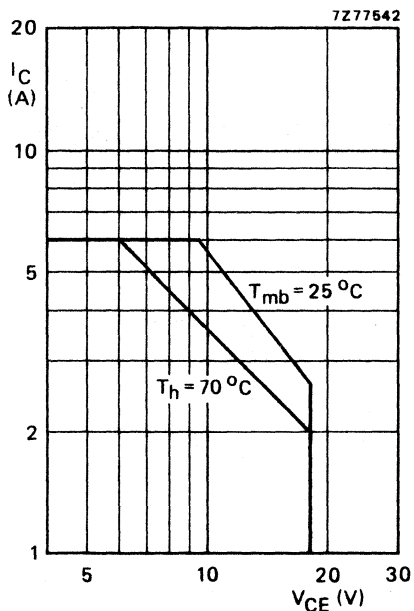


Fig. 2 D.C. SOAR.

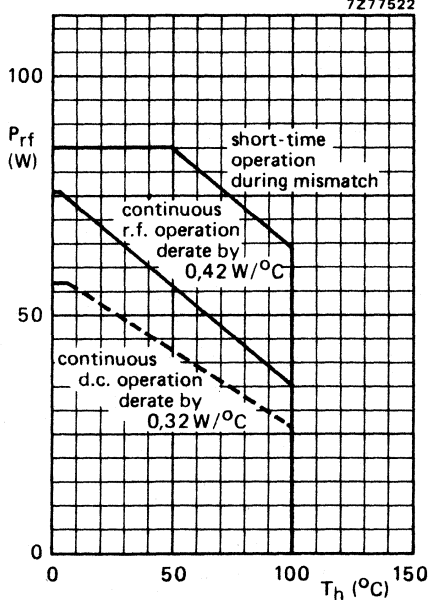


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f \geq 1$ MHz.

THERMAL RESISTANCE (dissipation = 20 W; $T_{mb} = 76$ °C; i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th j-mb(dc)}$	=	3,0 °C
From junction to mounting base (r.f. dissipation)	$R_{th j-mb(rf)}$	=	2,25 °C/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,3 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 25\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 10\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $E_{SBO} > 8\text{ mJ}$ $E_{SBR} > 8\text{ mJ}$

D.C. current gain*

 $I_C = 2,5\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 50
10 to 80

Collector-emitter saturation voltage*

 $I_C = 7,5\text{ A}; I_B = 1,5\text{ A}$ V_{CEsat} typ. 1,7 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 2,5\text{ A}; V_{CB} = 13,5\text{ V}$ $-I_E = 7,5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 800 MHz f_T typ. 750 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_C typ. 65 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 15\text{ V}$ C_{re} typ. 41 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

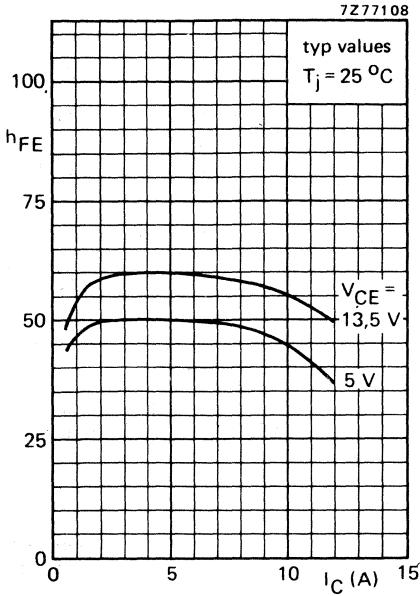


Fig. 4.

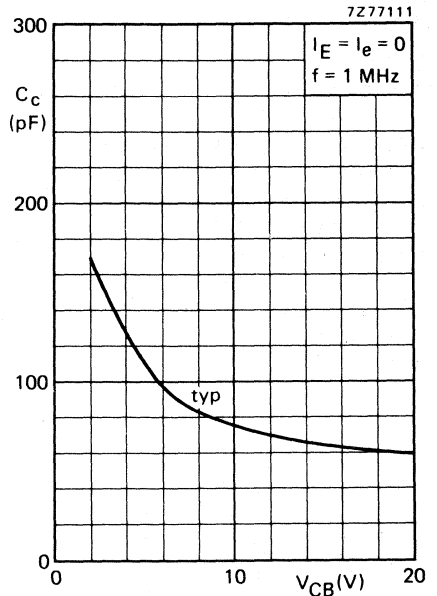


Fig. 5 $T_j = 25^\circ\text{C}$.

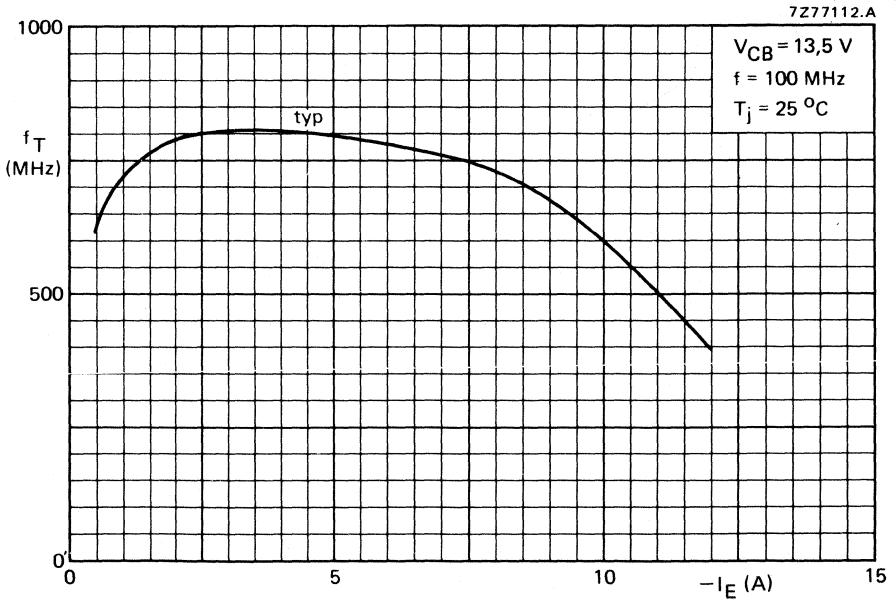


Fig. 6.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

$T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	25	< 6,25	> 6	< 2,64	> 70	$1,6 + j1,4$	$210 + j5,5$
175	12,5	25	—	typ. 6,6	—	typ. 75	—	—

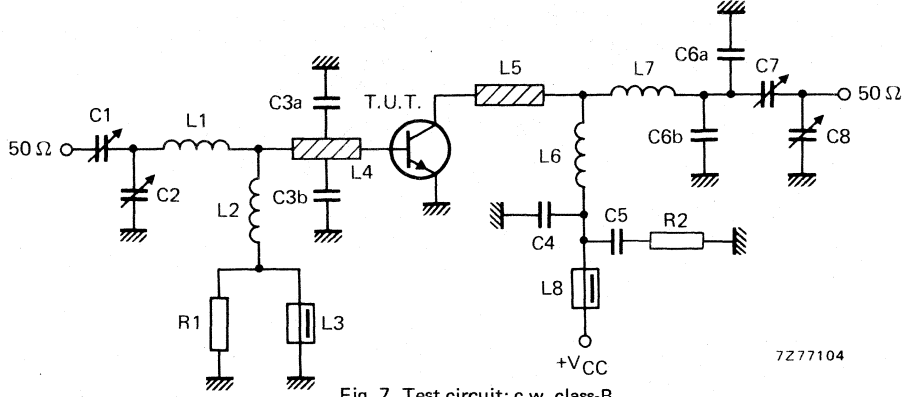


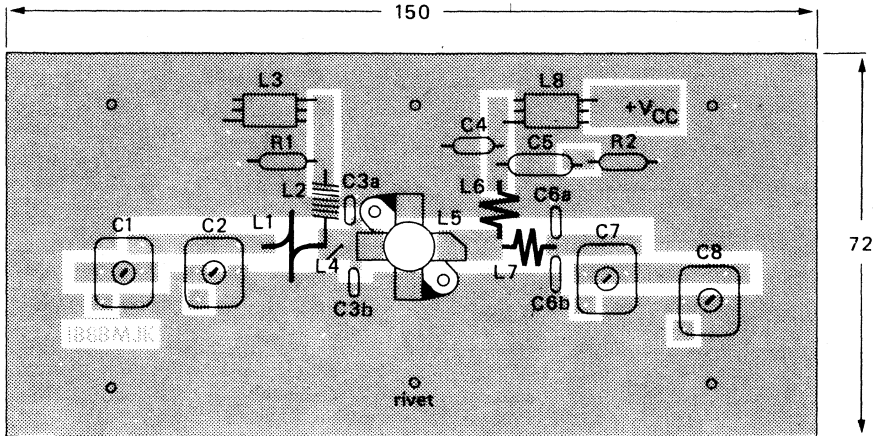
Fig. 7 Test circuit; c.w. class-B.

List of components:

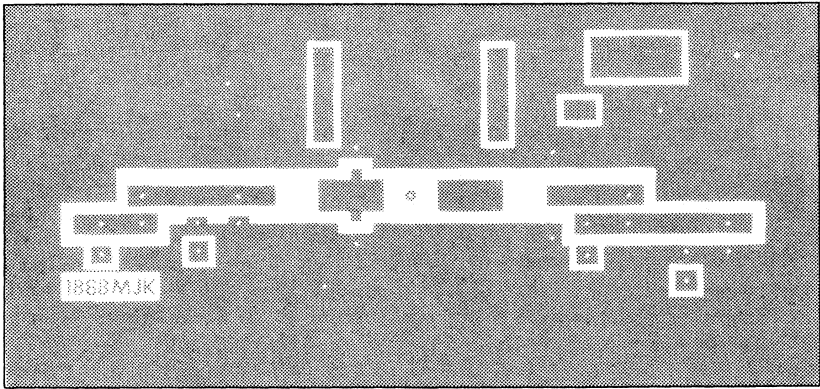
- C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
- C2 = C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
- C3a = C3b = 47 pF ceramic capacitor (500 V)
- C4 = 120 pF ceramic capacitor (500 V)
- C5 = 100 nF polyester capacitor
- C6a = C6b = 8,2 pF ceramic capacitor (500 V)
- C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
- L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
- L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
- L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
- L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
- L6 = 2 turns Cu wire (1,6 mm); int. dia. 5,0 mm; length 6,0 mm; leads 2 x 5 mm
- L7 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm
- L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".
- R1 = 10 Ω (\pm 10%) carbon resistor (0,25 W)
- R2 = 4,7 Ω (\pm 5%) carbon resistor (0,25 W)

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)



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7277548

Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

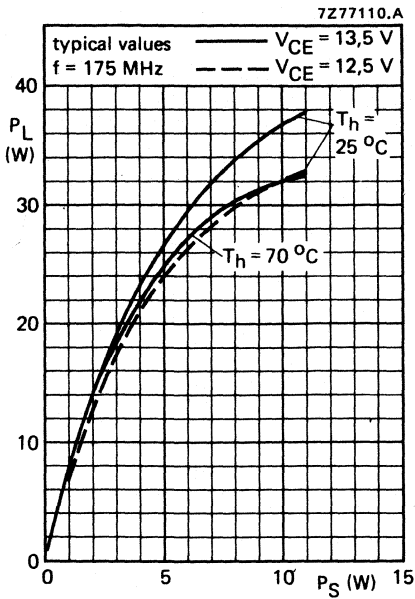


Fig. 9.

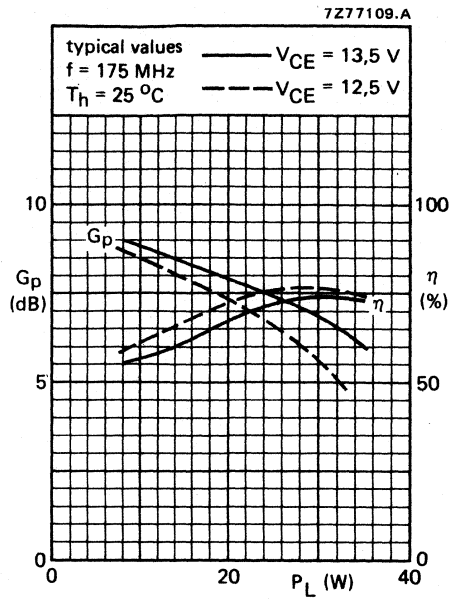


Fig. 10.

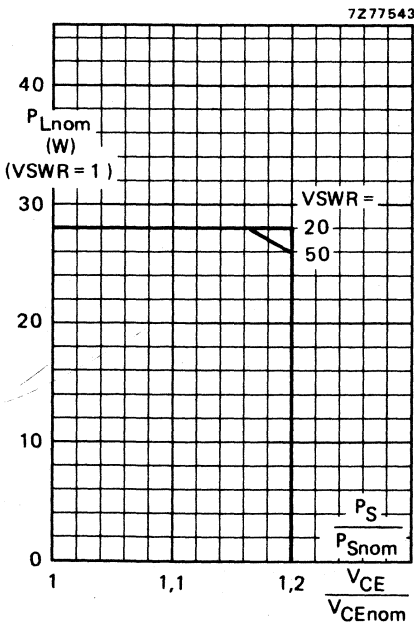


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th mb-h} = 0,3 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $V_{SWR} = 1$ (see page 5).

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($V_{SWR} = 1$), as a function of the expected supply over-voltage ratio with V_{SWR} as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

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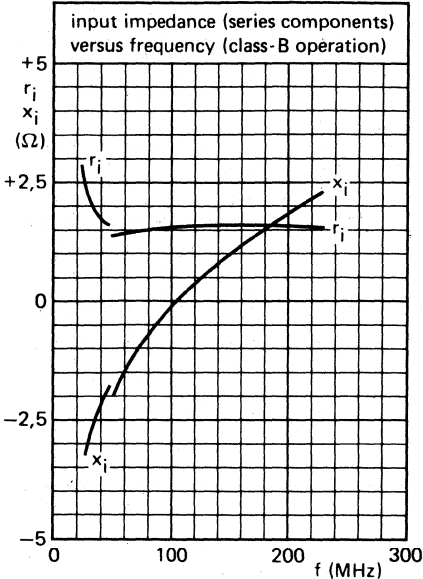


Fig. 12.

7Z67568

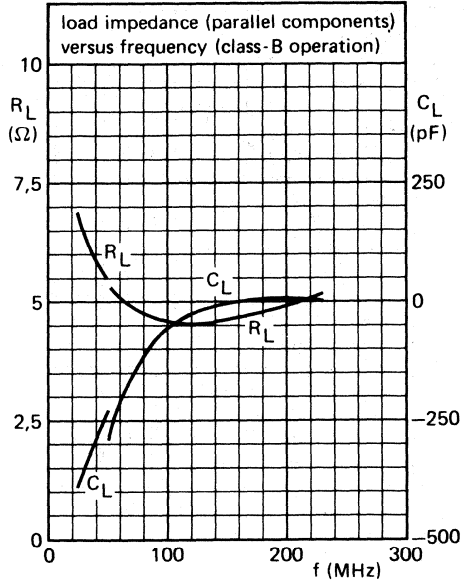
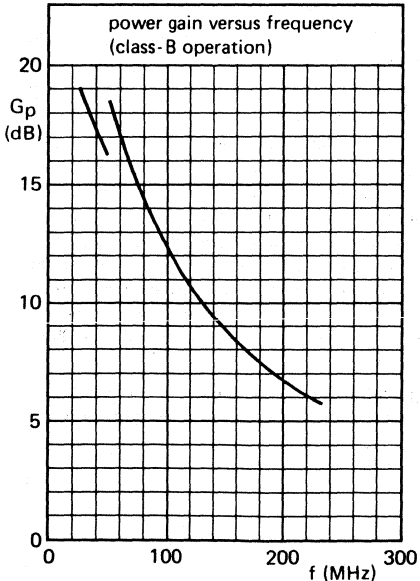


Fig. 13.

7Z67567



Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 13,5 \text{ V}$; $P_L = 25 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

Fig. 14.

DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

BLW95

H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-AB operated high power industrial and military transmitting equipment in the h.f. band. The transistor presents excellent performance as a linear amplifier in s.s.b. applications. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Matched h_{FE} groups are available on request.

The transistor has a 1/2" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	$I_C(ZS)$ A	f MHz	P_L W	G_D dB	η_{dt} %	d_3 dB
s.s.b. (class-AB)	50	0,1	1,6 – 28	20 – 160 (P.E.P.)	> 14	> 40*	< -30

* At 160 W P.E.P.

MECHANICAL DATA

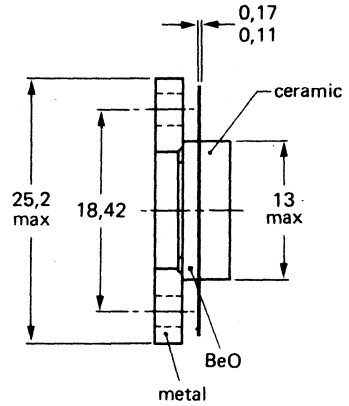
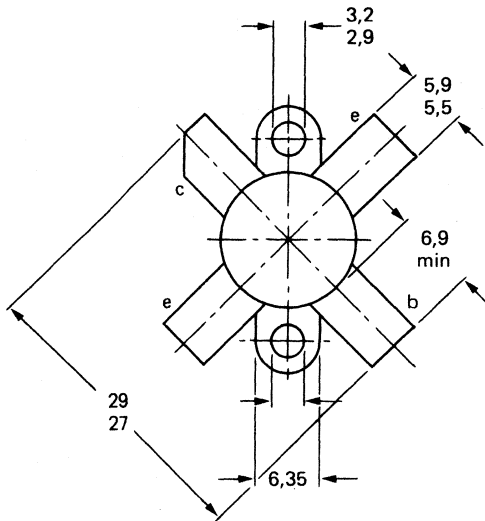
SOT-121A (see page 2)

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

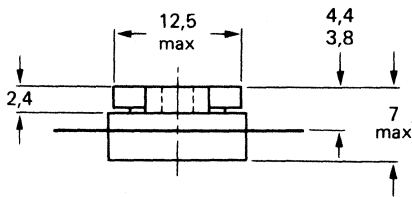
MECHANICAL DATA

Fig. 1 SOT-121A.

Dimensions in mm



7275334.1



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: raised cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 110 V

Collector-emitter voltage (open base)

V_{CEO} max. 53 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 8 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 20 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{Rf} max. 245 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

DEVELOPMENT SAMPLE DATA

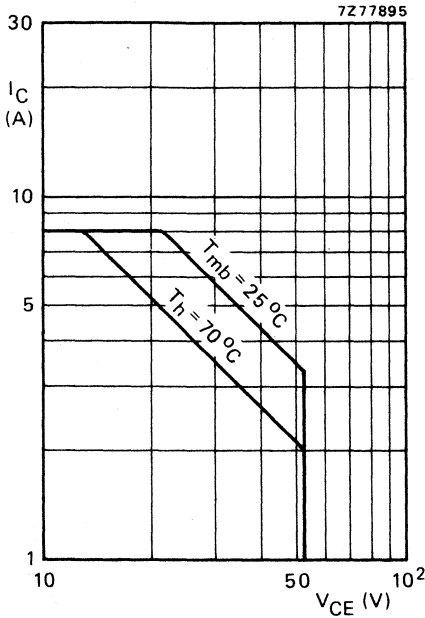


Fig. 2 D.C. SOAR.

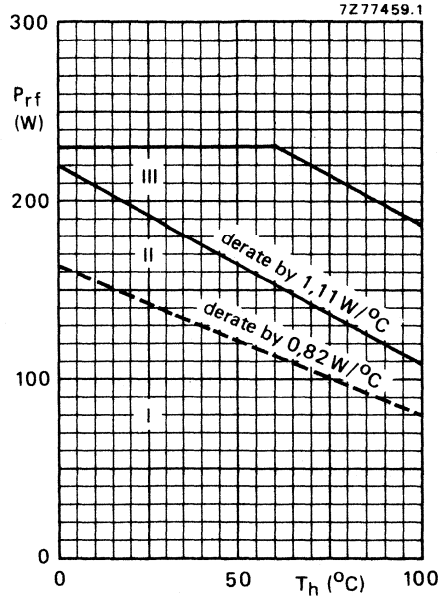


Fig. 3 R.F. power dissipation; $V_{CE} \leq 50$ V; $f \geq 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 100 W; $T_{mb} = 90$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th j-mb(dc)}$ = 1,0 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th j-mb(rf)}$ = 0,7 °C/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,2 °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage
 $V_{BE} = 0; I_C = 25\text{ mA}$

$V_{(BR)CES} > 110\text{ V}$

Collector-emitter breakdown voltage
 open base; $I_C = 100\text{ mA}$

$V_{(BR)CEO} > 53\text{ V}$

Emitter-base breakdown voltage
 open collector; $I_E = 20\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 53\text{ V}$

$I_{CES} < 10\text{ mA}$

Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$
 open base
 $R_{BE} = 10\text{ }\Omega$

$ES_{BO} > 12,5\text{ mJ}$

$ES_{BR} > 12,5\text{ mJ}$

D.C. current gain *
 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 30
 15 to 50

D.C. current gain ratio of matched devices *
 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} \leq 1,2$

Collector-emitter saturation voltage *
 $I_C = 12,5\text{ A}; I_B = 2,5\text{ A}$

V_{CEsat} typ. 2,2 V

Transition frequency at $f = 100\text{ MHz}$ *
 $-I_E = 4\text{ A}; V_{CB} = 40\text{ V}$
 $-I_E = 12,5\text{ A}; V_{CB} = 40\text{ V}$

f_T typ. 270 MHz

f_T typ. 285 MHz

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = I_e = 0; V_{CB} = 50\text{ V}$

C_C typ. 185 pF

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 150\text{ mA}; V_{CE} = 50\text{ V}$

C_{re} typ. 115 pF

Collector-flange capacitance

C_{cf} typ. 3 pF

* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

DEVELOPMENT SAMPLE DATA

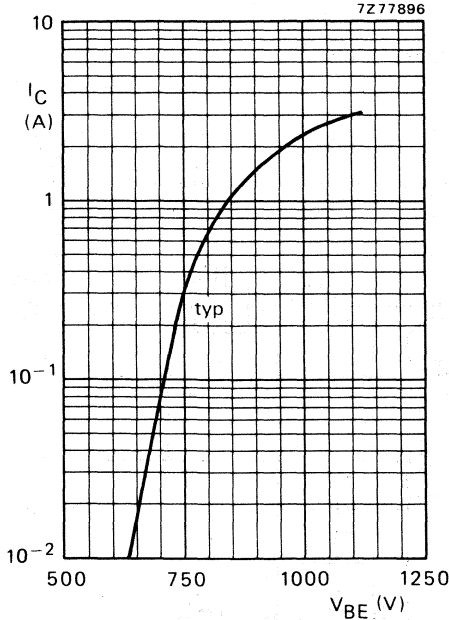


Fig. 4 $V_{CE} = 40$ V; $T_h = 25$ °C.

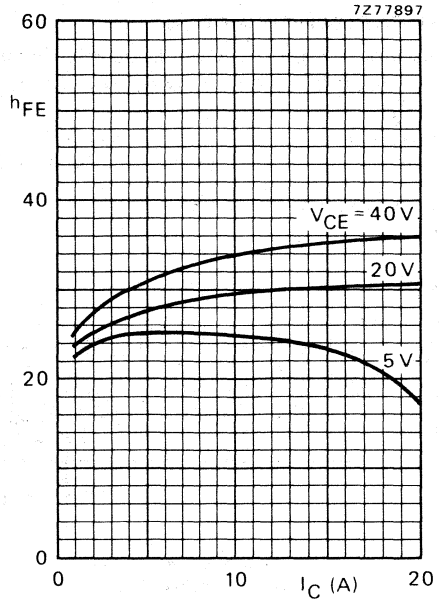


Fig. 5 Typical values; $T_j = 25$ °C.

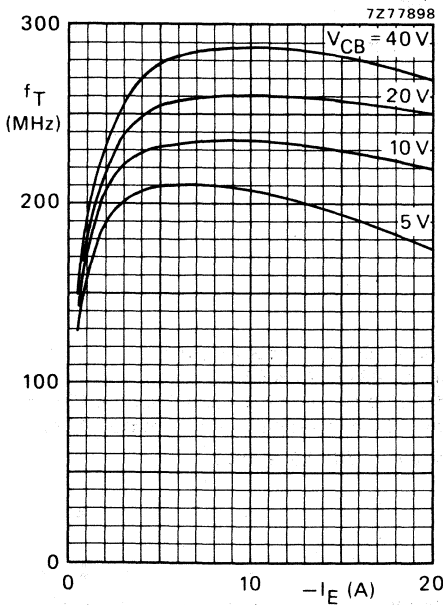


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25$ °C.

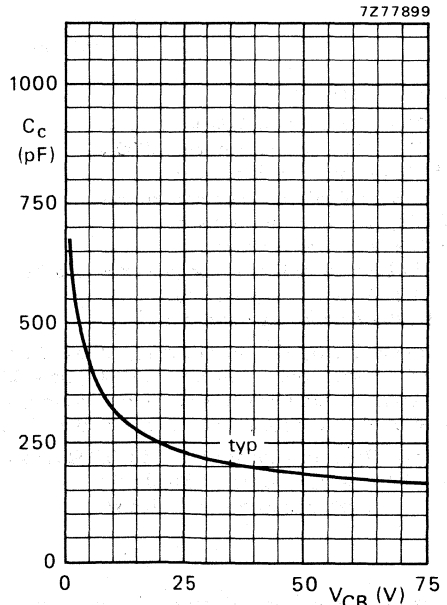


Fig. 7 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

 $V_{CE} = 50 \text{ V}$; $T_h = 25 \text{ }^\circ\text{C}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} (%) at 160 W (P.E.P.)	I_C (A) at 160 W (P.E.P.)	d_3 dB *	d_5 dB *	$I_{C(ZS)}$ A
20 to 160 (P.E.P.)	> 14	> 40	< 4,0	< -30	< -30	0,1

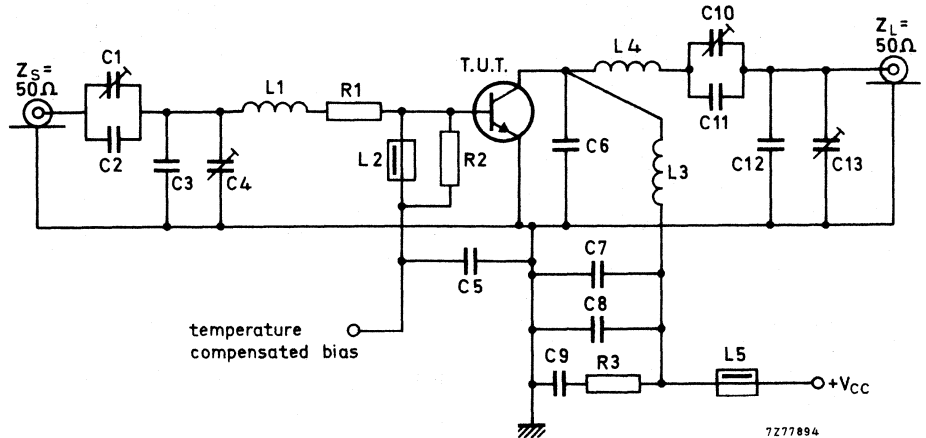


Fig. 8 Test circuit; s.s.b. class-AB.

List of components:

C1 = C10 = 100 pF film dielectric trimmer

C2 = C6 = 27 pF ceramic capacitor (500 V)

C3 = 220 pF polystyrene capacitor

C4 = C13 = 100 pF film dielectric trimmer

C5 = C7 = 3,9 nF ceramic capacitor

C8 = 100 nF polyester capacitor

C9 = 2,2 μF moulded metallized polyester capacitor

C11 = 68 pF ceramic capacitor (500 V)

C12 = 220 pF polystyrene capacitor

L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9,0 mm; length 6,1 mm; leads 2 x 5 mm

L2 = L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = 180 nH; 4 turns enamelled Cu wire (1,6 mm); int. dia. 12,0 mm; length 9,9 mm; leads 2 x 10 mm

L4 = 350 nH; 7 turns enamelled Cu wire (1,6 mm); int. dia. 12,0 mm; length 19,1 mm; leads 2 x 10 mm

R1 = 0,66 Ω ; parallel connection of 5 x 3,3 Ω carbon resistors ($\pm 5\%$; 0,5 W each)R2 = 27 Ω carbon resistor ($\pm 5\%$; 0,5 W)R3 = 4,7 Ω carbon resistor ($\pm 5\%$; 0,5 W)

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

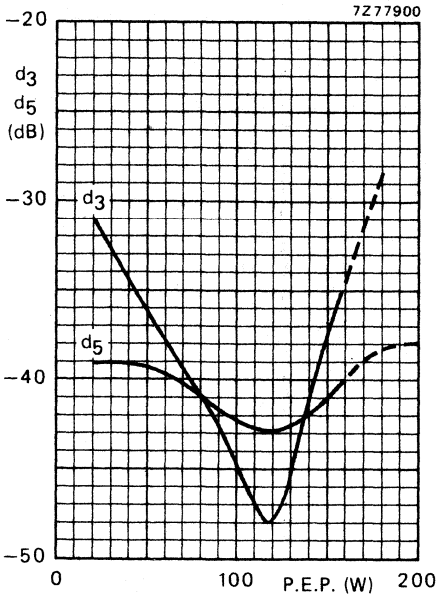


Fig. 9 Intermodulation distortion as a function of output power.*

Conditions for Figs 9 and 10:

$V_{CE} = 50 \text{ V}$; $I_{C(ZS)} = 0,1 \text{ A}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; typical values.

Ruggedness

The BLW95 is capable of withstanding full load mismatch (VSWR = 50) up to 150 W (P.E.P.) under the following conditions:

$V_{CE} = 45 \text{ V}$; $f = 28 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ }^\circ\text{C/W}$.

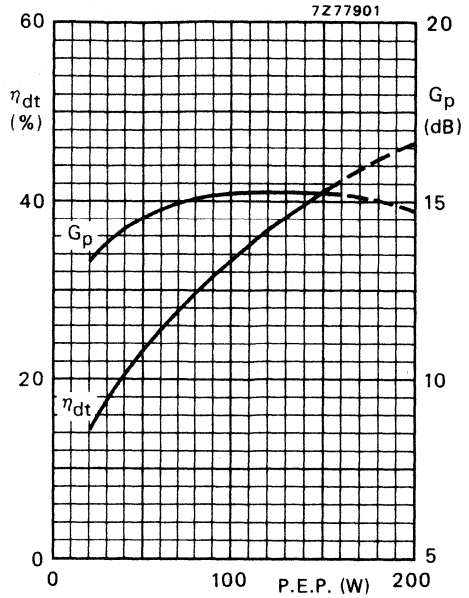


Fig. 10 Double-tone efficiency and power gain as a function of output power.

* See note on page 6.

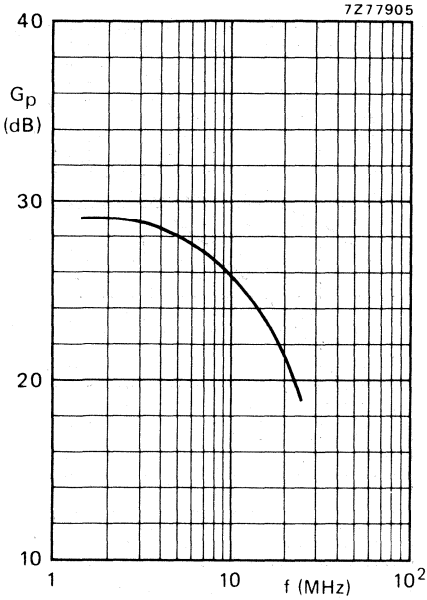


Fig. 11 Power gain as a function of frequency.

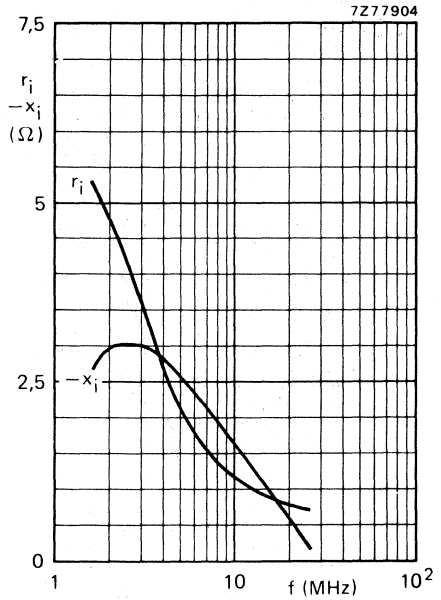


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 50 \text{ V}$; $I_{C(ZS)} = 0,1 \text{ A}$; $P_L = 160 \text{ W (P.E.P.)}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 6,25 \text{ } \Omega$ in series with $7,3 \text{ nH}$ (in parallel with -188 pF).

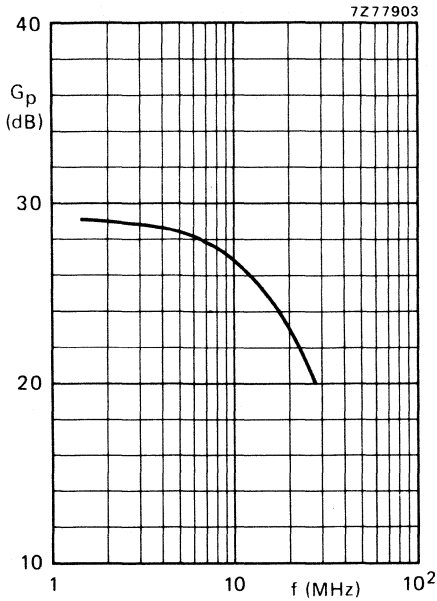


Fig. 13 Power gain as a function of frequency.

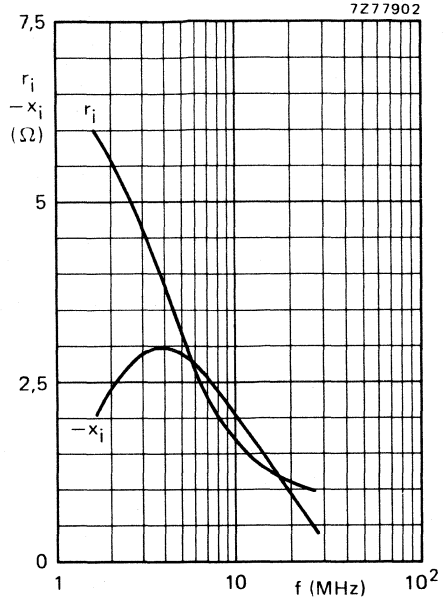


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for one transistor of a push-pull amplifier with cross-neutralization in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 50 \text{ V}$; $I_{C(ZS)} = 0,1 \text{ A}$; $P_L = 160 \text{ W (P.E.P.)}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 6,25 \text{ } \Omega$ in series with $10,4 \text{ nH}$ (in parallel with -267 pF); neutralizing capacitor: 82 pF .

DEVELOPMENT SAMPLE DATA



U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in u.h.f. power amplifiers, where optimum linearity is required. The transistor is specially suited for all transistorized television transposers and transmitters in band IV and V, as well as for driver stages in tube systems. The combination of excellent d.c. dissipation properties, which have been obtained by means of diffused emitter-ballasting resistors and the application of a Ti-Pt-Au sandwich metallization, gives an optimum reliability.

The transistor has a ¼" capstan envelope with ceramic cap.

QUICK REFERENCE DATA

R.F. performance

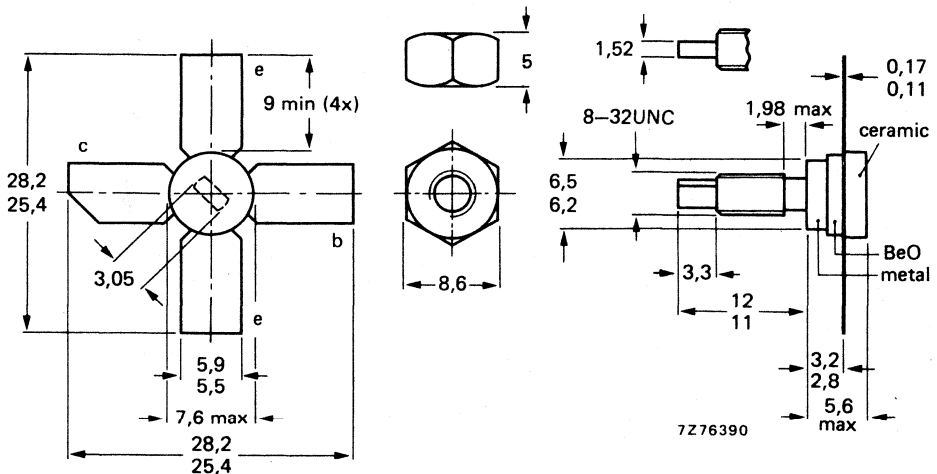
mode of operation	f_{vision} MHz	V_{CE} V	I_{C} mA	T_{h} °C	d_{im}^* dB	$P_{\text{o sync}}^*$ W	G_{p} dB
class-A; linear amplifier	860	25	850	70	-60	> 3,5	> 6,5
	860	25	850	25	-60	typ. 4,4	typ. 7

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or
countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	50 V
Collector-emitter voltage (open base)	V_{CEO}	max.	27 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	2 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	4 A
Total power dissipation at $T_h = 70$ °C	P_{tot}	max	21,5 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

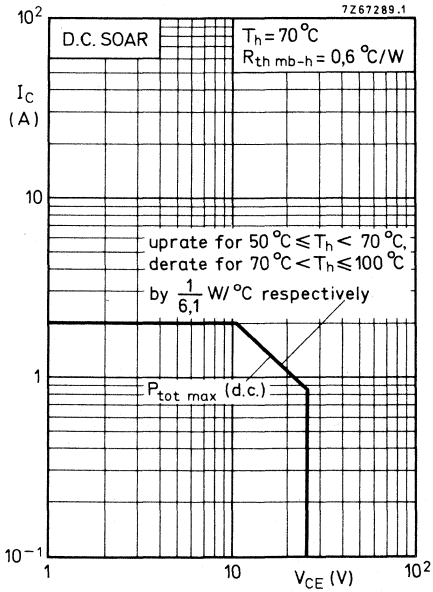


Fig. 2 D.C. SOAR.

THERMAL RESISTANCE

From junction to mounting base

$R_{th\ j-mb} = 5,5$ °C/W

From mounting base to heatsink

$R_{th\ mb-h} = 0,6$ °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$

Collector-base breakdown voltage
open emitter; $I_C = 10\text{ mA}$

$V_{(BR)CBO} > 50\text{ V}$

Collector-emitter breakdown voltage
open base; $I_C = 25\text{ mA}$

$V_{(BR)CEO} > 27\text{ V}$

Emitter-base breakdown voltage
open collector; $I_E = 5\text{ mA}$

$V_{(BR)EBO} > 3,5\text{ V}$

D.C. current gain*
 $I_C = 0,85\text{ A}; V_{CE} = 25\text{ V}$

$h_{FE} > 15$
typ. 40

Collector-emitter saturation voltage*
 $I_C = 500\text{ mA}; I_B = 100\text{ mA}$

V_{CEsat} typ. 0,25 V

Transition frequency at $f = 500\text{ MHz}$ *
 $-I_E = 0,85\text{ A}; V_{CB} = 25\text{ V}$

f_T typ. 2,5 GHz ←

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = I_e = 0; V_{CB} = 25\text{ V}$

C_c typ. 24 pF
< 30 pF

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 50\text{ mA}; V_{CE} = 25\text{ V}; T_{mb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 15 pF

Collector-stud capacitance

C_{cs} typ. 2 pF



* Measured under pulse conditions; $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

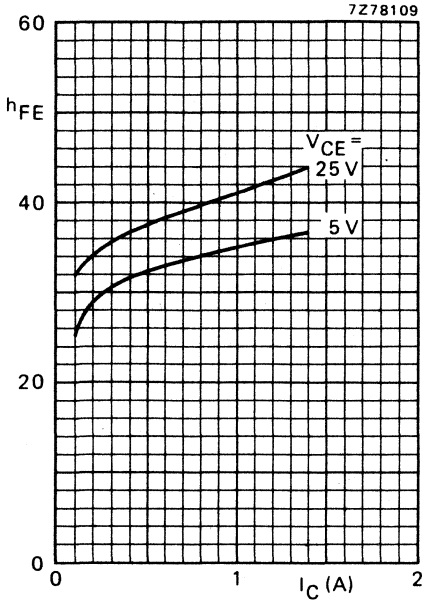


Fig. 3 Typical values; $T_j = 25$ °C.

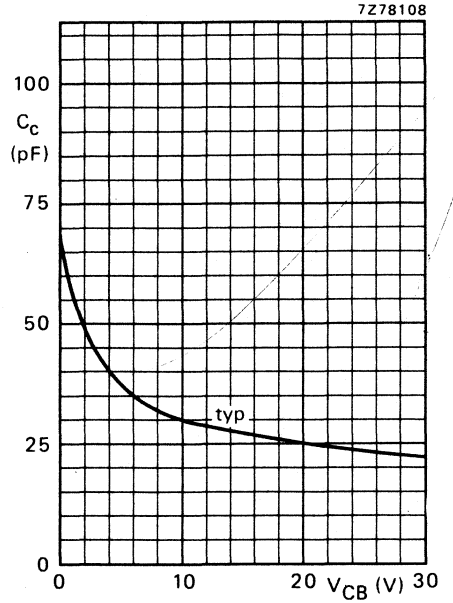


Fig. 4 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

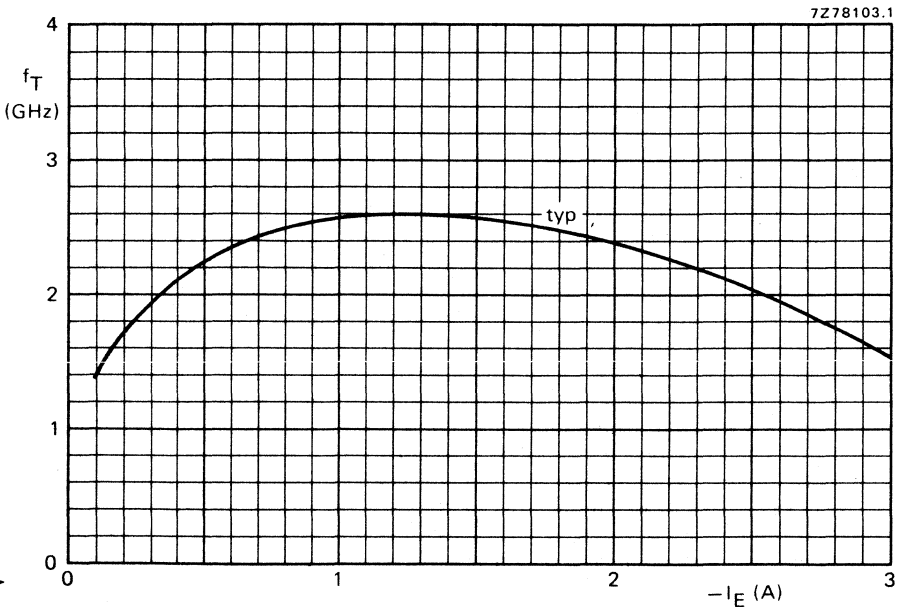


Fig. 5 $V_{CB} = 25$ V; $f = 500$ MHz; $T_j = 25$ °C.

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	T_{h} (°C)	d_{im} (dB)*	$P_{\text{o sync}}$ (W)*	G_{p} (dB)
860	25	850	70	-60	> 3,5	> 6,5
860	25	850	70	-60	typ. 3,8	typ. 7
860	25	850	25	-60	typ. 4,4	typ. 7

* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

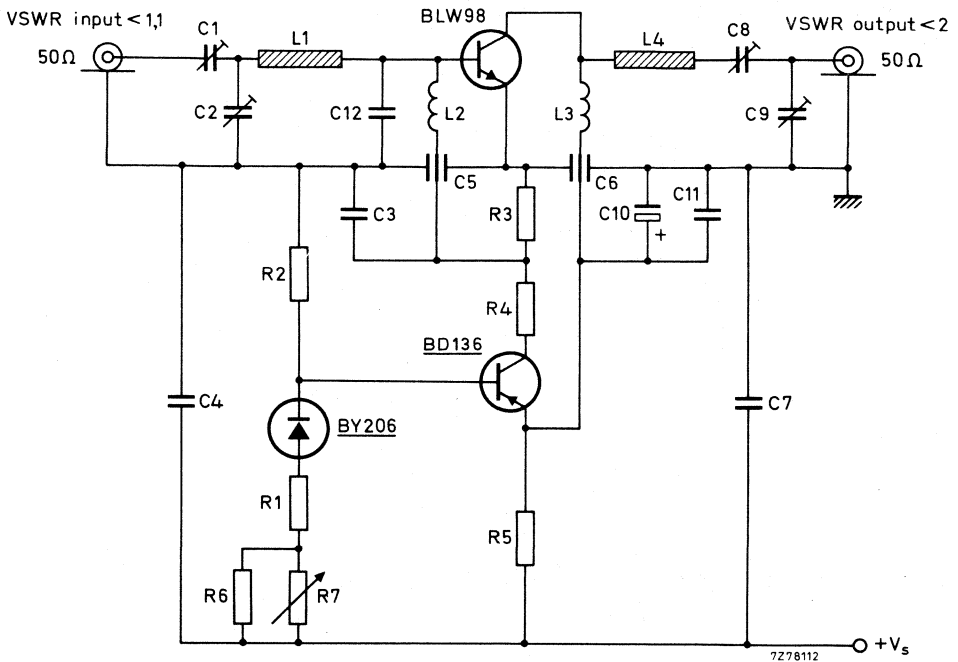


Fig. 6 Test circuit at $f_{\text{vision}} = 860$ MHz.

List of components (see also page 6):

- C1 = C2 = 1,4 to 5,5 pF film dielectric trimmers (cat. no. 2222 809 09001)
- C3 = C4 = 100 nF polyester capacitors
- C5 = C6 = 1 nF feed-through capacitors
- C7 = 5,6 pF ceramic capacitor
- C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
- C9 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
- C10 = 10 $\mu\text{F}/40$ V solid aluminium electrolytic capacitor
- C11 = 470 nF polyester capacitor
- C12 = 2 x 3,3 pF chip capacitors (in parallel)

APPLICATION INFORMATION (continued)

List of components (continued)

- R1 = 150 Ω carbon resistor (0,25 W)
- R2 = 1,8 kΩ carbon resistor (0,5 W)
- R3 = 33 Ω carbon resistor (0,5 W)
- R4 = 220 Ω carbon resistor (1 W)

- R5 = 4 x 12 Ω carbon resistors in parallel (1 W each)
- R6 = 1 kΩ carbon resistor (0,25 W)
- R7 = 220 Ω carbon potentiometer (0,25 W)

- L1 = stripline (13,6 mm x 6,9 mm)
- L2 = microchoke 0,47 μH (cat. no. 4322 057 04770)
- L3 = 1 turn Cu wire (1 mm); internal diameter 5,5 mm; leads 2 x 5 mm
- L4 = stripline (40,8 mm x 6,9 mm)

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,5 mm.

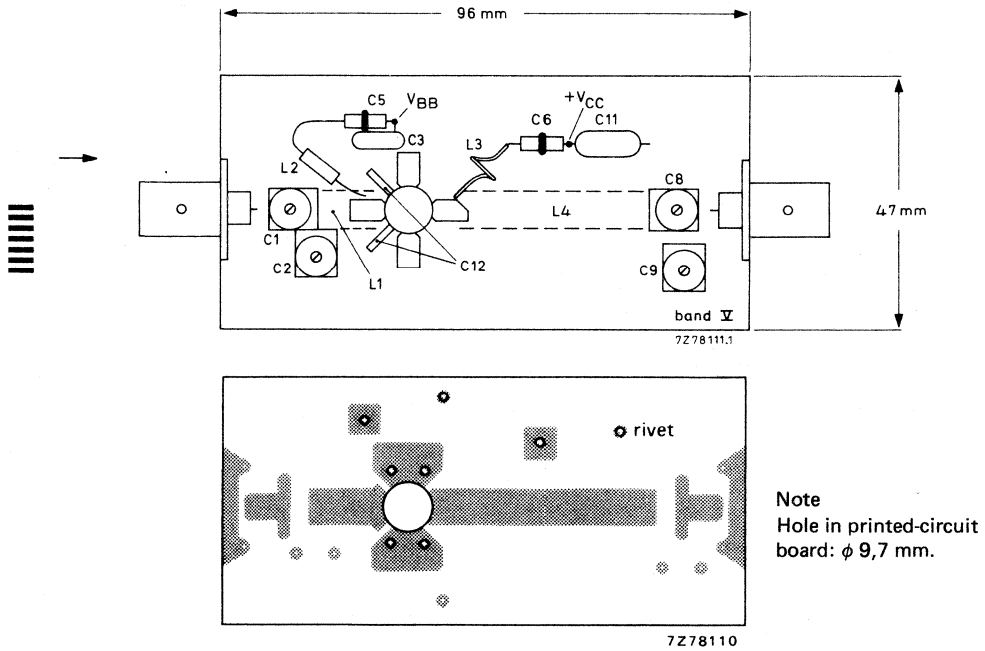
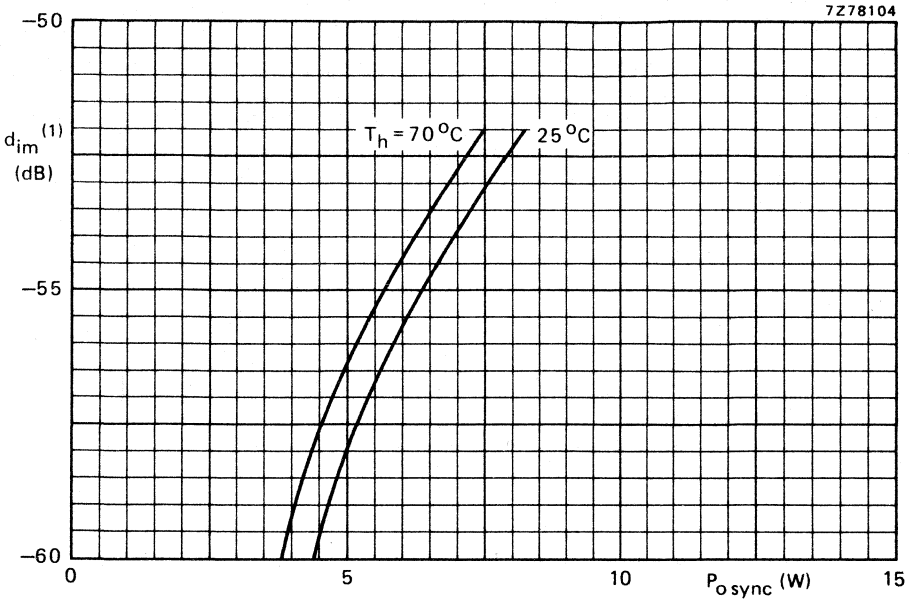


Fig. 7 Component layout and printed-circuit board for 860 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



(1) Three-tone-test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level. Intermodulation distortion of input signal ≤ -75 dB.

Fig. 8 Intermodulation distortion as a function of output power.
Typical values; $V_{CE} = 25$ V; $I_C = 850$ mA; $f_{\text{vision}} = 860$ MHz.

Information for wide-band application from 470 to 860 MHz available on request.

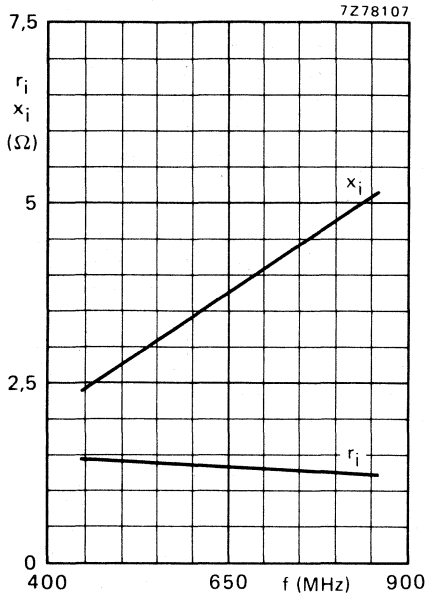


Fig. 9 Input impedance (series components) as a function of frequency.

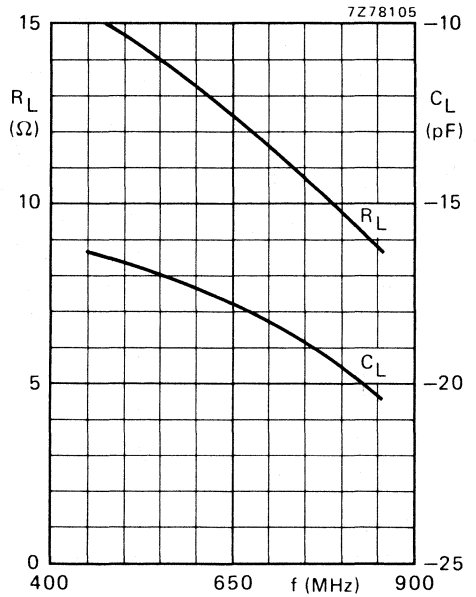


Fig. 10 Load impedance (parallel components) as a function of frequency.

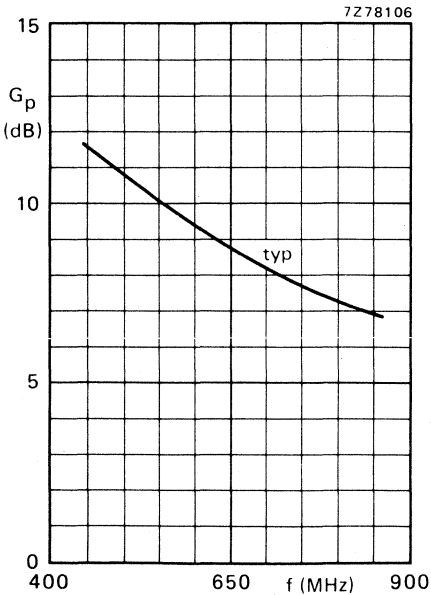


Fig. 11 Power gain as a function of frequency.

Conditions for Figs 9, 10 and 11

$V_{CE} = 25$ V; $I_C = 850$ mA; typical values.

H.F./V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for s.s.b. in class-A and AB and in f.m. transmitting applications in class-C with a supply voltage up to 28 V. The transistor is resistance stabilized and tested under severe load mismatch conditions. It has a 1/4" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

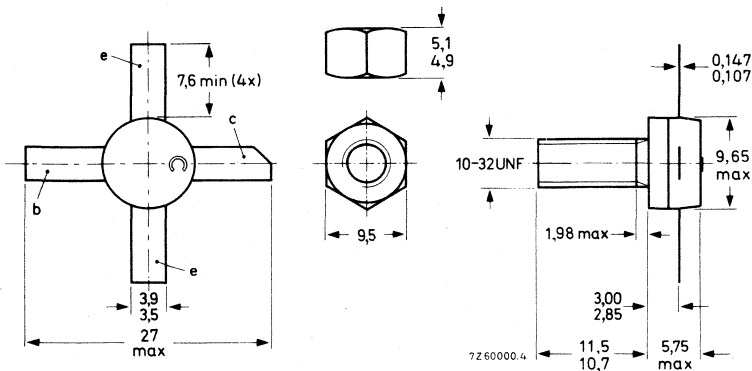
mode of operation	V_{CE} V	f_1 MHz	f_2 MHz	P_L W	G_p dB	d_3 dB	I_C A	η_{dt} %
s.s.b. (class-A)	26	28,000	28,001	0.8(P.E.P.)	> 18	< -40	< 1,2	—
s.s.b. (class-AB)	28	28,000	28,001	25(P.E.P.)	> 18	typ. -35	typ. 1,28	typ. 35

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	G_p dB	I_C A	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w. (class-B)	28	70	typ. 0,5	25	typ. 17	typ. 1,49	typ. 60	0,53 - j1,4	42,5 - j54

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 5,0 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

BLX13

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter)
peak value

Collector-emitter voltage (open base)

Emitter-base voltage (open collector)

V_{CBOM}	max.	65	V
V_{CEO}	max.	36	V
V_{EBO}	max.	4.0	V

Currents

Collector current (average)

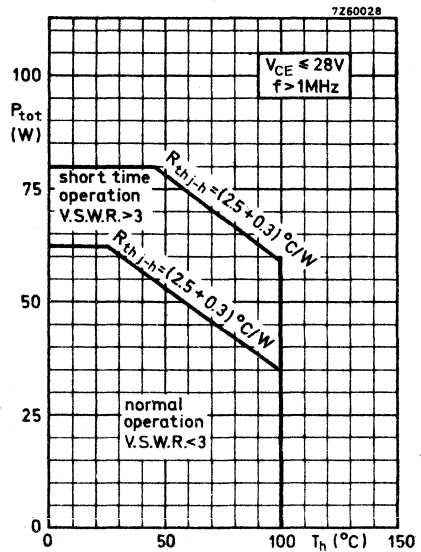
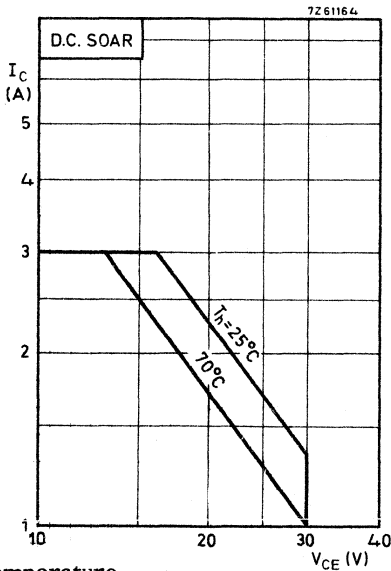
Collector current (peak value) $f > 1$ MHz

$I_{C(AV)}$	max.	3.0	A
I_{CM}	max.	6	A

Power dissipation

Total power dissipation up to $T_h = 25$ °C
 $f > 1$ MHz

P_{tot} max. 62.5 W



Temperature

Storage temperature

Operating junction temperature

T_{stg}	-30 to +200	°C
T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base

From mounting base to heatsink

$R_{th j-mb}$	=	2.5	°C/W
$R_{th mb-h}$	=	0.3	°C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter; $I_C = 50\text{ mA}$	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base; $I_C = 50\text{ mA}$	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	4.0	V

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$

open base	E	>	8	mWs
$-V_{BE} = 1.5\text{ V}; R_{BE} = 33\Omega$	E	>	8	mWs

D.C. current gain

$I_C = 1.0\text{ A}; V_{CE} = 5\text{ V}$	h_{FE}	typ.	50	
			10 to 100	

Transition frequency

$I_C = 3.0\text{ A}; V_{CE} = 20\text{ V}$	f_T	typ.	500	MHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 30\text{ V}$	C_c	typ.	50	pF
		<	65	pF

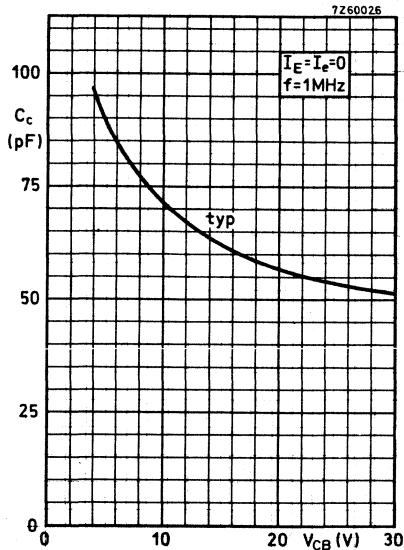
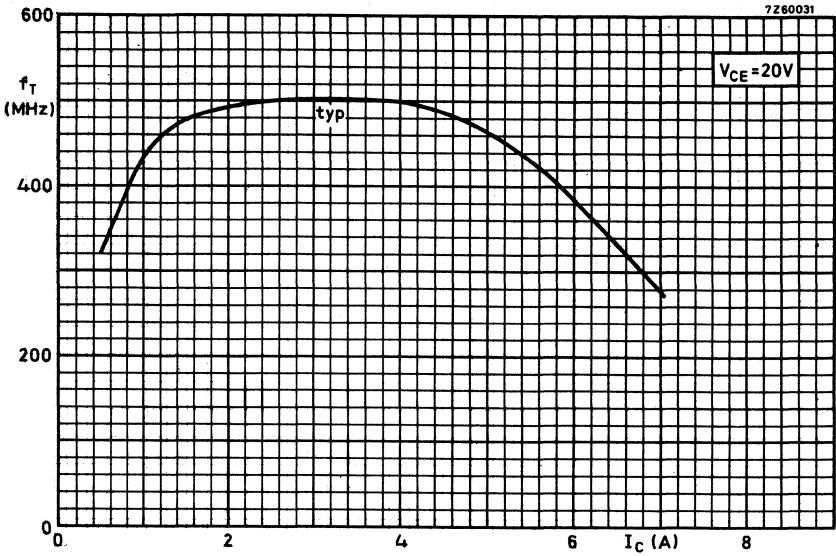
Feedback capacitance

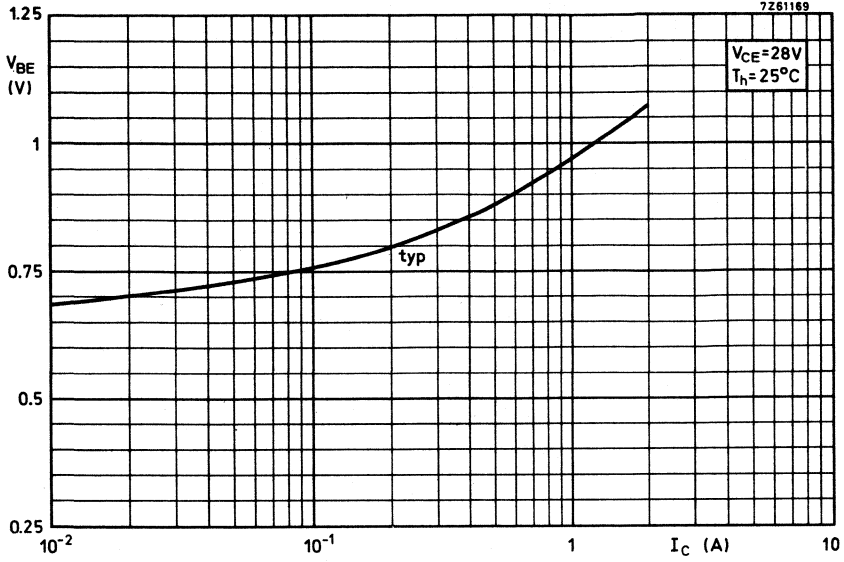
$I_C = 100\text{ mA}; V_{CE} = 30\text{ V}$	C_{re}	typ.	31	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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APPLICATION INFORMATION

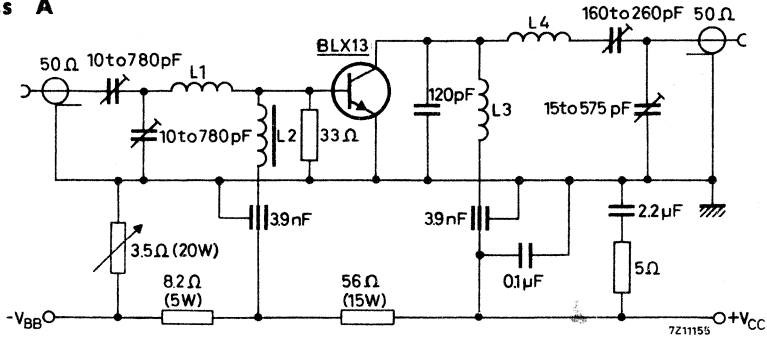
R. F. performance in S. S. B. operation (linear power amplifier)

$V_{CE} = 26 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$
 $f_1 = 28.000 \text{ MHz}$; $f_2 = 28.001 \text{ MHz}$

output power (W)	G_D (dB)	d_3 (dB) ¹⁾	I_C (A)	Class
0-8 (PEP)	> 18	< -40	< 1.2	A

Test circuit:

S.S.B. class A



L1 = 3 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 7 mm leads 50 mm totally

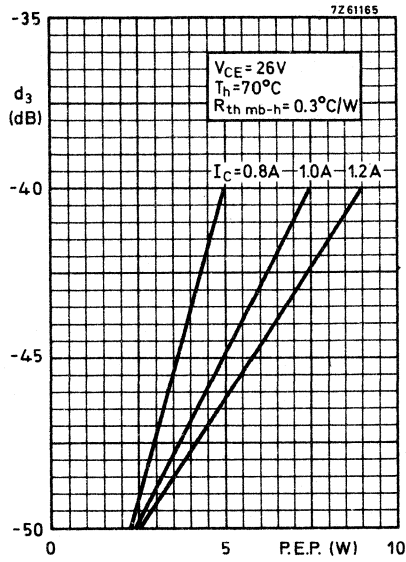
L2 = 7 turns enamelled Cu wire (0.7 mm) on 3H1 toroid; 60 μH
 (code number of 3H1: 4322 020 36620)

L3 = 4 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 10 mm

L4 = 7 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 12 mm

 Detailed information for a wide band application
 1.6 to 28 MHz available on request

¹⁾ Stated figures are maxima encountered at any driving level between the specified values of PEP and are referred to the according level of either of the equal ampl. tones. Relative to the according peak envelope power these figures should be increased by 6 dB.



APPLICATION INFORMATION

R. F. performance in S. S. B. operation (linear power amplifier)

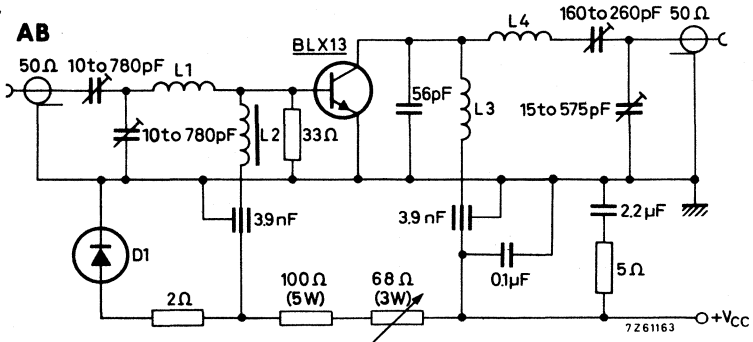
$V_{CC} = 28 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$

$f_1 = 28.000 \text{ MHz}$; $f_2 = 28.001 \text{ MHz}$

output power (W)	G_p (dB)	dt (%)	d_3 (dB) ¹⁾	I_{CZS} (mA)	I_C (A)	Class
25 PEP	> 18	typ. 35	typ. -35	25	typ. 1.28	AB

Test circuit:

**S.S.B.
class AB**



D1 = AYY10/120

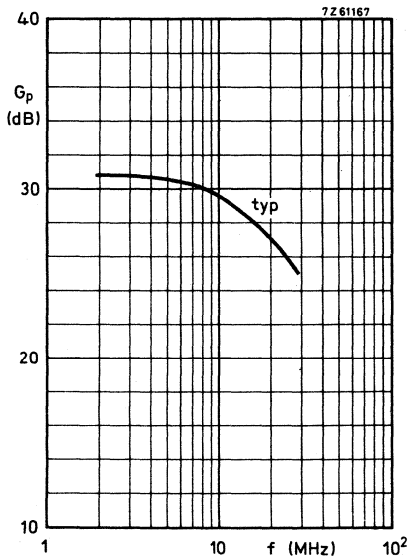
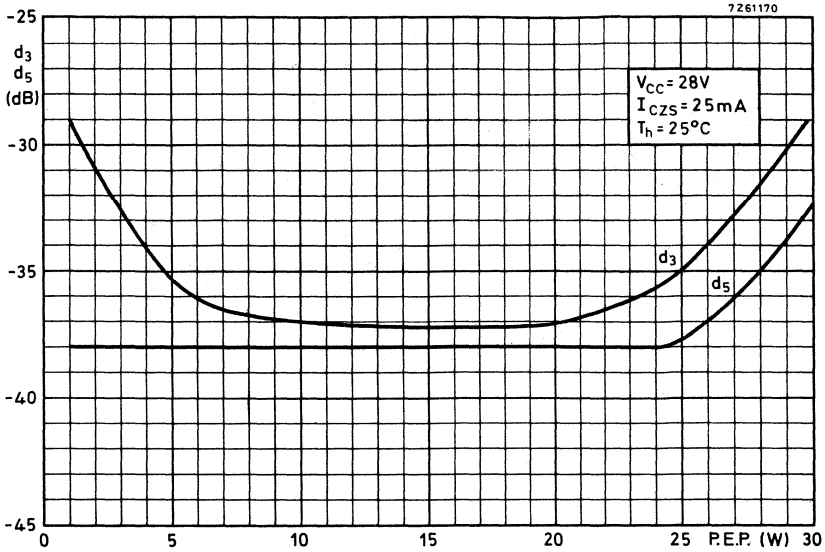
L1 = 3 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 7 mm leads 50 mm totally

L2 = 7 turns enamelled Cu wire (0.7 mm) on 3H1 toroid; 60 μH
(code number of 3H1: 4322 020 36620)

L3 = 4 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 10 mm

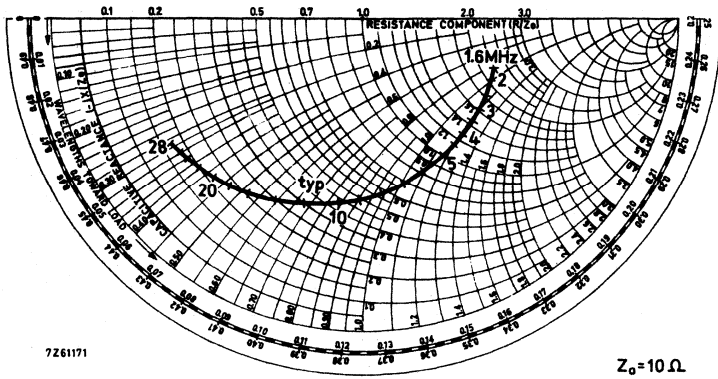
L4 = 7 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 12 mm

¹⁾ Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.



Conditions:

- $P_L = 25 \text{ W PEP}$
- $V_{CC} = 28 \text{ V}$
- $I_{CZS} = 25 \text{ mA}$
- $Z_L = 12.5 \Omega$
- $T_h = 25 \text{ }^\circ\text{C}$



Conditions:

$P_L = 25 \text{ W PEP}$

$V_{CC} = 28 \text{ V}$

$I_{CZS} = 25 \text{ mA}$

$Z_L = 12.5 \Omega$

$T_h = 25 \text{ }^\circ\text{C}$



APPLICATION INFORMATION

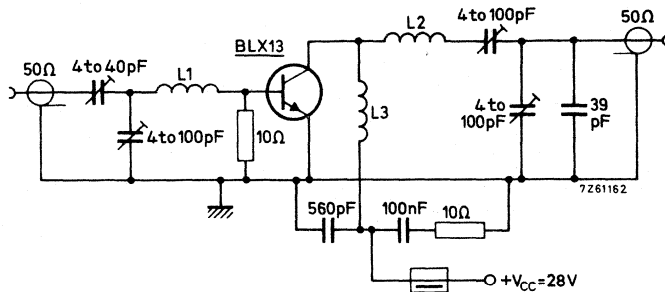
R.F. performance in c. w. operation (class B)

$V_{CC} = 28 \text{ V}; T_h \text{ up to } 25 \text{ }^\circ\text{C}$

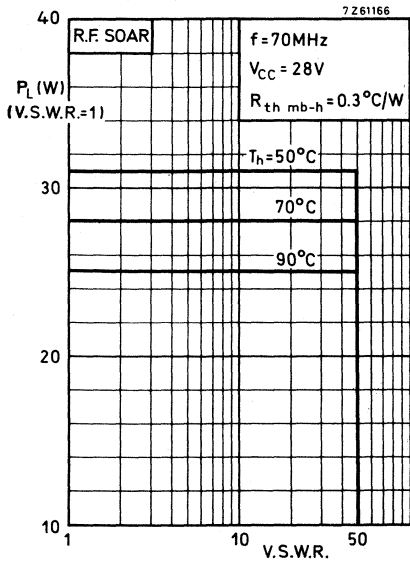
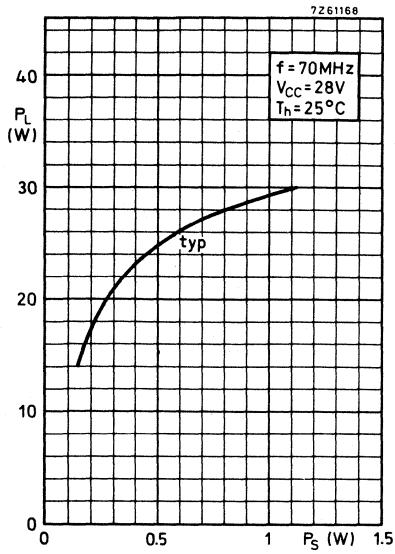
f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_D (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
70	typ. 0.5	25	typ. 1.49	typ. 17	typ. 60	0.53-j1.4	42.5-j54

Test circuit:

**C.W.
class B**



- L1 = 93 nH; 3 turns enamelled Cu wire (1.5 mm); int. diam. 10 mm; length 8 mm; leads 2 x 5 mm
- L2 = 147 nH; 5 turns enamelled Cu wire (1.5 mm); int. diam. 9 mm; length 14 mm; leads 2 x 5 mm
- L3 = 118 nH; 4 turns enamelled Cu wire (1.5 mm); int. diam. 9 mm; length 10.5 mm; leads 2 x 5 mm
- L4 = FXC choke (code number 4312 020 36640)



For high voltage operation, a stabilized power supply is generally used. The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	65 V
Collector-emitter voltage (open base)	V_{CEO}	max.	36 V
Emitter-base voltage (open-collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_C(AV)$	max.	3 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	9 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	73 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

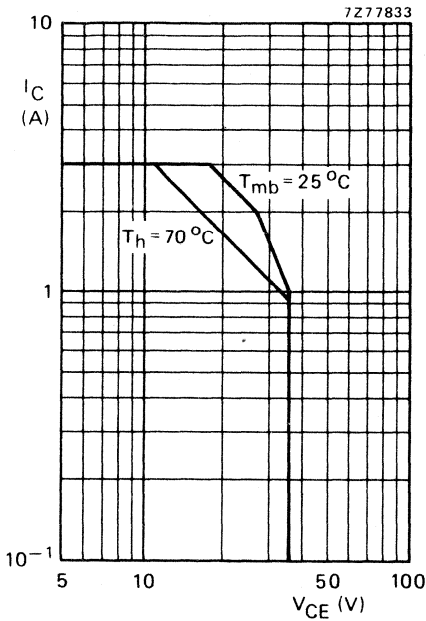


Fig. 2 D.C. SOAR.

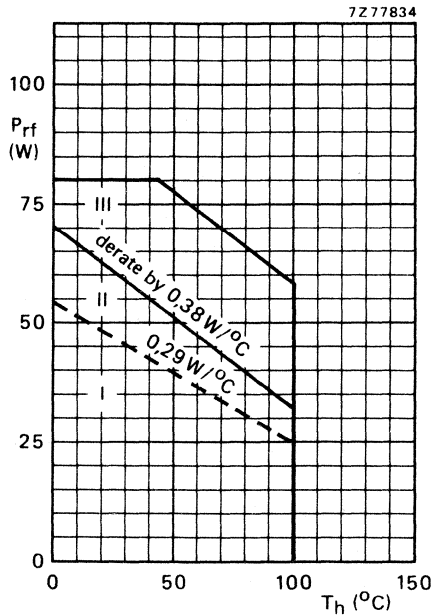


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operating during mismatch

THERMAL RESISTANCE (dissipation = 32,5 W; $T_{mb} = 85$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th j-mb(dc)}$	=	3,55 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th j-mb(rf)}$	=	2,65 °C/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,45 °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 10\text{ mA}$

$V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 50\text{ mA}$

$V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 36\text{ V}$

$I_{CES} < 4\text{ mA}$

Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

$E_{SBO} > 8\text{ mJ}$

$R_{BE} = 10\text{ }\Omega$

$E_{SBR} > 8\text{ mJ}$

D.C. current gain *

$I_C = 1,25\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 50
10 to 100

D.C. current gain ratio of matched devices *

$I_C = 1,25\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage *

$I_C = 3,75\text{ A}; I_B = 0,75\text{ A}$

V_{CEsat} typ. 1,5 V

Transition frequency at $f = 100\text{ MHz}$ *

$-I_E = 1,25\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 530 MHz

$-I_E = 3,75\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 530 MHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

C_c typ. 50 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$

C_{re} typ. 31 pF

Collector-stud capacitance

C_{cs} typ. 2 pF

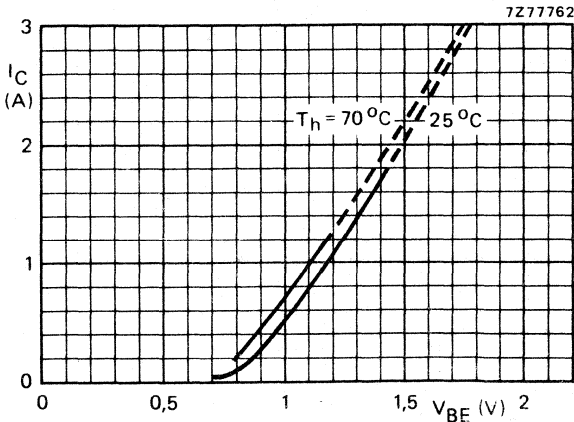


Fig. 4 Typical values; $V_{CE} = 28\text{ V}$.

* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

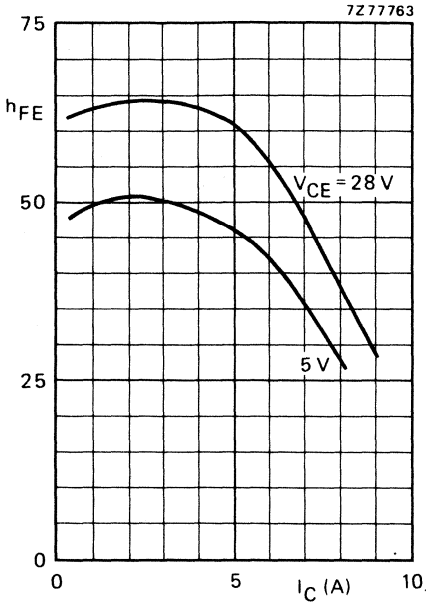


Fig. 5 Typical values; $T_j = 25$ °C.

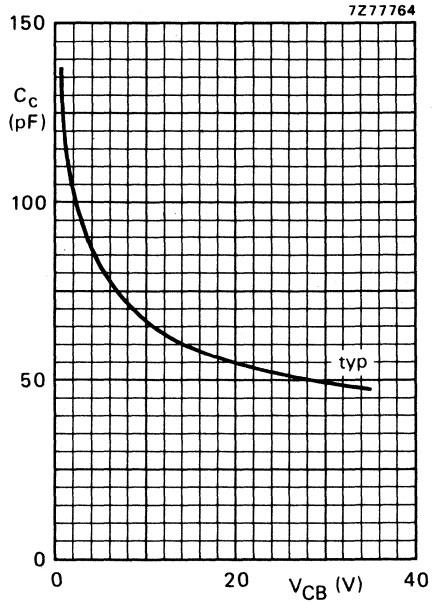


Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

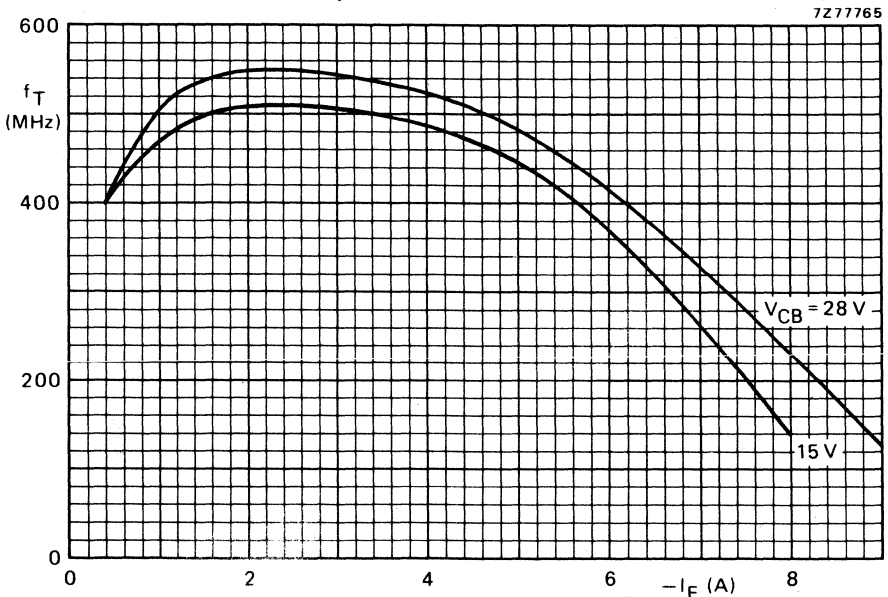


Fig. 7 Typical values; $f = 100$ MHz; $T_j = 25$ °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

$V_{CE} = 26 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	I_C A	d_3 dB*	d_5 dB*	T_h °C
> 8 (P.E.P.)	> 20	1,25	-40	< -40	70
typ. 10 (P.E.P.)	typ. 24	1,25	-40	< -40	25

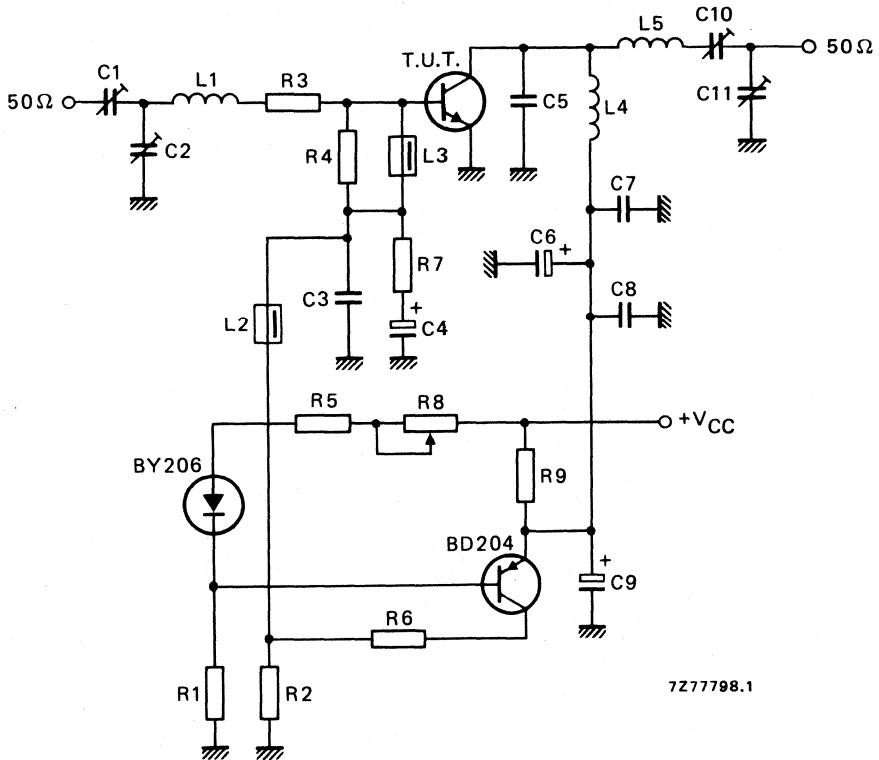


Fig. 8 Test circuit; s.s.b. class-A.

List of components on page 6.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

List of components in Fig. 8:

- C1 = C2 = 10 to 780 pF film dielectric trimmer
- C3 = 22 nF ceramic capacitor (63 V)
- C4 = 47 μ F/10 V electrolytic capacitor
- C5 = 56 pF ceramic capacitor (500 V)
- C6 = 47 μ F/35 V electrolytic capacitor
- C7 = C8 = 220 nF polyester capacitor
- C9 = 10 μ F/35 V electrolytic capacitor
- C10 = 10 to 210 pF film dielectric trimmer
- C11 = 15 to 575 film dielectric trimmer

- L1 = 3 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
- L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
- L4 = 11 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm
- L5 = 14 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

- R1 = 600 Ω ; parallel connection of 2 x 1,2 k Ω carbon resistors (\pm 5%; 0,5 W each)
- R2 = 15 Ω carbon resistor (\pm 5%; 0,25 W)
- R3 = 1,2 Ω parallel connection of 4 x 4,7 Ω carbon resistors (\pm 5%; 0,125 W each)
- R4 = 33 Ω carbon resistor (\pm 5%; 0,25 W)
- R5 = 18 Ω carbon resistor (\pm 5%; 0,25 W)
- R6 = 120 Ω wirewound resistor (\pm 5%; 5,5 W)
- R7 = 1 Ω carbon resistor (\pm 5%; 0,125 W)
- R8 = 47 Ω wirewound potentiometer (3 W)
- R9 = 1,57 Ω ; parallel connection of 3 x 4,7 Ω wirewound resistors (\pm 5%; 5,5 W each)

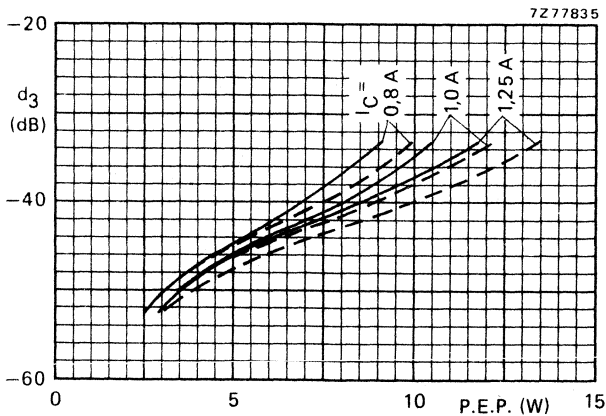


Fig. 9 Intermodulation distortion as a function of output power. Typical values; $V_{CE} = 26\text{ V}$; $f_1 = 28,000\text{ MHz}$; $f_2 = 28,001\text{ MHz}$; — $T_h = 70^\circ\text{C}$; - - - $T_h = 25^\circ\text{C}$.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

 $V_{CE} = 28 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} (%) at 25 W P.E.P.	I_C (A)	d_3 dB *	d_5 dB *	$I_{C(ZS)}$ mA	T_h °C
3 to 25 (P.E.P.)	typ. 21	typ. 45	typ. 1,0	typ. -30	< -30	25	25
3 to 22 (P.E.P.)	typ. 21	-	-	typ. -30	< -30	25	70

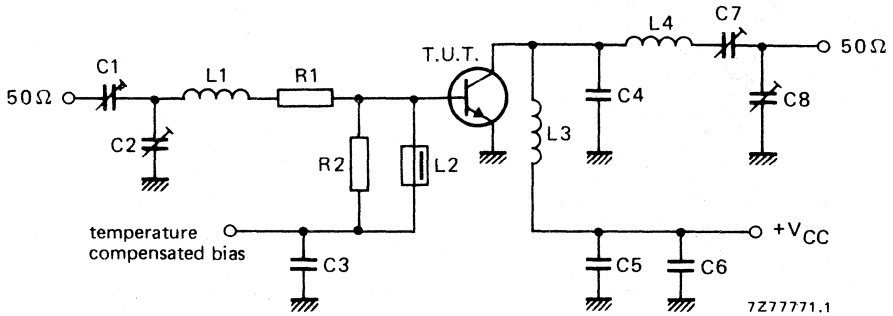


Fig. 10 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = C5 = C6 = 220 nF polyester capacitor

C4 = 56 pF ceramic capacitor (500 V)

C7 = C8 = 15 to 575 pF film dielectric trimmer

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm

L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm

L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω ; parallel connection of 4 x 4,7 Ω carbon resistorsR2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

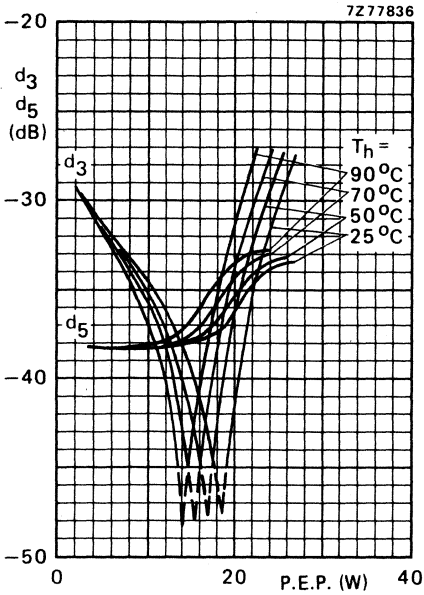


Fig. 11 Intermodulation distortion as a function of output power. *

Conditions for Fig. 11:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 25 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; typical values.

Conditions for Fig. 12:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 25 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25^\circ\text{C}$; typical values.

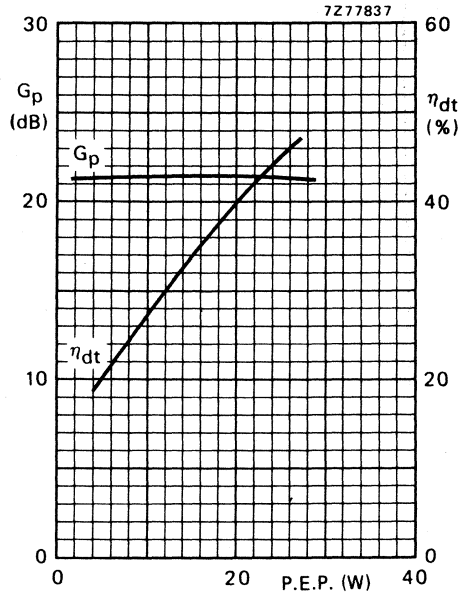


Fig. 12 Double-tone efficiency and power gain as a function of output power.

* See note on page 7.

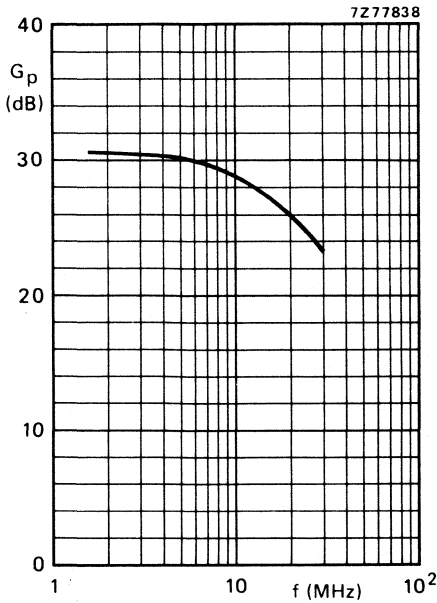


Fig. 13 Power gain as a function of frequency.

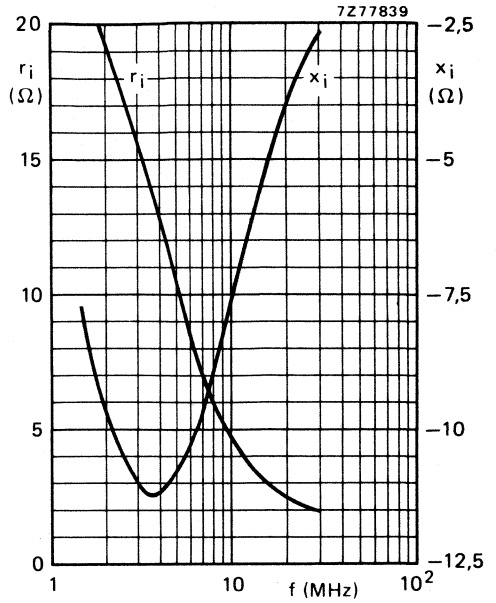


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 25 \text{ mA}$; $P_L = 25 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 12 \text{ } \Omega$.

Ruggedness in s.s.b. operation

The BLX13C is capable of withstanding a load mismatch (VSWR = 50) under the following conditions: $f_1 = 28,200 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $T_h = 70 \text{ }^\circ\text{C}$ and $P_{Lnom} = 30 \text{ W (P.E.P.)}$.

H.F./V.H.F. POWER TRANSISTOR

Silicon n-p-n power transistor for use in industrial and military s.s.b. and c.w. equipment operating in the h.f. and v.h.f. band:

- rated for 50 W P.E.P. at 1,6 MHz to 28 MHz (intermodulation distortion better than 30 dB down); full load mismatch permissible at stud temperatures up to 70 °C
- rated at 50 W for frequencies up to 70 MHz in c.w. operation
- supply voltage 28 V
- plastic stripline package

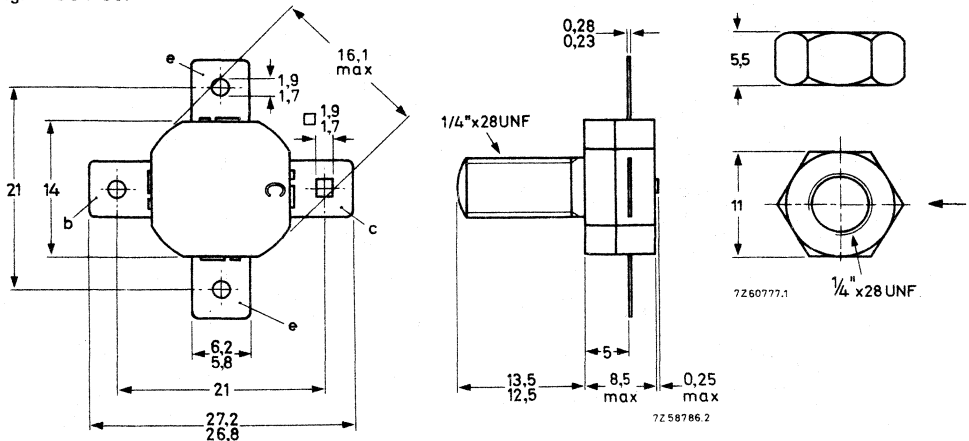
QUICK REFERENCE DATA

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	d_3 dB	$I_C(ZS)$ A
s.s.b. (class-A)	28	1,6 to 28	15 (P.E.P.)	> 13	typ. -40	2,0
s.s.b. (class-AB)	28	1,6 to 28	7,5-50 (P.E.P.)	> 13	< -30	0,1
c.w. (class-B)	28	70	50	> 7,5		
c.w. (class-B)	28	30	50	typ. 16		

MECHANICAL DATA

Fig. 1 SOT-55.

Dimensions in mm



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

Diameter of clearance hole in heatsink: max. 6,5 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

BLX14

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter)
peak value V_{CBOM} max. 85 V

Collector-emitter voltage ($R_{BE} = 10 \Omega$)
peak value V_{CERM} max. 85 V

Collector-emitter voltage (open base) V_{CEO} max. 36 V

Emitter-base voltage (open collector) V_{EBO} max. 4.0 V

Currents

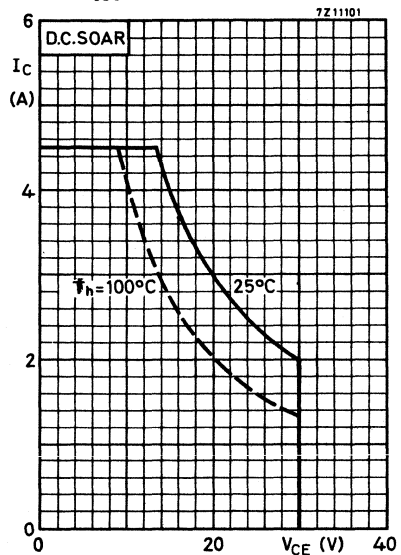
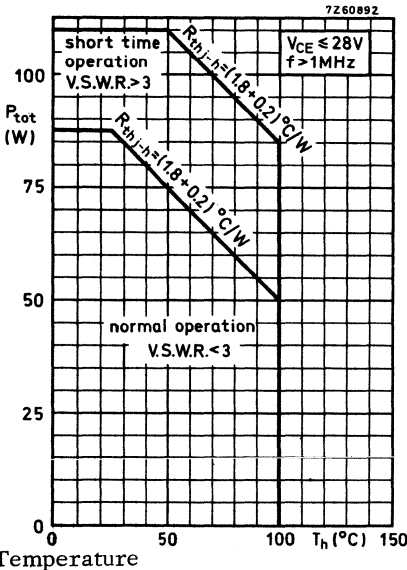
Collector current (average) I_{CAV} max. 4.0 A

Collector current (peak value) $f > 1$ MHz I_{CM} max. 12 A

Power dissipation

Total power dissipation up to $T_h = 25^\circ\text{C}$
 $f > 1$ MHz

P_{tot} max. 88 W



Temperature

Storage temperature

Operating junction temperature

T_{stg} -65 to +200 $^\circ\text{C}$

T_j max. +200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base

From mounting base to heatsink

$R_{th(j-mb)}$ = 1.8 $^\circ\text{C/W}$

$R_{th(mb-h)}$ = 0.2 $^\circ\text{C/W}$

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

CHARACTERISTICS

Breakdown voltages

Collector-base voltage open emitter; $I_C = 25\text{ mA}$	$V_{(BR)CBO}$	>	85	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$; $I_C = 25\text{ mA}$	$V_{(BR)CER}$	>	85	V
Collector-emitter voltage open base; $I_C = 50\text{ mA}$	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	4.0	V

Collector-emitter saturation voltage

$I_C = 0.7\text{ A}$; $I_B = 0.14\text{ A}$	V_{CEsat}	<	1.0	V
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Transient energy

$L = 25\text{ mH}$; $f = 50\text{ Hz}$

open base	E	>	8	mWs
$-V_{BE} = 1.5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	8	mWs

D.C. current gain

$I_C = 1.4\text{ A}$; $V_{CE} = 6\text{ V}$	h_{FE}		15 to 100	
--	----------	--	-----------	--

Transition frequency

$I_C = 3.0\text{ A}$; $V_{CE} = 10\text{ V}$	f_T	typ.	250	MHz
---	-------	------	-----	-----

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 30\text{ V}$	C_c	typ.	115	pF
		<	125	pF

Feedback capacitance at $f = 1\text{ MHz}$

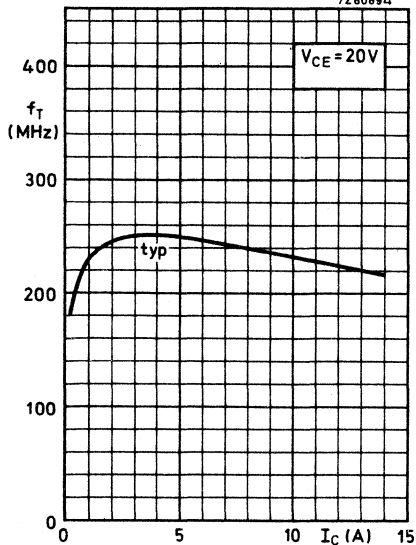
$I_C = 100\text{ mA}$; $V_{CE} = 30\text{ V}$	C_{re}	typ.	90	pF
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Collector-stud capacitance

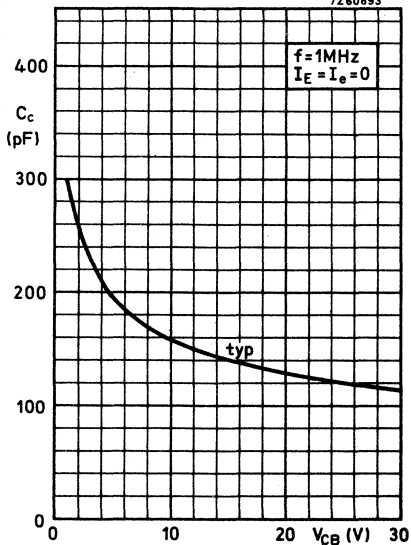
	C_{cs}	typ.	3.5	pF
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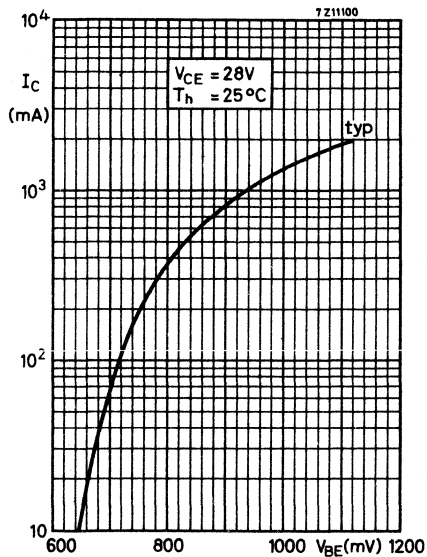
7Z60894



7Z60893



7Z11100



APPLICATION INFORMATION

R.F. performance in S.S.B. operation (linear power amplifier)

$V_{CC} = 28 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$

$f_1 = 28.000 \text{ MHz}$; $f_2 = 28.001 \text{ MHz}$

output power (W)	G_p (dB)	η_{dt} (%)	d_3 (dB) ¹⁾	d_5 (dB) ¹⁾	I_{CZS} (A)	I_C (A)	Class
7.5 to 50 (PEP)	>13	>35	< -30	< -30	0.1	<2.55	AB

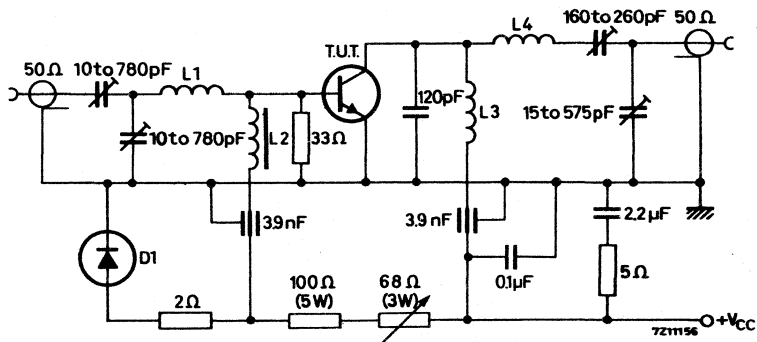
At temperatures up to $90 \text{ }^\circ\text{C}$ the output power relative to that at $25 \text{ }^\circ\text{C}$ is diminished by a factor $-40 \text{ mW}/^\circ\text{C}$

The transistor is designed to withstand a full load mismatch operating under 50 W PEP at $V_{CC} = 28 \text{ V}$ and $T_h = 70 \text{ }^\circ\text{C}$

Test circuit:

S.S.B.

class A-B



D1 = AYY10/120

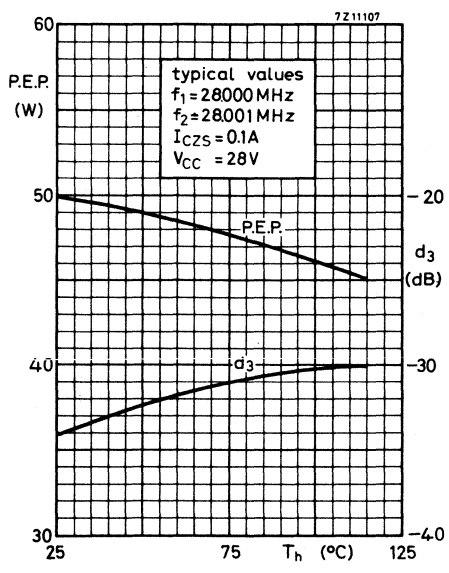
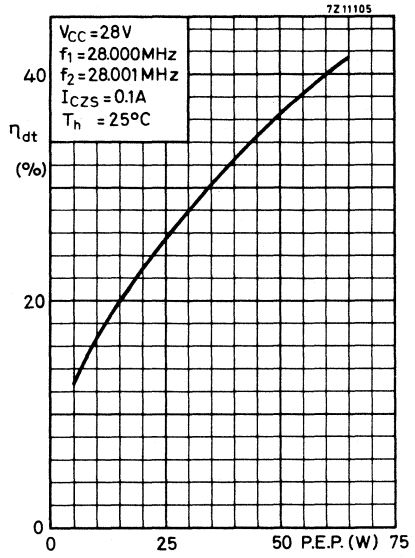
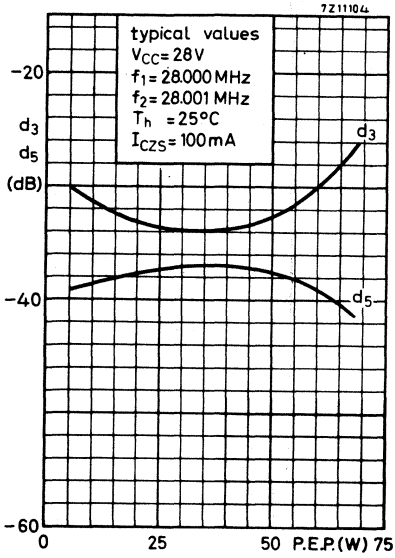
L1 = 3 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 7 mm leads 50 mm totally

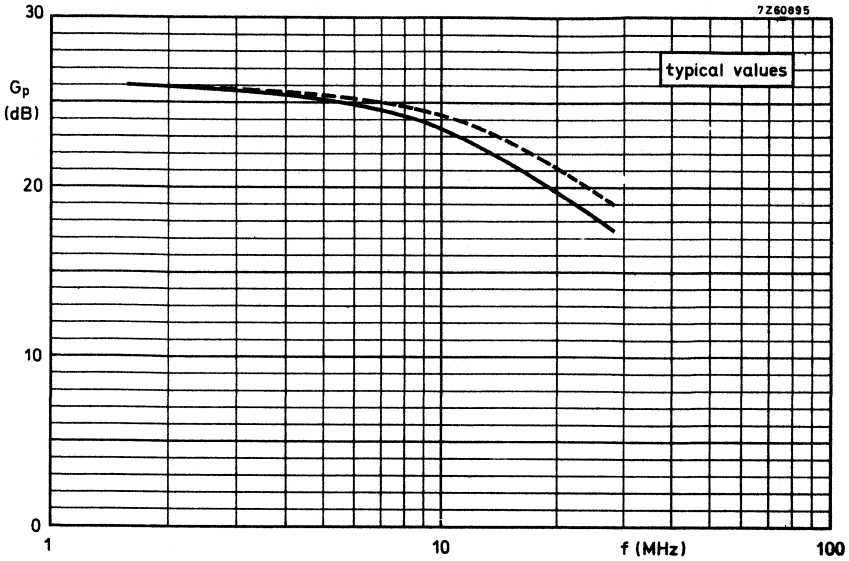
L2 = 7 turns enamelled Cu wire (0.7 mm) on 3H1 toroid; $60 \mu\text{H}$ (code number of 3H1: 4322 020 36620)

L3 = 4 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 10mm

L4 = 7 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 12mm

¹⁾ Stated figures are maxima encountered at any driving level between the specified values of PEP and are referred to the according level of either of the equal ampl. tones. Relative to the according peak envelope power these figures should be increased by 6 dB.



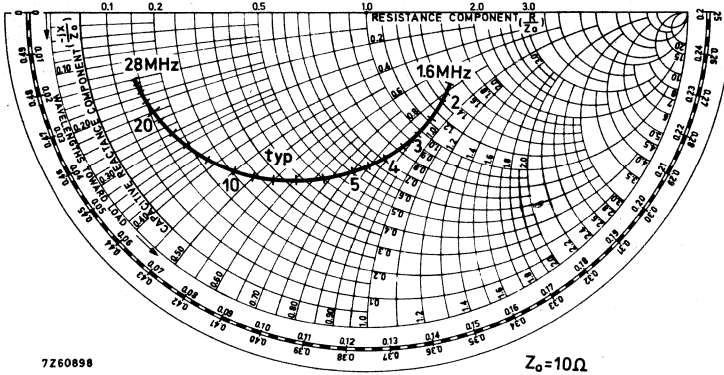
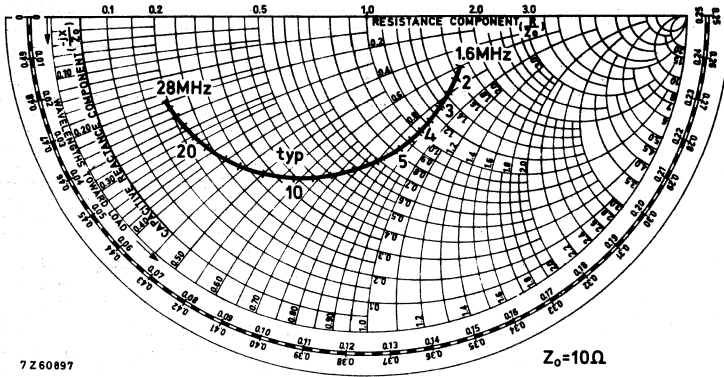


S.S.B. class AB operation

$P_L = 50 \text{ W PEP}$
 $V_{CC} = 28 \text{ V}$
 $I_C = 100 \text{ mA}$
 $Z_L = 6.25 \Omega$
 $T_h = 25 \text{ }^\circ\text{C}$

The drawn curve holds for an unneutralized amplifier.

The dashed curve holds for a push-pull amplifier with cross neutralization.
 Collector-base neutralizing capacitor: 82 pF



S.S.B. class AB operation

- $P_L = 50$ W PEP
- $V_{CC} = 28$ V
- $I_C = 100$ mA
- $Z_L = 6.25 \Omega$
- $T_h = 25$ °C

The upper graph holds for a push-pull amplifier with cross neutralization.
Collector-base neutralizing capacitor: 82 pF

The lower graph holds for an unneutralized amplifier.

APPLICATION INFORMATION (continued)

R. F. performance in s. s. b. operation (linear power amplifier)

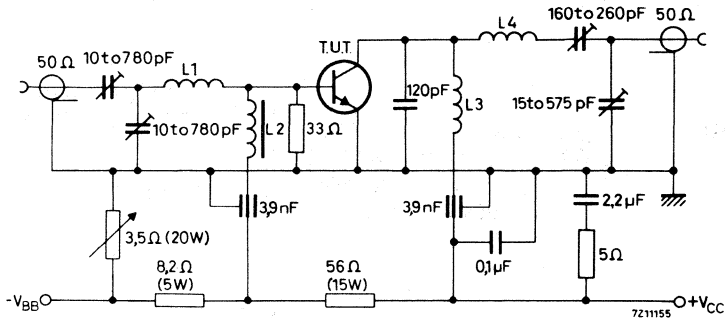
$V_{CC} = 28 \text{ V}$; T_h up to 25°C

$f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power (W)	G_p (dB)	d_3 (dB) ¹⁾	d_5 (dB) ¹⁾	I_C (A)	Class
15 PEP	> 13	typ. -40	typ. -45	2,0	A

Test circuit:

S.S.B. class-A

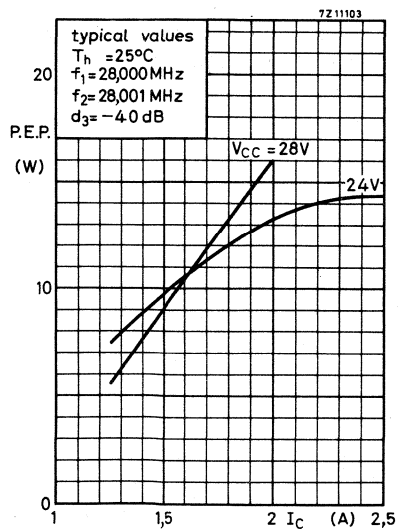
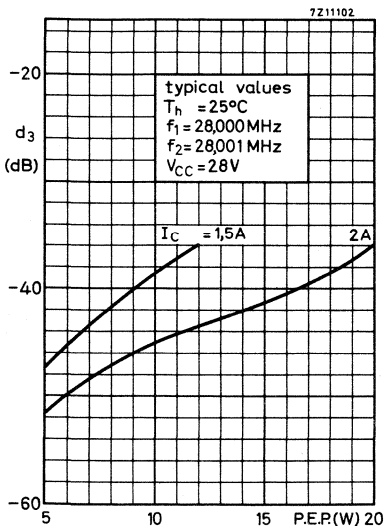


L1 = 3 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 7 mm leads 50 mm totally

L2 = 7 turns enamelled Cu wire (0,7 mm) on 3H1 toroid; 60 μH (code number of 3H1: 4322 020 36620)

L3 = 4 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 10 mm

L4 = 7 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 12 mm



APPLICATION INFORMATION

R. F. performance in c. w. operation (class B)

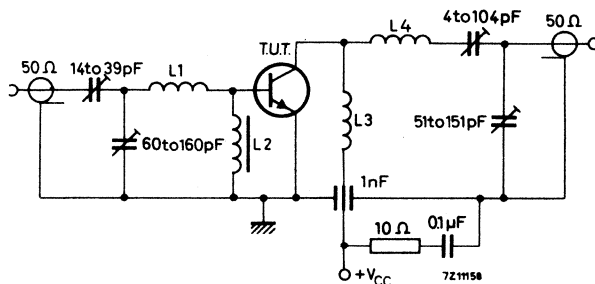
$V_{CC} = 28 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
70	< 8.9	50	< 3.25	> 7.5	> 55	$1.0 + j0.2$	$120 - j75$
50	typ. 4	50	typ. 3.25	typ. 11	typ. 55	-	-
30	typ. 1.2	50	typ. 3.25	typ. 16	typ. 55	-	-

At temperatures up to $90 \text{ }^\circ\text{C}$ the output power relative to that at $25 \text{ }^\circ\text{C}$ is diminished by a factor $-40 \text{ mW}/^\circ\text{C}$.

Test circuit :

C.W.
70 MHz

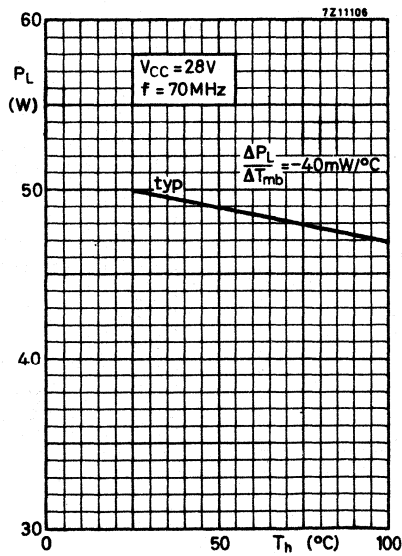
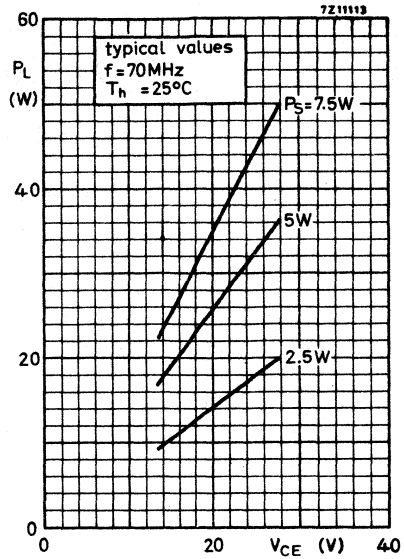
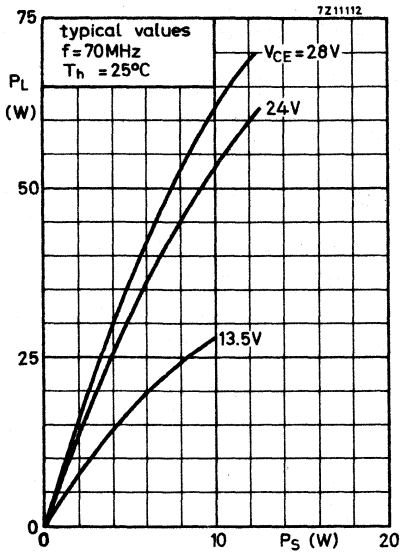


L1 = 60 mm straight enamelled Cu wire (1.5 mm); 9 mm above chassis

L2 = FXC choke coil (code number 4322 020 36640)

L3 = 2 turns enamelled Cu wire (1.5 mm); winding pitch 2 mm; internal diam. 10 mm;
leads 55 mm totally

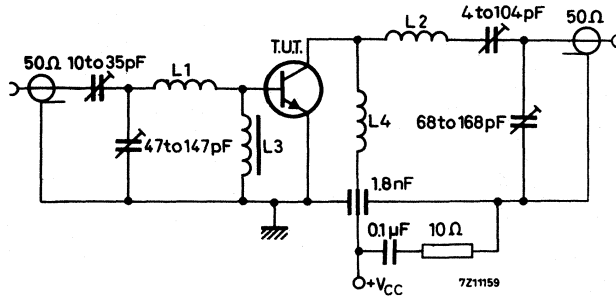
L4 = 3 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; internal diam. 10 mm;
leads 50 mm totally



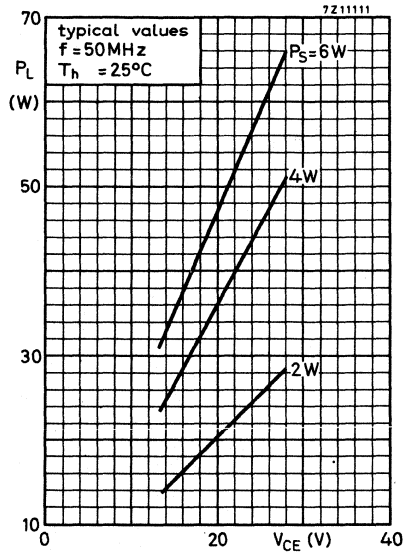
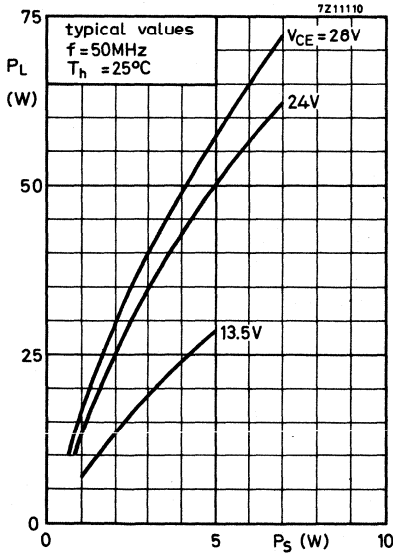
APPLICATION INFORMATION (continued)

Test circuit:

C.W.
50 MHz



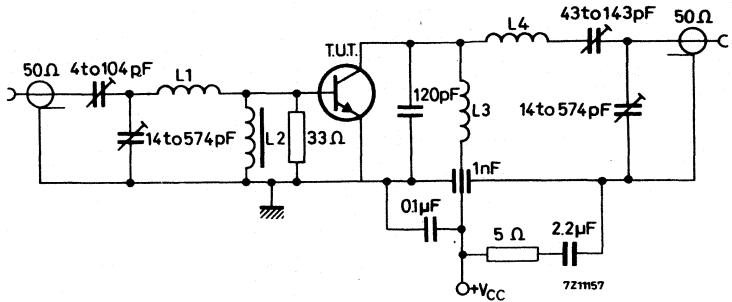
- L1 = 1 turn enamelled Cu wire (1.5 mm); int. diam. 10 mm; leads 40 mm totally
- L2 = 4 turns enamelled Cu wire (1.5 mm); int. diam. 12 mm; leads 40 mm totally winding pitch 2 mm
- L3 = FXC choke coil (code number 4322 020 36640)
- L4 = 3 turns enamelled Cu wire (1.5 mm); int. diam. 10 mm; leads 40 mm totally winding pitch 2 mm



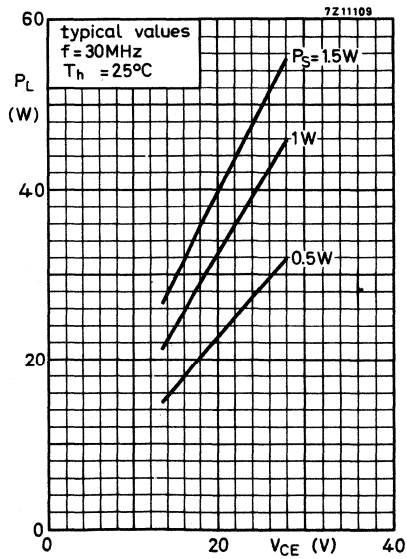
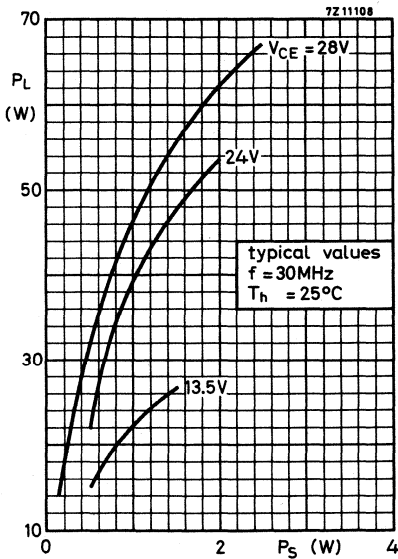
APPLICATION INFORMATION (continued)

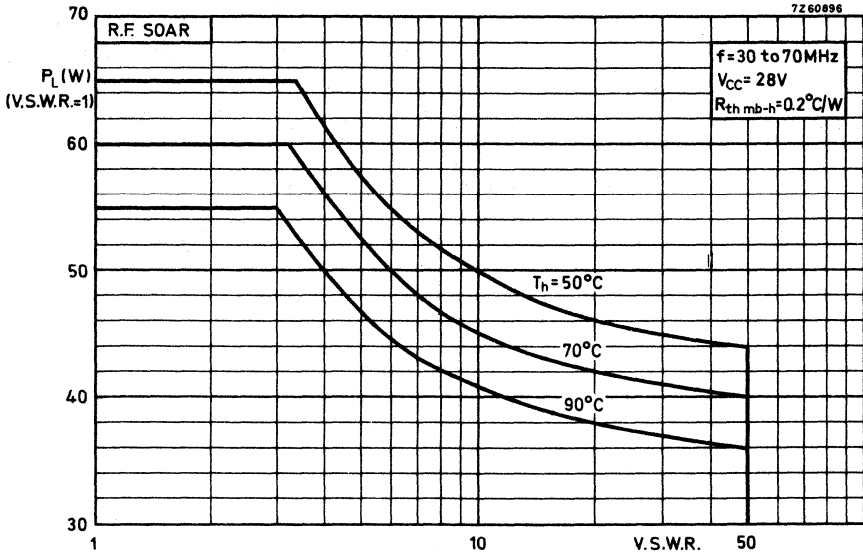
Test circuit :

C.W.
30 MHz



- L1 = 2 turns enamelled Cu wire (1.5 mm); winding pitch 2 mm; int. diam. 10 mm leads 60 mm totally
- L2 = 7 turns enamelled Cu wire (0.7 mm) on 3H1 toroid; 60 μ H (code number of 3H1: 4322 020 36620)
- L3 = 4 turns enamelled Cu wire (1.5 mm); winding pitch 2 mm; int. diam. 10 mm leads 50 mm totally
- L4 = 6 turns enamelled Cu wire (1.5 mm); winding pitch 2 mm; int. diam. 12 mm leads 50 mm totally

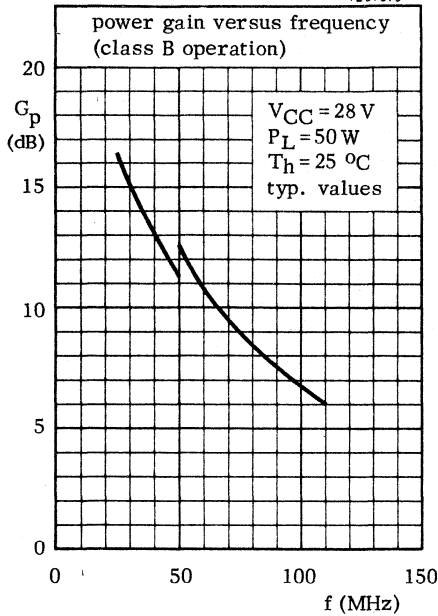




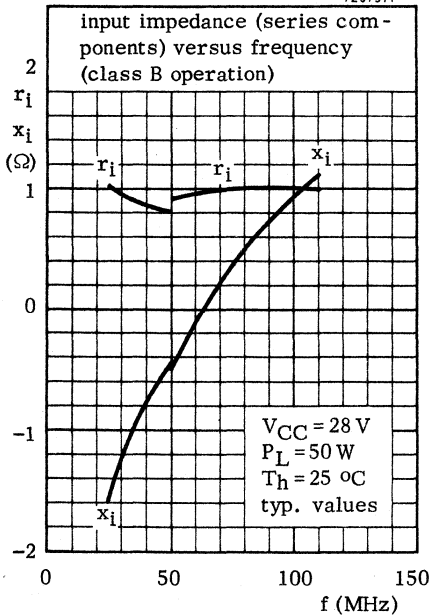
For high voltage operation, a stabilized power supply is generally used. The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heatsink temperature as parameter.

OPERATING NOTE Below 50 MHz a base-emitter resistor of $6,8 \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.

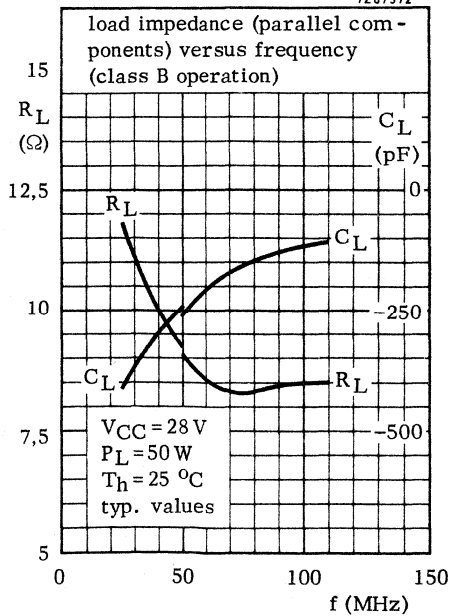
7Z67570



7Z67571



7Z67572



H.F./V.H.F. POWER TRANSISTOR

Silicon n-p-n power transistor for use in industrial and military s.s.b. and c.w. equipment operating in the h.f. and v.h.f. band:

- rated for 150 W P.E.P. at 1,6 MHz to 28 MHz
(intermodulation distortion better than 30 dB down)
- rated at 150 W output power for frequencies up to 108 MHz in c.w. operation
- supply voltage up to 50 V
- plastic encapsulated stripline package
- delivered in matched h_fE groups

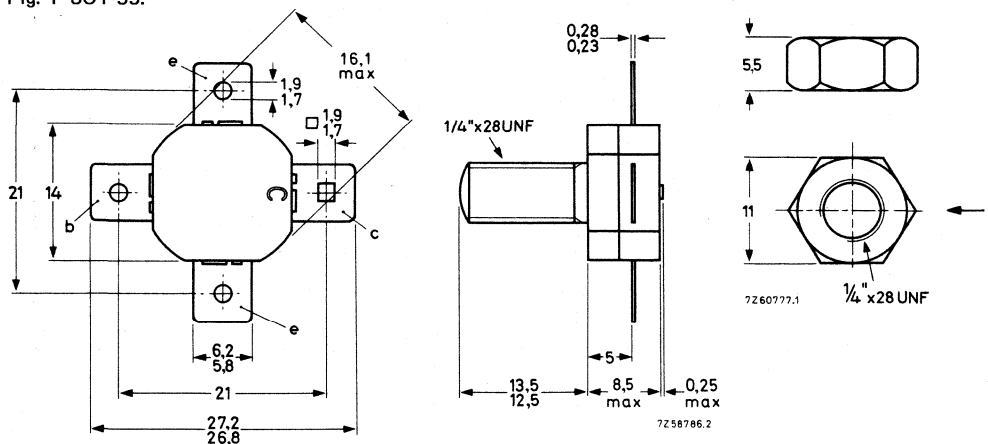
QUICK REFERENCE DATA

mode of operation	V _{CE} V	f MHz	P _L W	G _p dB	d ₃ dB	I _C (ZS) A
s.s.b. (class-AB)	50	1,6 to 28	20 to 150 (P.E.P.)	> 14	< -30	0,10
s.s.b. (class-A)	40	1,6 to 28	typ. 30 (P.E.P.)	> 14	< -40	2,5
c.w. (class-B)	50	70	150	> 10	-	-
c.w. (class-B)	50	108	150	typ. 7,5	-	-

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-55.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

Diameter of clearance hole in heatsink: max. 6,5 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

BLX15

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter)
peak value

V_{CBOM} max. 110 V

Collector-emitter voltage ($R_{BE} = 10\Omega$)
peak value

V_{CERM} max. 110 V

Collector-emitter voltage (open base)

V_{CEO} max. 53 V

Emitter-base voltage (open collector)

V_{EBO} max. 4,0 V

Currents

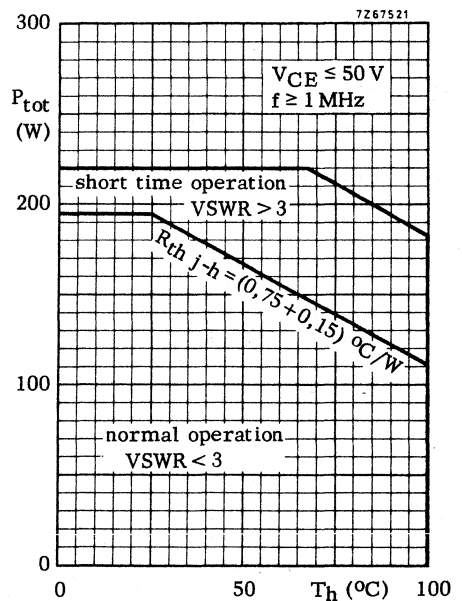
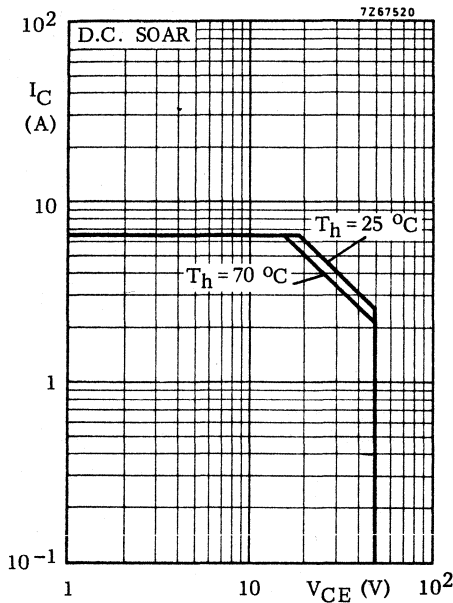
Collector current (average)

$I_{C(AV)}$ max. 6,5 A

Collector current (peak value) $f > 1$ MHz

I_{CM} max. 20 A

Power dissipation



Temperatures

Storage temperature

T_{stg} -65 to +200 °C

Junction temperature

T_j max. 200 °C

THERMAL RESISTANCE

From junction to mounting base

$R_{th j-mb} = 0,75$ °C/W

From mounting base to heatsink

$R_{th mb-h} = 0,15$ °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter ; $I_C = 100\text{ mA}$	$V_{(BR)CBO}$	>	110	V
Collector-emitter voltage $R_{BE} = 5\ \Omega$; $I_C = 100\text{ mA}$	$V_{(BR)CER}$	>	110	V
Collector-emitter voltage open base ; $I_C = 100\text{ mA}$	$V_{(BR)CEO}$	>	53	V
Emitter-base voltage open collector; $I_E = 20\text{ mA}$	$V_{(BR)EBO}$	>	4,0	V

Transient energy

$L = 25\text{ mH}$; $f = 50\text{ Hz}$

open base	E	>	12,5	mWs
$-V_{BE} = 1,5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	12,5	mWs

D.C. current gain

$I_C = 1,4\text{ A}$; $V_{CE} = 6\text{ V}$	h_{FE}		15 to 50	
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D.C. current gain ratio of matched devices

$I_C = 1,4\text{ A}$; $V_{CE} = 6\text{ V}$	h_{FE1}/h_{FE2}	<	1,2	
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Transition frequency

$I_C = 6,0\text{ A}$; $V_{CE} = 35\text{ V}$	f_T	typ.	275	MHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 50\text{ V}$	C_c	typ.	185	pF
		<	220	pF

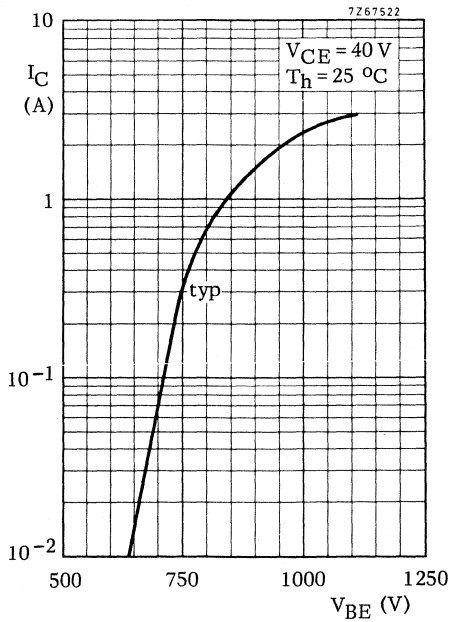
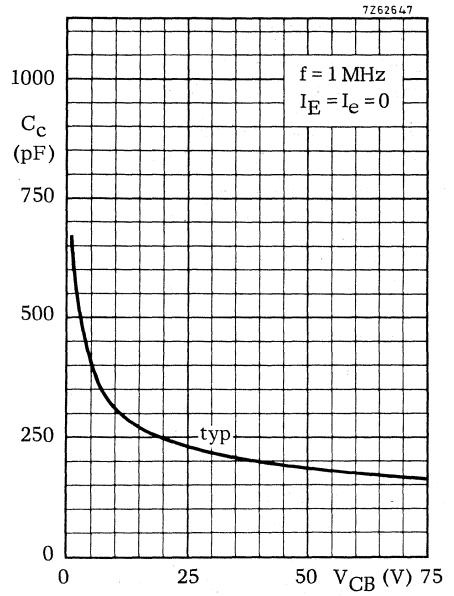
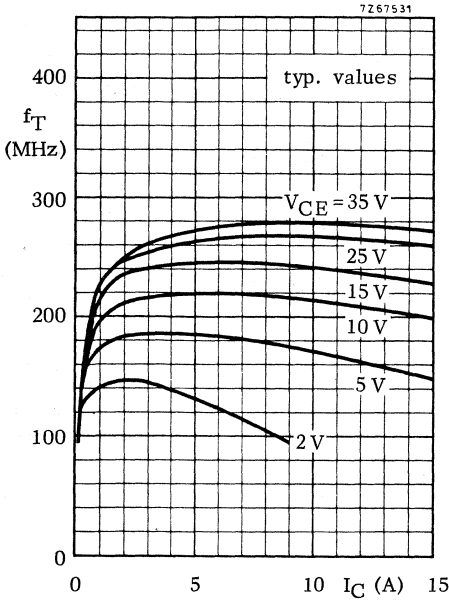
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 150\text{ mA}$; $V_{CE} = 50\text{ V}$	C_{re}	typ.	115	pF
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Collector-stud capacitance

	C_{CS}	typ.	3,5	pF
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APPLICATION INFORMATION

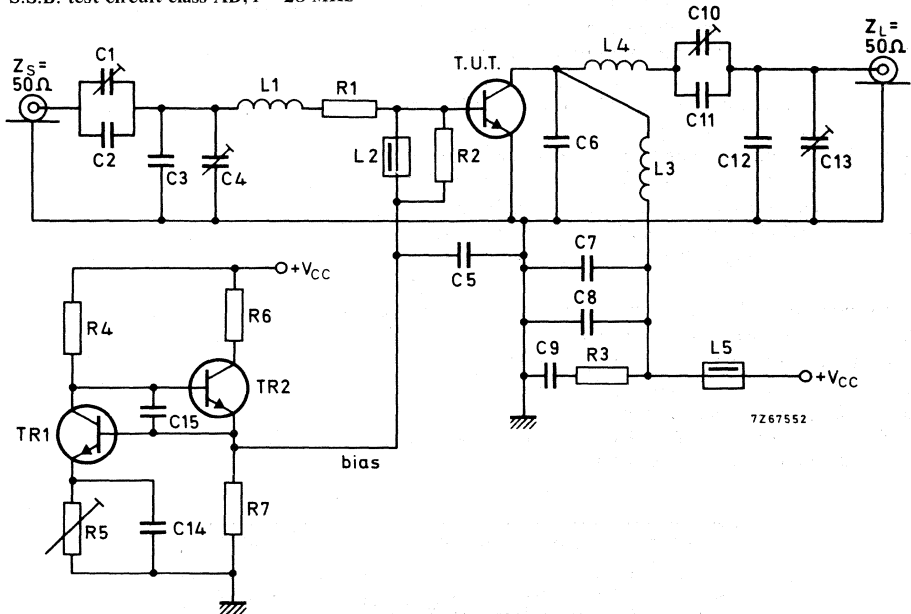
R.F. performance in s.s.b. operation (linear power amplifier)

T_h up to 25 °C

$f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz

output power (W)	G_p (dB)	η_{dt} (%)	d_3 (dB) 1)	d_5 (dB) 1)	I_{CZS} (A)	I_C (A)	V_{CE} (V)	Class
20 to 150 (PEP)	> 14	> 37.5	< -30	< -30	0,10	< 4	50	AB
typ. 30 (PEP)	> 14	typ. 15	< -40	< -40	2,5	-	40	A

S.S.B. test circuit class AB; $f = 28$ MHz



List of components: see page 6.

1) Stated figures are maxima encountered at any driving level between the specified values of PEP and are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope power these figures should be increased by 6dB.

APPLICATION INFORMATION (continued)

List of components:

Tr1 = BD135

Tr2 = BD228

C1 = C10 = 100 pF air dielectric capacitor (single insulated rotor type)

C2 = C6 = 27 pF ceramic capacitor

C3 = 180 pF ceramic capacitor

C4 = C13 = 100 pF air dielectric capacitor (single non-insulated rotor)

C5 = C7 = 3,9 nF polyester capacitor ($\pm 10\%$)

C8 = C14 = C15 = 100 nF polyester capacitor ($\pm 10\%$)

C9 = 2,2 μ F moulded metallized polyester capacitor

C11 = 68 pF ceramic capacitor

C12 = 220 pF ceramic capacitor

L1 = 88 nH; 3 turns Cu wire (1,0 mm); internal diameter 9 mm; coil length 6,1 mm; leads 2 x 5 mm

L2 = L5 = ferroxcube bead, grade 3B (code number 4312 020 36640)

L3 = 180 nH; 4 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 9,9 mm; leads 2 x 10 mm

L4 = 350 nH; 7 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 19,1 mm; leads 2 x 10 mm

R1 = 0,66 Ω parallel connection of 5 x 3,3 Ω carbon resistors ($\pm 5\%$; 0,5 W each)

R2 = 27 Ω carbon resistor ($\pm 5\%$; 0,5 W)

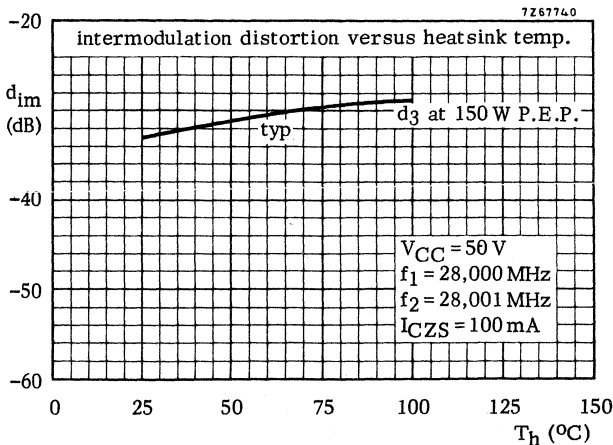
R3 = 4,7 Ω carbon resistor ($\pm 5\%$; 0,5 W)

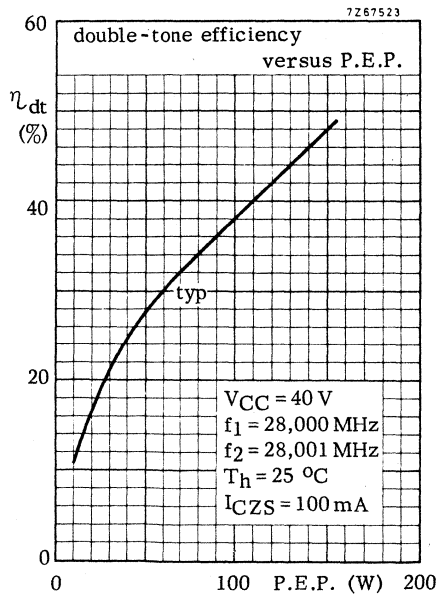
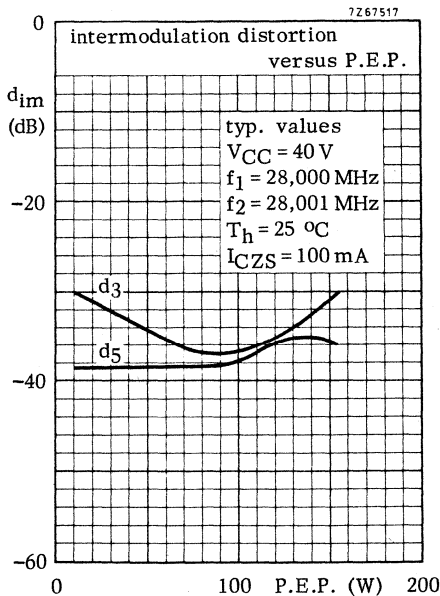
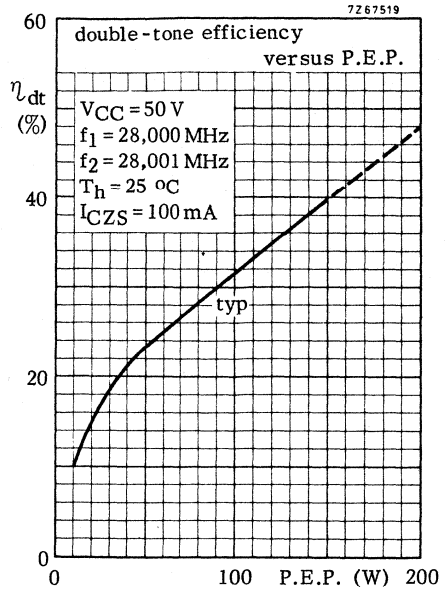
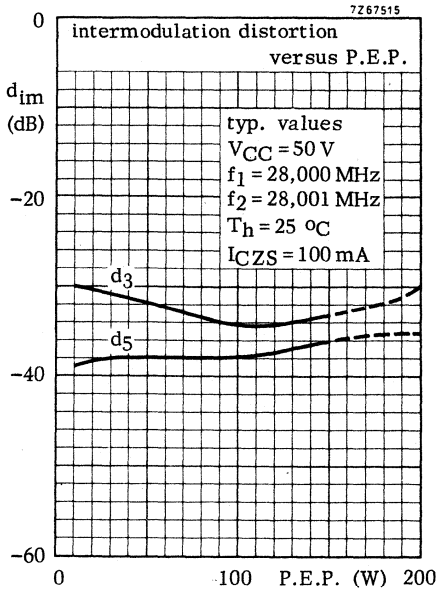
R4 = 5,6 k Ω carbon resistor ($\pm 5\%$; 1 W)

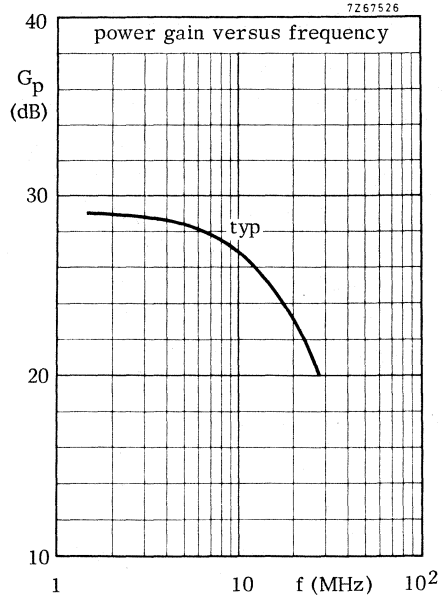
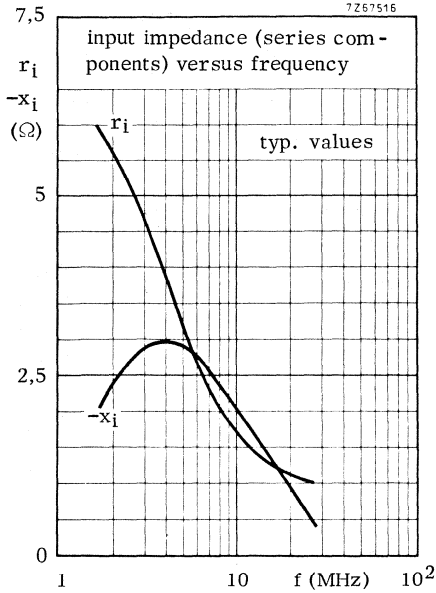
R5 = 15 Ω wire-wound potentiometer (3W)

R6 = 157 Ω parallel connection of 3 x 470 Ω wire-wound resistors (5,5W each)

R7 = 68 Ω carbon resistor ($\pm 5\%$; 0,5 W)







S.S.B. class AB operation

$P_L = 150 \text{ W (PEP)}$

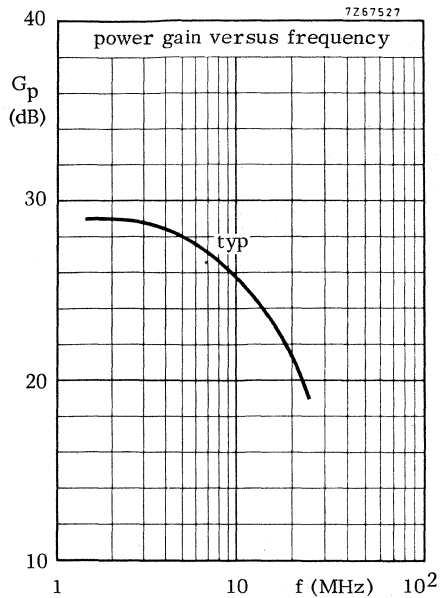
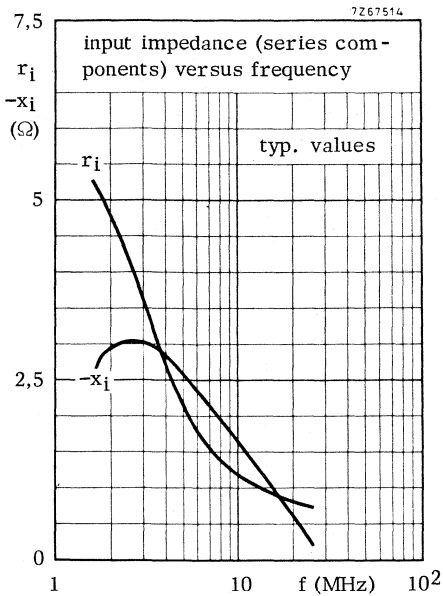
$V_{CC} = 50 \text{ V}$

$I_{CZS} = 100 \text{ mA}$

$T_h = 25 \text{ }^\circ\text{C}$

$Z_L = 6,25 \Omega$ in series with 10,4 nH (in parallel with -267 pF)

The graphs hold for one transistor of a push-pull amplifier with cross neutralization; collector (Tr1) - base (Tr2), neutralizing capacitor: 82 pF.



S.S.B. class AB operation

$P_L = 150$ W (PEP)

$V_{CC} = 50$ V

$I_{CZS} = 100$ mA

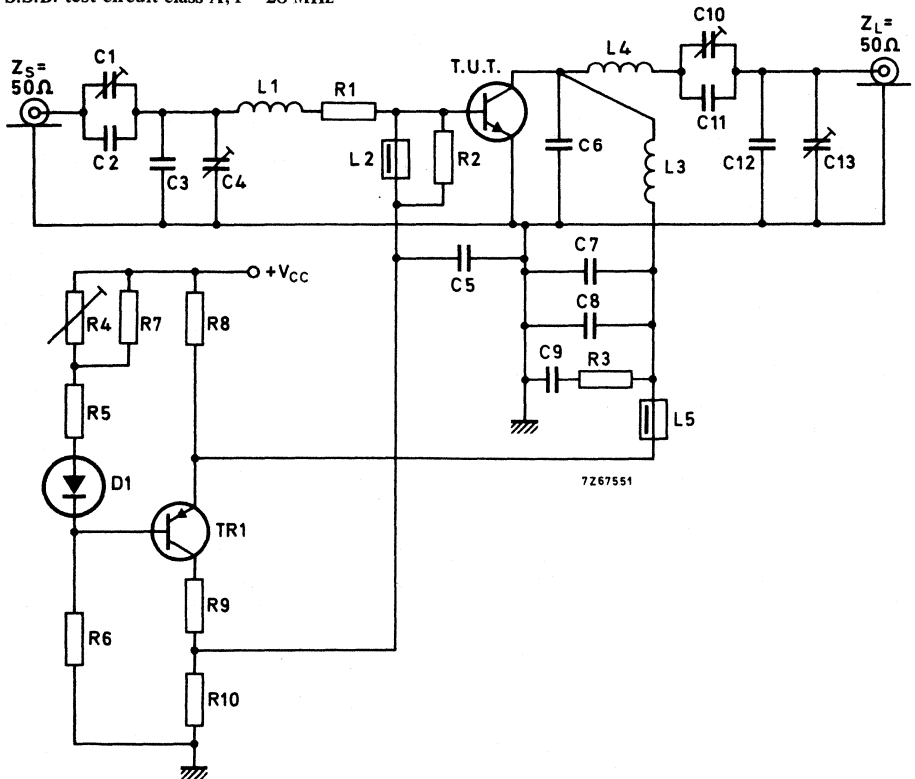
$T_h = 25$ °C

$Z_L = 6,25 \Omega$ in series with 7,3 nH (in parallel with -188 pF)

The graphs hold for an unneutralized amplifier.

APPLICATION INFORMATION (continued)

S.S.B. test circuit class-A; $f = 28 \text{ MHz}$



List of components: (see also page 11)

D1 = BY206

TR1 = BD204

C1 - C10 = 100 pF air dielectric capacitor (single insulated rotor type)

C2 = C6 = 27 pF ceramic capacitor

C3 = 180 pF ceramic capacitor

C4 = C13 = 100 pF air dielectric capacitor (single non-insulated rotor)

C5 = C7 = 3,9 nF polyester capacitor ($\pm 10\%$)

C8 = 100 nF polyester capacitor ($\pm 10\%$)

C9 = 2,2 μF moulded metallized polyester capacitor

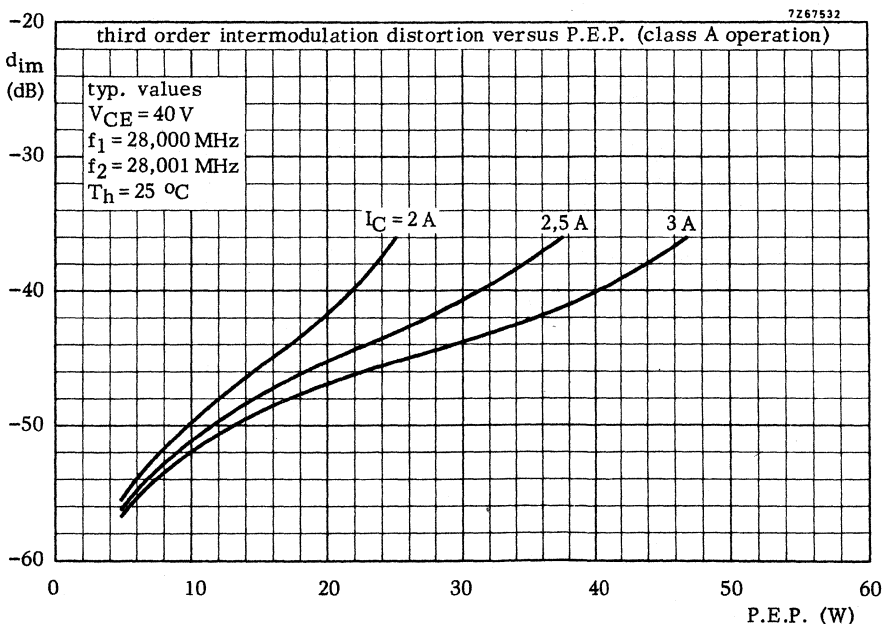
C11 = 68 pF ceramic capacitor

C12 = 220 pF ceramic capacitor

APPLICATION INFORMATION (continued)

List of components: (continued)

- L1 = 88 nH; 3 turns Cu wire (1,0 mm); internal diameter 9 mm; coil length 6,1 mm; leads 2 x 5 mm
- L2 = L5 = ferroxcube bead, grade 3B (code number 4312 020 36440)
- L3 = 180 nH; 4 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 9,9 mm; leads 2 x 10 mm
- L4 = 350 nH; 7 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 19,1 mm; leads 2 x 10 mm
- R1 = 0,66 Ω parallel connection of 5 x 3,3 Ω carbon resistors ($\pm 5\%$; 0,5 W each)
- R2 = 27 Ω carbon resistor ($\pm 5\%$; 0,5 W)
- R3 = 4,7 Ω carbon resistor ($\pm 5\%$; 0,5 W)
- R4 = 50 Ω wire-wound potentiometer (1 W)
- R5 = 10 Ω carbon resistor ($\pm 5\%$; 1 W)
- R6 = 560 Ω enamelled wire-wound resistor (5,5 W)
- R7 = 270 Ω carbon resistor ($\pm 5\%$; 1 W)
- R8 = 0,6 Ω parallel connection of 3 x 1,8 Ω wire-wound resistors (8 W each)
- R9 = 90 Ω parallel connection of 3 x 270 Ω enamelled wire-wound resistor (5,5 W each)
- R10 = 12 Ω carbon resistor ($\pm 5\%$; 1 W)



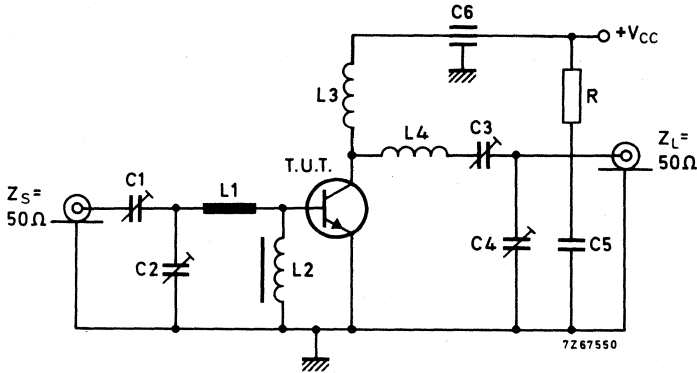
APPLICATION INFORMATION (continued)

R.F. performance in c.w. operation (class-B circuit)

$V_{CE} = 50 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)
70	< 15	150	< 4,6	> 10	> 65
108	typ. 30	150	typ. 4,0	typ. 7,5	typ. 75

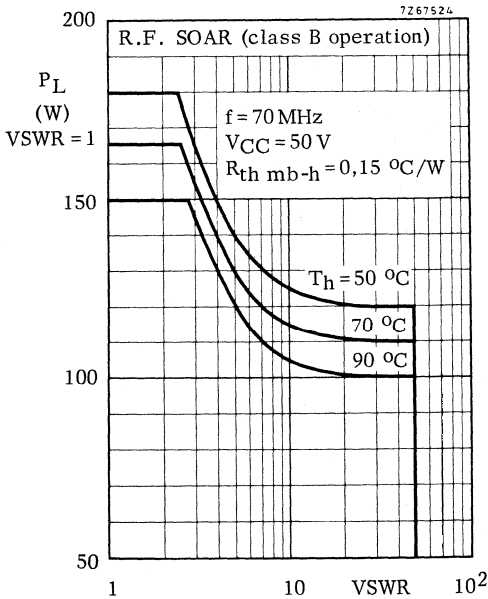
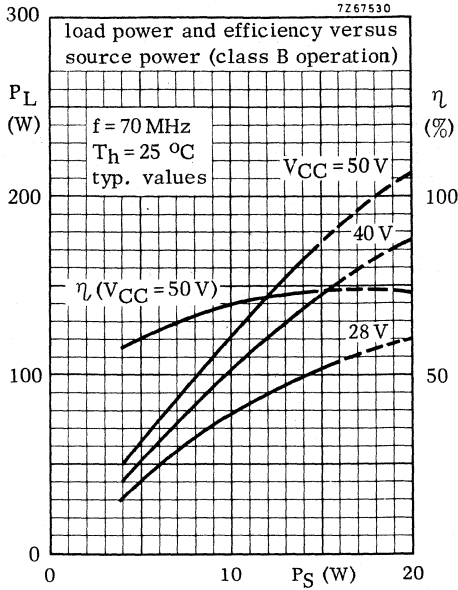
Test circuit: 70 MHz; c.w. class-B.



List of components:

- L1 = 60 mm straight enamelled Cu wire (1,6 mm); 9 mm above chassis
- L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
- L3 = 18 turns enamelled Cu wire (1,6 mm); internal diameter 10 mm; pitch 2 mm; leads 55 mm totally
- L4 = 3 turns enamelled Cu wire (1,6 mm); internal diameter 10 mm; pitch 2,5 mm; leads 50 mm totally
- C1 = 4 to 29 pF concentric air trimmer in parallel with 10 pF ceramic capacitor
- C2 = 4 to 104 pF film dielectric trimmer in parallel with 56 pF ceramic capacitor
- C3 = 4 to 104 pF film dielectric trimmer
- C4 = 4 to 104 pF film dielectric trimmer in parallel with 47 pF ceramic capacitor
- C5 = 100 nF polyester capacitor ($\pm 10\%$)
- C6 = 1 nF ceramic feed-through capacitor
- R = 10 Ω carbon resistor (0,5 W)

At $P_L = 150 \text{ W}$ and $V_{CE} = 50 \text{ V}$, the output power at heatsink temperatures between $25 \text{ }^\circ\text{C}$ and $75 \text{ }^\circ\text{C}$ relative to that at $25 \text{ }^\circ\text{C}$ is diminished by $100 \text{ mW}/^\circ\text{C}$.



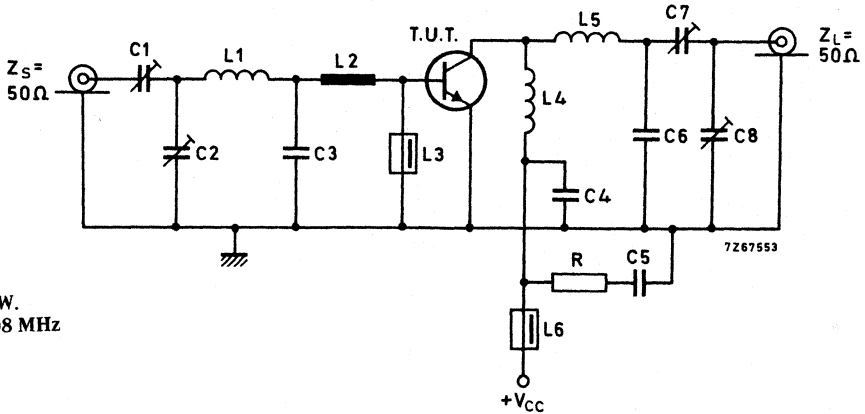
Indicated load power as a function of overload.

The graph has been derived from an evaluation of the performance of transistors matched up to 180 W load power in the test amplifier on page 12 and subsequently subjected to various mismatch conditions at 50 V with VSWR up to 50 and elevated heatsink temperatures.

This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

APPLICATION INFORMATION (continued)

Test circuit:



C.W.
108 MHz

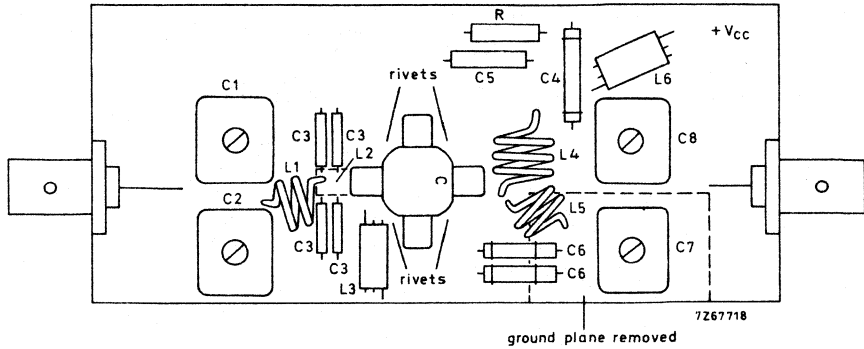
List of components:

- C1 = C2 = 40 pF film dielectric trimmer
- C3 = 400 pF parallel connection of 4 x 100 pF ceramic capacitors
- C4 = 270 pF ceramic capacitor
- C5 = 100 nF polyester capacitor ($\pm 10\%$)
- C6 = 20 pF parallel connection of 2 x 10 pF ceramic capacitors
- C7 = C8 = 60 pF film dielectric trimmer
- L1 = 49 nH; 2 turns enamelled Cu wire (1,5 mm); internal diameter 9 mm; coil length 4,8 mm; leads 2 x 5 mm
- L2 = strip-line (7,7 mm x 6 mm); tap for C3 is 7,5 mm from transistor edge
- L3 = L6 = ferrocube bead, grade 3B (code number 4312 020 36640)
- L4 = 67 nH; 3 turns enamelled Cu wire (1,5 mm); internal diameter 8 mm; coil length 8,3 mm; leads 2 x 5 mm
- L5 = 57 nH; 2 turns enamelled Cu wire (1,5 mm); internal diameter 10 mm; coil length 4,5 mm; leads 2 x 5 mm
- R = 10 Ω carbon resistor (0,5 W)

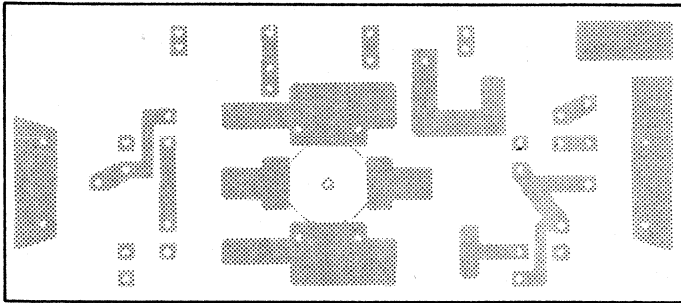
Component lay-out for 108 MHz test circuit see page 15.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 108 MHz test circuit.



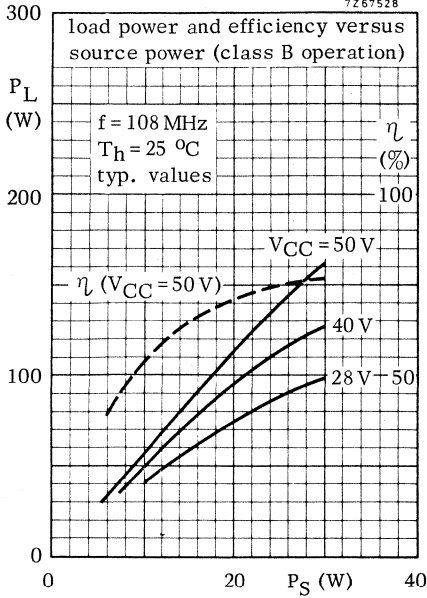
Dimensions of printed circuit board 123 mm x 55 mm.



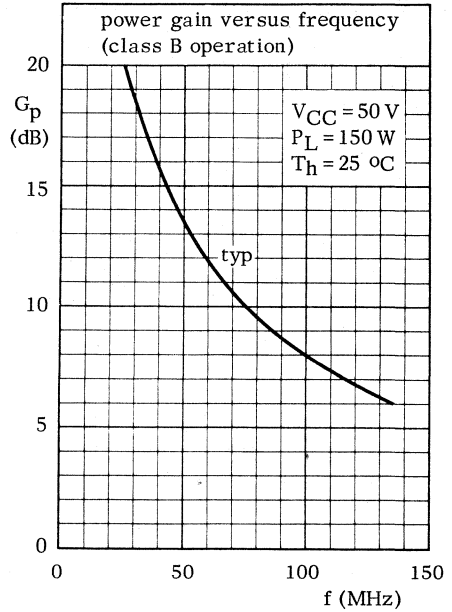
7Z67664

The circuit has been built on epoxy fibre-glass double copper clad printed circuit board (thickness 1/16"). To minimize the dielectric losses, the ground plane under the interconnection of L5, C6 and C7 has been removed.

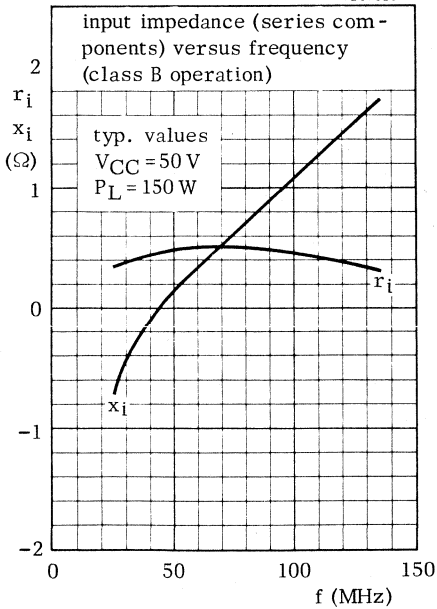
7267528



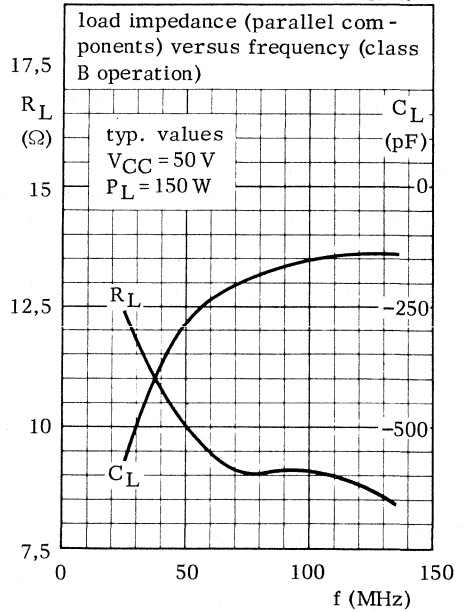
7267525



7267529



7267518



H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Matched h_{FE} groups are available on request.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

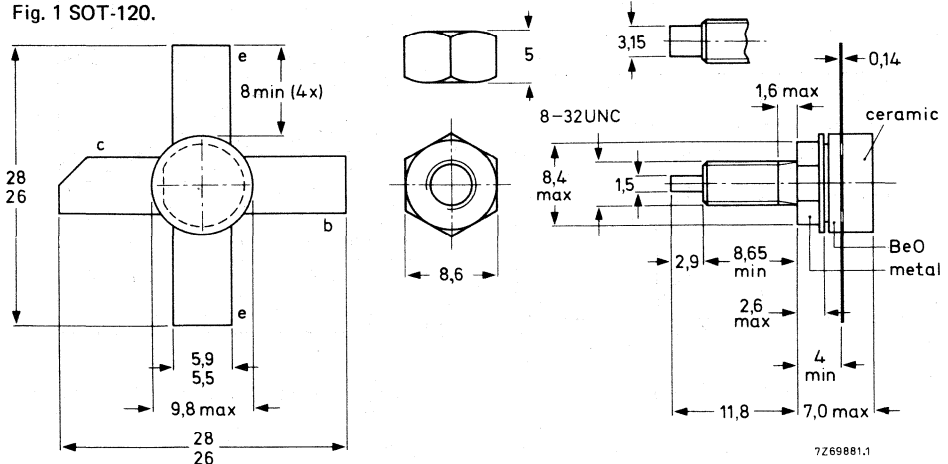
R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V	d ₃ dB
c.w. (class-B)	28	175	45	> 7,5	> 70	$0,7 + j1,3$	$110 - j62$	—
s.s.b. (class-AB)	28	1,6–28	5–42,5 (P.E.P)	typ. 19	typ. 50	—	—	typ. –30
s.s.b. (class-A)	26	1,6–28	15 (P.E.P)	typ. 20	—	—	—	typ. –42

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)

peak value

V_{CESM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open-collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 4 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 12 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 100 W

Storage temperature

T_{stg} - 65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

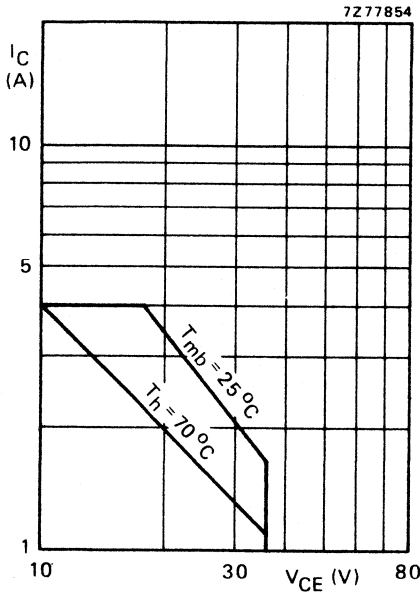


Fig. 2 D.C. SOAR.

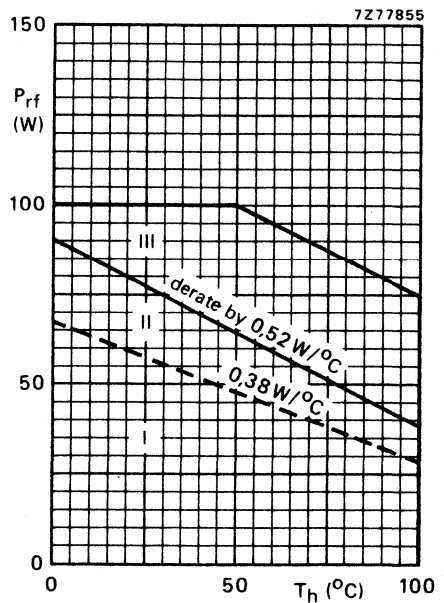


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 40 W; $T_{mb} = 88$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb(dc)}$ = 2,8 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb(rf)}$ = 2,05 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,45 °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 25\text{ mA}$

$V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$

$V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 36\text{ V}$

$I_{CES} < 10\text{ mA}$

Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

$R_{BE} = 10\text{ }\Omega$

$E_{SBO} > 8\text{ mJ}$

$E_{SBR} > 8\text{ mJ}$

D.C. current gain *

$I_C = 2,5\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 45
10 to 80

D.C. current gain ratio of matched devices *

$I_C = 2,5\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage *

$I_C = 7,5\text{ A}; I_B = 1,5\text{ A}$

V_{CEsat} typ. 1,5 V

Transition frequency at $f = 100\text{ MHz}$ *

$-I_E = 2,5\text{ A}; V_{CB} = 28\text{ V}$

$-I_E = 7,5\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 570 MHz

f_T typ. 570 MHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

C_c typ. 82 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$

C_{re} typ. 54 pF

Collector-stud capacitance

C_{cs} typ. 2 pF

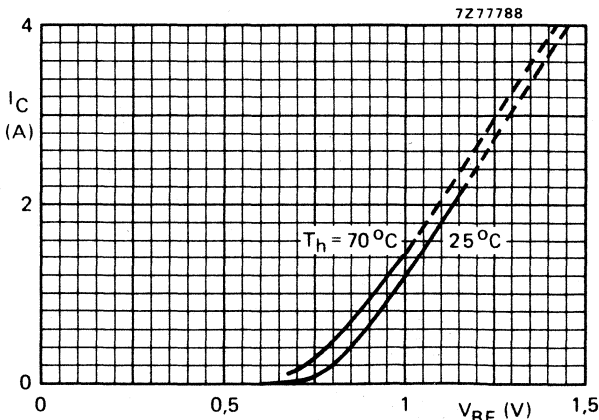


Fig. 4 Typical values; $V_{CE} = 28\text{ V}$.

* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

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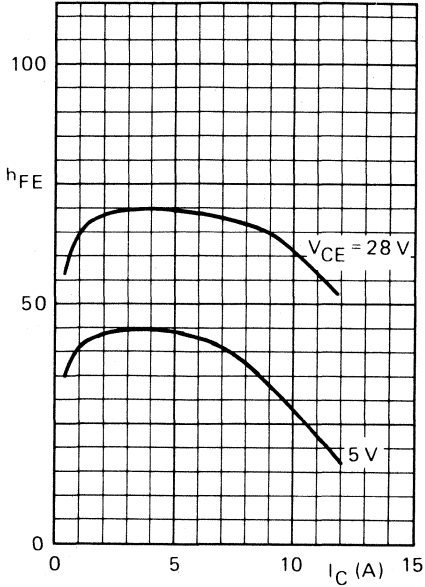


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

7Z77796

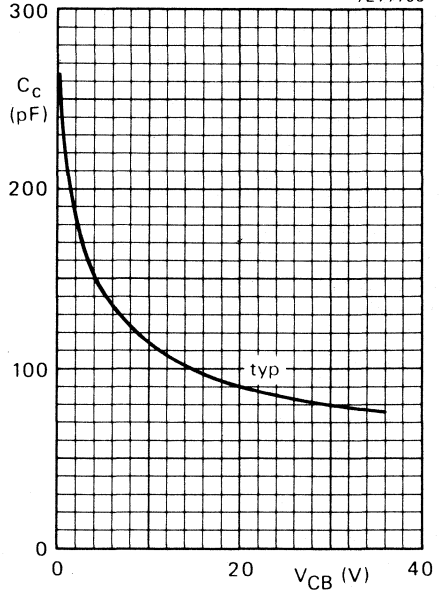


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

7Z77797

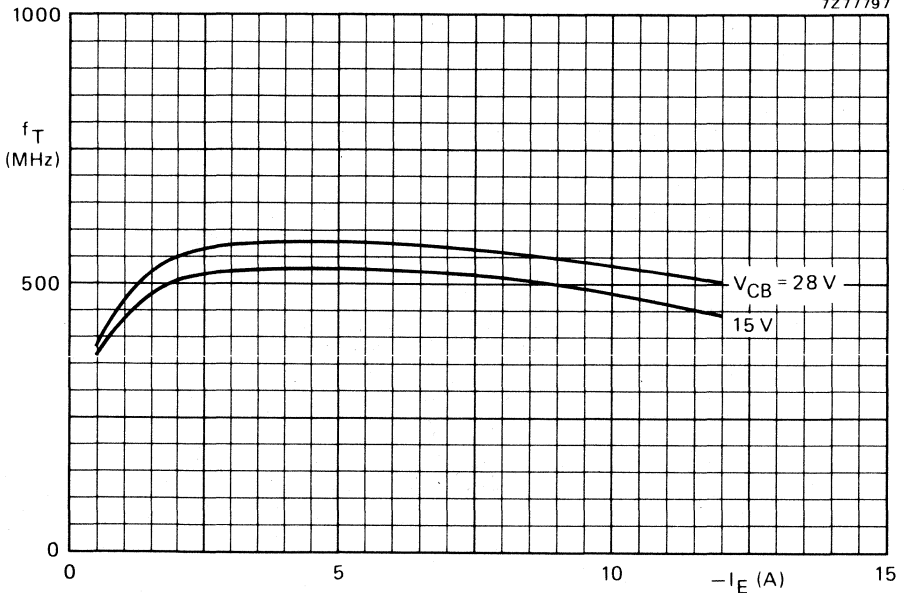


Fig. 7 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	28	45	< 8	> 7,5	< 2,47	> 70	$0,7 + j1,3$	$110 - j62$

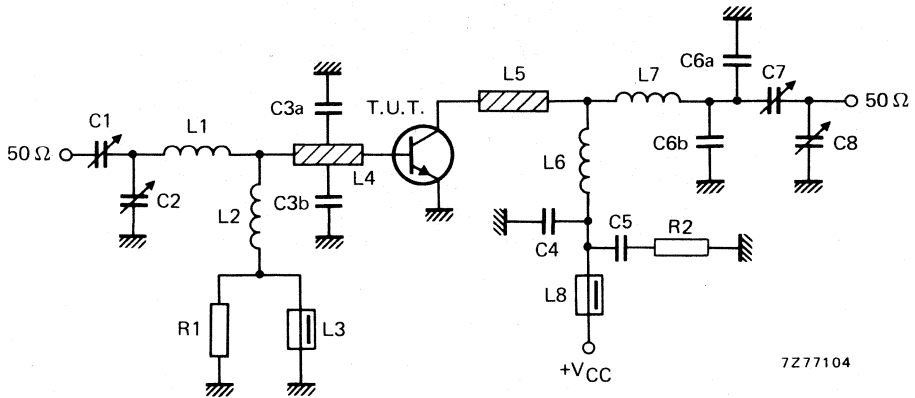


Fig. 8 Test circuit; c.w. class-B.

List of components:

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

C6a = 2,2 pF ceramic capacitor (500 V)

C6b = 1,8 pF ceramic capacitor (500 V)

C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 14 nH; 1 turn Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 80 nH; 3 turns Cu wire (1,6 mm); int. dia. 9,0 mm; length 8,0 mm; leads 2 x 5 mm

L7 = 62 nH; 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor.

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 9.

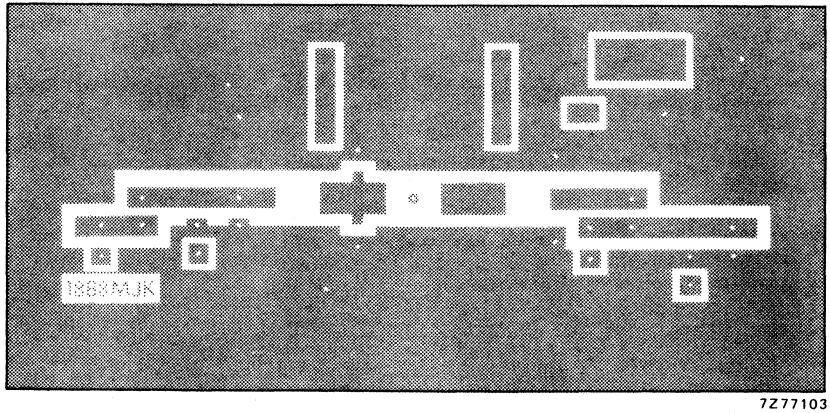
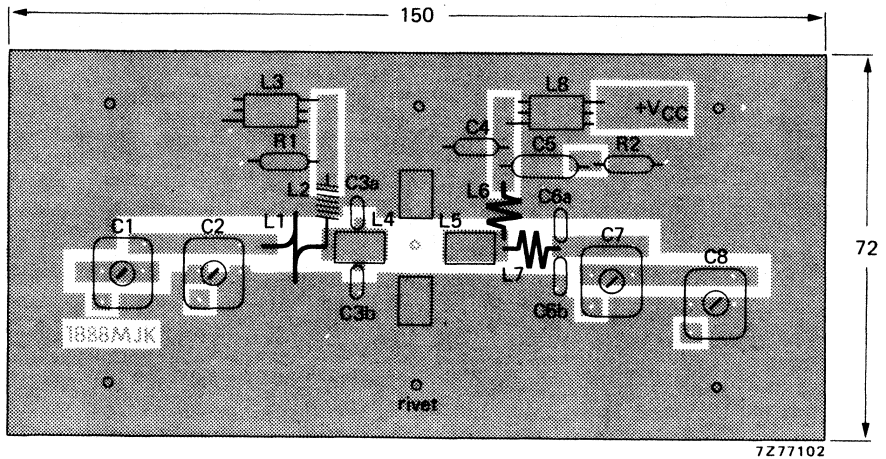


Fig. 9 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

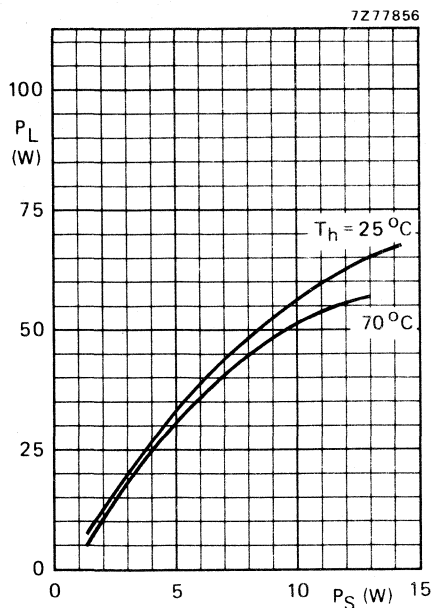


Fig. 10 Typical values; $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$.

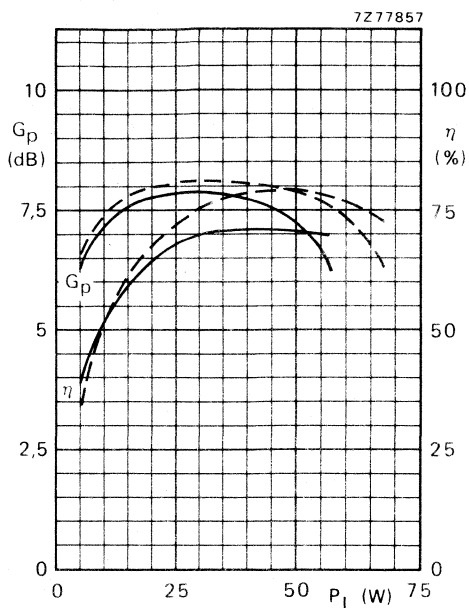


Fig. 11 Typical values; $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$;
 --- $T_h = 25^\circ\text{C}$; — $T_h = 70^\circ\text{C}$.

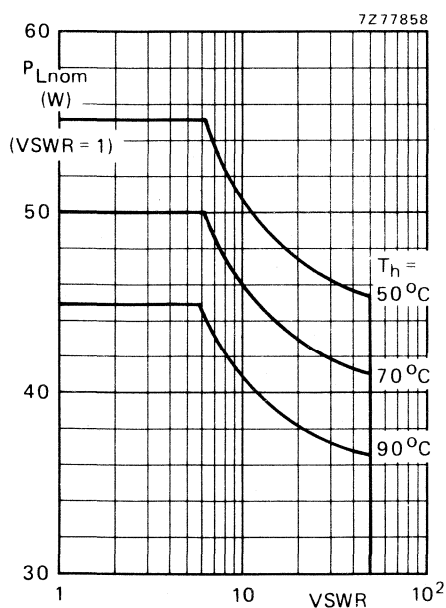


Fig. 12 R.F. SOAR; c.w. class-B operation; $f = 175 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $R_{th \text{ mb-h}} = 0,45^\circ\text{C/W}$.
 The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

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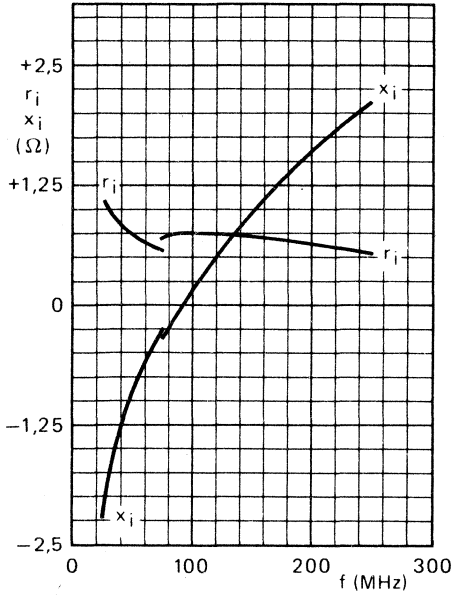


Fig. 13 Input impedance (series components).

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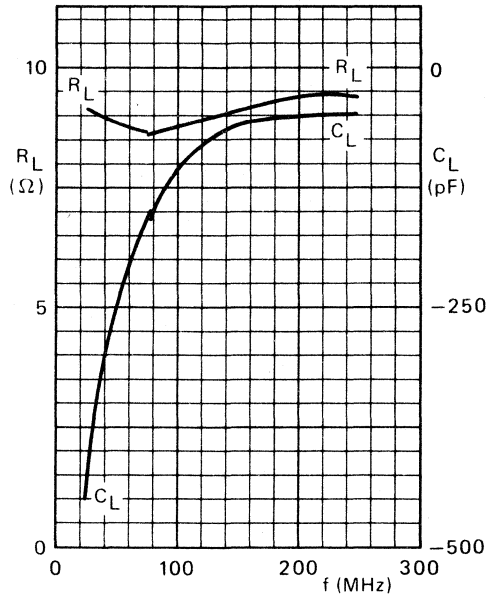


Fig. 14 Load impedance (parallel components).

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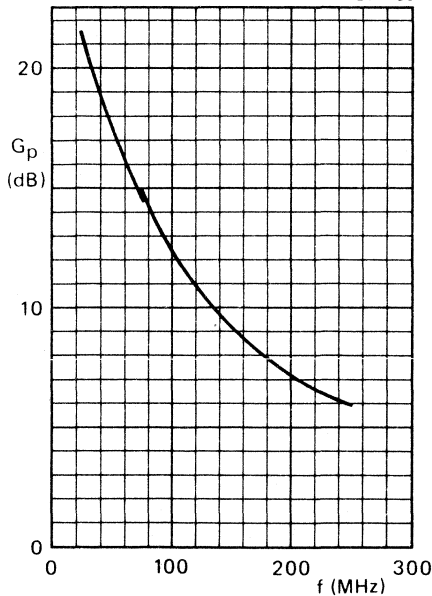


Fig. 15 Power gain versus frequency.

OPERATING NOTE

Below 75 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

Conditions for Figs 13; 14 and 15.

Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 45 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

$V_{CE} = 28 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	$\eta_{dt}(\%)$ at 42,5 W (P.E.P)	I_C (A)	d_3 dB*	d_5 dB*	$I_C(ZS)$ mA	T_h $^{\circ}\text{C}$
5 to 42,5(P.E.P)	typ. 19	typ. 50	typ. 1,52	typ. -30	< -30	50	25
5 to 37,5(P.E.P)	typ. 19	—	—	typ. -30	< -30	50	70

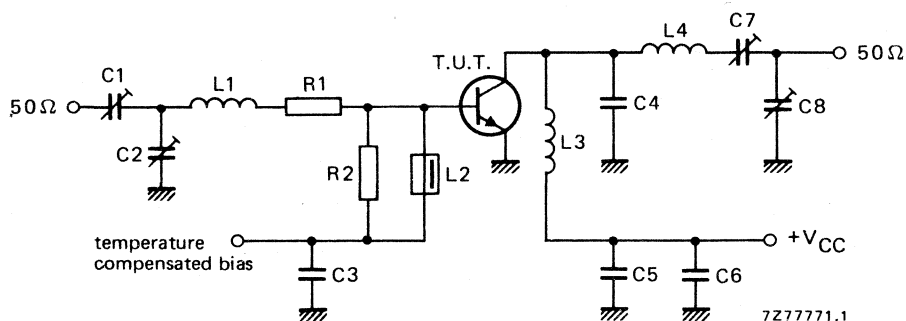


Fig. 16 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = C5 = C6 = 220 nF polyester capacitor

C4 = 56 pF ceramic capacitor (500 V)

C7 = C8 = 15 to 575 pF film dielectric capacitor

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm

L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm

L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω ; parallel connection of 4 x 4,7 Ω carbon resistors

R2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

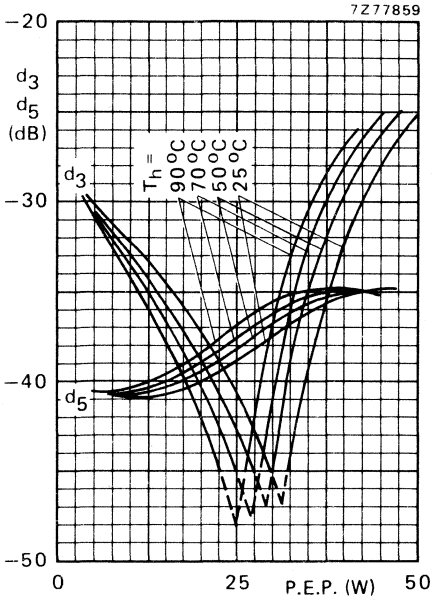


Fig. 17 Intermodulation distortion as a function of output power.*

Conditions for Fig. 17:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; typical values.

Conditions for Fig. 18:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; typical values.

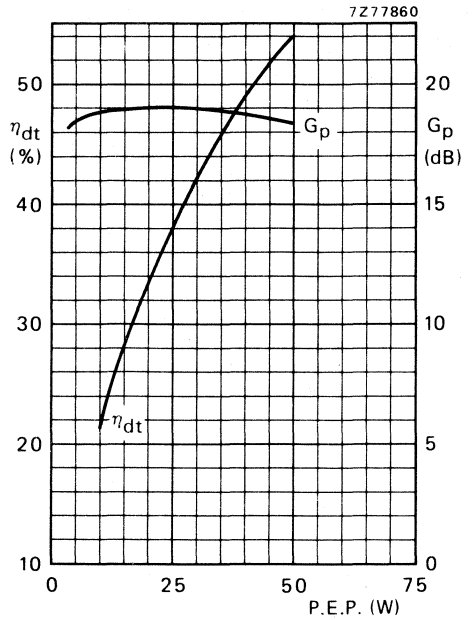


Fig. 18 Double-tone efficiency and power gain as a function of output power.

* See note on page 9.

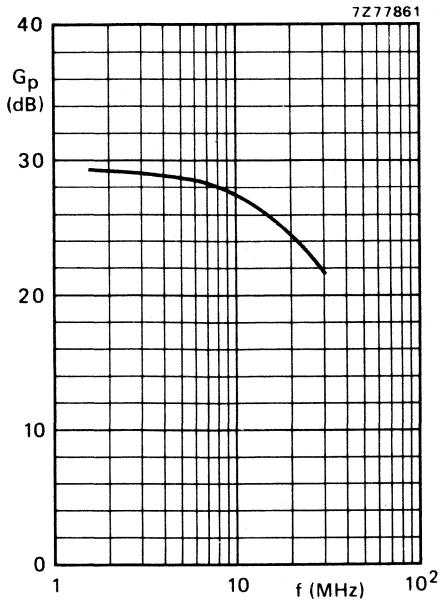


Fig. 19 Power gain as a function of frequency.

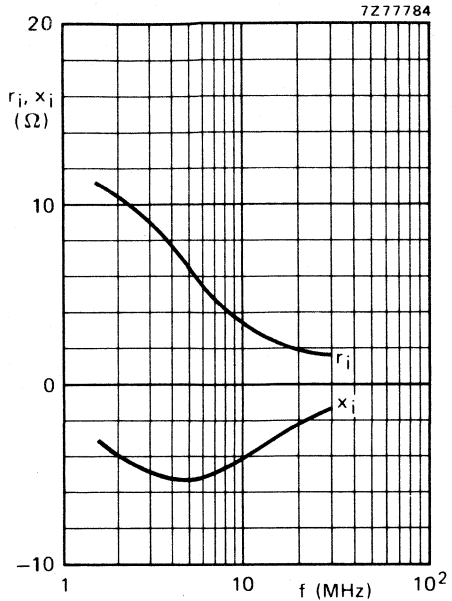


Fig. 20 Input impedance (series components) as a function of frequency.

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $P_L = 42,5 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 7,4 \text{ } \Omega$.

Ruggedness in s.s.b. operation

The BLX39 is capable of withstanding a load mismatch ($V_{SWR} = 50$) under the following conditions:

Class-AB operation; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $T_h = 70 \text{ }^\circ\text{C}$ and $P_{Lnom} = 45 \text{ W P.E.P.}$

List of components in Fig. 21:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = 22 nF ceramic capacitor (63 V)

C4 = 47 μ F/10 V electrolytic capacitor

C5 = 56 pF ceramic capacitor (500 V)

C6 = 47 μ F/35 V electrolytic capacitor

C7 = C8 = 220 nF polyester capacitor

C9 = 10 μ F/35 V electrolytic capacitor

C10 = 10 to 210 pF film dielectric trimmer

C11 = 15 to 575 pF film dielectric trimmer

L1 = 3 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = 11 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

L5 = 14 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

R1 = 600 Ω ; parallel connection of 2 x 1,2 k Ω carbon resistors (\pm 5%; 0,5 W each)

R2 = 15 Ω carbon resistor (\pm 5%; 0,25 W)

R3 = 1,2 Ω ; parallel connection of 4 x 4,7 Ω carbon resistors (\pm 5%; 0,125 W each)

R4 = 33 Ω carbon resistor (\pm 5%; 0,25 W)

R5 = 18 Ω carbon resistor (\pm 5%; 0,25 W)

R6 = 120 Ω wirewound resistor (\pm 5%; 5,5 W)

R7 = 1 Ω carbon resistor (\pm 5%; 0,125 W)

R8 = 47 Ω wirewound potentiometer (3 W)

R9 = 1,57 Ω ; parallel connection of 3 x 4,7 Ω wirewound resistors (\pm 5%; 5,5 W each)

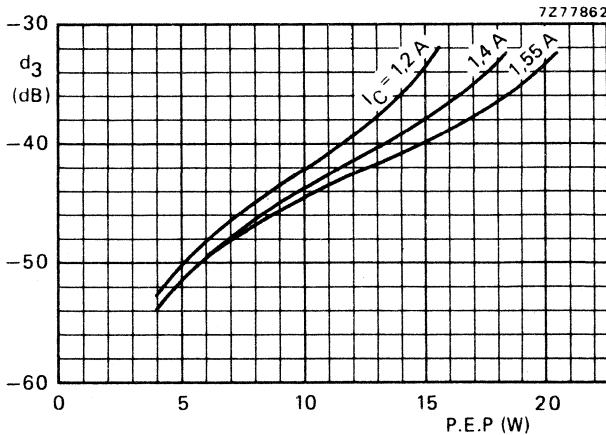


Fig. 22 Intermodulation distortion as a function of output power. Typical values; $V_{CE} = 26$ V; $T_H = 70$ °C; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz.

U.H.F./V.H.F. TRANSMITTING TRANSISTOR

N-P-N transistor intended for use in class-B and C operated mobile, industrial and military transmitters with a supply voltage of 13,8 V. It has a TO-39 metal envelope with the collector connected to the case.

QUICK REFERENCE DATA

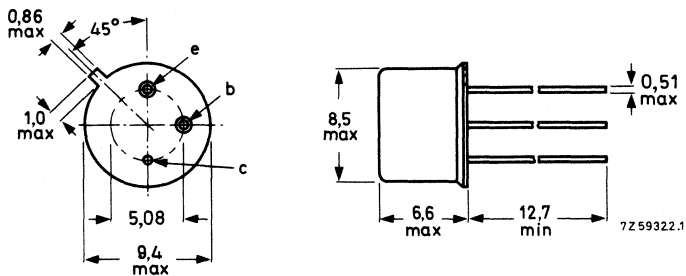
R.F. performance up to $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_{S} W	P_{L} W	I_{C} A	G_{p} dB	η %	\bar{z}_1 Ω	\bar{Y}_{L} mA/V
c.w.	13,8	470	typ. 0,4	2,0	typ. 0,22	typ. 7	typ. 66	$5 + j11$	$17 - j19$
c.w.	12,5	470	< 0,5	2,0	< 0,25	> 6	> 65	—	—
c.w.	12,5	175	typ. 0,12	2,0	typ. 0,21	typ. 12	typ. 75	—	—

MECHANICAL DATA

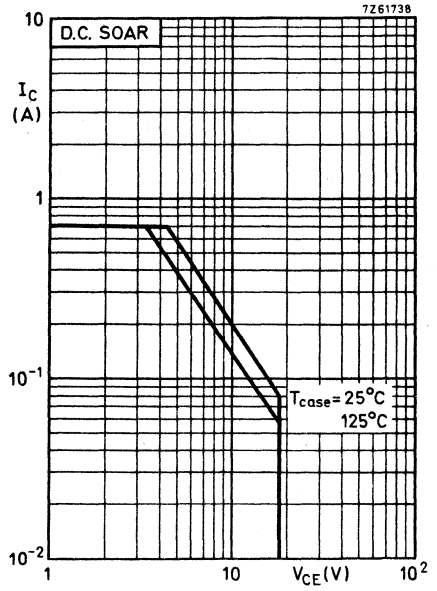
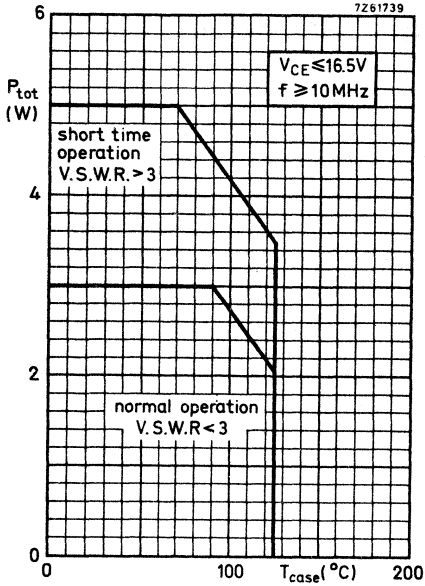
Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56218 (package); 56245 (distance disc).



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

Currents

Collector current (average)	$I_{C(AV)}$	max.	0.7	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	2.0	A

Power dissipation

Total power dissipation up to $T_{case} = 90$ °C $f > 10$ MHz	P_{tot}	max.	3.0	W
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Temperatures

Storage temperature	T_{stg}	-65 to +150	°C
Operating junction temperature	T_j	max	165 °C

THERMAL RESISTANCE

From junction to case	$R_{th j-c}$	=	25	°C/W
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{th mb-h}$	=	2.5	°C/W



CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 10\text{ mA}$

$V_{(BR)CBO} > 36\text{ V}$

Collector-emitter voltage
 $V_{BE} = 0; I_C = 10\text{ mA}$

$V_{(BR)CES} > 36\text{ V}$

Collector-emitter voltage
open base, $I_C = 25\text{ mA}$

$V_{(BR)CEO} > 18\text{ V}$

Emitter-base voltage
open collector, $I_E = 1.0\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector-emitter saturation voltage

$I_C = 100\text{ mA}; I_B = 20\text{ mA}$

V_{CEsat} typ. 0.1 V

D. C. current gain

$I_C = 100\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE} > 10$
typ. 40

Transition frequency

$I_C = 200\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$

f_T typ. 1400 MHz

Collector capacitance at $f = 1\text{ MHz}$

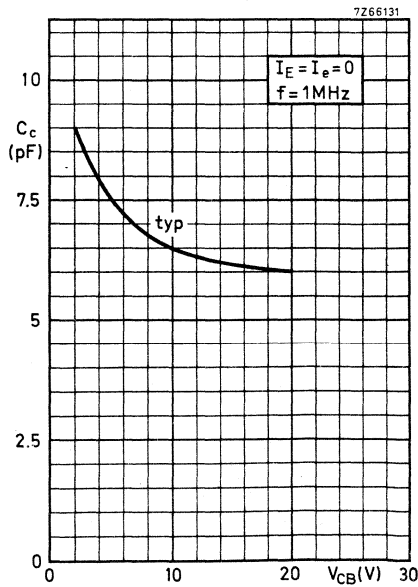
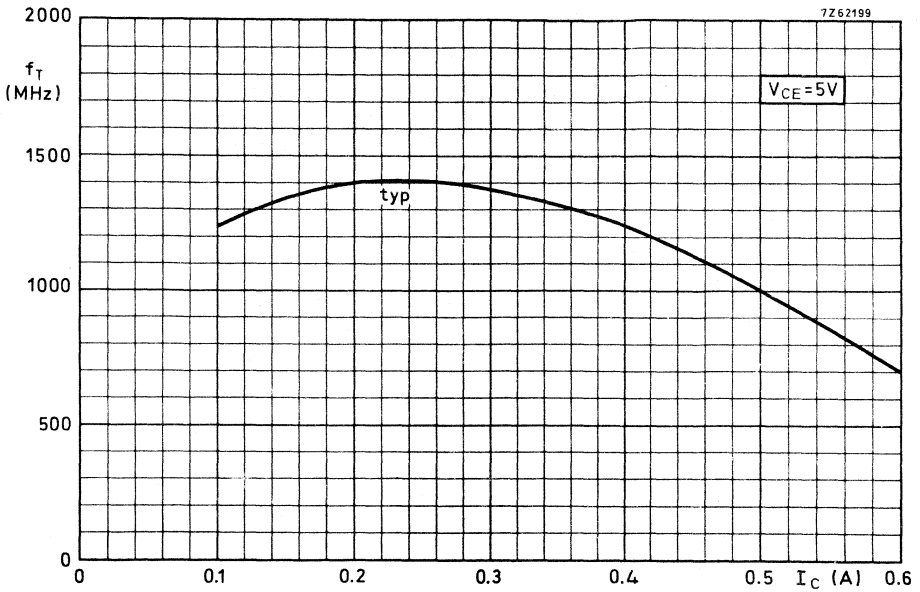
$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_c typ. 6.5 pF
< 9.0 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 20\text{ mA}; V_{CE} = 10\text{ V}$

C_{re} typ. 4.8 pF



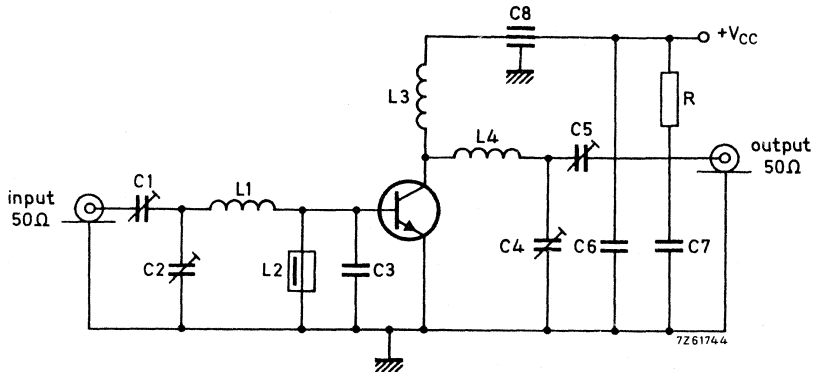
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class B circuit)

T_{case} up to 25 °C

f (MHz)	V _{CC} (V)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	Z _i (Ω)	Y _L (mA/V)
470	13.8	typ. 0.4	2.0	typ. 0.22	typ. 7	typ. 66	5 + j11	17 - j19
470	12.5	< 0.5	2.0	< 0.25	< 6	> 65	-	-
175	12.5	typ. 0.12	2.0	typ. 0.21	typ. 12	typ. 75	-	-

Test circuit:



To obtain optimum gain performance the emitter lead length should not exceed 1.6 mm

- C1 = C2 = C4 = C5 = 1.8 to 18 pF film dielectric trimmer
- C3 = 22 pF disc ceramic capacitor
- C6 = 10 nF ceramic capacitor
- C7 = 0.1 μF polyester capacitor
- C8 = 4 nF feed-through capacitor

- L1 = 1 turn Cu wire (1 mm); int. diam. 5 mm; max. lead length 1 mm
- L2 = 0.22 μH choke
- L3 = 1 turn Cu wire (1 mm); int. diam. 7 mm; lead length 2 mm
- L4 = 1 turn Cu wire (1 mm); int. diam. 5 mm; lead length 2 mm
- R = 10 Ω carbon

At $P_L = 2.0$ W and $V_{CC} = 12.5$ V the output power at case temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 5 mW/°C.

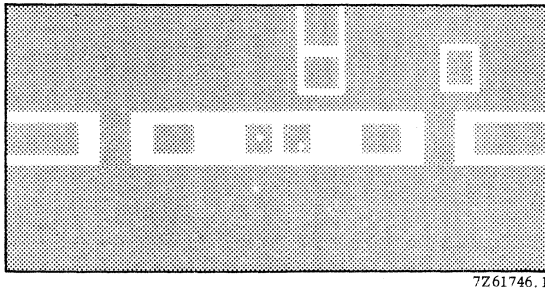
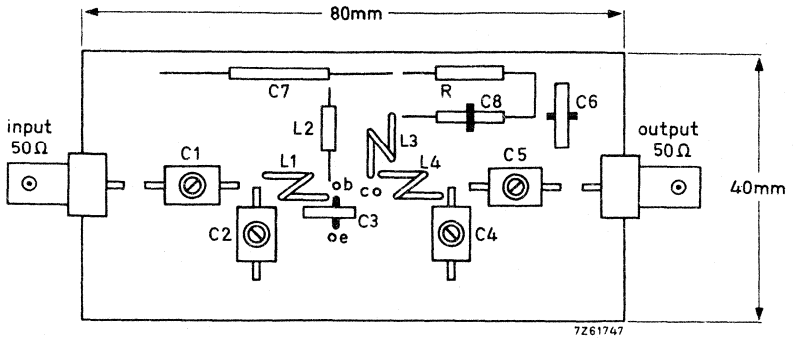
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 16.5$ V; $f = 470$ MHz; $T_{case} = 70$ °C

V.S.W.R. = 50 : 1 through all phases; $P_S = P_{Snom} + 20\%$
 where $P_{Snom} = P_S$ for 1.4 W transistor output into 50 Ω load at $V_{CC} = 13.8$ V.

Component lay-out for 470 MHz see page 7.

APPLICATION INFORMATION (continued)

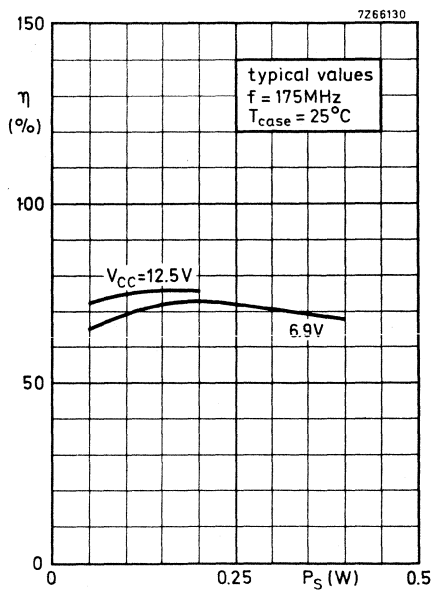
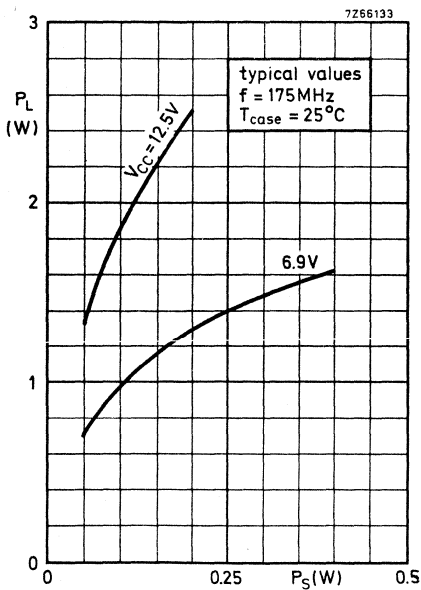
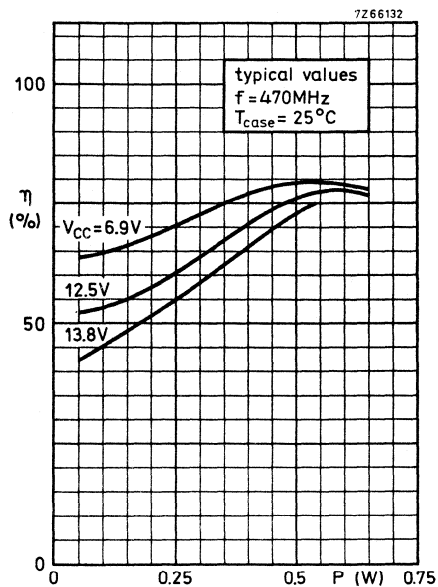
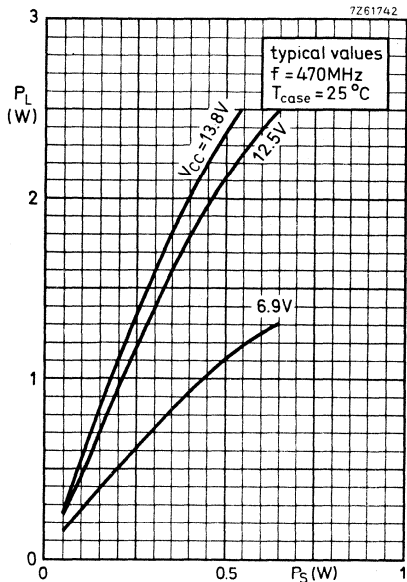
Component lay-out and printed circuit board for 470 MHz test circuit.

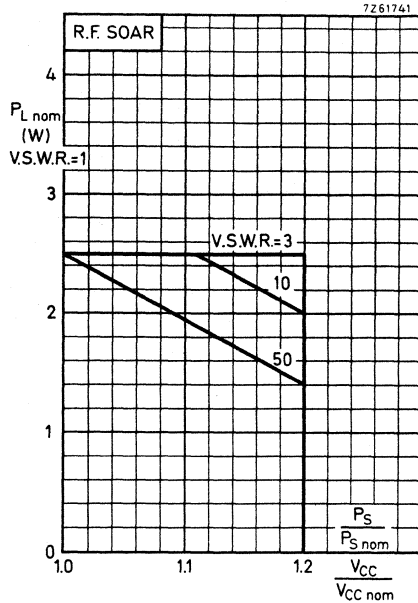


Shaded area copper

Back area not metalized

Material of printed circuit board: 1.5 mm epoxy fibre-glass





Conditions for R.F. SOAR

$f = 470$ MHz

$P_{S nom} = P_S$ at $V_{CC} = V_{CCnom}$ and $V.S.W.R. = 1$

$T_{case} = 70$ °C

$V_{CCnom} = 13.8$ V

see also page 6

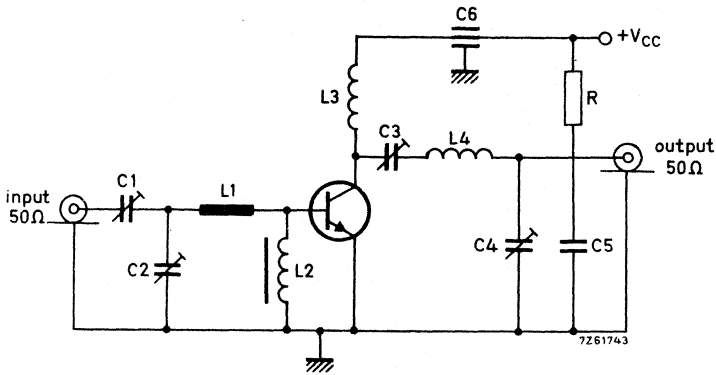
The transistor was developed for use with unstabilized supply voltage V_{CC} . The above graph is based on its measured performance in the circuit given on page 6. Supply voltage was varied from V_{CCnom} to $1.2 V_{CCnom}$, and $V.S.W.R.$ from 1 to 50. It shows the maximum allowable output power under nominal conditions in order not to exceed the maximum allowable power dissipation under conditions of supply overvoltage ($V_{CC} > V_{CCnom}$) and load mismatch ($V.S.W.R. > 1$).

It is assumed that the drive power increases linearly with the supply voltage; i.e.

$$P_S/P_{S nom} = V_{CC}/V_{CCnom}$$

APPLICATION INFORMATION (continued)

Test circuit for 175 MHz



To obtain optimum gain performance the emitter lead length should not exceed 1.6 mm

C1 = C4 = 60 pF concentric air trimmer

C2 = C3 = 30 pF concentric air trimmer

C5 = 0.25 μF polyester capacitor

C6 = 4 nF feed-through capacitor

L1 = 25 mm straight Cu wire (1.2 mm); height above print 3 mm

L2 = 3 turns Cu wire (0.5 mm) on ferrite FX1115, d = 2 mm, D = 4 mm, l = 5 mm, material 3B (code number 3113 991 16740)

L3 = 5 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

L4 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

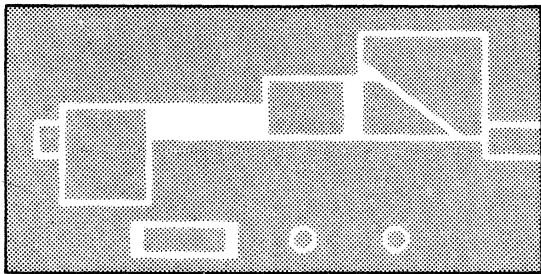
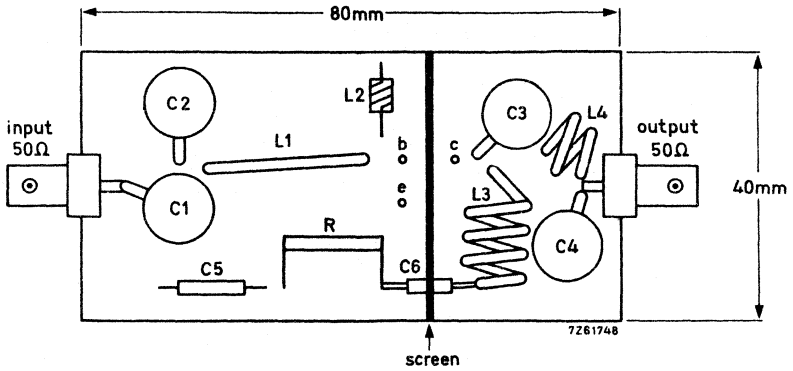
R = 10 Ω carbon

Graphs (P_L versus P_S and η versus P_S) for 175 MHz on page 8.

Component lay-out for 175 MHz on page 11.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit :



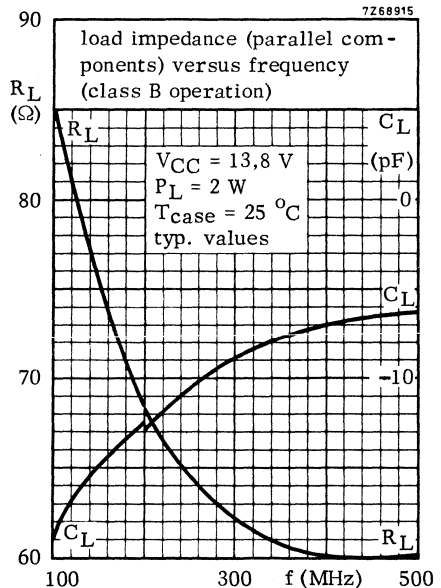
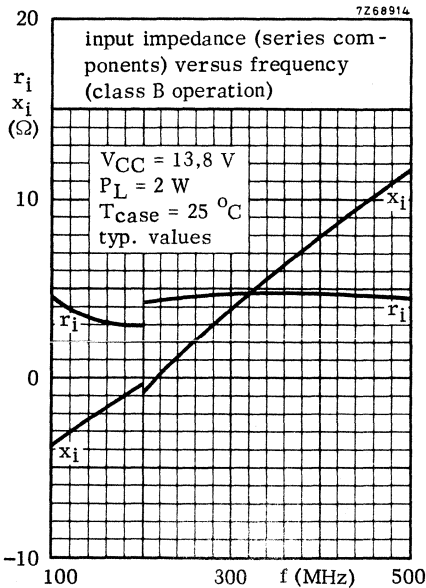
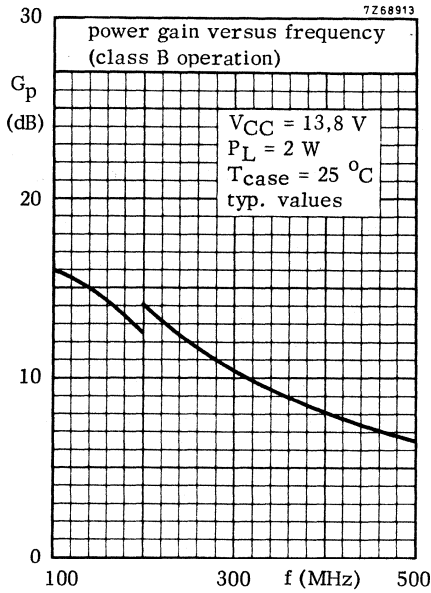
Shaded area copper

Back area not metallized

Material of printed circuit board: 1.5 mm epoxy fibre-glass



OPERATING NOTE Below 200 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



U.H.F./V.H.F. TRANSMITTING TRANSISTOR

N-P-N transistor intended for use in class-B and C operated mobile, industrial and military transmitters with a supply voltage of 13,8 V. It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

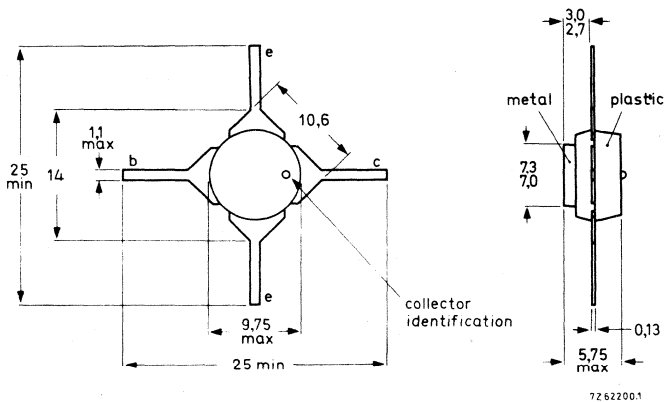
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	13,8	470	typ. 0,15	1,5	typ. 0,17	typ. 10	typ. 65	—	—
c.w.	13,8	470	typ. 0,28	2,5	typ. 0,24	typ. 9,5	typ. 75	$2,6 + j4,8$	$23 - j23$
c.w.	12,5	470	$< 0,35$	2,5	$< 0,31$	$> 8,5$	> 65	—	—
c.w.	12,5	175	typ. 0,03	3,0	typ. 0,29	typ. 20	typ. 84	—	—

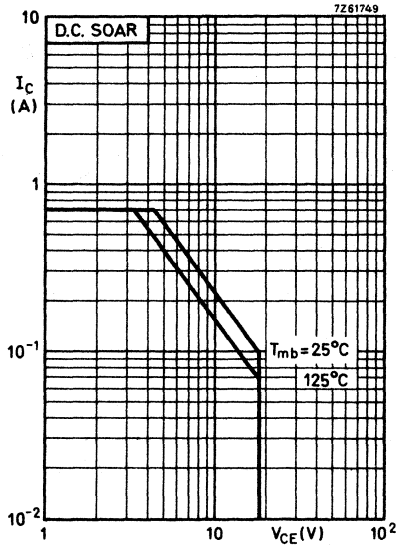
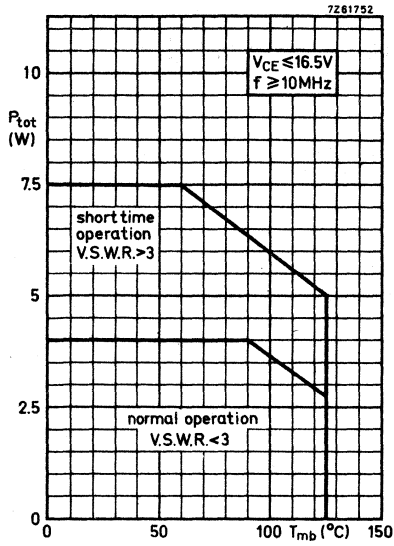
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48 (without stud).



72.62200.1



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage ($R_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V

Currents

Collector current (average)	$I_{C(AV)}$	max.	0.7 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	2.0 A

Power dissipation

Total power dissipation up to $T_{mb} = 90$ °C $f > 10$ MHz	P_{tot}	max.	4.0 W
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Temperatures

Storage temperature	T_{stg}	-65 to +150	°C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	12 °C/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 10\text{ mA}$	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage $V_{BE} = 0; I_C = 10\text{ mA}$	$V_{(BR)CES}$	>	36	V
Collector-emitter voltage open base, $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, $I_E = 1,0\text{ mA}$	$V_{(BR)EBO}$	>	4	V

Collector-emitter saturation voltage

$I_C = 100\text{ mA}; I_B = 20\text{ mA}$	V_{CEsat}	typ.	0,1	V
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D. C. current gain

$I_C = 100\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	>	10
		typ.	40

Transition frequency

$I_C = 200\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$	f_T	typ.	1400	MHz
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Collector capacitance at $f = 1\text{ MHz}$

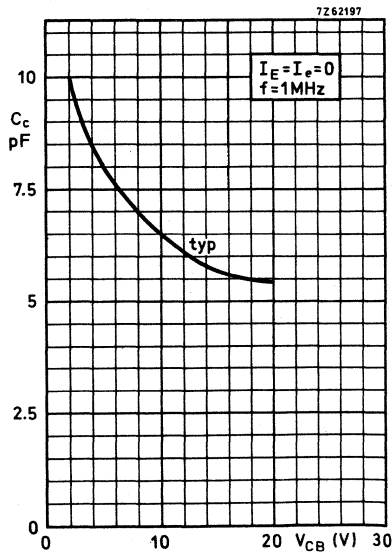
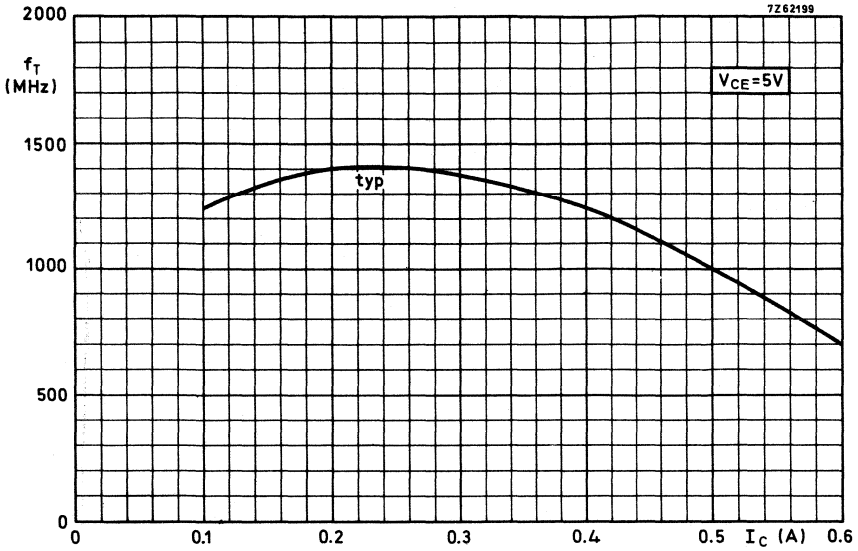
$I_E = I_e = 0; V_{CB} = 10\text{ V}$	C_c	typ.	6,5	pF
		<	9,0	pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 20\text{ mA}; V_{CE} = 10\text{ V}$	C_{re}	typ.	4,8	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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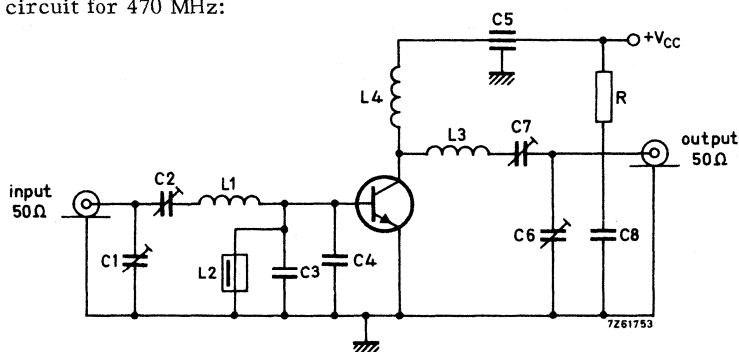
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralized common-emitter class B circuit)

$T_{mb} = 25\text{ }^{\circ}\text{C}$

f (MHz)	V _{CC} (V)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
470	13.8	typ. 0.15	1.5	typ. 0.17	typ. 10	typ. 65	-	-
470	13.8	typ. 0.28	2.5	typ. 0.24	typ. 9.5	typ. 75	2.6 + j4.8	23 - j23
470	12.5	< 0.35	2.5	< 0.31	> 8.5	> 65	-	-
175	12.5	typ. 0.03	3.0	typ. 0.29	typ. 20	typ. 84	-	-

Test circuit for 470 MHz:



- C1 = C2 = C6 = C7 = 1.8 to 18 pF film dielectric trimmer
- C3 = C4 = 18 pF disc ceramic capacitor
- C5 = 4 nF feed-through capacitor
- C8 = 0.1 μF polyester capacitor

L1 = 1 turn Cu wire (1.2 mm); int. diam. 6 mm; max. lead length 1 mm.

L2 = 1 μH choke

L3 = 30 mm straight Cu wire (2 mm); height above print 2 mm.

L4 = 2 turns closely wound Cu wire (0.5 mm); int. diam. 3 mm; max. lead length 8 mm.

R = 10 Ω carbon

At $P_L = 2.5\text{ W}$ and $V_{CC} = 12.5\text{ V}$ the output power at mounting-base temperatures between $25\text{ }^{\circ}\text{C}$ and $90\text{ }^{\circ}\text{C}$ relative to that at $25\text{ }^{\circ}\text{C}$ is diminished by typ. $5\text{ mW}/^{\circ}\text{C}$

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 16.5\text{ V}$; $f = 470\text{ MHz}$; $T_{mb} = 70\text{ }^{\circ}\text{C}$;

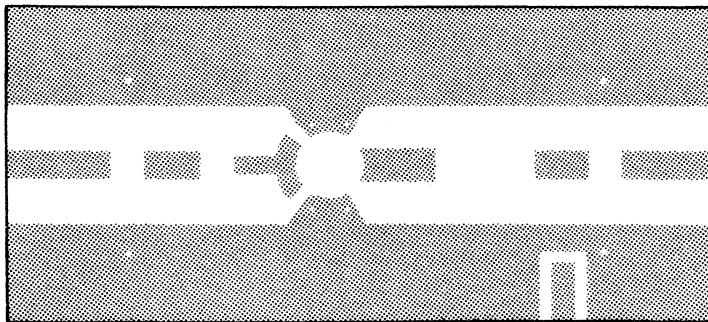
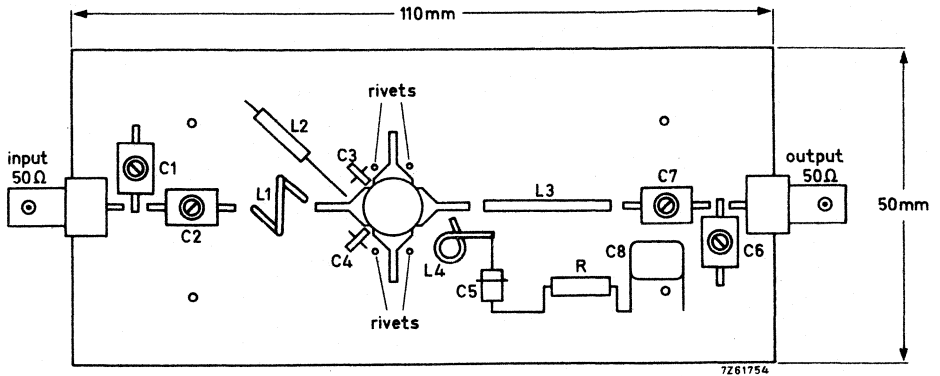
V.S.W.R. = 50 : 1 through all phases; $P_S = P_{Snom} + 20\%$

where $P_{Snom} = P_S$ for 2.5 W transistor output into $50\text{ }^{\circ}\Omega$ load at $V_{CC} = 13.8\text{ V}$

Component lay-out for 470 MHz see page 7

APPLICATION INFORMATION (continued)

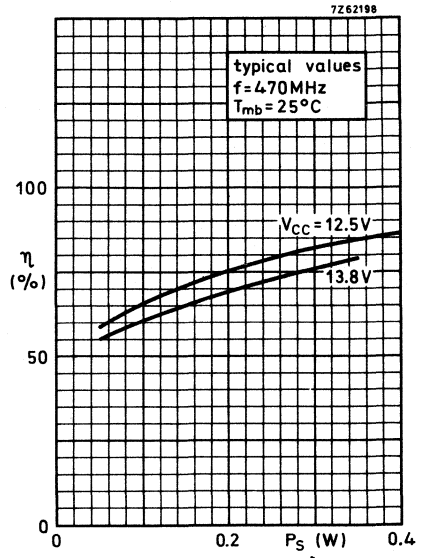
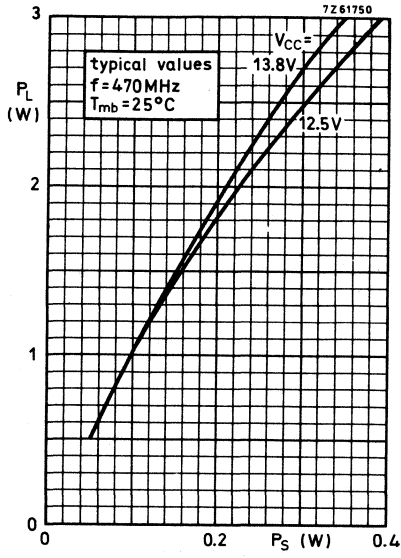
Component lay-out and printed circuit board for 470 MHz test circuit.

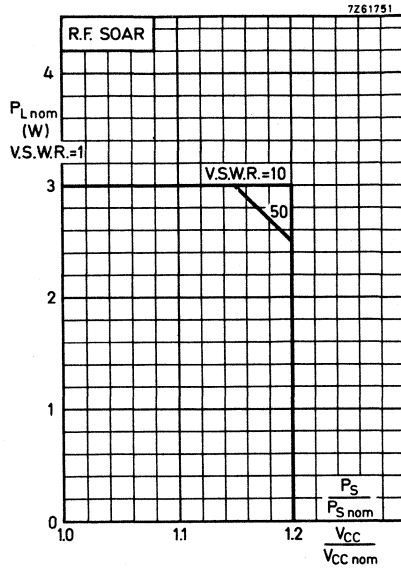


Shaded area copper

Back area completely copper clad

Material of printed circuit board: 1.5 mm epoxy fibre glass





Conditions for R.F. SOAR

$f = 470 \text{ MHz}$

$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.R. = 1

$T_{mb} = 70 \text{ }^\circ\text{C}$

$V_{CCnom} = 13.8 \text{ V}$

see also page 6

The transistor was developed for use with unstabilized supply voltage V_{CC} .

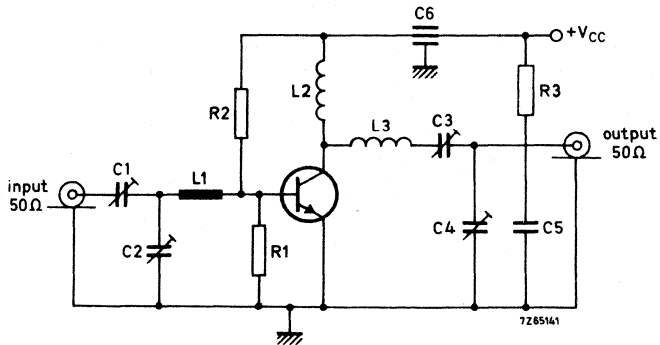
The above graph is based on its measured performance in the circuit given on page 6. Supply voltage was varied from V_{CCnom} to $1.2 V_{CCnom}$, and V.S.W.R. from 1 to 50. It shows the max. allowable output power under nominal conditions in order not to exceed the max. allowable power dissipation under conditions of supply overvoltage ($V_{CC} > V_{CCnom}$) and load mismatch (V.S.W.R. > 1).

It is assumed that the drive power increases linearly with the supply voltage; i.e.

$$P_S/P_{Snom} = V_{CC}/V_{CCnom}$$

APPLICATION INFORMATION (continued)

Test circuit for 175 MHz:



- C1 = C3 = C4 = 30 pF concentric air trimmer
- C2 = 60 pF concentric air trimmer
- C5 = 0.25 μ F polyester capacitor
- C6 = 4 nF feed-through capacitor

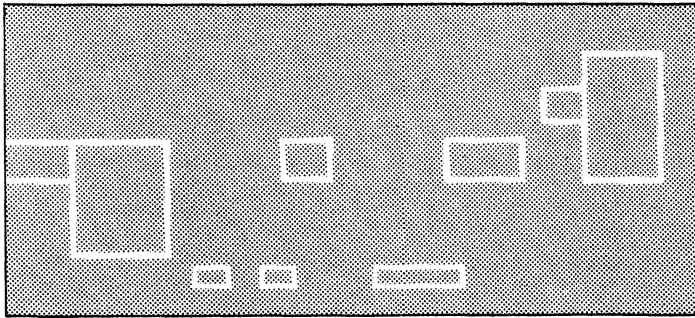
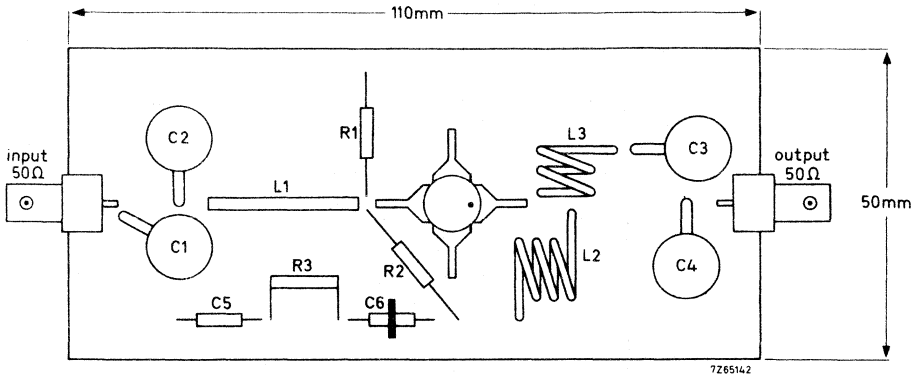
- L1 = 25 mm straight Cu wire (1.2 mm); height above print max. 3 mm
- L2 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; max. lead length 5 mm
- L3 = 2 turns closely wound Cu wire (1.7 mm); int. diam. 12 mm; max. lead length 5 mm

- R1 = 50 Ω carbon
- R2 = 1.2 k Ω carbon
- R3 = 5 Ω carbon

Component lay-out for 175 MHz see page 11.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

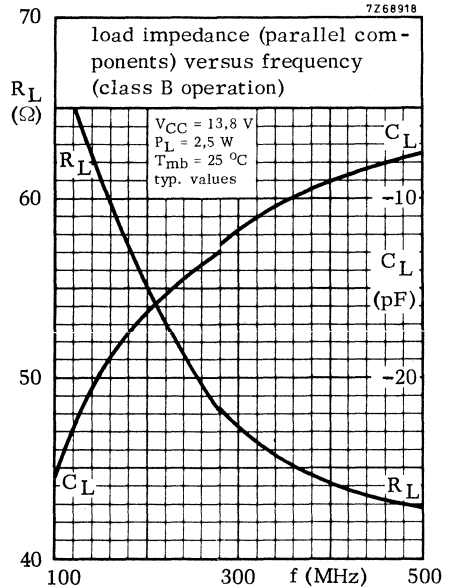
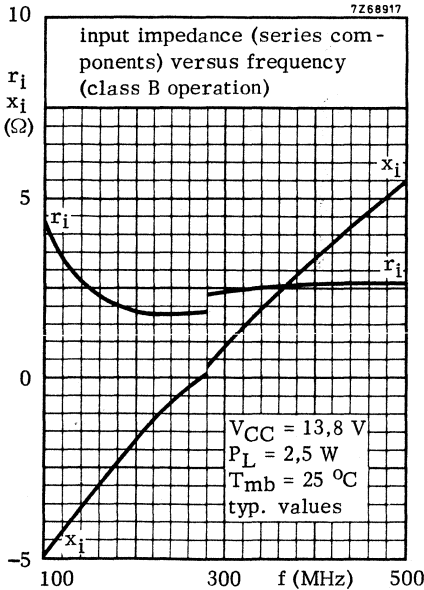
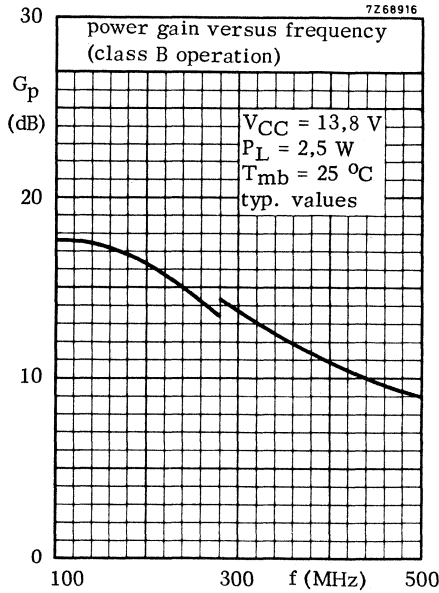


Shaded area copper

Back area not metallized

Material of printed circuit board: 1.5 mm epoxy fibre glass

OPERATING NOTE Below 280 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



U.H.F./V.H.F. TRANSMITTING TRANSISTOR

N-P-N transistor intended for use in class B and C operated mobile, industrial and military transmitters with a supply voltage of 13.8 V. It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

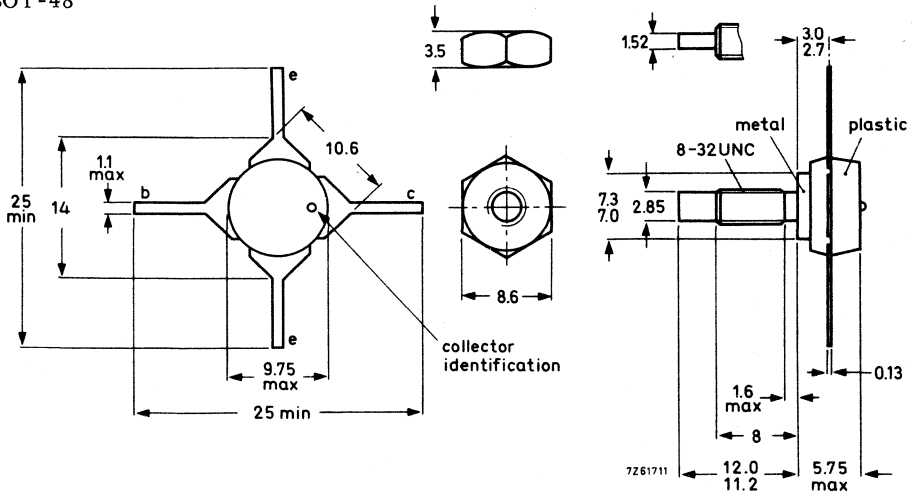
R. F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class B circuit

Mode of operation	V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	13.8	470	typ. 0.15	1.5	typ. 0.17	typ. 10	typ. 65	-	-
c. w.	13.8	470	typ. 0.35	3.0	typ. 0.28	typ. 9.3	typ. 79	2.9 + j5.1	27 - j21
c. w.	12.5	470	< 0.35	2.5	< 0.31	> 8.5	> 65	-	-
c. w.	12.5	175	typ. 0.03	3.0	typ. 0.29	typ. 20	typ. 84	-	-

MECHANICAL DATA

Dimensions in mm

SOT-48

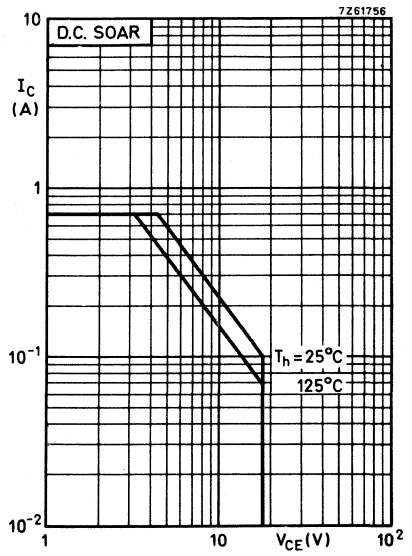
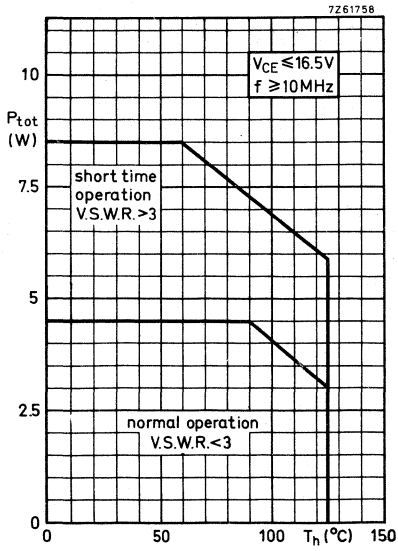


When locking is required an adhesive instead of a lock washer is preferred

Torque on nut: min. 7.5 kg cm
(0.75 Newton metres)
max. 8.5 kg cm
(0.85 Newton metres)

Diameter of clearance hole in heatsink: max. 4.17 mm.

Mounting hole to have no burrs at either end
De-burring must leave surface flat; do not chamfer or countersink either end of hole.



RATINGS Limiting values in accordance with the Absolute Maximum System(IEC134)Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage ($R_{BE} = 0$) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

Currents

Collector current (average)	$I_{C(AV)}$	max.	0.7	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	2.0	A

Power dissipation

Total power dissipation up to $T_h = 90$ °C $f > 10$ MHz	P_{tot}	max.	4.5	W
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Temperature

Storage temperature	T_{stg}	-65 to +150	°C
Junction temperature	T_j	max. 150	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	12	°C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6	°C/W

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

CHARACTERISTICS

Breakdown voltages

Collector-base voltage open emitter, $I_C = 10\text{ mA}$	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage $V_{BE} = 0$; $I_C = 10\text{ mA}$	$V_{(BR)CES}$	>	36	V
Collector-emitter voltage open base, $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, $I_E = 1,0\text{ mA}$	$V_{(BR)EBO}$	>	4	V

Collector-emitter saturation voltage

$I_C = 100\text{ mA}$; $I_B = 20\text{ mA}$	V_{CEsat}	typ.	0,1	V
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D.C. current gain

$I_C = 100\text{ mA}$; $V_{CE} = 5\text{ V}$	h_{FE}	>	10
		typ.	40

Transition frequency

$I_C = 0,2\text{ A}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$	f_T	typ.	1400	MHz
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Collector capacitance at $f = 1\text{ MHz}$

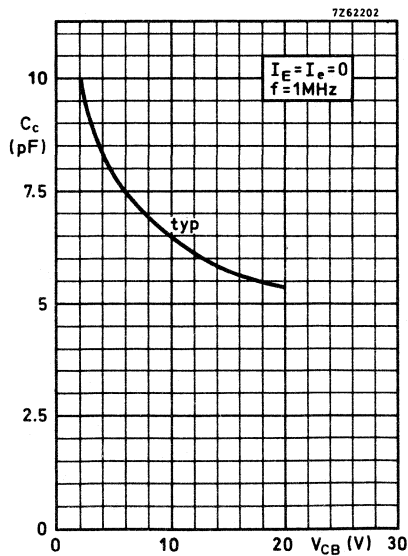
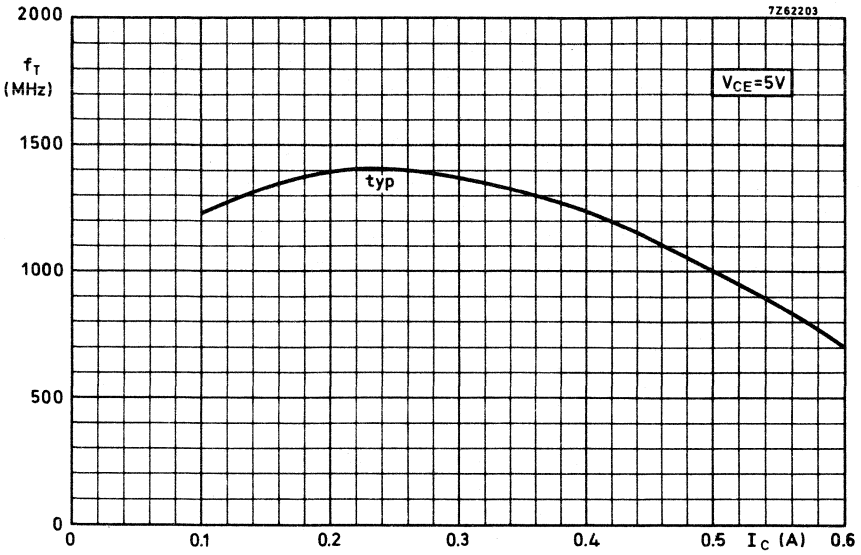
$I_E = I_e = 0$; $V_{CB} = 10\text{ V}$	C_c	typ.	6,5	pF
		<	9,0	pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 20\text{ mA}$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	4,8	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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APPLICATION INFORMATION

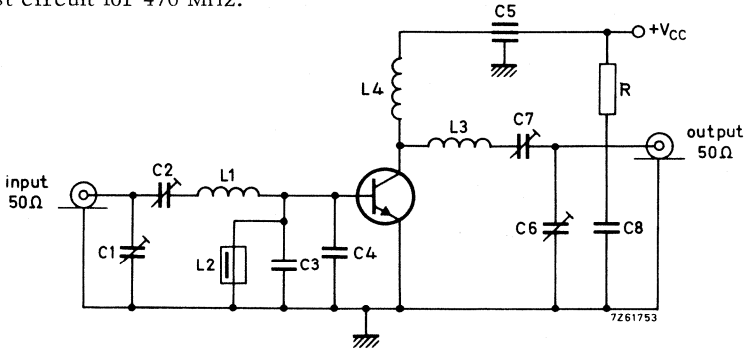
$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

R. F. performance in c. w. operation (unneutralized common-emitter class B circuit)

T_h up to $25\text{ }^\circ\text{C}$

f (MHz)	V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
470	13.8	typ. 0.15	1.5	typ. 0.17	typ. 10	typ. 65	-	-
470	13.8	typ. 0.35	3.0	typ. 0.28	typ. 9.3	typ. 79	$2.9 + j5.1$	$27 - j21$
470	12.5	< 0.35	2.5	< 0.31	> 8.5	> 65	-	-
175	12.5	typ. 0.03	3.0	typ. 0.29	typ. 20	typ. 84	-	-

Test circuit for 470 MHz:



C1 = C2 = C6 = C7 = 1.8 to 18 pF film dielectric trimmer

C3 = C4 = 18 pF disc ceramic capacitor

C5 = 4 nF feed-through capacitor

C8 = 0.1 μF polyester capacitor

L1 = 1 turn Cu wire (1.2 mm); int. diam. 6 mm; max. lead length 1 mm

L2 = 1 μH choke

L3 = 30 mm straight Cu wire (2 mm); height above print 2 mm

L4 = 2 turns closely wound Cu wire (0.5 mm); int. diam. 3 mm; max. lead length 8 mm

R = 10 Ω carbon

At $P_L = 2.5\text{ W}$ and $V_{CC} = 12.5\text{ V}$, the output power at heatsink temperatures between $25\text{ }^\circ\text{C}$ and $90\text{ }^\circ\text{C}$ relative to that at $25\text{ }^\circ\text{C}$ is diminished by typ. $5\text{ mW}/^\circ\text{C}$.

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 16.5\text{ V}$; $f = 470\text{ MHz}$; $T_h = 70\text{ }^\circ\text{C}$;

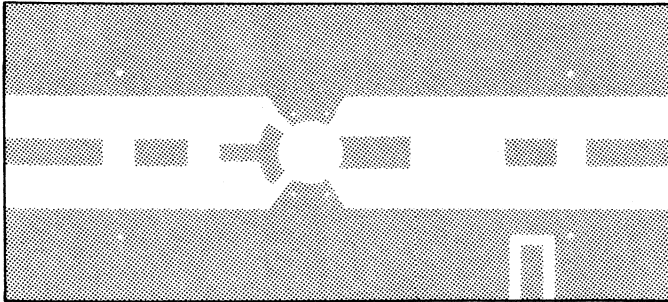
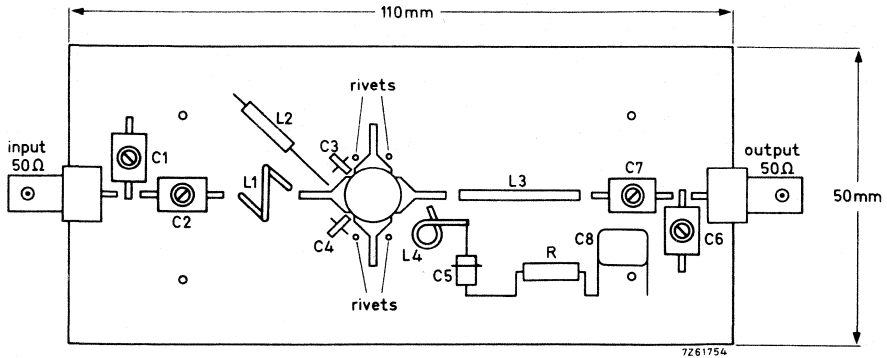
V. S. W. R. = 50 : 1 through all phases; $P_S = P_{Snom} + 20\%$

where $P_{Snom} = P_S$ for 2.5 W transistor output into 50 Ω load and $V_{CC} = 13.8\text{ V}$

Component lay-out for 470 MHz see page 7

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 470 MHz test circuit.



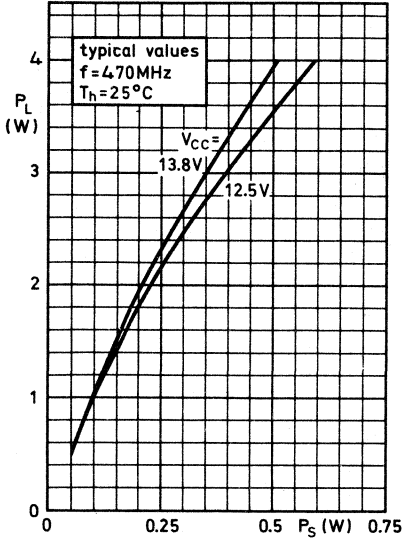
Shaded area copper

Back area completely copper clad.

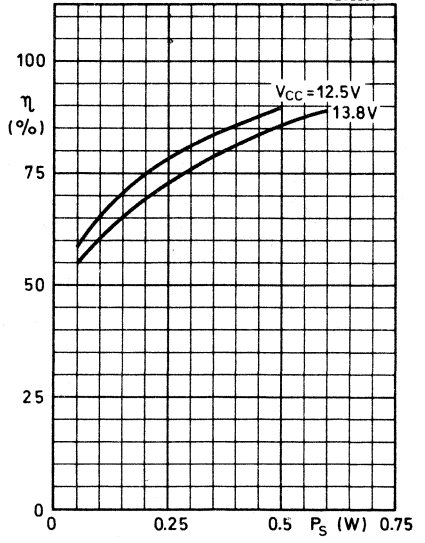
Material of printed circuit board: 1,5 mm epoxy fibre glass.

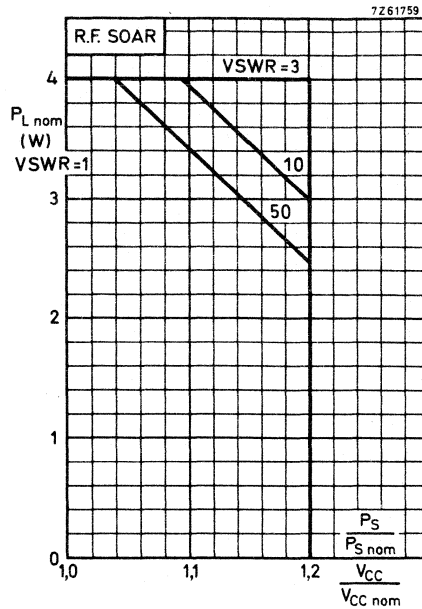


7261757



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Conditions for R. F. SOAR

$f = 470 \text{ MHz}$

$T_h = 70 \text{ }^\circ\text{C}$

$V_{CCnom} = 13,8 \text{ V}$

$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and $VSWR = 1$

$R_{th \text{ mb-h}} = 0,6 \text{ }^\circ\text{C/W}$

see also page 6

The transistor was developed for use with unstabilized supply voltage V_{CC} .

The above graph is based on its measured performance in the circuit given on page 6.

Supply voltage was varied from V_{CCnom} to $1,2 V_{CCnom}$, and $VSWR$ from 1 to 50.

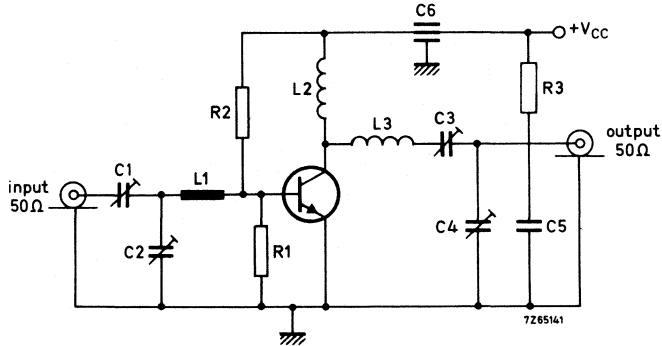
It shows the max. permissible output power under nominal conditions in order not to exceed the max. permissible power dissipation under conditions of supply over-voltage ($V_{CC} > V_{CCnom}$) and load mismatch ($VSWR > 1$).

It is assumed that the drive power increases linearly with the supply voltage; i. e.

$$P_S/P_{Snom} = V_{CC}/V_{CCnom}$$

APPLICATION INFORMATION (continued)

Test circuit for 175 MHz:



- C1 = C3 = C4 = 30 pF concentric air trimmer
- C2 = 60 pF concentric air trimmer
- C5 = 0.25 μ F ceramic capacitor
- C6 = 4 nF polyester capacitor

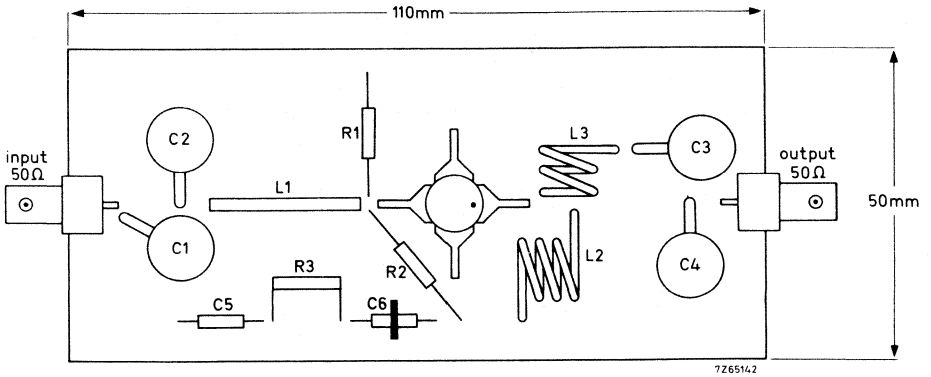
- L1 = 25 mm straight Cu wire (1.2 mm); height above print max. 3 mm
- L2 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm
- L3 = 2 turns closely wound Cu wire (1.7 mm); int. diam. 12 mm; lead length 5 mm

- R1 = 50 Ω carbon
- R2 = 1.2 k Ω carbon
- R3 = 5 Ω carbon

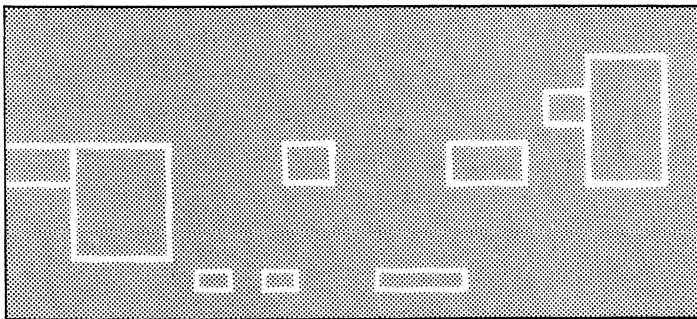
Component lay-out for 175 MHz see page 11.

APPLICATION INFORMATION (continued)

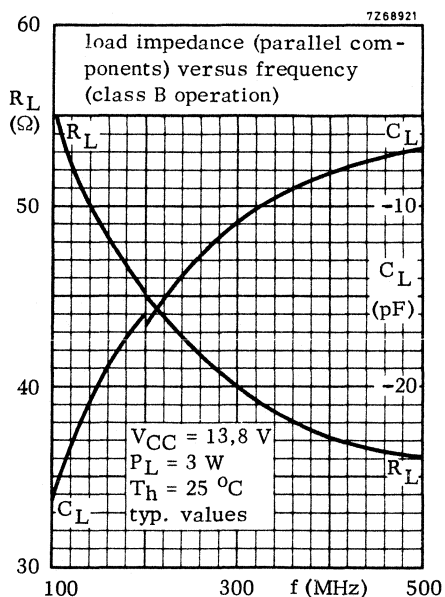
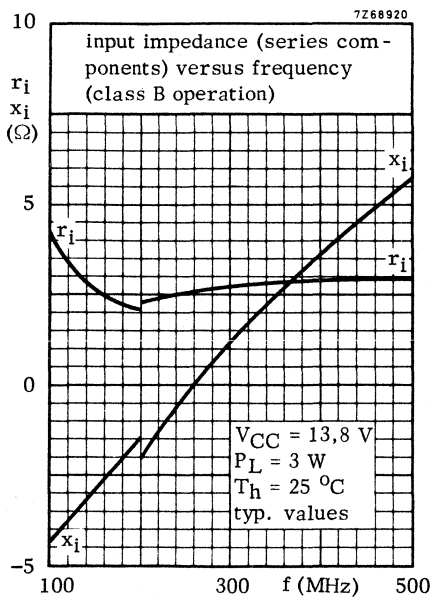
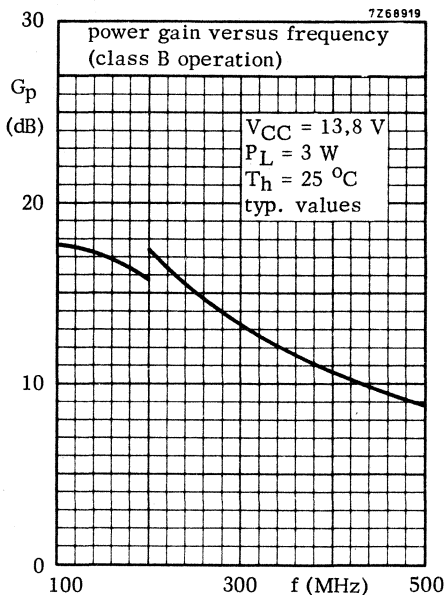
Component lay-out and printed circuit board for 175MHz test circuit.



Shaded area copper
 Back area not metalized
 Material of pcb : 1.5 mm epoxy fibre glass



OPERATING NOTE Below 200 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



U.H.F./ V.H.F. POWER TRANSISTOR

N-P-N- transistor intended for use in class B and C operated mobile, industrial and military transmitters with a supply voltage of 13.8 V. It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

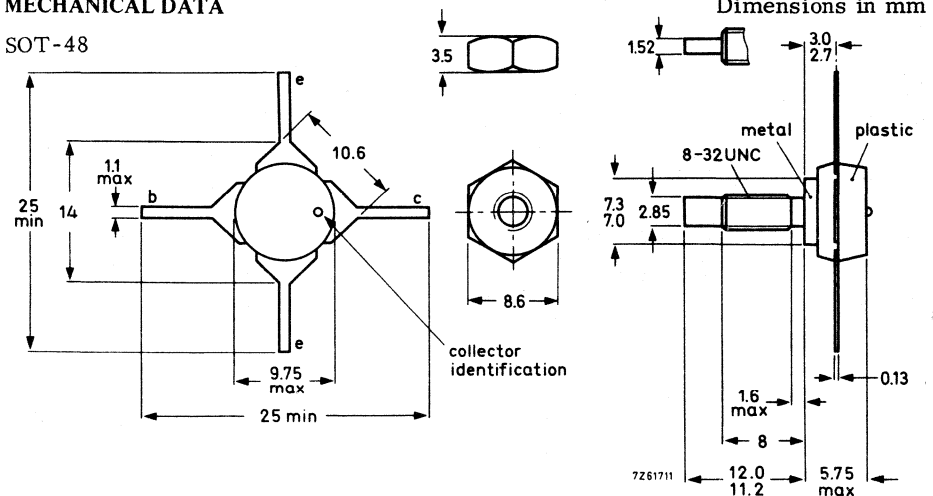
QUICK REFERENCE DATA

R. F. performance up to $T_H = 25\text{ }^\circ\text{C}$ in an unneutralised common-emitter class B circuit.

Mode of operation	V_{CC} (V)	f (MHz)	PS (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	13.8	470	< 2.0	7.0	< 0.78	> 5.4	> 65	—	—
c. w.	13.8	470	typ. 2.0	7.8	typ. 0.81	typ. 5.9	typ. 70	$2.4 + j6.7$	$60 - j20$
c. w.	12.5	470	< 2.2	7.0	< 0.86	> 5.0	> 65	—	—
c. w.	12.5	175	typ. 0.4	7.2	typ. 0.87	typ. 12.6	typ. 66	—	—

MECHANICAL DATA

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 7.5 kg cm
(0.75 Newton metres)
max. 8.5 kg cm
(0.85 Newton metres)

Diameter of clearance hole in heatsink: max. 4.17 mm.

Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage ($R_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V

Currents

Collector current (average)	$I_{C(AV)}$	max.	1.0 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	4.0 A

Power dissipation

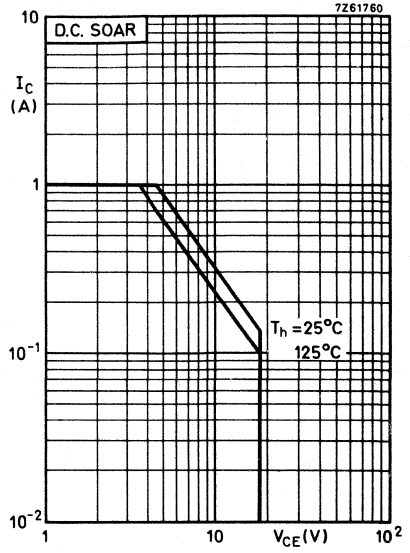
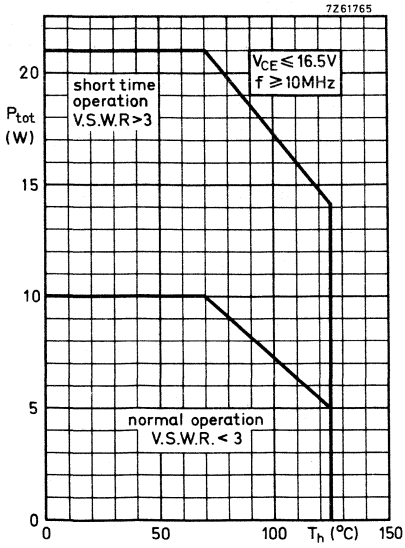
Total power dissipation up to $T_h = 70$ °C $f > 10$ MHz	P_{tot}	max.	10 W
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Temperatures

Storage temperature	T_{stg}	-65 to +150	°C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	7.0 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6 °C/W



CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 10\text{ mA}$	$V_{(BR)CBO}$	>	36 V
Collector-emitter voltage $V_{BE} = 0$; $I_C = 10\text{ mA}$	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base, $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	18 V
Emitter-base voltage open collector, $I_E = 1.0\text{ mA}$	$V_{(BR)EBO}$	>	4 V

Collector-emitter saturation voltage

$I_C = 500\text{ mA}$; $I_B = 100\text{ mA}$	V_{CEsat}	typ.	0.2 V
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D.C. current gain

$I_C = 500\text{ mA}$; $V_{CE} = 5\text{ V}$	h_{FE}	>	10
		typ.	40

Transition frequency

$I_C = 500\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$	f_T	typ.	1300 MHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 10\text{ V}$	C_c	typ.	14 pF
		<	20 pF

Emitter capacitance at $f = 1\text{ MHz}$

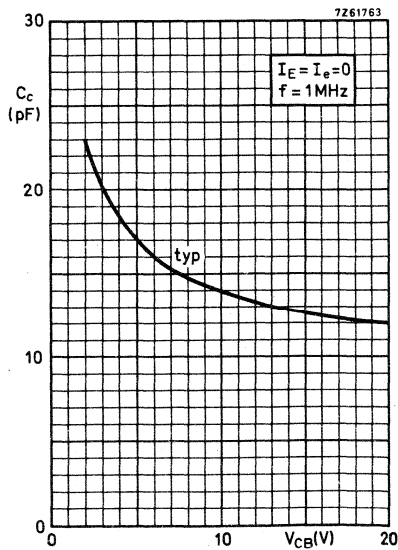
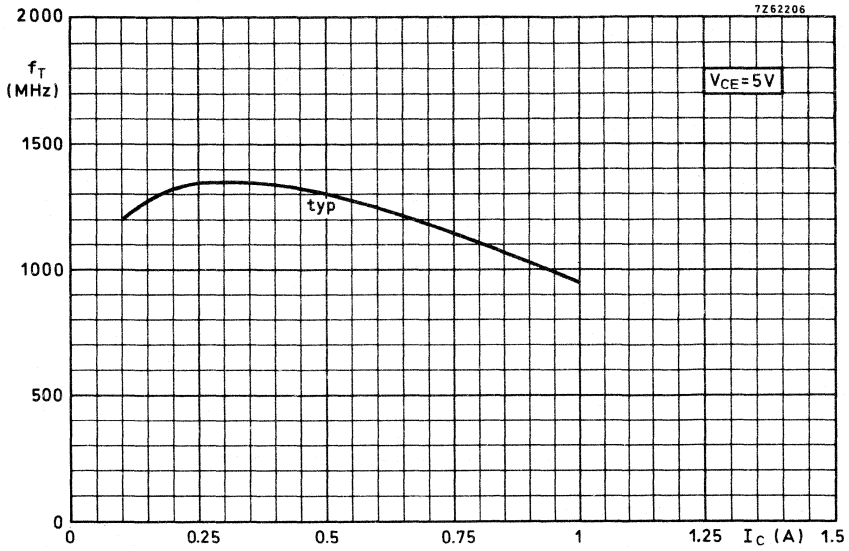
$I_C = I_c = 0$; $V_{EB} = 0$	C_e	typ.	65 pF
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Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 50\text{ mA}$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	10.5 pF
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Collector-stud capacitance

	C_{cs}	typ.	2 pF
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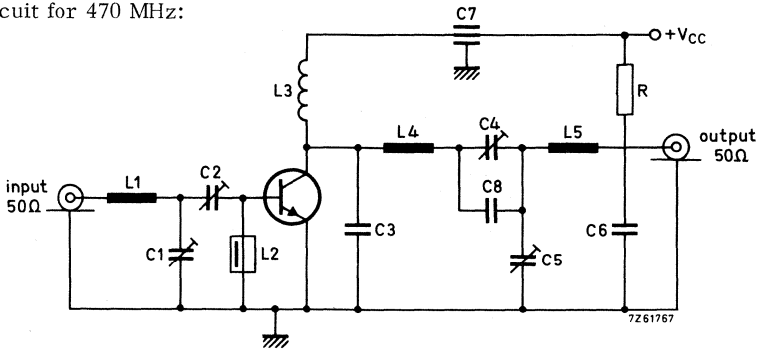
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralized common-emitter class B circuit)

T_h up to 25 °C

f (MHz)	V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_D (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
470	13.8	< 2.0	7.0	< 0.78	> 5.4	> 65	—	—
470	13.8	typ. 2.0	7.8	typ. 0.81	typ. 5.9	typ. 70	2.4 + j6.7	60 - j20
470	12.5	< 2.2	7.0	< 0.86	> 5.0	> 65	—	—
175	12.5	typ. 0.4	7.2	typ. 0.87	typ. 12.6	typ. 66	—	—

Test circuit for 470 MHz:



C1 = C2 = C4 = C5 = 1.8 to 18 pF film dielectric trimmer

C3 = 6.8 pF ceramic capacitor

C6 = 0.1 μ F polyester capacitor

C7 = 4 nF feed-through capacitor

C8 = 10 pF ceramic capacitor

L1 = L4 = L5 = 20 mm straight Cu wire (1.2 mm); height above print 12 mm

L2 = 0.47 μ H choke

L3 = 1 turn Cu wire (1.7 mm); int. diam. 10 mm; max. lead length 5 mm

R = 10 Ω carbon

At $P_L = 7.0$ W and $V_{CC} = 12.5$ V the output power at heatsink temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 10 mW/°C

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 16.5$ V; f = 470 MHz; $T_h = 70$ °C;

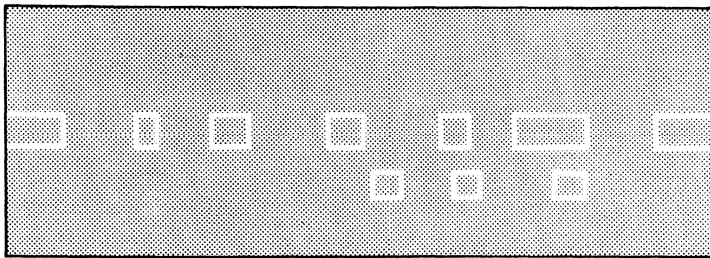
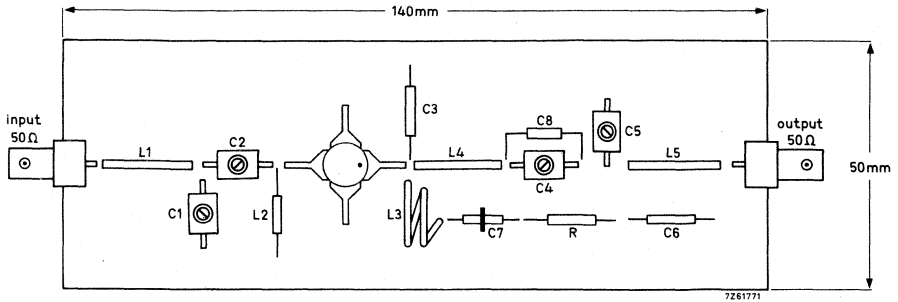
V.S.W.R. = 50 : 1 through all phases; $P_S = P_{Snom} + 20\%$

where $P_{Snom} = P_S$ for 7.0 W transistor output into 50 Ω load at $V_{CC} = 13.8$ V

Component lay-out for 470 MHz see page 7

APPLICATION INFORMATION (continued)

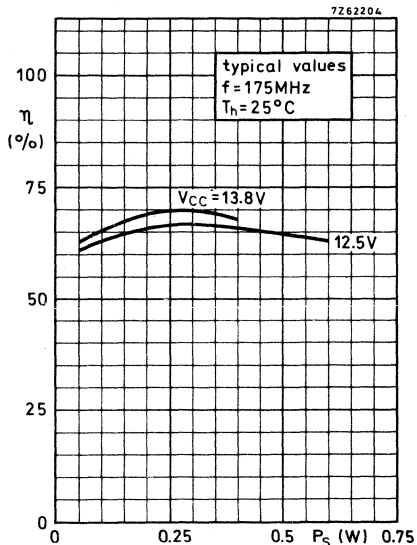
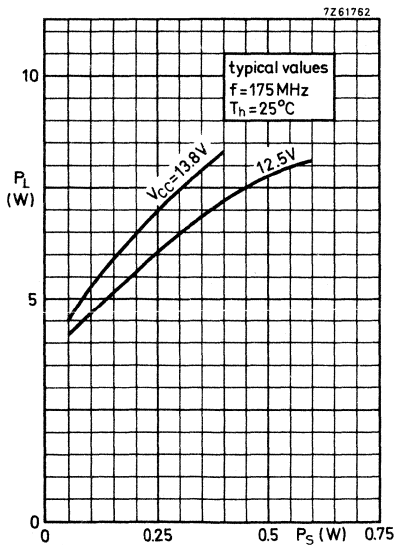
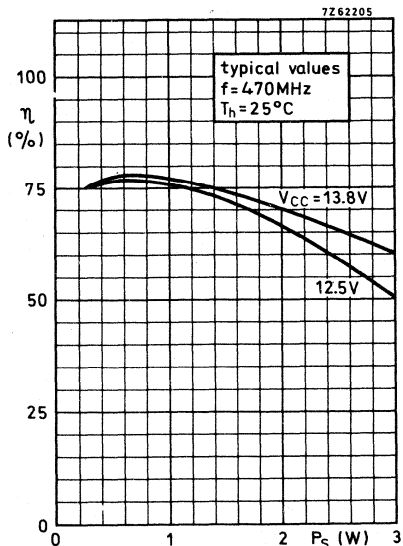
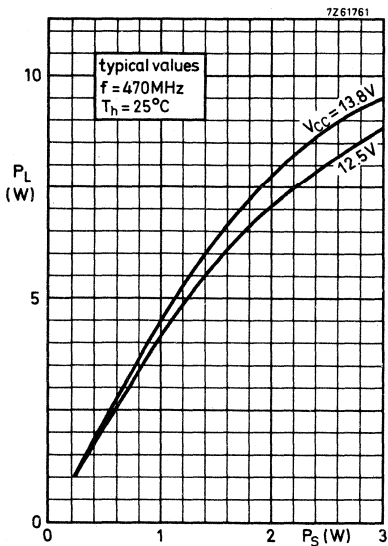
Component lay-out and printed circuit board for 470 MHz test circuit.

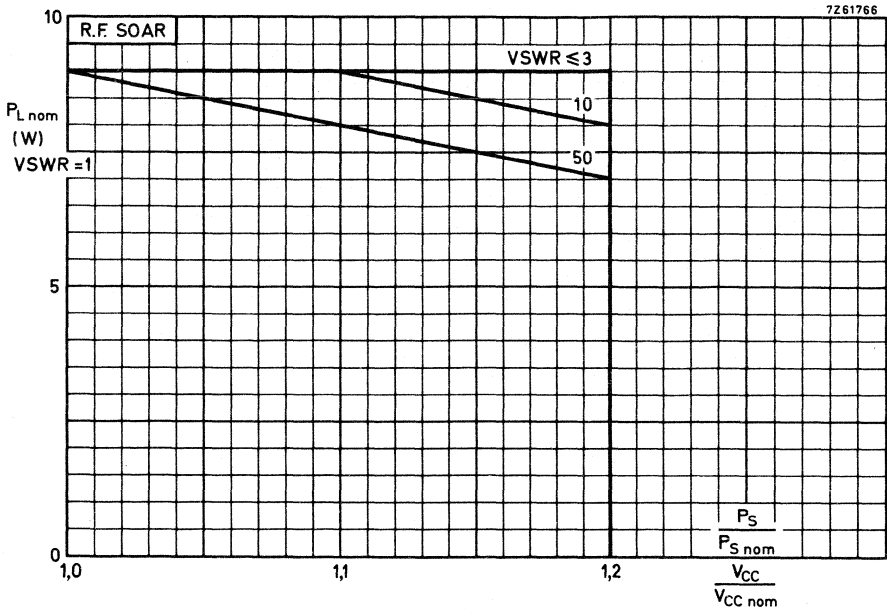


Shaded area copper

Back area completely copper clad

Material of printed circuit board: 1.5 mm epoxy fibre glass





Conditions for R. F. SOAR :

$f = 470 \text{ MHz}$

$P_{S\text{nom}} = P_S$ at $V_{CC} = V_{CC\text{nom}}$ and $V_{\text{SWR}} = 1$

$T_h = 70 \text{ }^\circ\text{C}$

$V_{CC\text{nom}} = 13,8 \text{ V}$

see also page 6

The transistor was developed for use with unstabilized supply voltage V_{CC} .

The above graph is based on its measured performance in the circuit given on page 6.

Supply voltage was varied from $V_{CC\text{nom}}$ to $1,2 V_{CC\text{nom}}$, and V_{SWR} from 1 to 50.

It shows the max. permissible output power under nominal conditions in order not to ex-

ceed the max. permissible power dissipation under conditions of supply over-voltage

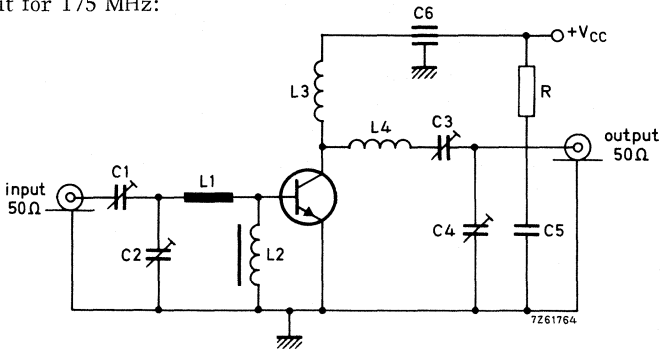
($V_{CC} > V_{CC\text{nom}}$) and load mismatch ($V_{\text{SWR}} > 1$).

It is assumed that the drive power increases linearly with the supply voltage; i. e.

$P_S/P_{S\text{nom}} = V_{CC}/V_{CC\text{nom}}$.

APPLICATION INFORMATION (continued)

Test circuit for 175 MHz:



- C1 = C3 = C4 = 30 pF concentric air trimmer
- C2 = 60 pF concentric air trimmer
- C5 = 0.25 μ F polyester capacitor
- C6 = 4.0 nF feed-through capacitor

L1 = 25 mm straight Cu wire (1.2 mm); height above print 3 mm

L2 = 3 turns Cu wire (0.5 mm) on Ferrite FX1115, d = 2 mm, D = 4 mm, l = 5 mm material 3B (code number 3113991 16740)

L3 = 5 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

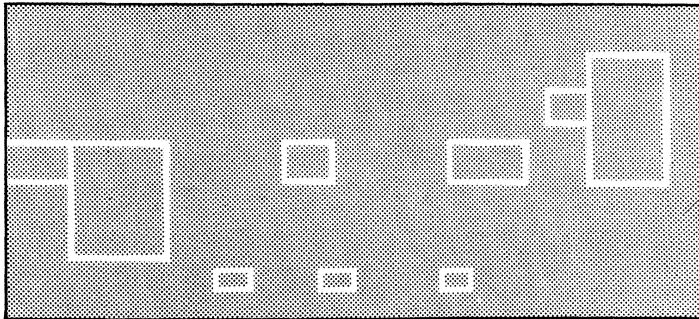
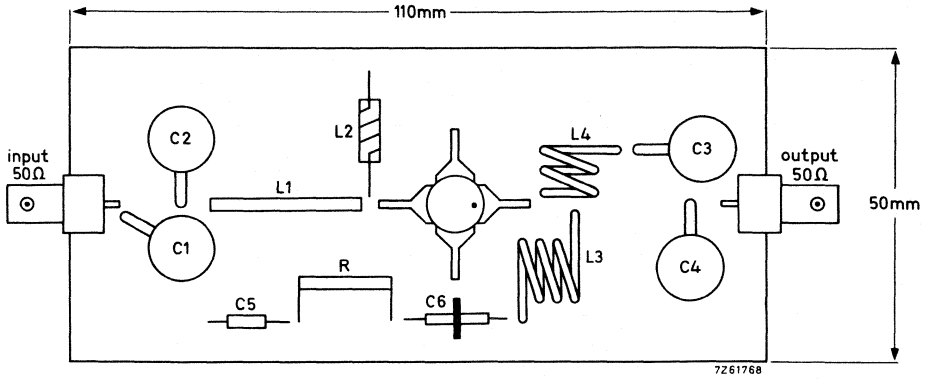
L4 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

R = 10 Ω carbon

Graphs (P_L versus P_S and η versus P_S) for 175 MHz on page 8.
 Component lay-out for 175 MHz on page 11.

APPLICATION INFORMATION (continued)

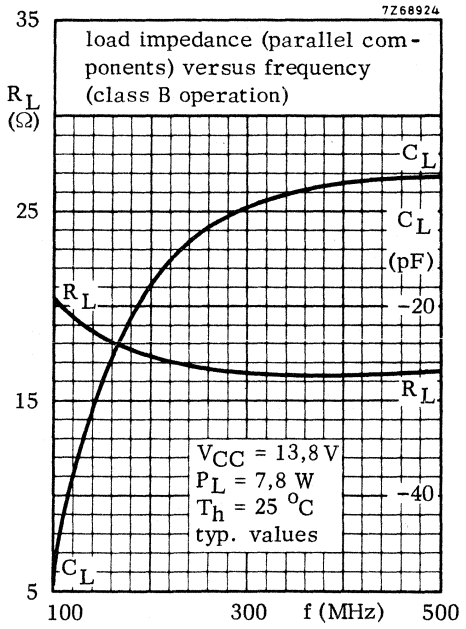
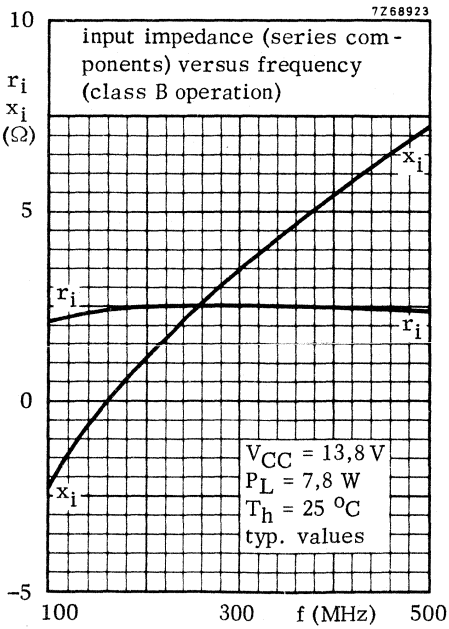
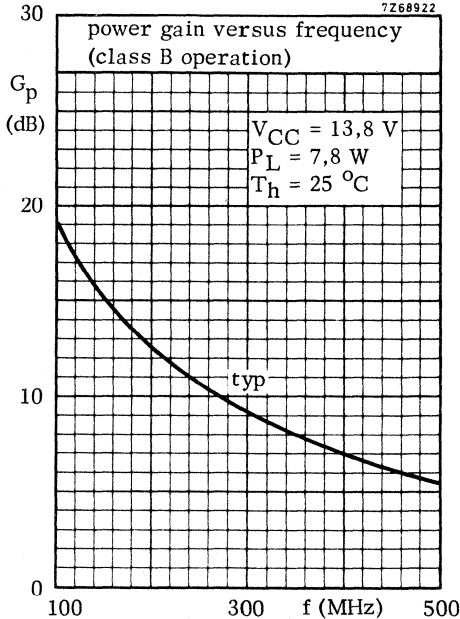
Component lay-out and printed circuit board for 175 MHz test circuit



Shaded area copper

Back area not metalized

Material of printed circuit board: 1.5 mm epoxy fibre glass



U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13,5 V.

The transistor is resistance stabilized, Gold metallization ensures extremely high reliability. Every transistor is tested under severe load mismatch conditions with a supply overvoltage to 16,5 V.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

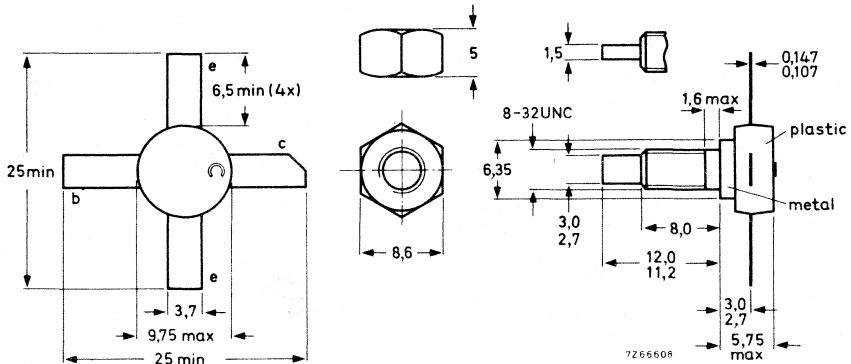
R. F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralised common-emitter class B circuit.

Mode of operation	V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	13,5	470	< 8,0	20	< 2,28	> 4	> 65	$1,2 + j4,5$	$163 - j35$
c. w.	12,5	470	< 6,8	17	< 2,09	> 4	> 65	—	—

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required, an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.

Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

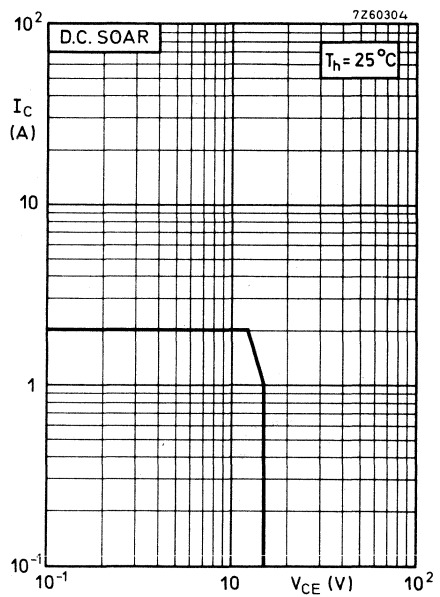
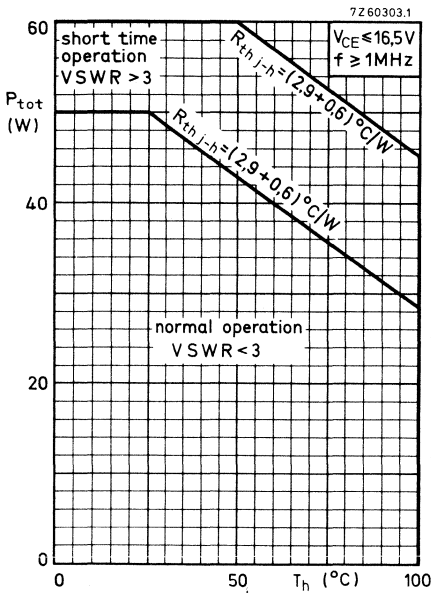
Currents

Collector current (average)	$I_{C(AV)}$	max.	3,5	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	10	A

Power dissipation

Total power dissipation up to $T_h = 25$ °C
 $f \geq 1$ MHz

P_{tot}	max.	50	W
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Temperatures

Storage temperature	T_{stg}	-65 to +200	°C
Junction temperature	T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	2,9	°C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	°C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter ; $I_C = 25\text{ mA}$	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base ; $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector ; $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	4	V

Transient energy

$L = 25\text{ mH}$; $f = 50\text{ Hz}$

open base	E	>	3, 1	mWs
$-V_{BE} = 1, 5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	3, 1	mWs

D. C. current gain

$I_C = 1\text{ A}$; $V_{CE} = 5\text{ V}$

h_{FE}	>	10
	typ.	30

Transition frequency

$I_C = 2\text{ A}$; $V_{CE} = 10\text{ V}$

f_T	typ.	1, 0	GHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 15\text{ V}$

C_c	typ.	55	pF
	<	70	pF

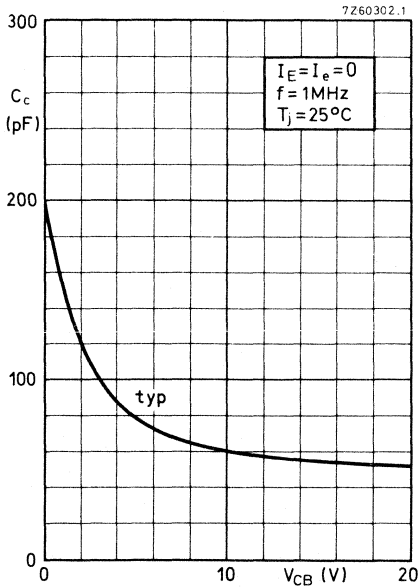
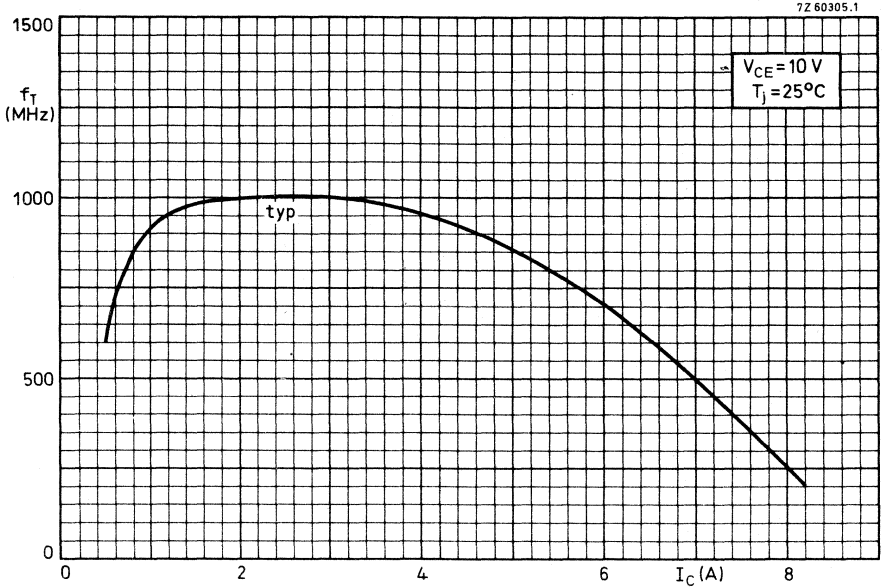
Feedback capacitance

$I_C = 100\text{ mA}$; $V_{CE} = 15\text{ V}$

C_{re}	typ.	32	pF
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Collector-stud capacitance

C_{cs}	typ.	2	pF
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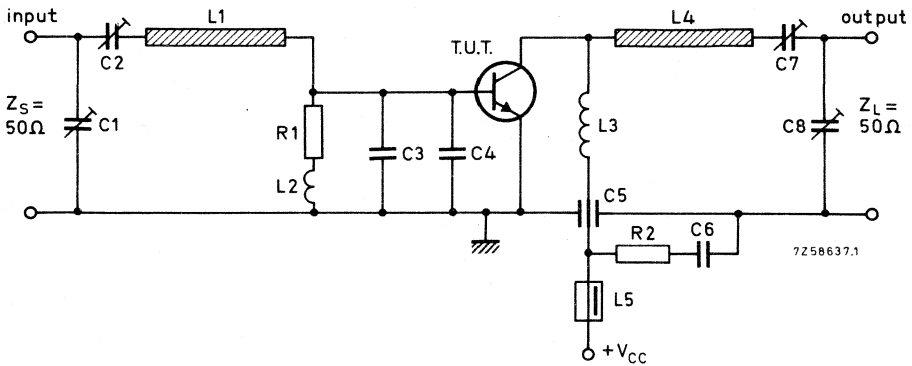
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 T_{mb} up to 25 °C

f (MHz)	V_{CE} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
470	13,5	< 8,00	20	< 2,28	> 4	> 65	$1,2 + j4,5$	$163 - j35$
470	12,5	< 6,80	17	< 2,09	> 4	> 65	—	—
175	12,5	typ. 1,35	17	typ. 2,30	typ. 11	typ. 60	—	—

Test circuit: 470 MHz; c.w. class-B.



List of components:

C1 = C2 = C7 = C8 = 2,0 to 9,0 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = C4 = 15 pF chip capacitor

C5 = 100 pF feed-through capacitor

C6 = 33 nF polyester capacitor

R1 = 1 Ω carbon resistorR2 = 10 Ω carbon resistor

L1 = stripline (41,1 mm x 5,0 mm)

L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm (0,32 μ H)

L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4 mm; leads 2 x 5 mm

L4 = stripline (52,7 mm x 5,0 mm)

L5 = Ferroxcube choke coil. Z (at f = 50 MHz) = 750 $\Omega \pm 20\%$ (cat. no. 4312 020 36640)

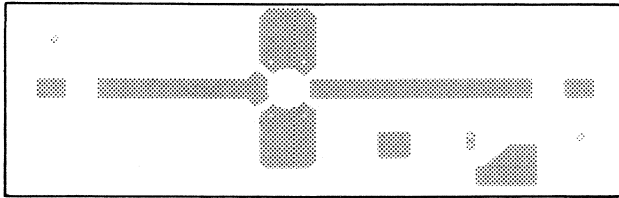
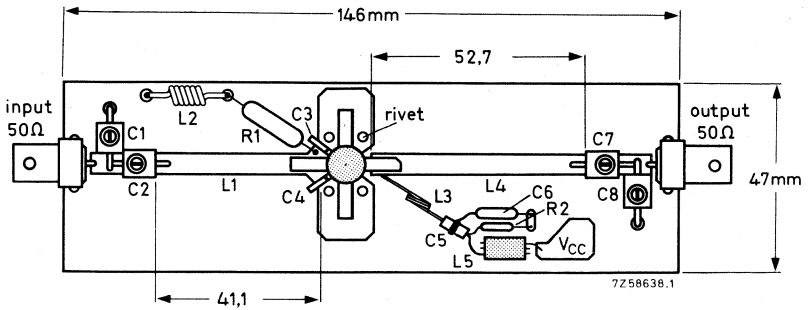
L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric.

 $(\epsilon_r = 2,74)$; thickness 1,45 mm.

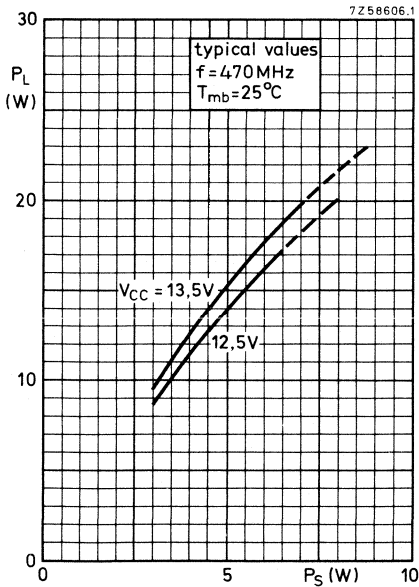
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

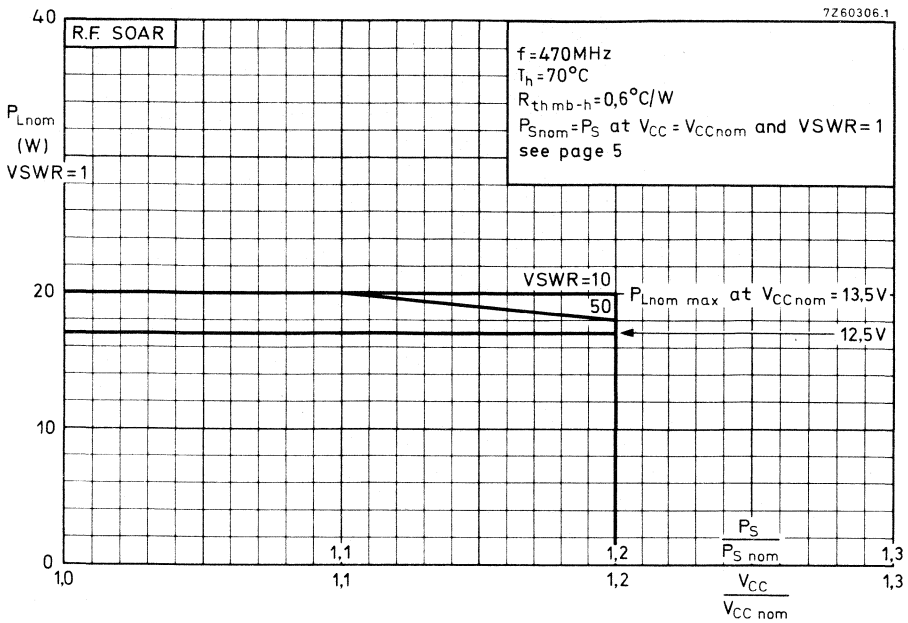
APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.



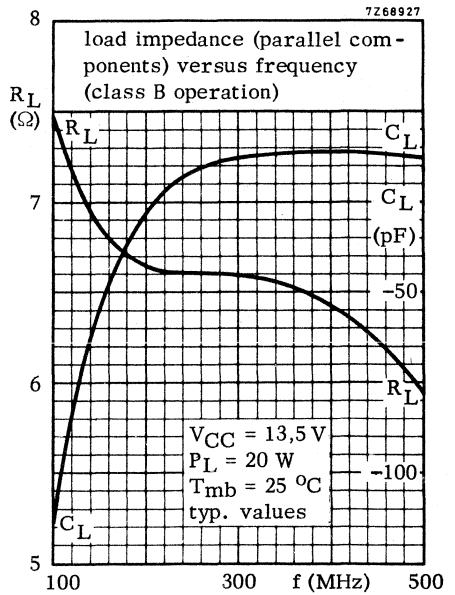
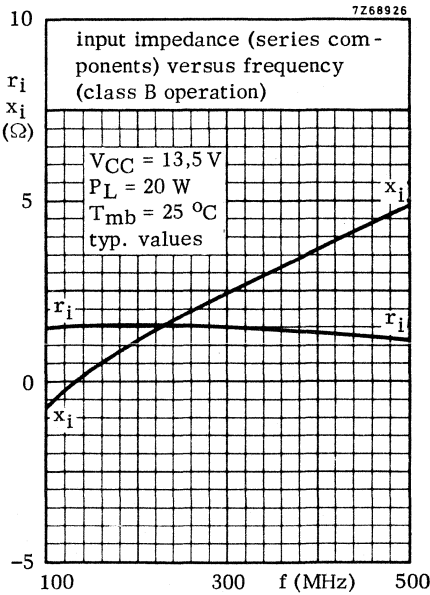
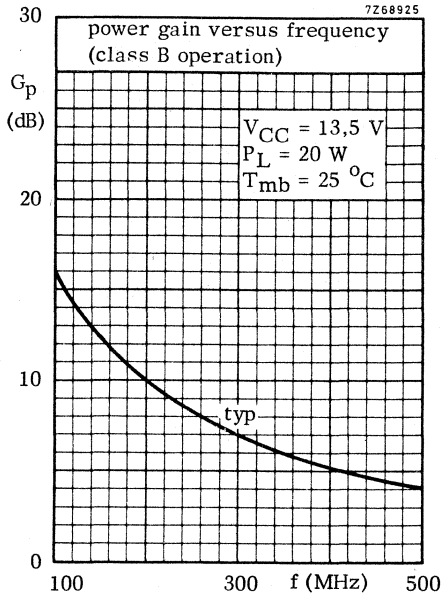
The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.





The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph above for safe operation at supply voltages other than the nominal. The graph shows the allowable output power, under nominal conditions, as a function of the supply overvoltage ratio, with VSWR as parameter. The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with the supply overvoltage ratio.

The horizontal line at 20 W applies at $V_{CCnom} = 13,5 \text{ V}$.
 For $V_{CCnom} = 12,5 \text{ V}$, P_L should be derated to 17 W.



U.H.F. TRANSMITTING TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C with a supply voltage up to 28 V.
 The transistor is resistance stabilized and is tested under severe load mismatch conditions. Gold metallization ensures extremely high reliability.
 It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

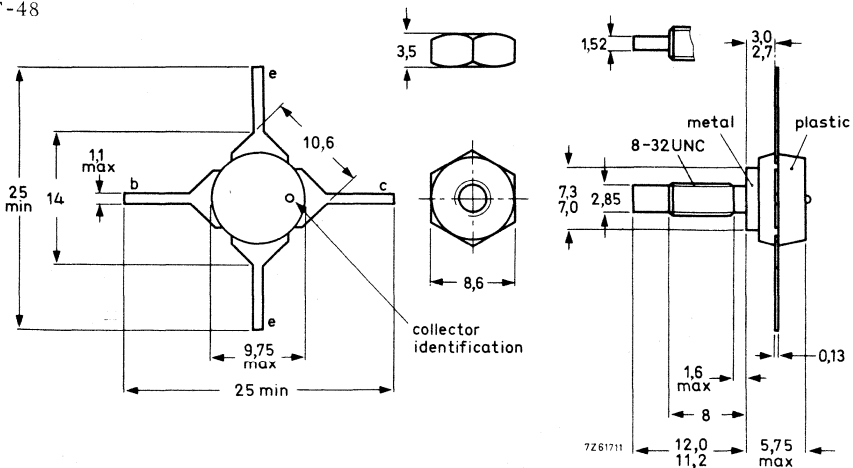
R. F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit.

Mode of operation	V _{CC} (V)	f (MHz)	P _S (mW)	P _L (W)	I _C (mA)	G _p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	24	470	typ. 50	0,85	typ. 67	typ. 12,3	typ. 53	—	—
c. w.	28	470	< 80	1,0	< 71	> 11,0	> 50	—	—
c. w.	28	470	typ. 80	1,45	typ. 86	typ. 12,6	typ. 60	2,5 + j0,2	3,4 - j16
c. w.	28	1000	typ. 400	1,4	typ. 100	typ. 5,4	typ. 50	—	—

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
 (7,5 kg cm)
 max. 0,85 Nm
 (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
 Mounting hole to have no burrs at either end.
 De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4,0	V

Currents

Collector current (d. c.)	I_C	max.	400	mA
Collector current (peak value); $f \geq 10$ MHz	I_{CM}	max.	800	mA

Power dissipation

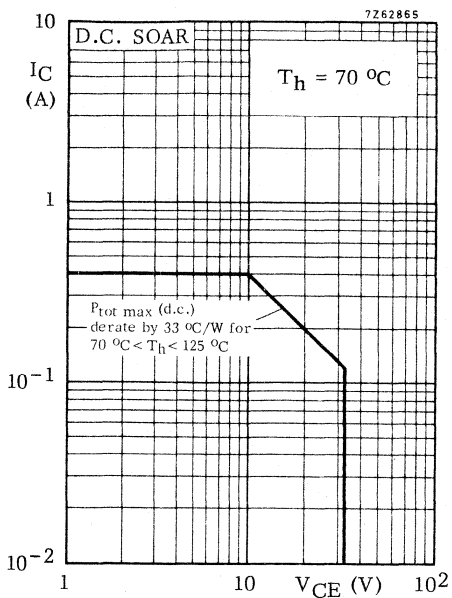
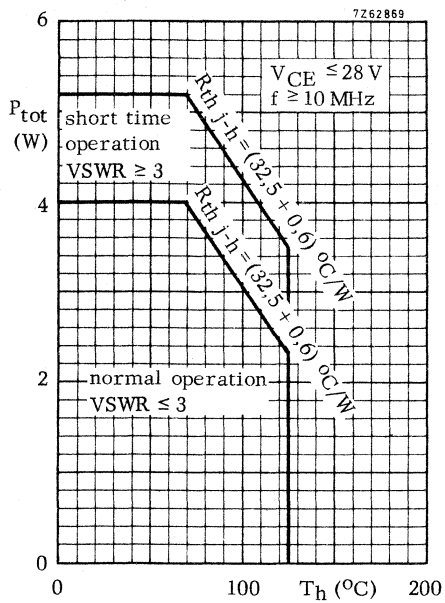
Total power dissipation up to $T_h = 70$ °C $f \geq 10$ MHz (see also page 3)	P_{tot}	max.	4,0	W
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Temperatures

Storage temperature	T_{stg}	-65 to +150	°C
Operating junction temperature	T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	32,5	°C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	°C/W



CHARACTERISTICS

$T_j = 25^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 10\text{ mA}$	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage $V_{BE} = 0$, $I_C = 10\text{ mA}$	$V_{(BR)CES}$	>	65	V
Collector-emitter voltage open base, $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	33	V
Emitter-base voltage open collector, $I_E = 1.0\text{ mA}$	$V_{(BR)EBO}$	>	4,0	V

D. C. current gain

$I_C = 100\text{ mA}$; $V_{CE} = 5.0\text{ V}$	h_{FE}	>	10	
		typ.	35	

Transition frequency

$I_C = 50\text{ mA}$; $V_{CE} = 5.0\text{ V}$	f_T	typ.	1,2	GHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_C = 0$; $V_{CB} = 10\text{ V}$	C_C	typ.	3,5	pF
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Emitter capacitance at $f = 1\text{ MHz}$

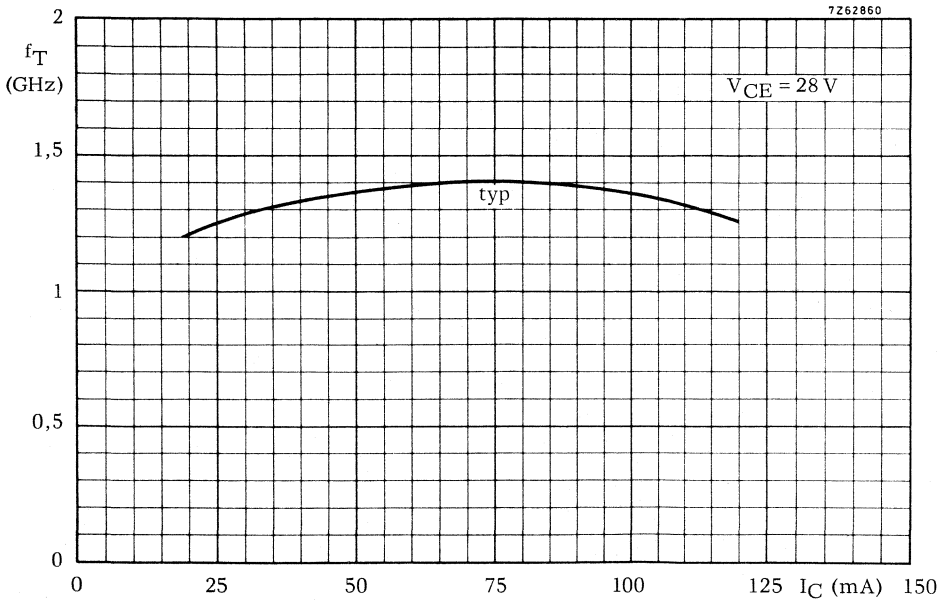
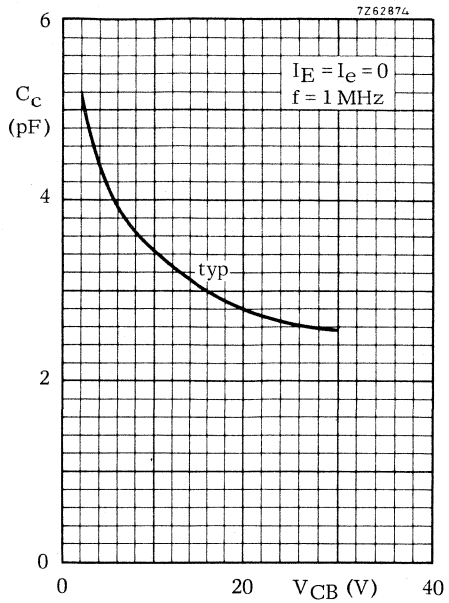
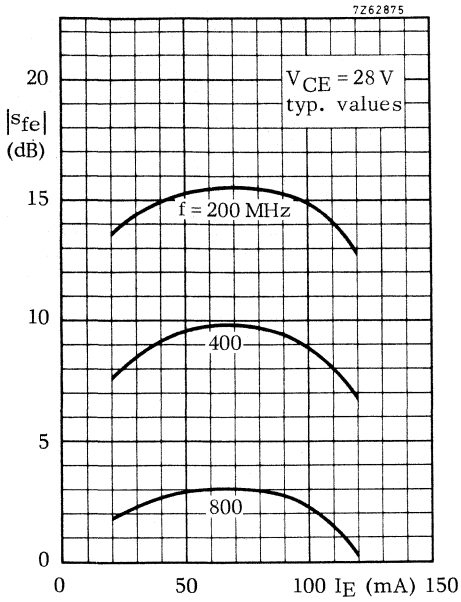
$I_C = I_E = 0$; $V_{EB} = 0$	C_E	typ.	11	pF
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Feedback capacitance at $f = 1\text{ MHz}$

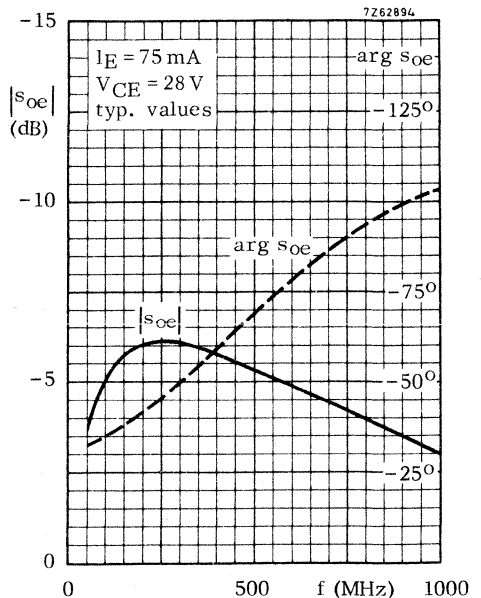
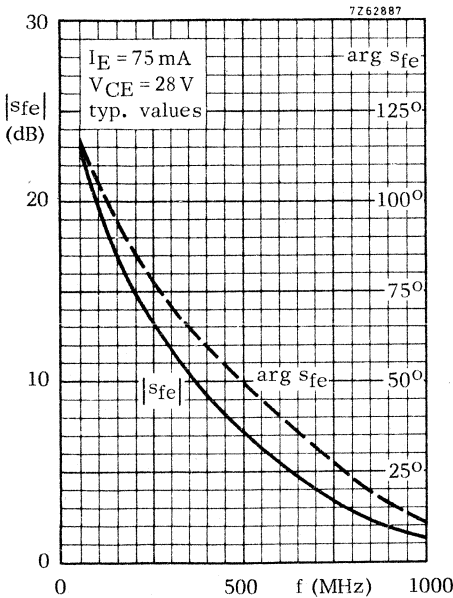
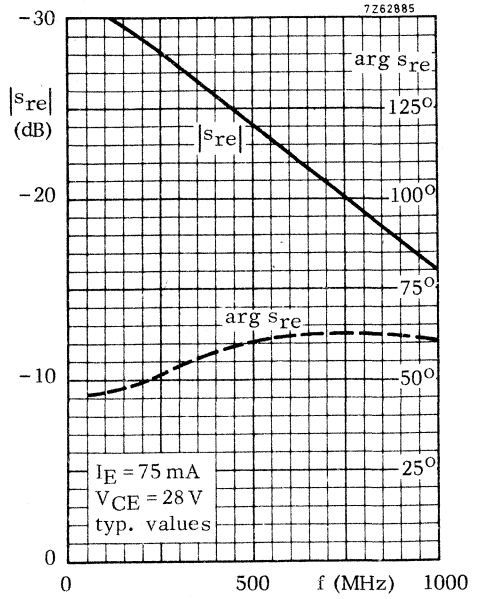
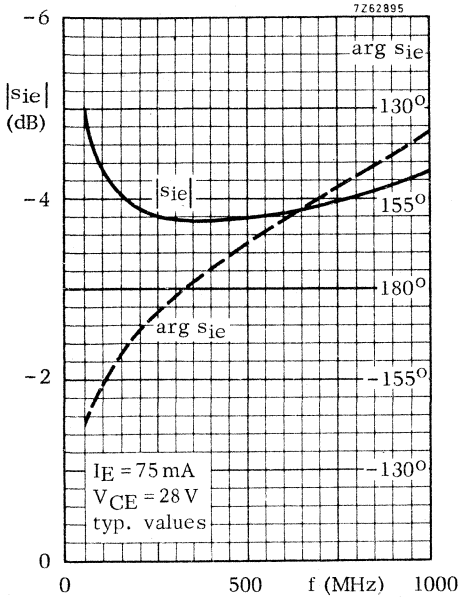
$I_C = 5\text{ mA}$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	2,5	pF
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Collector-stud capacitance

	C_{cs}	typ.	2,0	pF
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BLX91A



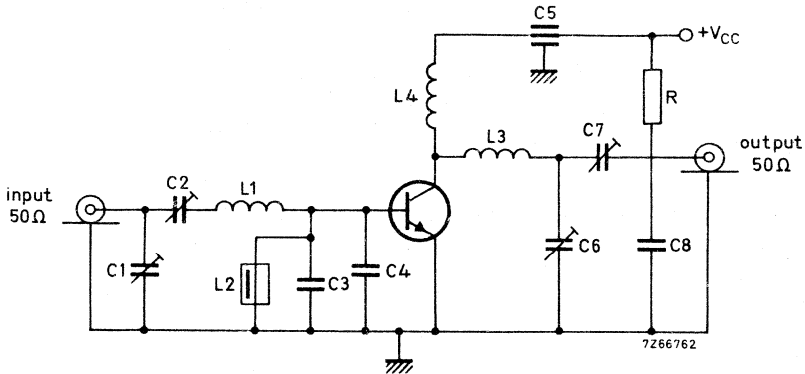
APPLICATION INFORMATION

R. F. performance in c. w. operation (Unneutralized common-emitter class-B circuit)

$T_h = 25 \text{ }^\circ\text{C}$

V_{CC} (V)	f (MHz)	P_S (mW)	P_L (W)	I_C (mA)	G_p (dB)	η (%)	\bar{Z}_i (Ω)	\bar{Y}_L (mA/V)
24	470	typ. 50	0,85	typ. 67	typ. 12,3	typ. 53	—	—
28	470	< 80	1,0	< 71	> 11,0	> 50	—	—
28	470	typ. 80	1,45	typ. 86	typ. 12,6	typ. 60	$2,5 + j0,2$	$3,4 - j16$
28	1000	typ. 400	1,4	typ. 100	typ. 5,4	typ. 50	—	—

Test circuit for 470 MHz:



C1 = C2 = C7 = 1,8 to 18 pF film dielectric trimmer

C3 = C4 = 18 pF disc ceramic capacitor

C5 = 1 nF feed-through capacitor

C6 = 1,0 to 9,0 pF film dielectric trimmer

C8 = 0,1 μ F polyester capacitor

L1 = 1 turn Cu wire (1,2 mm); int. dia. 5 mm; lead length = 2 mm

L2 = 0,47 μ H choke

L3 = 4 turns closely wound enamelled Cu wire (1,2 mm); int. dia. 6,5 mm; lead length = 4 mm

L4 = 5 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; lead length = 5 mm

R = 10 Ω carbon

At $P_L = 1,0$ W and $V_{CC} = 28$ V, the output power at heatsink temperatures between 25 $^\circ\text{C}$ and 90 $^\circ\text{C}$ relative to that at 25 $^\circ\text{C}$ is diminished by typ. 2 mW/ $^\circ\text{C}$.

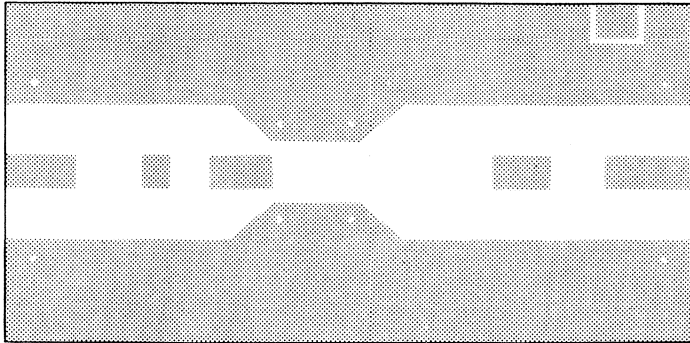
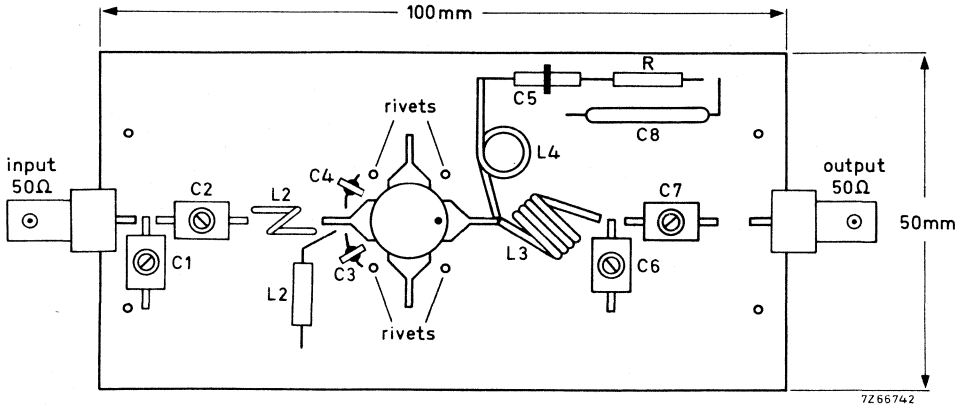
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 28$ V; f = 470 MHz; $T_h = 90$ $^\circ\text{C}$.

VSWR = 50 : 1 through all phases; $P_L = 1,2$ W.

Component layout for 470 MHz test circuit see page 8.

APPLICATION INFORMATION (continued)

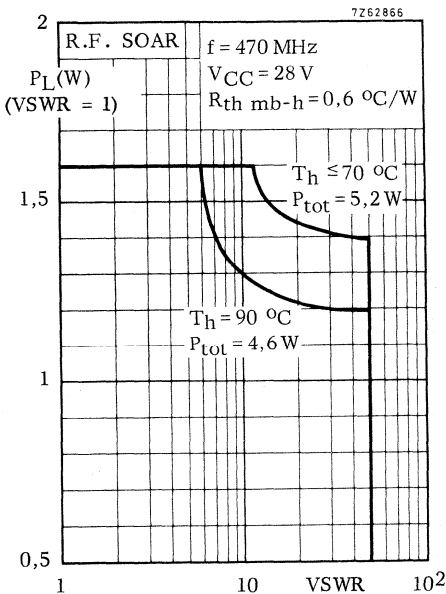
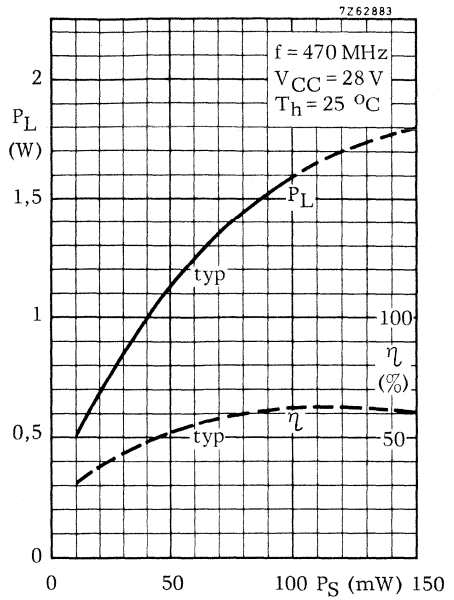
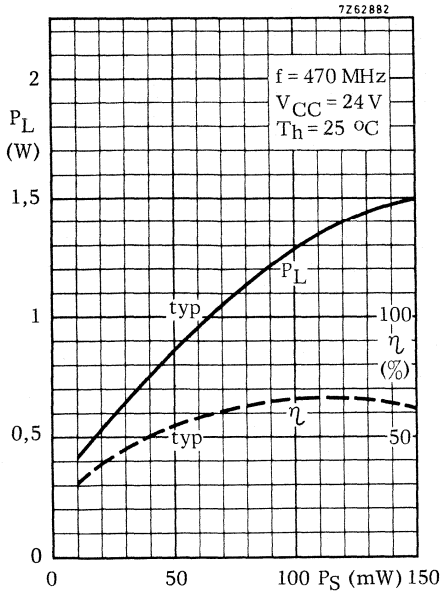
Component layout and printed-circuit board for 470 MHz test circuit.



Shaded area copper

Back area completely copper clad

Material of printed-circuit board: 1,5 mm epoxy fibre-glass

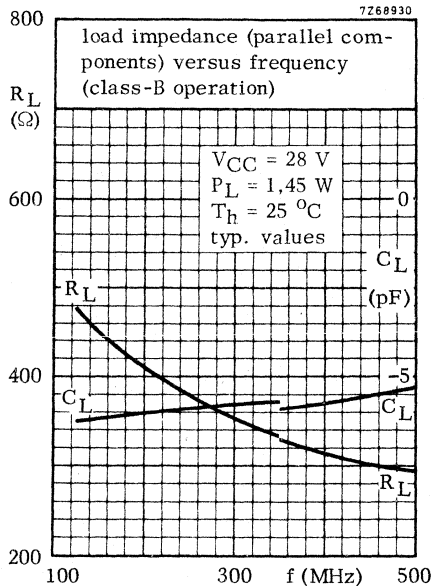
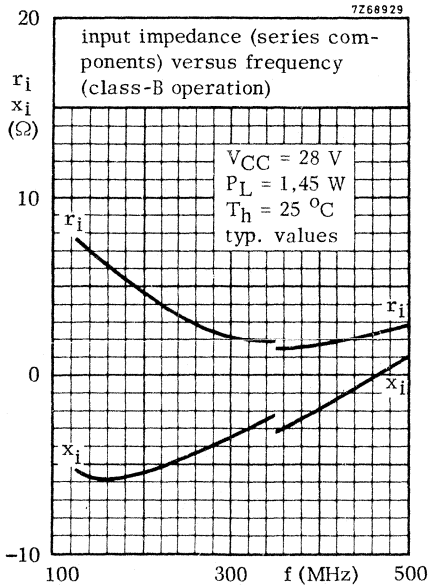
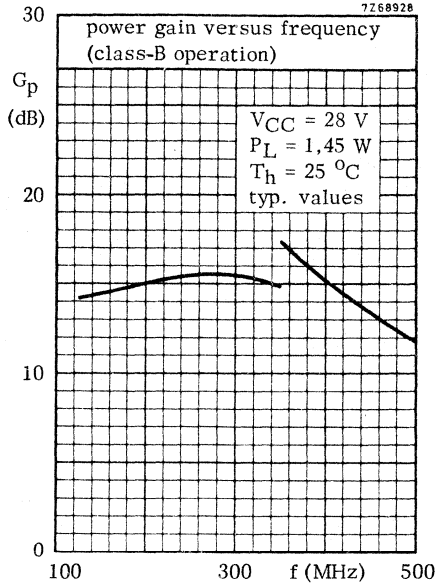


Indicated load power as a function of overload

The graph has been derived from an evaluation of the performance of transistors matched up to 1,6 W load power in the test amplifier on page 7 and subsequently subjected to various mismatch conditions at 28 V with VSWR up to 50 and elevated heatsink temperatures.

This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

OPERATING NOTE Below 350 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4,0	V

Currents

Collector current (d. c.)	I_C	max.	0,7	A
Collector current (peak value) $f \geq 10$ MHz	I_{CM}	max.	2,0	A

Power dissipation

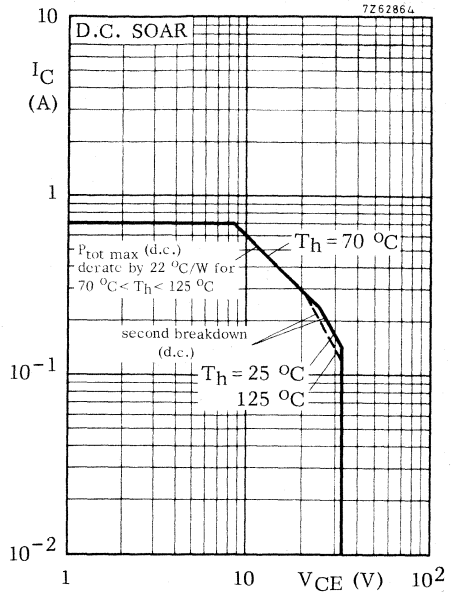
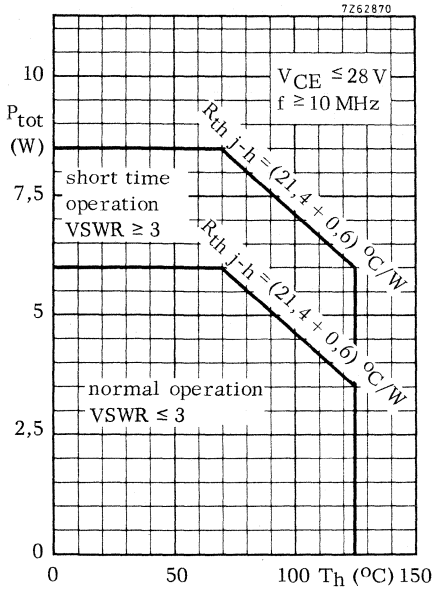
Total power dissipation up to $T_h = 70$ °C $f \geq 10$ MHz (see also page 3)	P_{tot}	max.	6,0	W
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Temperatures

Storage temperature	T_{stg}	-65 to +150	°C
Operating junction temperature	T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	21,4	°C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	°C/W



$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

CHARACTERISTICS

Breakdown voltages

Collector-base voltage open emitter, $I_C = 10\text{ mA}$	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage $V_{BE} = 0$, $I_C = 10\text{ mA}$	$V_{(BR)CES}$	>	65	V
Collector-emitter voltage open base, $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	33	V
Emitter-base voltage open collector, $I_E = 1,0\text{ mA}$	$V_{(BR)EBO}$	>	4,0	V

Collector-emitter saturation voltage

$I_C = 100\text{ mA}$; $I_B = 20\text{ mA}$	V_{CEsat}	typ.	0,17	V
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D. C. current gain

$I_C = 100\text{ mA}$; $V_{CE} = 5,0\text{ V}$	h_{FE}	>	10
		typ.	40

Transition frequency

$I_C = 100\text{ mA}$; $V_{CE} = 5,0\text{ V}$	f_T	typ.	1,2	GHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 10\text{ V}$	C_c	typ.	6,5	pF
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Emitter capacitance at $f = 1\text{ MHz}$

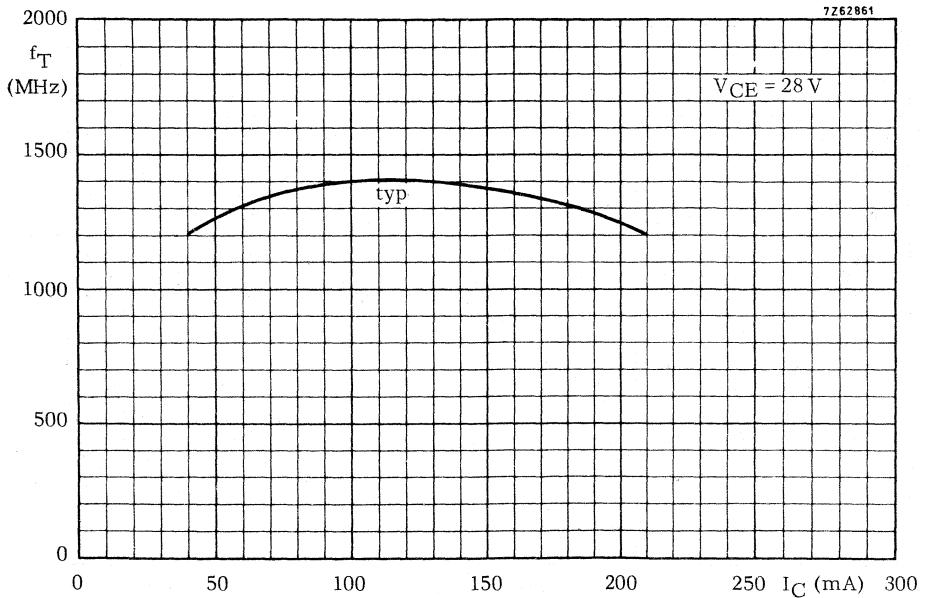
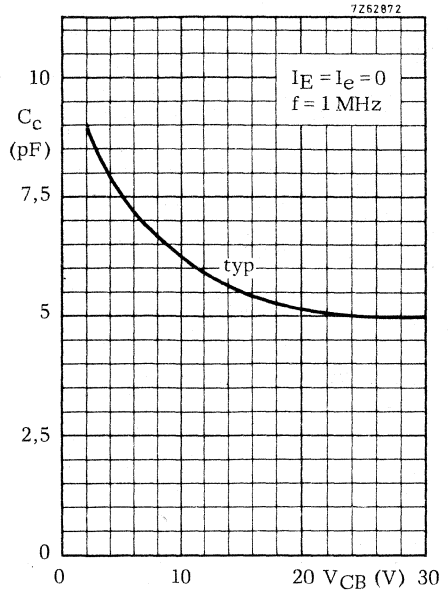
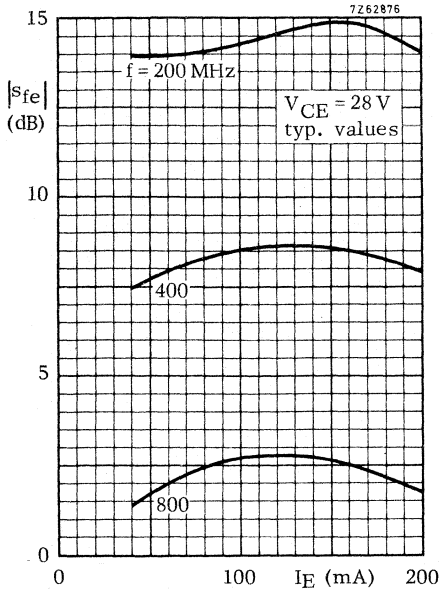
$I_C = I_c = 0$; $V_{EB} = 0$	C_e	typ.	25	pF
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Feedback capacitance at $f = 1\text{ MHz}$

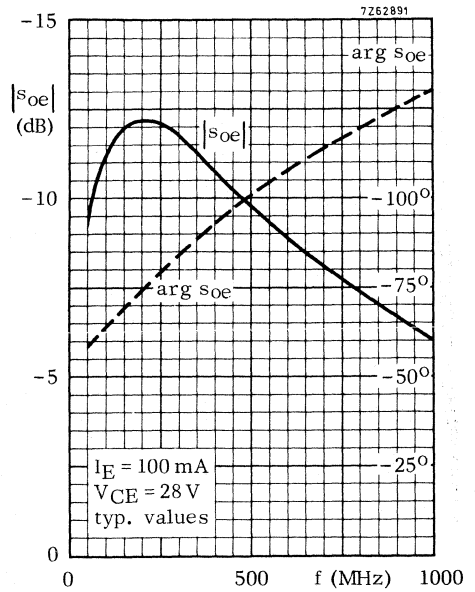
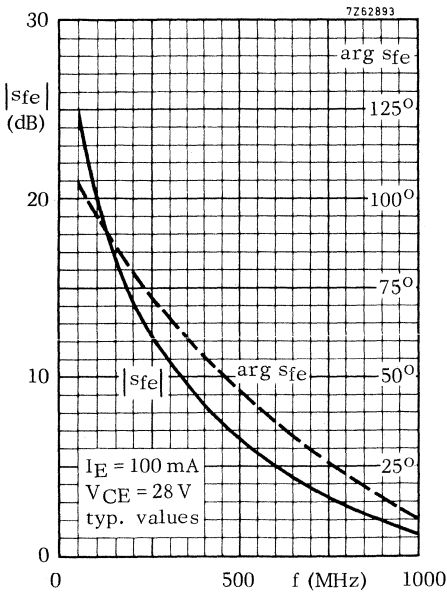
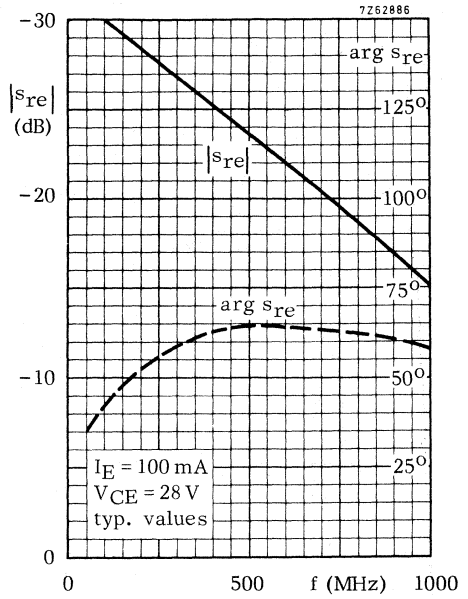
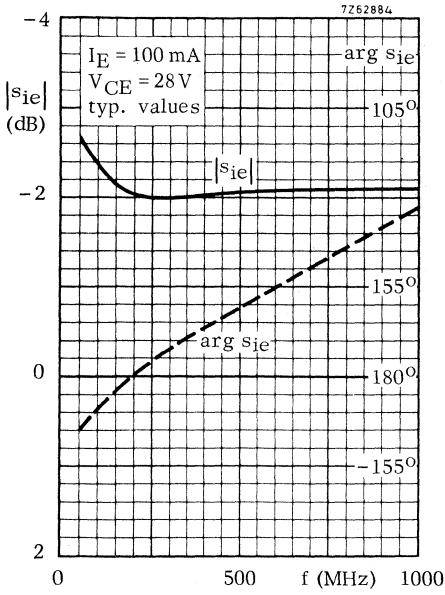
$I_C = 10\text{ mA}$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	4,8	pF
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Collector-stud capacitance

	C_{cs}	typ.	2,0	pF
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BLX92A



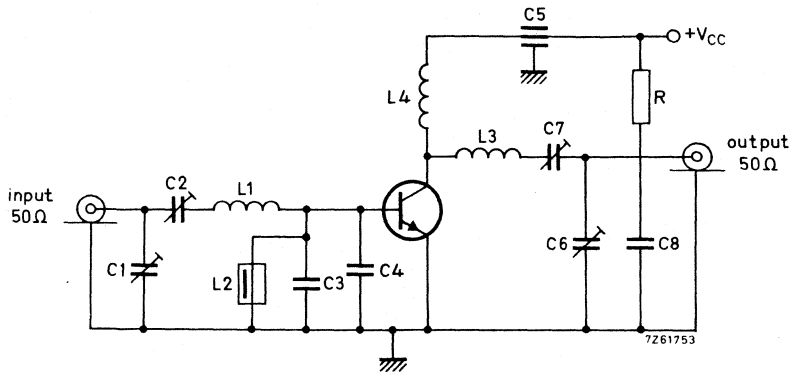
APPLICATION INFORMATION

R. F. performance in c. w. operation (Unneutralized common-emitter class-B circuit)

$T_h = 25\text{ }^\circ\text{C}$

V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (mA)	G_p (dB)	η (%)	\bar{Z}_i (Ω)	\bar{Y}_L (mA/V)
24	470	typ. 0,2	2,4	typ. 143	typ. 10,8	typ. 70	-	-
28	470	< 0,2	2,5	< 149	> 11,0	> 60	-	-
28	470	typ. 0,2	3,0	typ. 162	typ. 11,7	typ. 66	$1,8 + j2,8$	$7,2 - j24$
28	1000	typ. 0,7	2,5	typ. 179	typ. 5,5	typ. 50	-	-

Test circuit for 470 MHz:



- C1 = C2 = 1,8 to 18 pF film dielectric trimmer
- C3 = C4 = 18 pF disc ceramic capacitor
- C5 = 1 nF feed-through capacitor
- C6 = C7 = 1,0 to 9,0 pF film dielectric trimmer
- C8 = 0,1 μ F polyester capacitor

L1 = 1 turn Cu wire (1,2 mm); int. dia. 5 mm; lead length = 2 mm

L2 = 0,47 μ H choke

L3 = 2 turns closely wound enamelled Cu wire (1,2 mm); int. dia. 6,5 mm; lead length = 4 mm

L4 = 3 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm; lead length = 5 mm

R = 10 Ω carbon

At $P_L = 2,5$ W and $V_{CC} = 28$ V, the output power at heatsink temperatures between 25 $^\circ$ C and 90 $^\circ$ C relative to that at 25 $^\circ$ C is diminished by typ. 5 mW/ $^\circ$ C.

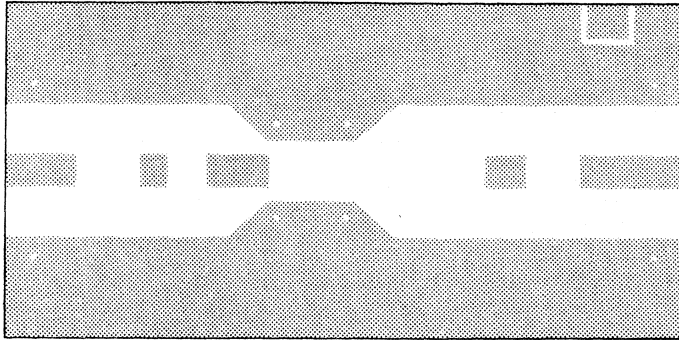
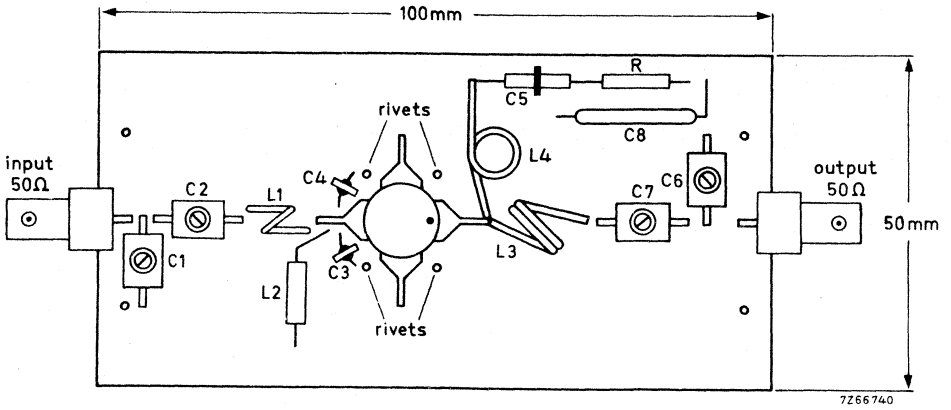
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 28$ V; f = 470 MHz; $T_h = 90$ $^\circ$ C.

VSWR = 50 : 1 through all phases; $P_L = 2,5$ W.

Component layout for 470 MHz test circuit see page 8.

APPLICATION INFORMATION (continued)

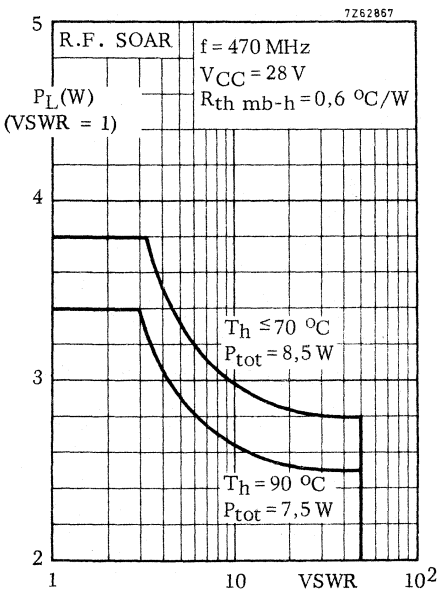
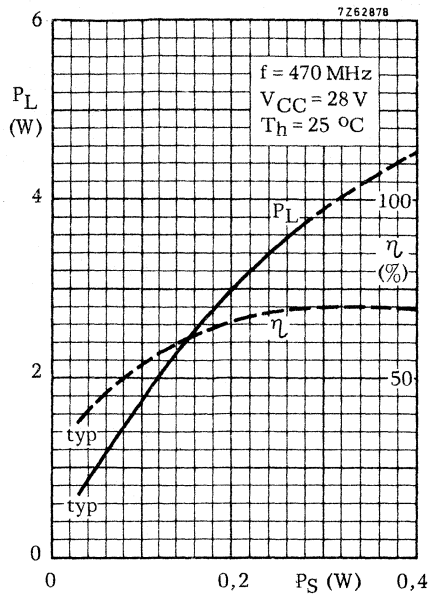
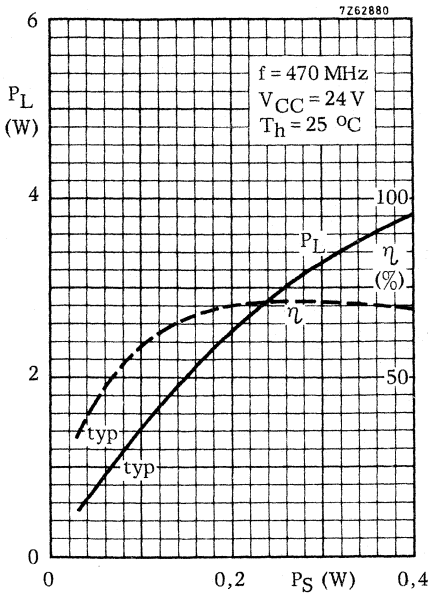
Component layout and printed-circuit board for 470 MHz test circuit.



Shade area copper

Back area completely copper clad

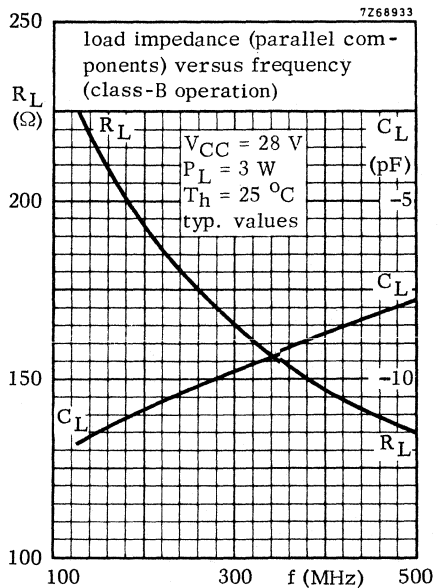
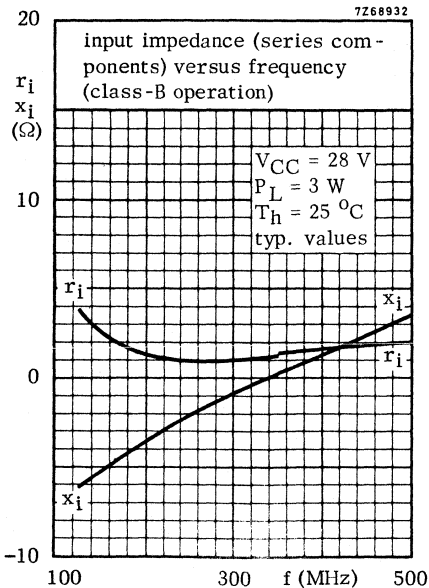
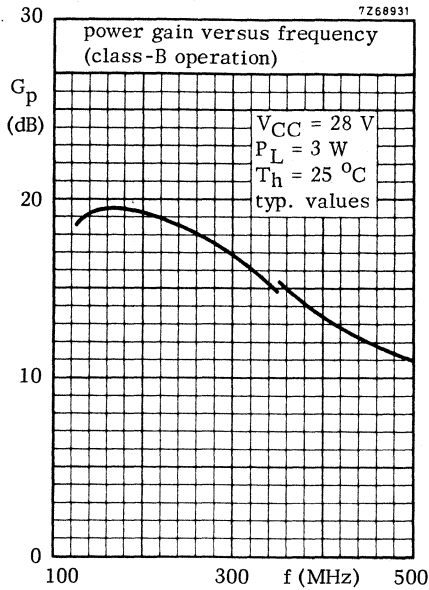
Material of printed-circuit board: 1,5 mm epoxy fibre-glass



Indicated load power as a function of overload

The graph has been derived from an evaluation of the performance of transistors matched up to 3,8 W load power in the test amplifier on page 7 and subsequently subjected to various mismatch conditions at 28 V with VSWR up to 50 and elevated heatsink temperatures. This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

OPERATING NOTE Below 350 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



U.H.F. TRANSMITTING TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C with a supply voltage up to 28 V.

The transistor is resistance stabilized and is tested under severe load mismatch conditions. Gold metallization ensures extremely high reliability.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

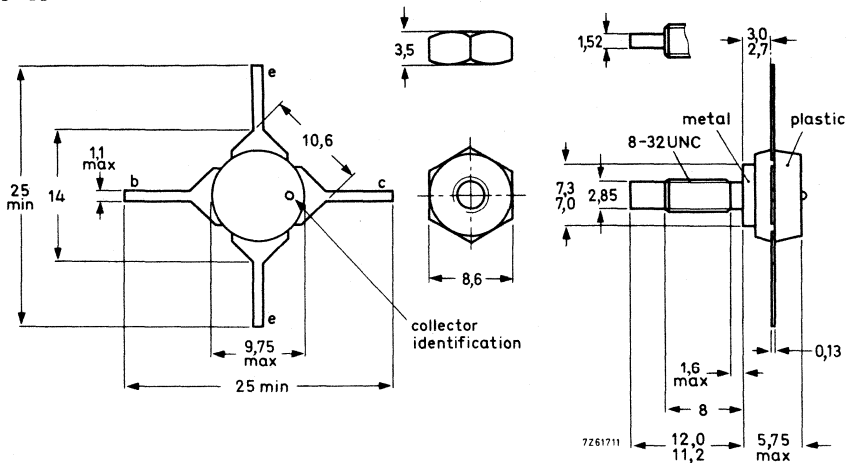
R. F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit.

Mode of operation	V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_D (dB)	η (%)	\bar{Z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	24	470	typ. 1,0	7,0	typ. 0,42	typ. 8,5	typ. 70	—	—
c. w.	28	470	< 1,0	7,0	< 0,42	> 8,5	> 60	—	—
c. w.	28	470	typ. 1,0	8,0	typ. 0,38	typ. 9,0	typ. 75	$1,8 + j5,3$	$19 - j32$
c. w.	28	1000	typ. 1,5	5,0	typ. 0,40	typ. 5,2	typ. 45	—	—

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.

Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4,0	V

Currents

Collector current (d. c.)	I_C	max.	1,0	A
Collector current (peak value) $f \geq 10$ MHz	I_{CM}	max.	3,0	A

Power dissipation

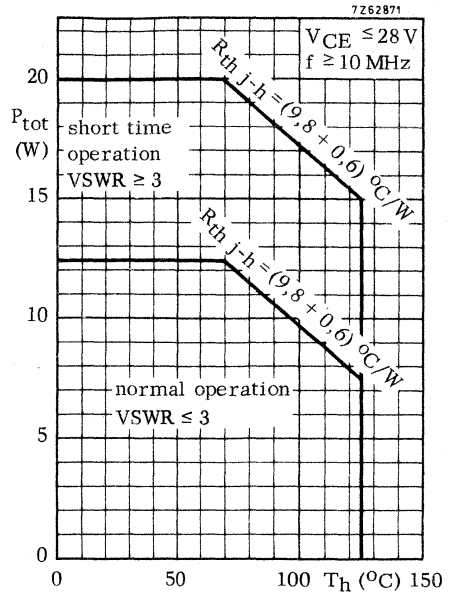
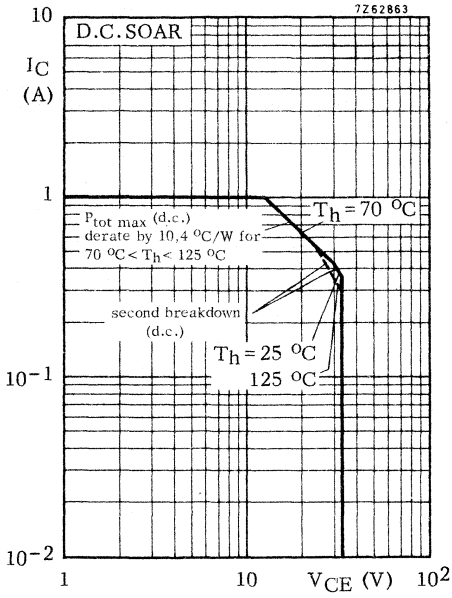
Total power dissipation up to $T_h = 70$ °C $f \geq 10$ MHz (see also page 3)	P_{tot}	max.	12,5	W
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Temperatures

Storage temperature	T_{stg}	-65 to +150	°C
Operating junction temperature	T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	9,8	°C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	°C/W



CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 10\text{ mA}$	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, $I_C = 10\text{ mA}$	$V_{(BR)CES}$	>	65	V
Collector-emitter voltage open base, $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	33	V
Emitter-base voltage open collector, $I_E = 1,0\text{ mA}$	$V_{(BR)EBO}$	>	4,0	V

D. C. current gain

$I_C = 100\text{ mA}; V_{CE} = 5,0\text{ V}$	h_{FE}	>	10	
		typ.	35	

Transition frequency

$I_C = 200\text{ mA}; V_{CE} = 5,0\text{ V}$	f_T	typ.	1,2	GHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$	C_c	typ.	14	pF
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Emitter capacitance at $f = 1\text{ MHz}$

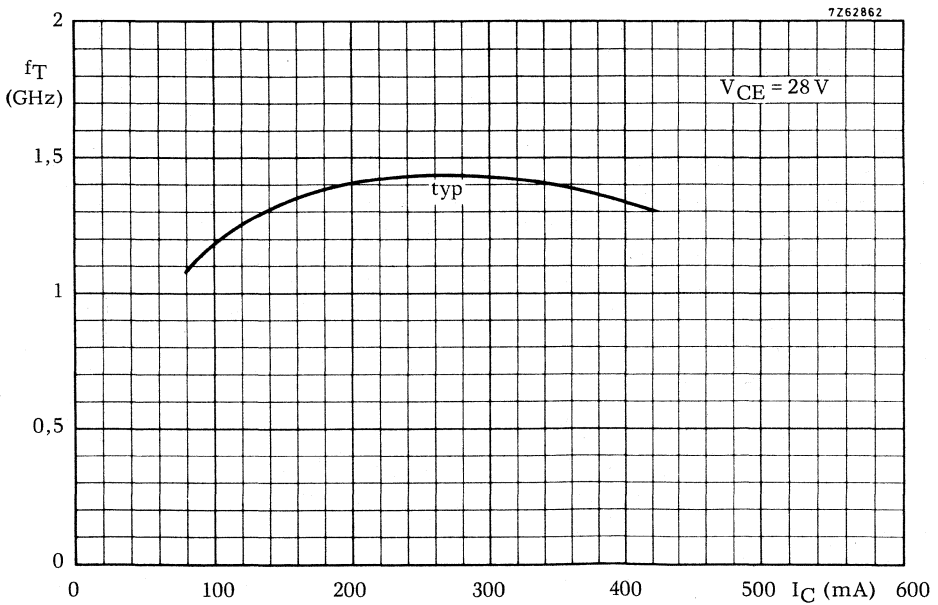
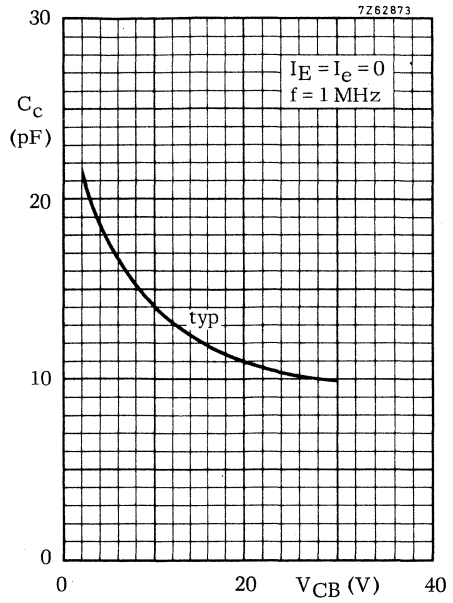
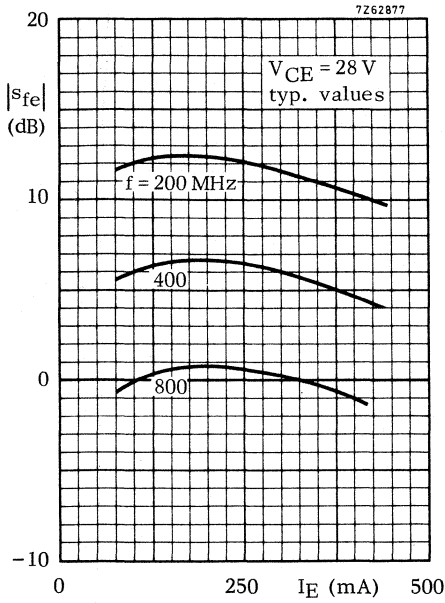
$I_C = I_c = 0; V_{EB} = 0$	C_e	typ.	60	pF
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Feedback capacitance at $f = 1\text{ MHz}$

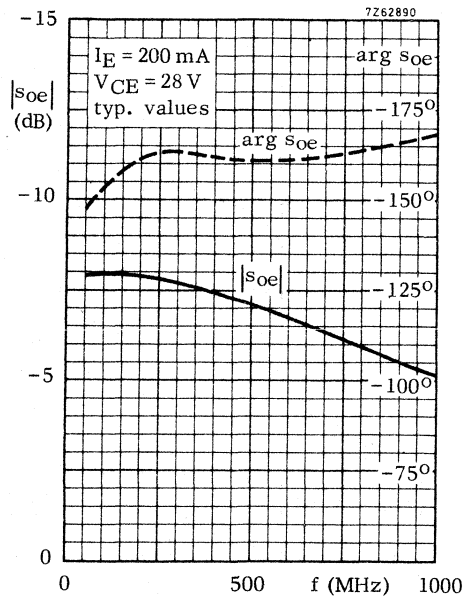
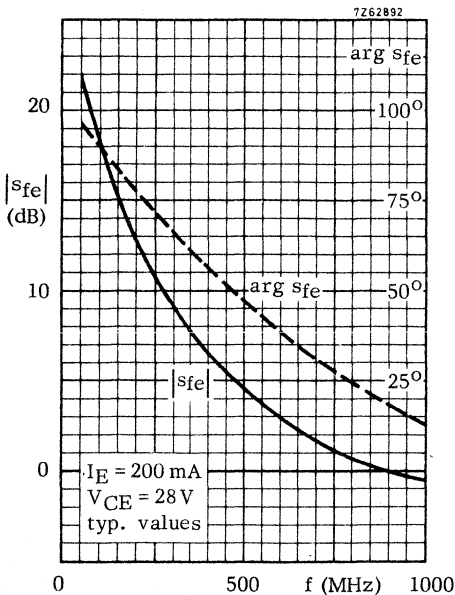
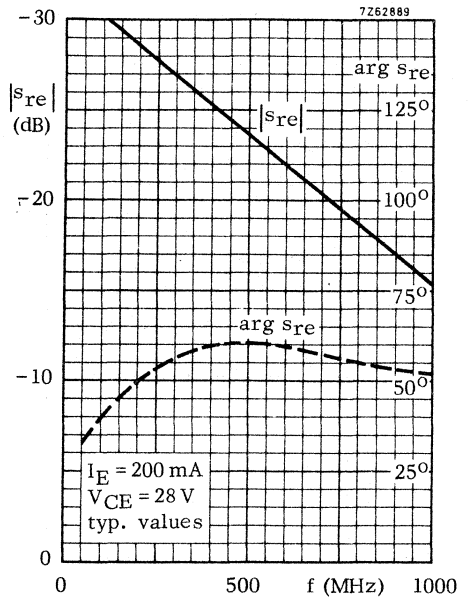
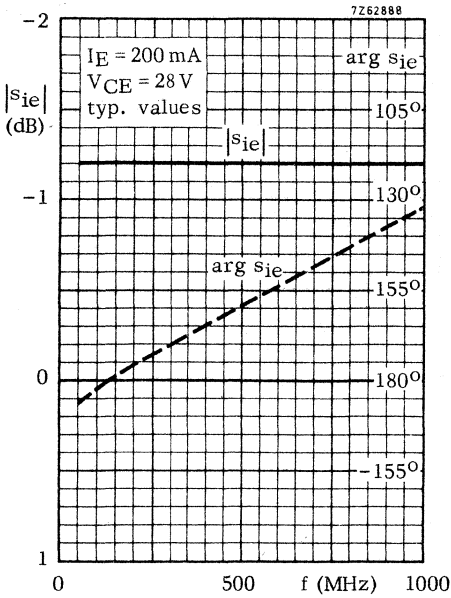
$I_C = 20\text{ mA}; V_{CE} = 10\text{ V}$	C_{re}	typ.	10	pF
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Collector-stud capacitance

	C_{CS}	typ.	2,0	pF
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BLX93A



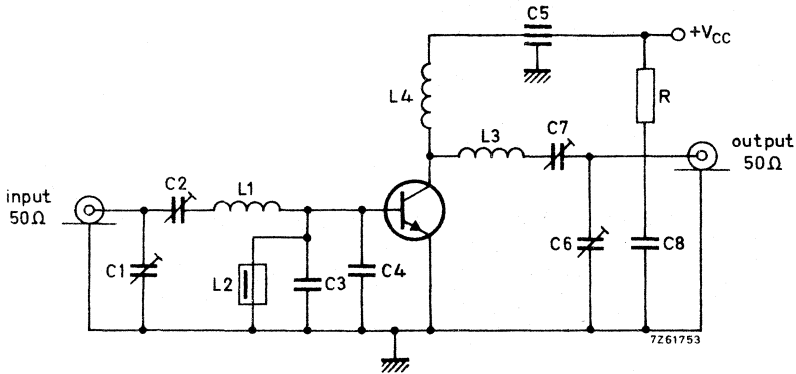
APPLICATION INFORMATION

R.F. performance in c.w. operation (Unneutralized common-emitter class-B circuit)

$T_h = 25\text{ }^\circ\text{C}$

V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
24	470	typ. 1,0	7,0	typ. 0,42	typ. 8,5	typ. 70	—	—
28	470	< 1,0	7,0	< 0,42	> 8,5	> 60	—	—
28	470	typ. 1,0	8,0	typ. 0,38	typ. 9,0	typ. 75	$1,8 + j5,3$	$19 - j32$
28	1000	typ. 1,5	5,0	typ. 0,40	typ. 5,2	typ. 45	—	—

Test circuit for 470 MHz:



C1 = C2 = 1,8 to 18 pF film dielectric trimmer

C3 = C4 = 18 pF disc ceramic capacitor

C5 = 1 nF feed-through capacitor

C6 = C7 = 1,0 to 9,0 pF film dielectric trimmer

C8 = 0,1 μ F polyester capacitor

L1 = 1 turn Cu wire (1,2 mm); int. dia. 5 mm; lead length = 2 mm

L2 = 0,47 μ H choke

L3 = 2 turns closely wound enamelled Cu wire (1,2 mm); int. dia. 6,5 mm; lead length = 4 mm

L4 = 3 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm; lead length = 5 mm

R = 10 Ω carbon

At $P_L = 7,0$ W and $V_{CC} = 28$ V, the output power at heatsink temperatures between 25 $^\circ\text{C}$ and 90 $^\circ\text{C}$ relative to that at 25 $^\circ\text{C}$ is diminished by typ. 10 mW/ $^\circ\text{C}$.

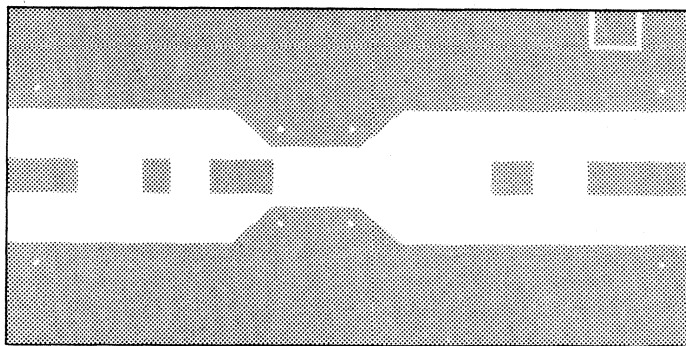
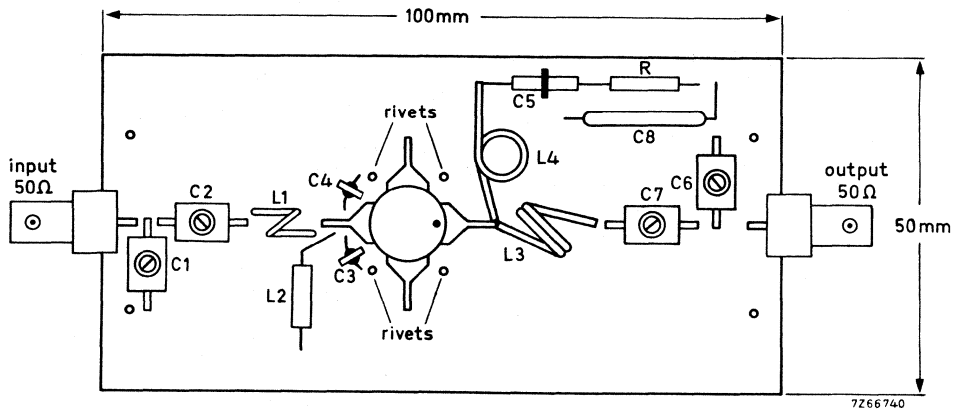
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 28$ V; $f = 470$ MHz; $T_h = 90$ $^\circ\text{C}$.

VSWR = 50 : 1 through all phases; $P_L = 7,0$ W.

Component layout for 470 MHz test circuit see page 8.

APPLICATION INFORMATION (continued)

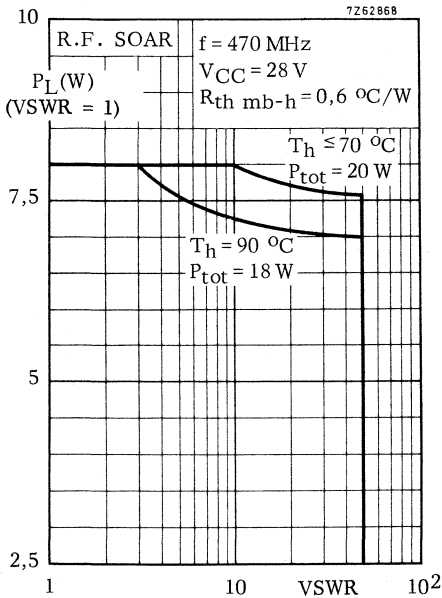
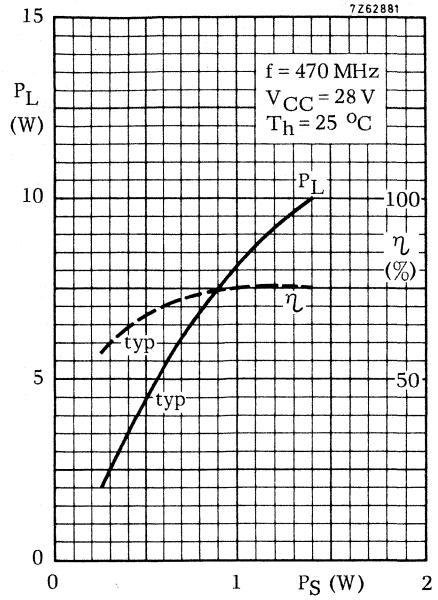
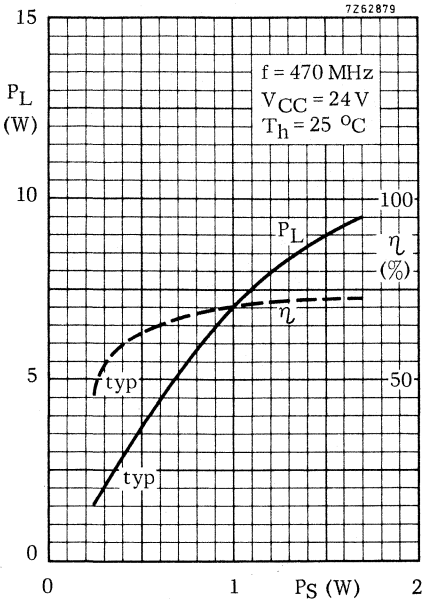
Component layout and printed-circuit board for 470 MHz test circuit.



Shaded area copper

Back area completely copper clad

Material of printed-circuit board: 1,5 mm epoxy fibre-glass

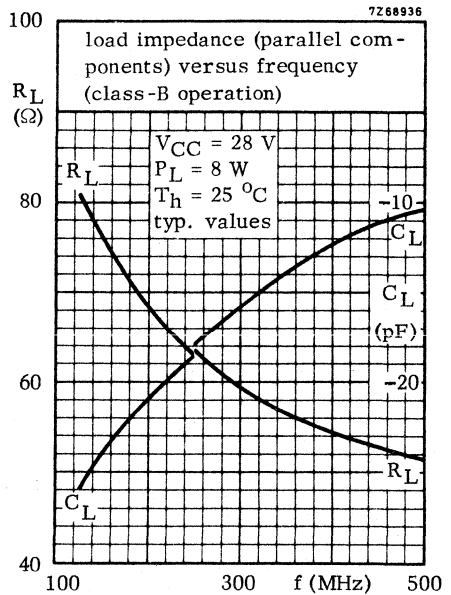
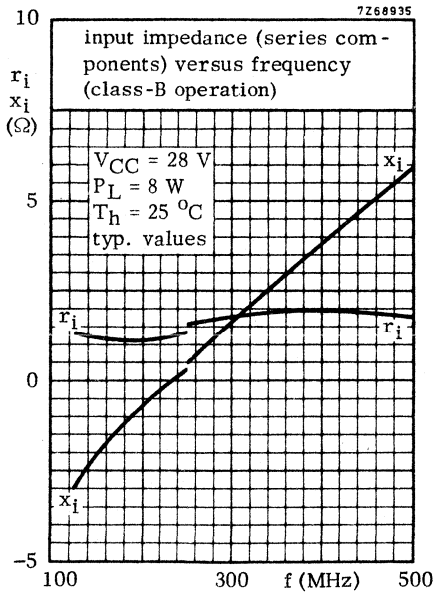
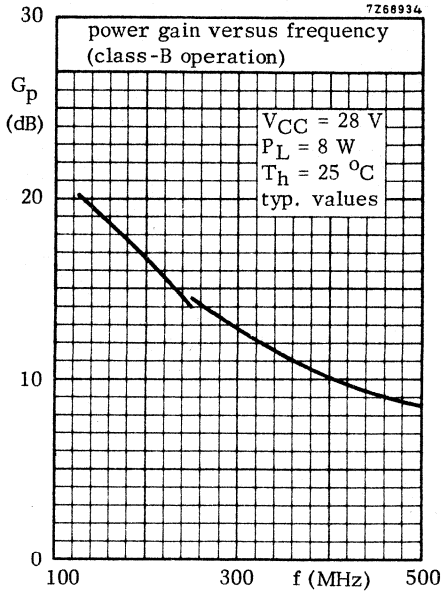


Indicated load power as a function of overload

The graph has been derived from an evaluation of the performance of transistors matched up to 8 W load power in the test amplifier on page 7 and subsequently subjected to various mismatch conditions at 28 V with VSWR up to 50 and elevated heatsink temperatures.

This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

OPERATING NOTE Below 250 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class A, B or C amplifiers in U.H.F. transmitters with supply voltages up to 28 V.

The transistor is resistance stabilized and tested under conditions of severe load mismatch. Gold metallization ensures extremely high reliability.

The transistor is housed in a plastic encapsulated stripline package. All leads are isolated from the stud.

QUICK REFERENCE DATA

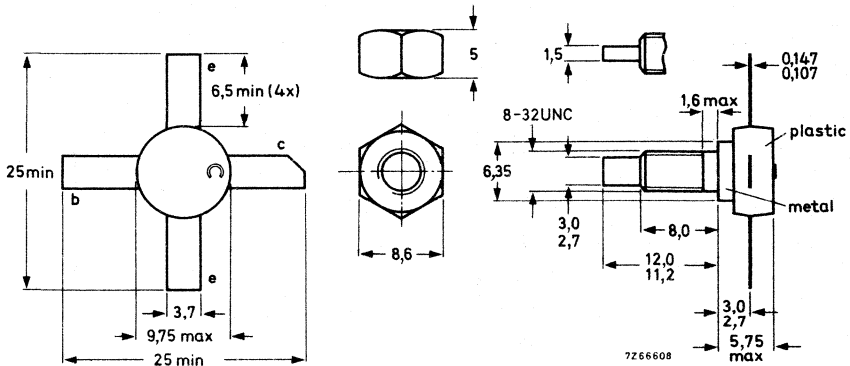
R. F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class B circuit.

Mode of operation	V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	28	470	< 6, 25	25	< 1, 62	> 6	> 55	$0,8 + j4,3$	$62 - j64$

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required, an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.

Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

BLX94A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

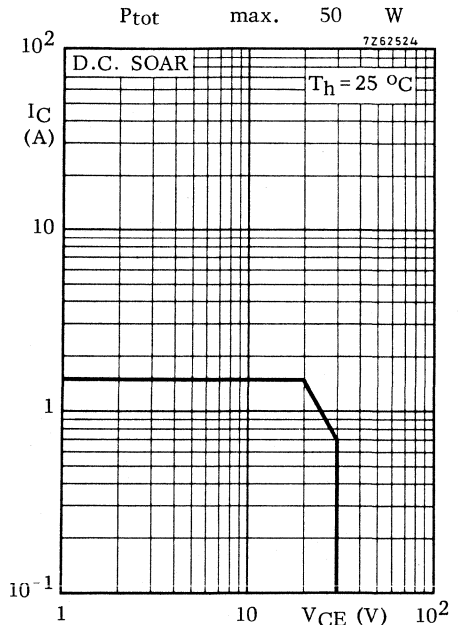
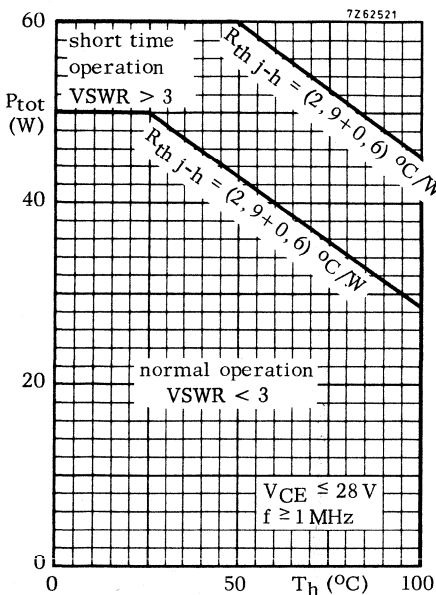
Collector-base voltage (open emitter) peak value	V_{CBOM} max.	65	V
Collector-emitter voltage (open base)	V_{CEO} max.	30	V
Emitter-base voltage (open collector)	V_{EBO} max.	4	V

Currents

Collector current (average)	$I_C(AV)$ max.	2,0	A
Collector current (peak value) $f > 1$ MHz	I_{CM} max.	6,0	A

Power dissipation

Total power dissipation up to $T_h = 25$ °C
 $f > 1$ MHz



Temperatures

Storage temperature	T_{stg}	-65 to +200	°C
Junction temperature	T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$ =	2,9	°C/W
From mounting base to heatsink	$R_{th mb-h}$ =	0,6	°C/W

CHARACTERISTICS $T_j = 25^\circ\text{C}$ unless otherwise specifiedCollector cut-off current

$I_B = 0; V_{CE} = 28\text{ V}$	I_{CEO}	<	10	mA
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Breakdown voltages

Collector-base voltage open emitter, $I_C = 25\text{ mA}$	$V_{(BR)CBO}$	>	65	V
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Collector-emitter voltage open base, $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	30	V
--	---------------	---	----	---

Emitter-base voltage open collector, $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	4	V
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Transient energy

L = 25 mH; f = 50 Hz

open base	E	>	3	mWs
$-V_{BE} = 1,5\text{ V}; R_{BE} = 33\ \Omega$	E	>	3	mWs

D. C. current gain

$I_C = 1\text{ A}; V_{CE} = 5\text{ V}$	h_{FE}	>	15	
		typ.	50	

Transition frequency

$I_C = 2\text{ A}; V_{CE} = 20\text{ V}$	f_T	typ.	1,0	GHz
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Collector capacitance at f = 1 MHz

$I_E = I_e = 0; V_{CB} = 30\text{ V}$	C_c	typ.	32	pF
		<	50	pF

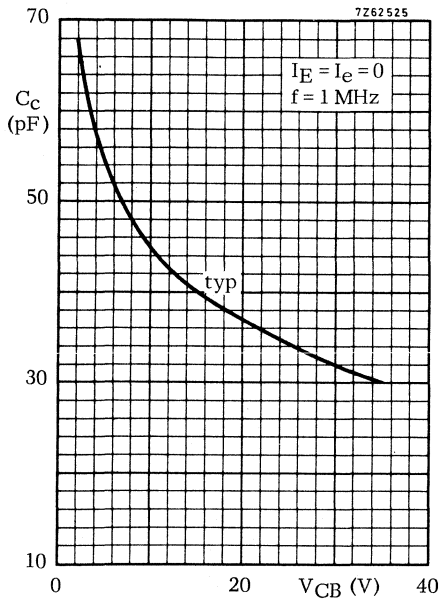
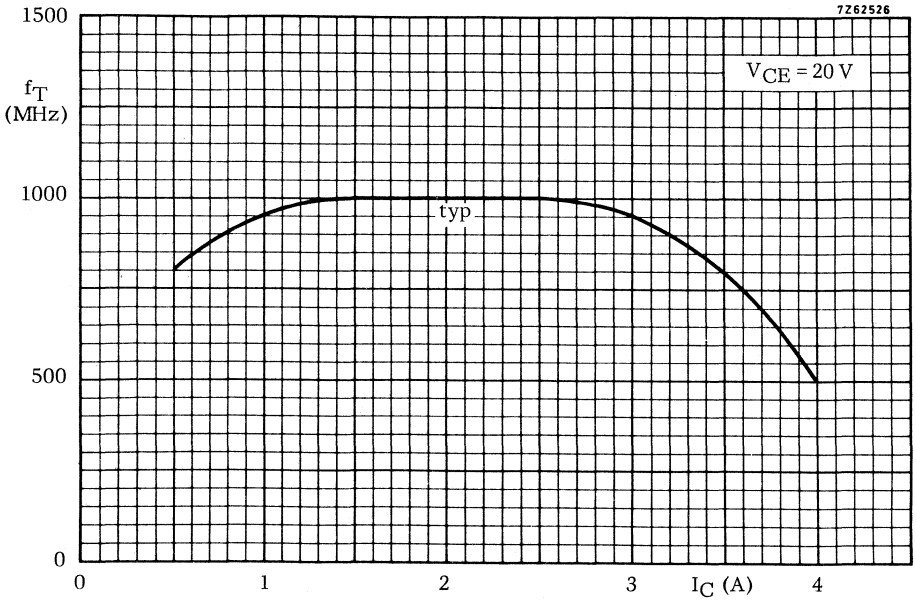
Feedback capacitance at f = 1 MHz

$I_C = 100\text{ mA}; V_{CE} = 30\text{ V}$	C_{re}	typ.	18	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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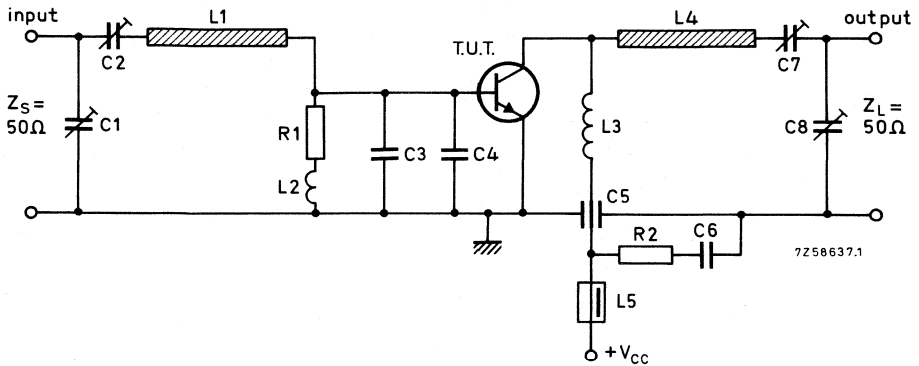
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $f = 470 \text{ MHz}$; $T_{mb} = 25 \text{ }^\circ\text{C}$

V_{CE} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
28	< 6,25	25	< 1,62	> 6	> 55	$0,8 + j4,3$	$62 - j64$

Test circuit: 470 MHz; c.w. class-B.



List of components:

C1 = C2 = C8 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = C4 = 15 pF chip capacitor

C5 = 100 pF feed-through capacitor

C6 = 33 nF polyester capacitor

C7 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

R1 = 1 Ω carbon resistorR2 = 10 Ω carbon resistor

L1 = stripline (40,8 mm x 5,0 mm)

L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm

L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4 mm; leads 2 x 5 mm

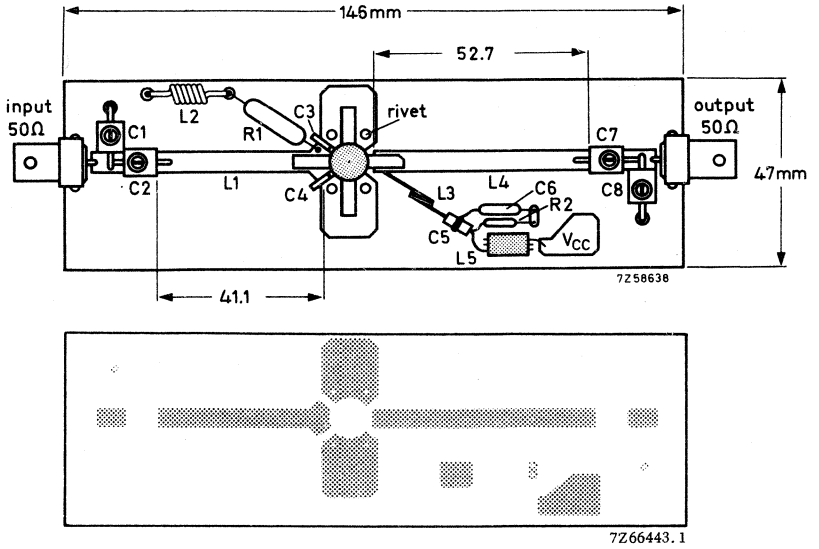
L4 = stripline (52,4 mm x 5,0 mm)

L5 = Ferroxcube choke coil. Z (at $f = 50 \text{ MHz}$) = $750 \Omega \pm 20\%$ (cat. no. 4312 020 36640)L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric. ($\epsilon_r = 2,74$); thickness 1,45 mm.

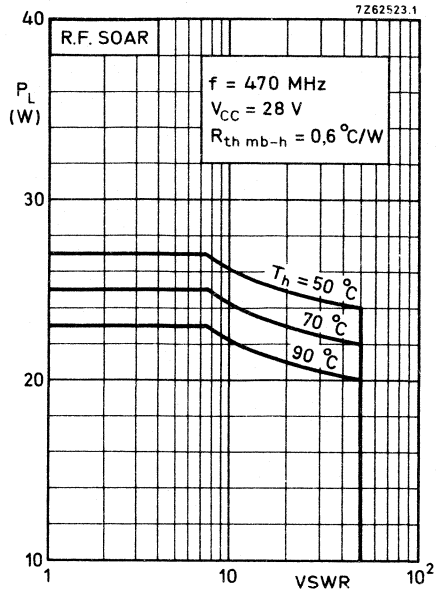
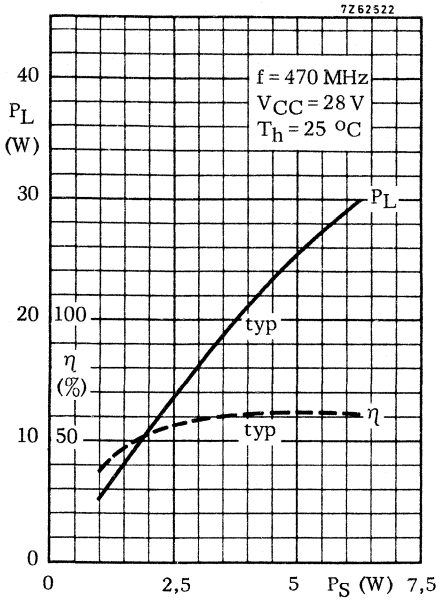
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

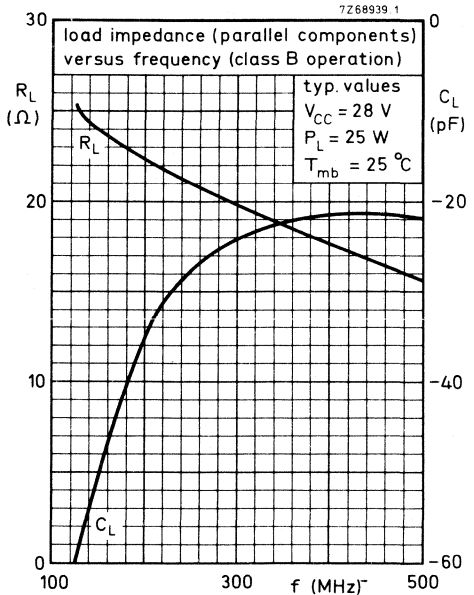
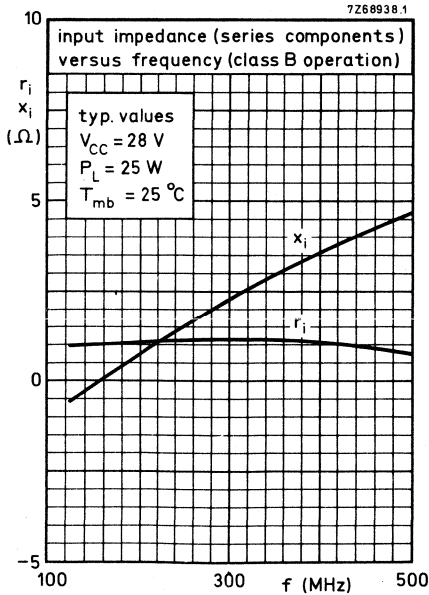
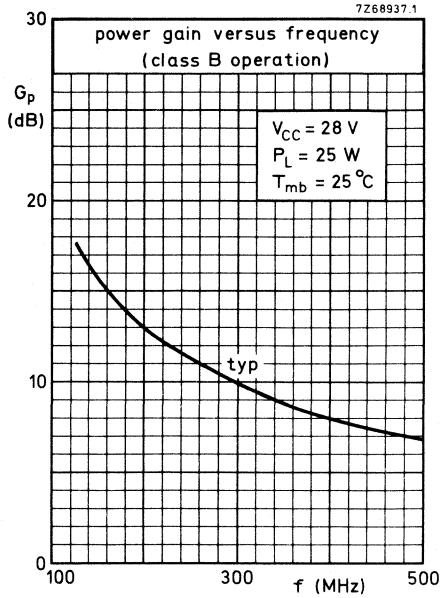
Component layout and printed-circuit board for 470 MHz test circuit.



The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



For high voltage operation, a stabilized power supply is generally used. The graph shows the allowable output power under nominal conditions as a function of the VSWR, with heatsink temperature as parameter.



U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C in the u.h.f. frequency range for supply voltages up to 28 V. The transistor is resistance stabilized and is tested under severe load mismatch conditions. Due to a gold metallization excellent reliability properties have been obtained. The transistor is housed in a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

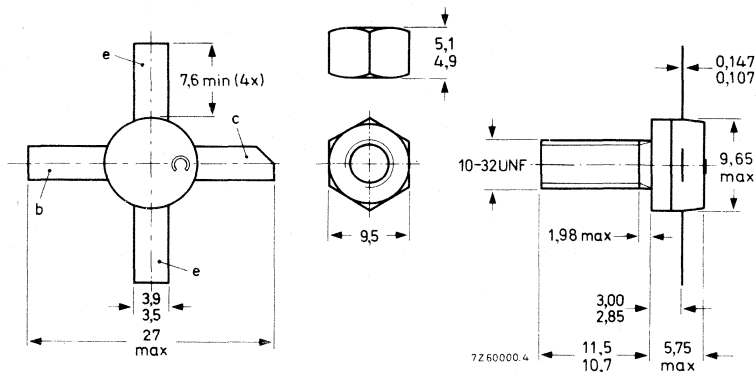
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %
c.w.	28	470	< 14,2	40	< 2,4	< 4,5	> 60
c.w.	28	175	typ. 3,2	40	typ. 1,9	typ. 11	typ. 75

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 5,0 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

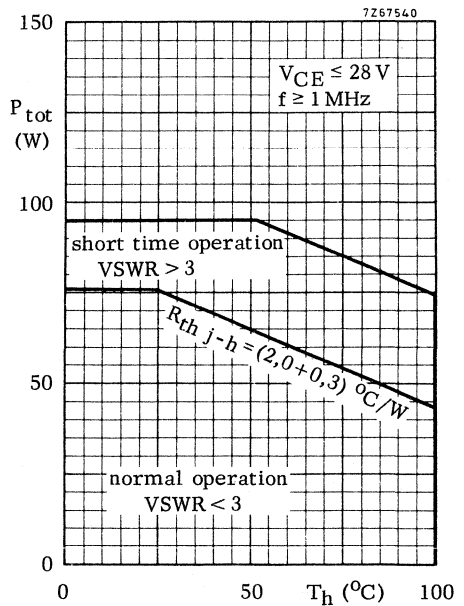
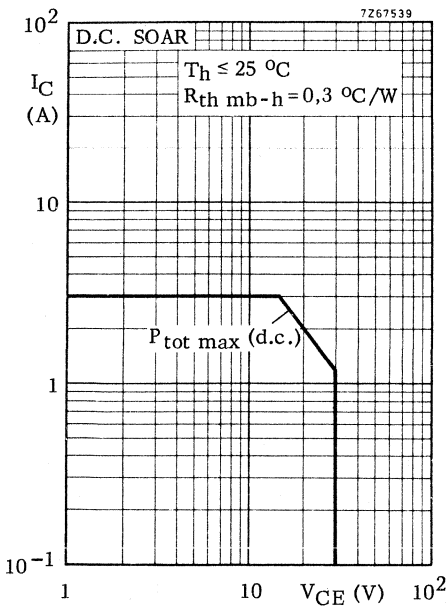
Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65 V
Collector-emitter voltage ($R_{BE} = 10\Omega$) peak value	V_{CERM}	max.	65 V
Collector-emitter voltage (open base)	V_{CEO}	max.	30 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V

Currents

Collector current (average)	$I_{C(AV)}$	max.	3,0 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	10,0 A

Power dissipation



Temperatures

Storage temperature	T_{stg}	-65 to +200 °C
Junction temperature	T_j	max. 200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	2,0 °C/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,3 °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 50\text{ mA}$	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$, $I_C = 50\text{ mA}$	$V_{(BR)CER}$	>	65	V
Collector-emitter voltage open base, $I_C = 50\text{ mA}$	$V_{(BR)CEO}$	>	30	V
Emitter-base voltage open collector, $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	4	V

Transient energy

$L = 25\text{ mH}$; $f = 50\text{ Hz}$

open base	E	>	4,5	mWs
$-V_{BE} = 1,5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	4,5	mWs

D. C. current gain

$I_C = 1,0\text{ A}$; $V_{CE} = 5\text{ V}$	h_{FE}		25 to 100
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Transition frequency

$I_C = 4\text{ A}$; $V_{CE} = 25\text{ V}$	f_T	typ.	900	MHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 30\text{ V}$	C_c	typ.	68	pF
		<	80	pF

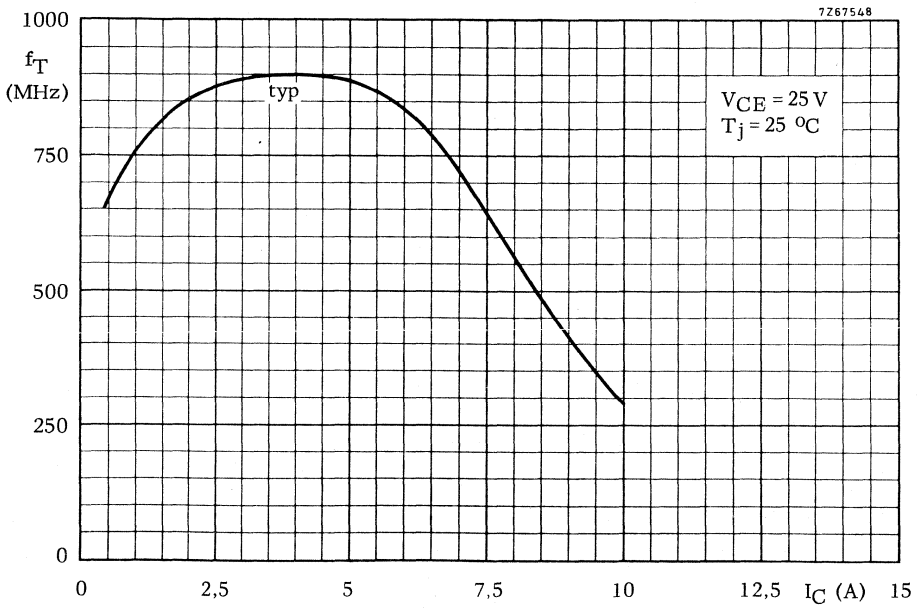
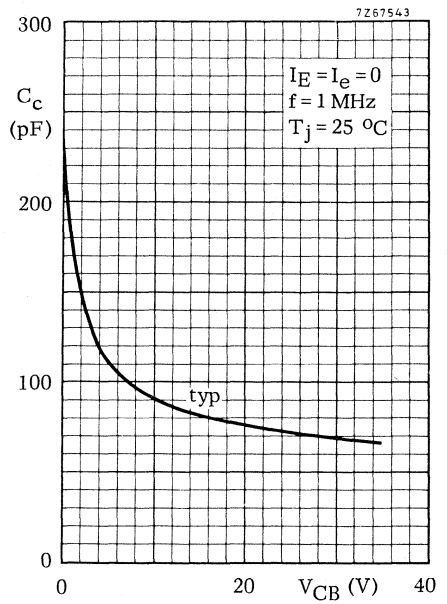
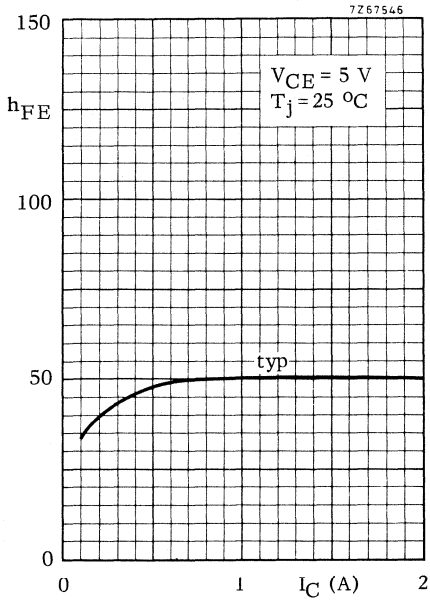
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 200\text{ mA}$; $V_{CE} = 30\text{ V}$	C_{re}	typ.	39	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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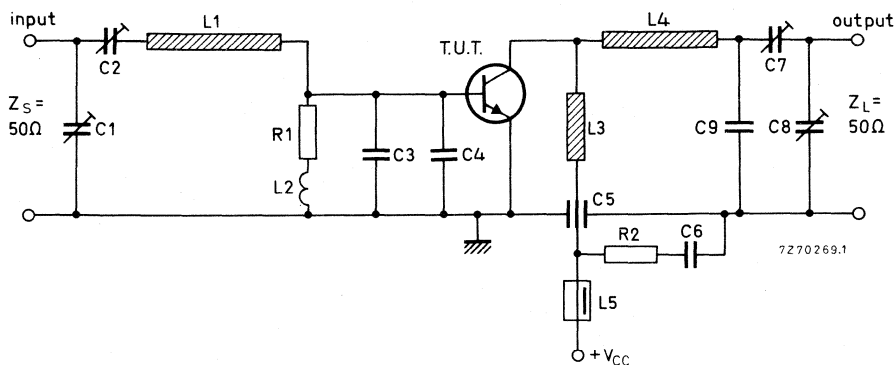
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $V_{CE} = 28 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)
470	< 14,2	40	< 2,4	> 4,5	> 60
175	typ. 3,2	40	typ. 1,9	typ. 11	typ. 75

Test circuit: 470 MHz; c.w. class-B.



List of components:

C1 = C7 = C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

C2 = 1,8 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = C4 = 18 pF chip capacitor

C5 = 100 pF feed-through capacitor

C6 = 33 nF polyester capacitor

C9 = 2 x 3,3 pF miniature ceramic plate capacitors (in parallel)

R1 = 1 Ω carbon resistor (0,25 W)

R2 = 10 Ω carbon resistor (0,25 W)

L1 = stripline (21,4 mm x 5,3 mm)

L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); internal diameter 4,0 mm

L3 = stripline (43,8 mm x 3,0 mm)

L4 = stripline (45,5 mm x 5,3 mm)

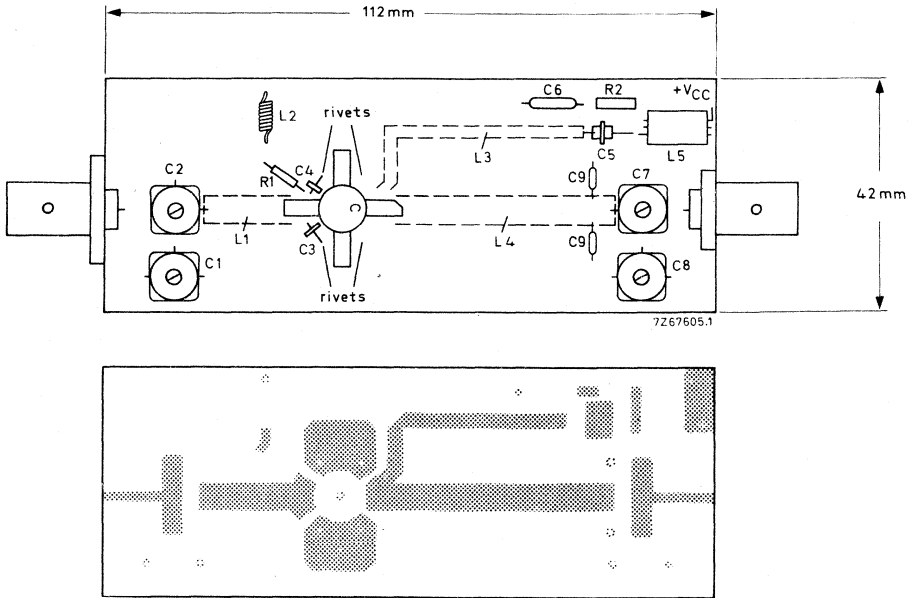
L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L1; L3; L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric. ($\epsilon_r = 2,74$); thickness 1/32''.At $P_L = 40 \text{ W}$ and $V_{CE} = 28 \text{ V}$, the output power at heatsink temperatures between $25 \text{ }^\circ\text{C}$ and $70 \text{ }^\circ\text{C}$ relative to that at $25 \text{ }^\circ\text{C}$ is diminished by typ. 50 mW/ $^\circ\text{C}$.The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CE} = 28 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$.VSWR = 50 through all phases; $P_L = 36 \text{ W}$.

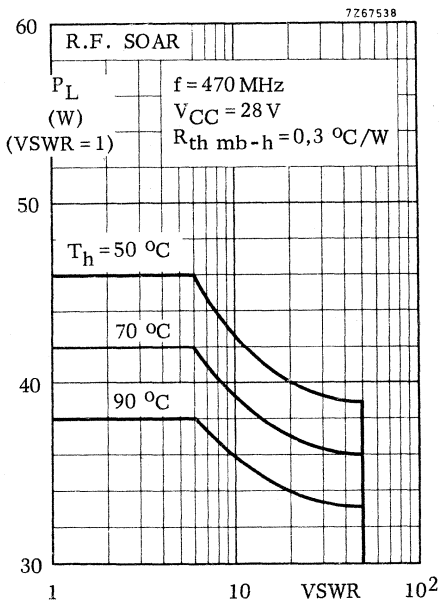
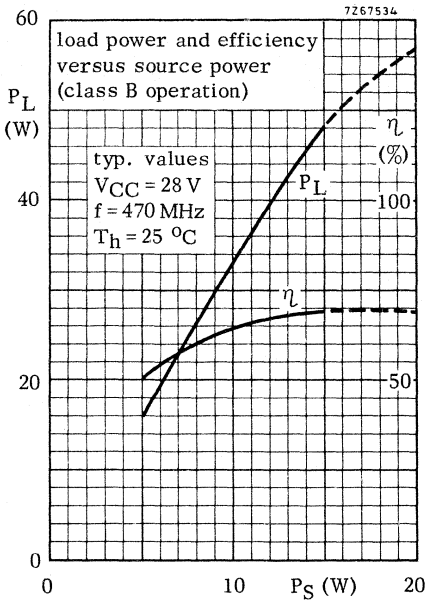
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.



The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



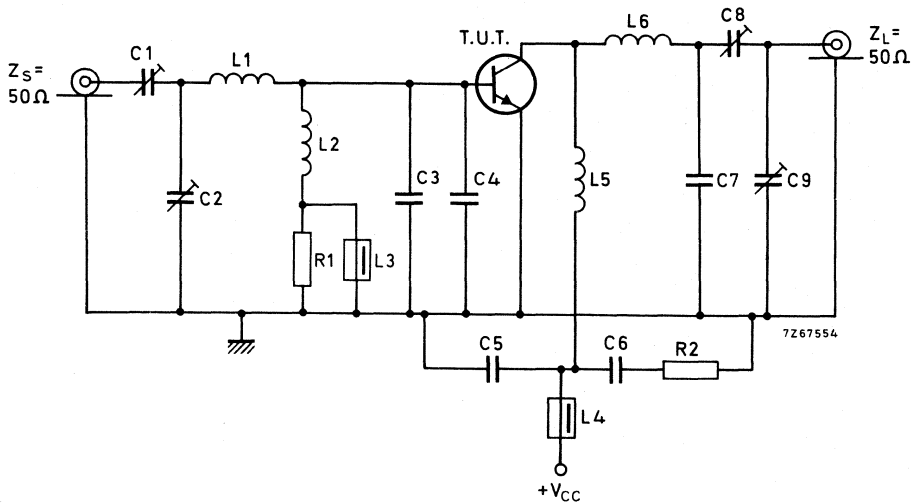
Indicated load power as a function of overload.

The graph has been derived from an evaluation of the performance of transistors matched up to 46W load power in the test amplifier on page 5 and subsequently subjected to various mismatch conditions at 28 V with VSWR up to 50 and elevated heatsink temperatures.

This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

APPLICATION INFORMATION (continued)

Test circuit for 175 MHz:



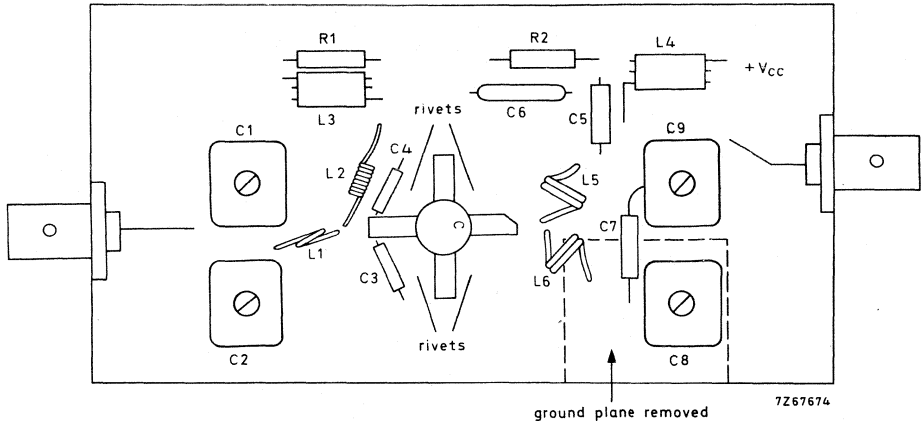
List of components:

- C1 = 2,5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
- C2 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
- C3 = C4 = 47 pF ceramic capacitor
- C5 = 100 pF ceramic capacitor
- C6 = 100 nF polyester capacitor
- C7 = 6,8 pF ceramic capacitor
- C8 = 4 to 60 pF film dielectric trimmer (code number 2222 809 07011)
- C9 = 4 to 100 pF film dielectric trimmer (code number 2222 809 07015)
- L1 = 0,5 turn enamelled Cu wire (1,5 mm); int. diam. 6 mm;
lead length 2 x 6 mm
- L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. diam. 3 mm;
lead length 2 x 5 mm
- L3 = L4 = ferrocube choke coil (code number 4312 020 36640)
- L5 = 53 nH; 2 turns enamelled Cu wire (1,5 mm); int. diam. 10 mm;
coil length 5,2 mm; lead length 2 x 5 mm
- L6 = 46 nH; 2 turns enamelled Cu wire (1,5 mm); int. diam. 9 mm;
coil length 5,4 mm; lead length 2 x 5 mm
- R1 = R2 = 10 Ω carbon resistor (0,25 W)

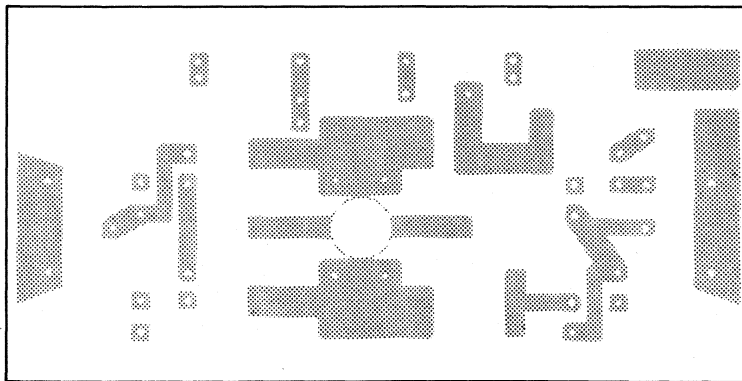
Component lay-out for 175 MHz test circuit see page 9.

APPLICATION INFORMATION (continued)

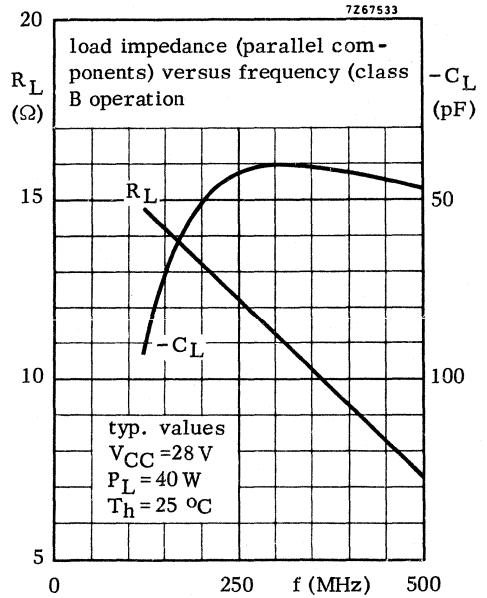
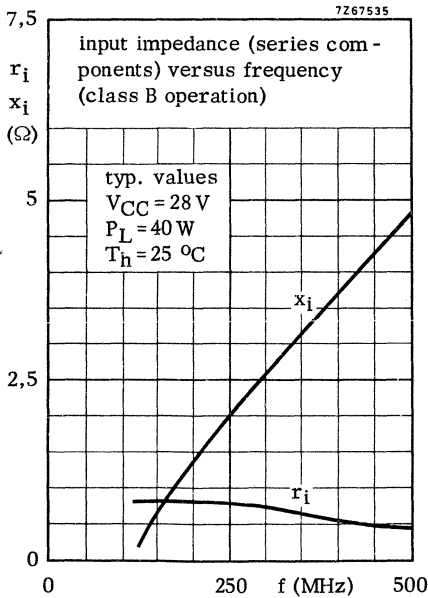
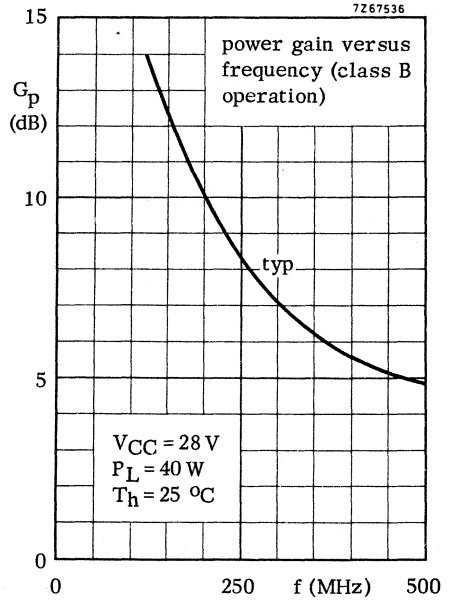
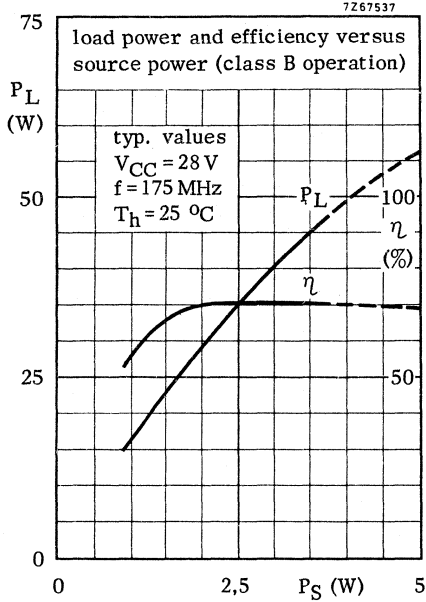
Component lay-out and printed circuit board for 175 MHz test circuit.



Dimensions of printed circuit board 123 mm x 55 mm.



The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter silicon transistor in a capstan envelope. It has extremely good inter-modulation properties and high power gain. The device is primarily intended for pre-amplifiers in television transmitters and transposers.

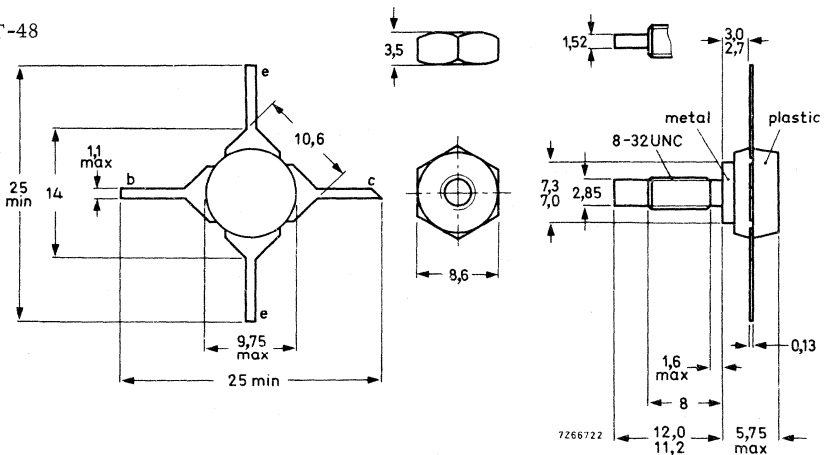
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	27 V
Collector current (peak value)	I_{CM}	max.	1 A
Junction temperature	T_j	max.	200 °C
Thermal resistance from junction to mounting base	$R_{th\ j-mb}$	=	15 °C/W
Transition frequency	f_T	>	1,2 GHz
$I_C = 200\text{ mA}; V_{CE} = 20\text{ V}$			
Output power at $f_{vision} = 860\text{ MHz}$ *)	$P_o\ sync$	>	0,5 W
$I_C = 250\text{ mA}; V_{CE} = 25\text{ V}; T_h = 25\text{ °C}; d_{im} = -60\text{ dB}$			
Power gain at $f_{vision} = 860\text{ MHz}$	G_p	>	6 dB
$I_C = 250\text{ mA}; V_{CE} = 25\text{ V}; T_h = 25\text{ °C}$			

*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, side band signal -16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max.
4,17 mm.

Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not
chamfer or countersink either end of hole.

BLX96

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

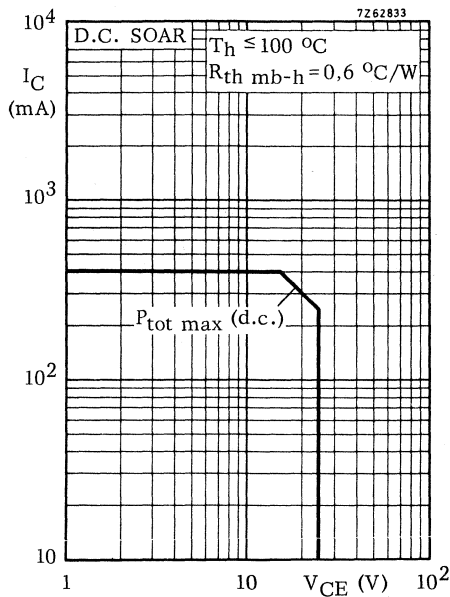
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage ($R_{BE} = 10 \Omega$; peak value)	V_{CERM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V

Currents

Collector current (d.c.)	I_C	max.	0,4	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	1	A

Power dissipation

Total power dissipation up to $T_h = 100 \text{ }^\circ\text{C}$	P_{tot}	max.	6,25	W
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Temperatures

Storage temperature	T_{stg}	-65 to +200	$^\circ\text{C}$
Junction temperature	T_j	max. 200	$^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	15	$^\circ\text{C/W}$
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	$^\circ\text{C/W}$

CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specifiedCollector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}$

$I_{CBO} < 100\text{ }\mu\text{A}$

Breakdown voltagesCollector-base voltage

open emitter; $I_C = 1\text{ mA}$

$V_{(BR)CBO} > 40\text{ V}$

Collector-emitter voltage

$R_{BE} = 10\text{ }\Omega; I_C = 5\text{ mA}$

$V_{(BR)CER} > 40\text{ V}$

open base; $I_C = 5\text{ mA}$

$V_{(BR)CEO} > 27\text{ V}$

Emitter-base voltage

open collector; $I_E = 1\text{ mA}$

$V_{(BR)EBO} > 3,5\text{ V}$

Saturation voltage

$I_C = 200\text{ mA}; I_B = 20\text{ mA}$

$V_{CEsat} < 0,75\text{ V}$

D.C. current gain

$I_C = 200\text{ mA}; V_{CE} = 20\text{ V}$

$h_{FE} > 30$

$I_C = 400\text{ mA}; V_{CE} = 20\text{ V}$

$h_{FE} > 20$

Transition frequency

$I_C = 200\text{ mA}; V_{CE} = 20\text{ V}$

$f_T > 1,2\text{ GHz}$

$I_C = 350\text{ mA}; V_{CE} = 20\text{ V}$

$f_T > 1,0\text{ GHz}$

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 20\text{ V}$

$C_c < 10\text{ pF}$

Feedback capacitance at $f = 1\text{ MHz}$

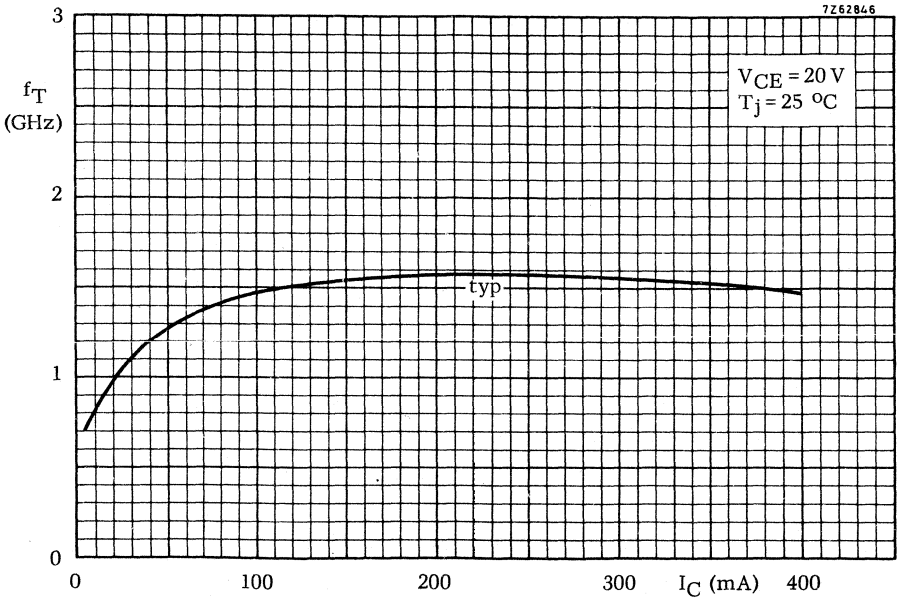
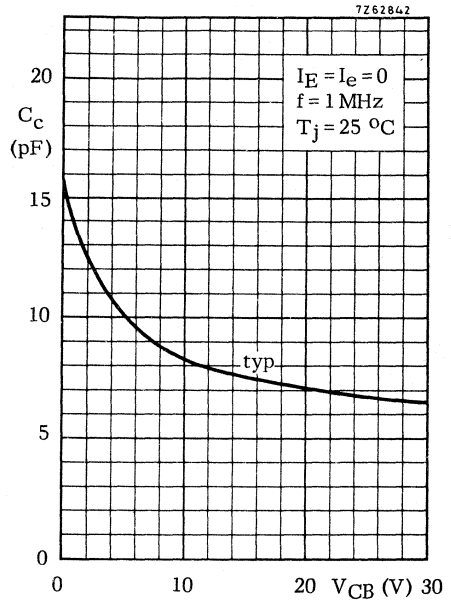
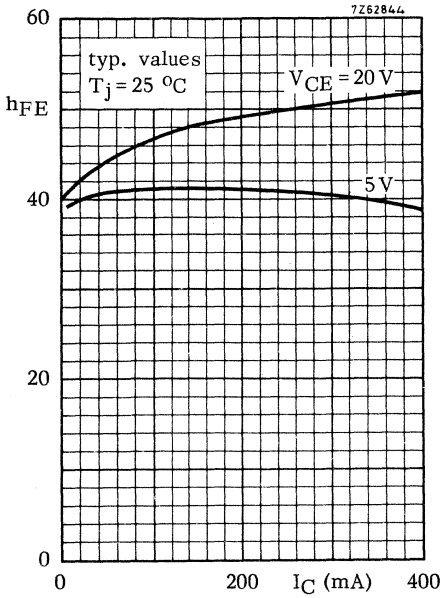
$I_C = 10\text{ mA}; V_{CE} = 20\text{ V}; T_{mb} = 25\text{ }^\circ\text{C}$

$C_{re} \text{ typ. } 3,5\text{ pF}$

Collector-stud capacitance

$C_{cs} \text{ typ. } 2\text{ pF}$



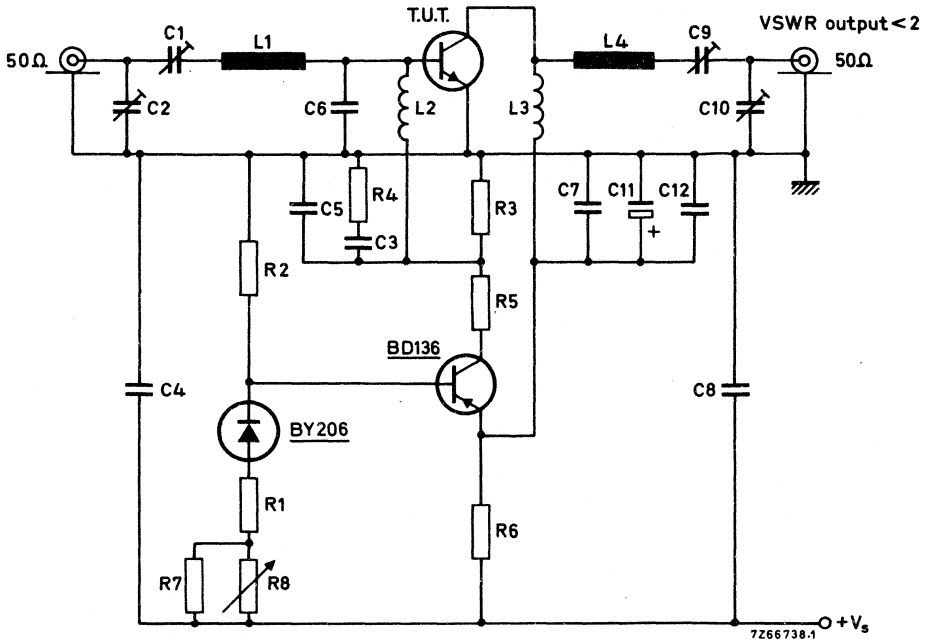


APPLICATION INFORMATION

d_{im} (dB) *	f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	G_p (dB)	$P_{o\ sync}$ (W) *	T_h (°C)
-60	860	25	250	> 6	> 0,5	25
-60	860	25	250	typ. 7	typ. 0,6	25

*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

Test circuit at $f_{vision} = 860$ MHz



List of components: (see also page 6)

$C1 = C2 = C10 = 2$ to 9 pF film dielectric trimmers

$C3 = C4 = C12 = 100$ nF polyester capacitors

$C5 = C7 = C8 = 100$ pF feed-through capacitors

$C6 = 2 \times 2,7$ pF in parallel, chip capacitors

$C9 = 2$ to 18 pF film dielectric trimmer

$C11 = 10$ μ F/40 V solid aluminium electrolytic capacitor

$R1 = 220$ Ω

$R5 = 470$ Ω (1 W)

$R2 = 4,7$ k Ω

$R6 = 3 \times 22$ Ω in parallel; (1 W)

$R3 = 100$ Ω

$R7 = 12$ k Ω

$R4 = 10$ Ω

$R8 = 1$ k Ω

APPLICATION INFORMATION (continued)

List of components: (continued)

L1 = stripline (14,8 mm x 4,3 mm)

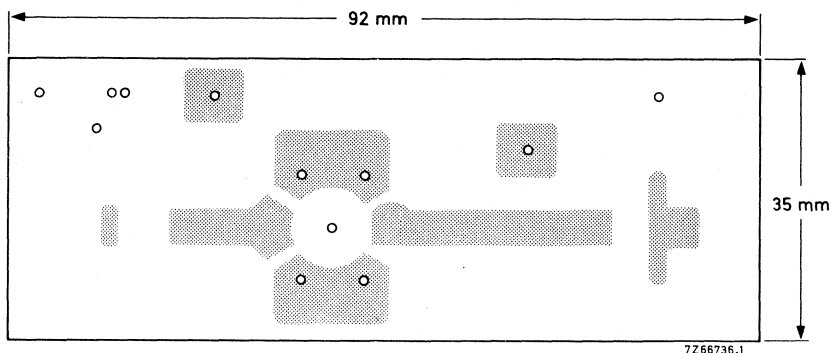
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4,5 mm; leads 2 x 5 mm

L4 = stripline (29,5 mm x 4,3 mm)

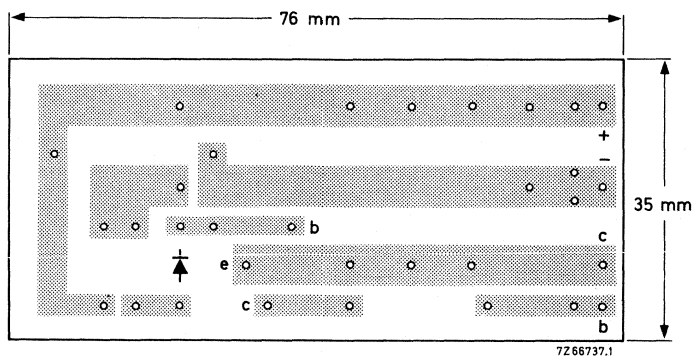
L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,45 mm.

Layout of printed-circuit board for 860 MHz test circuit.

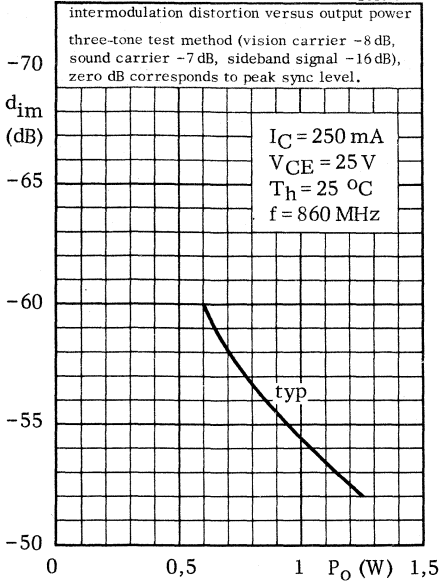


The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

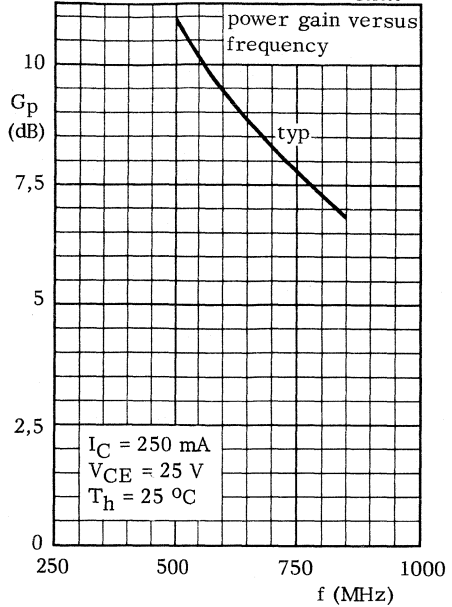
Layout of printed board bias circuit.



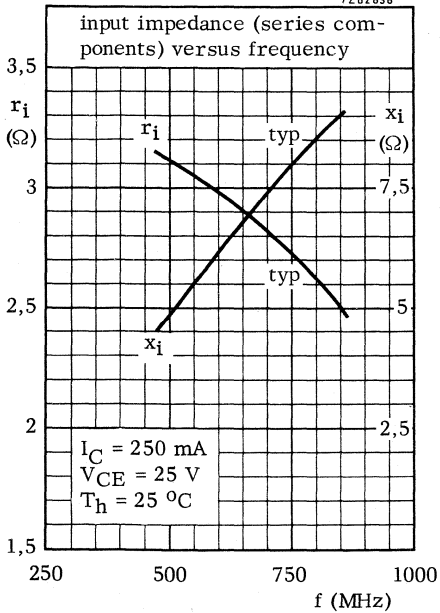
7Z62839



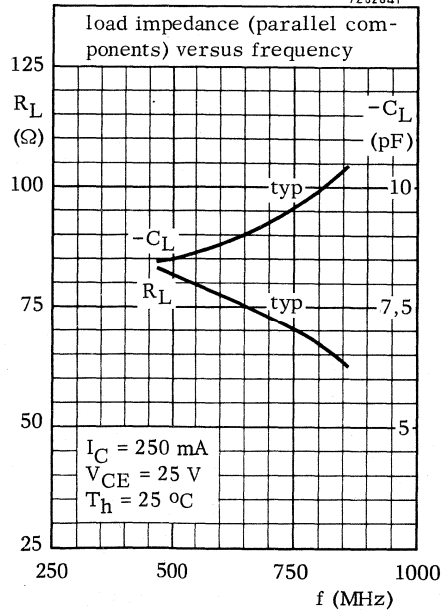
7Z62835



7Z62838



7Z62841



SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter silicon transistor in a capstan envelope. It has extremely good inter-modulation properties and high power gain.

The device is primarily intended for pre-amplifiers in television transmitters and transposers.

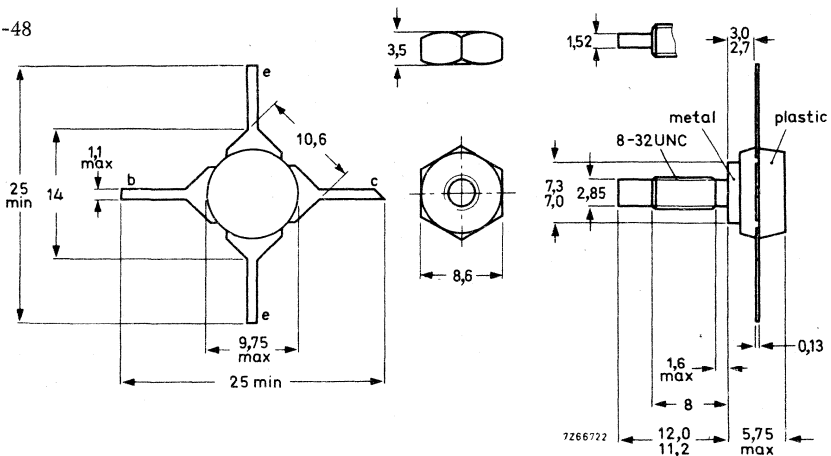
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	27	V
Collector current (peak value)	I_{CM}	max.	2	A
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to mounting base	$R_{th\ j-mb}$	=	7,5	°C/W
Transition frequency	f_T	>	1,2	GHz
$I_C = 400\text{ mA}; V_{CE} = 20\text{ V}$				
Output power at $f_{vision} = 860\text{ MHz}$ *)	$P_o\ sync$	>	1,0	W
$I_C = 500\text{ mA}; V_{CE} = 25\text{ V}; T_h = 25\text{ °C}; d_{im} = -60\text{ dB}$				
Power gain at $f_{vision} = 860\text{ MHz}$	G_p	>	5,5	dB
$I_C = 500\text{ mA}; V_{CE} = 25\text{ V}; T_h = 25\text{ °C}$				

*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, side band signal -16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

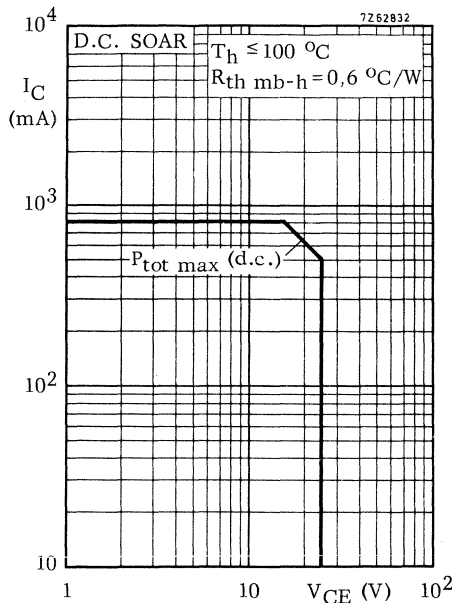
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage ($R_{BE} = 10 \Omega$; peak value)	V_{CERM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V

Currents

Collector current (d.c.)	I_C	max.	0,8	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	2	A

Power dissipation

Total power dissipation up to $T_h = 100 \text{ }^\circ\text{C}$	P_{tot}	max.	12,5	W
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Temperatures

Storage temperature	T_{stg}	-65 to +200	$^\circ\text{C}$
Junction temperature	T_j	max. 200	$^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	7,5	$^\circ\text{C/W}$
From mounting base to heatsink	$R_{th mb-h}$	=	0,6	$^\circ\text{C/W}$

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}$

$I_{CBO} < 200\text{ }\mu\text{A}$

Breakdown voltages

Collector-base voltage

open emitter; $I_C = 2\text{ mA}$

$V_{(BR)CBO} > 40\text{ V}$

Collector-emitter voltage

$R_{BE} = 10\text{ }\Omega; I_C = 10\text{ mA}$

$V_{(BR)CER} > 40\text{ V}$

open base; $I_C = 10\text{ mA}$

$V_{(BR)CEO} > 27\text{ V}$

Emitter-base voltage

open collector; $I_E = 2\text{ mA}$

$V_{(BR)EBO} > 3,5\text{ V}$

Saturation voltage

$I_C = 400\text{ mA}; I_B = 40\text{ mA}$

$V_{CEsat} < 0,75\text{ V}$

D. C. current gain

$I_C = 400\text{ mA}; V_{CE} = 20\text{ V}$

$h_{FE} > 30$

$I_C = 800\text{ mA}; V_{CE} = 20\text{ V}$

$h_{FE} > 20$

Transition frequency

$I_C = 400\text{ mA}; V_{CE} = 20\text{ V}$

$f_T > 1,2\text{ GHz}$

$I_C = 700\text{ mA}; V_{CE} = 20\text{ V}$

$f_T > 1,0\text{ GHz}$

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 20\text{ V}$

$C_c < 20\text{ pF}$

Feedback capacitance at $f = 1\text{ MHz}$

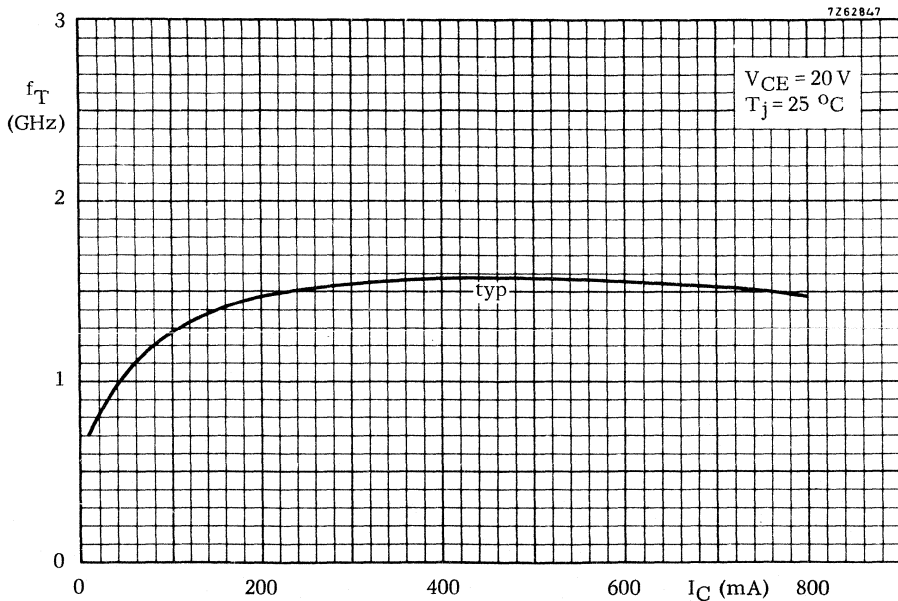
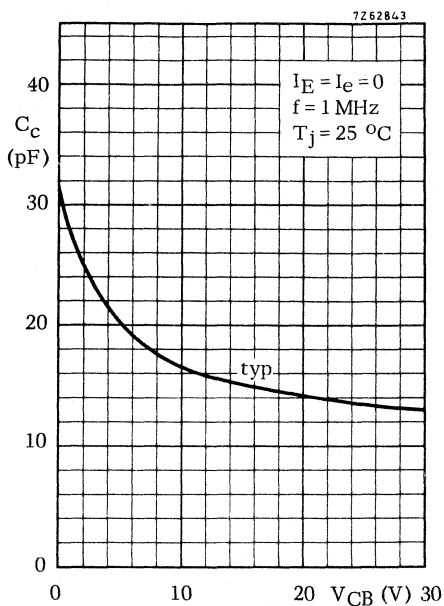
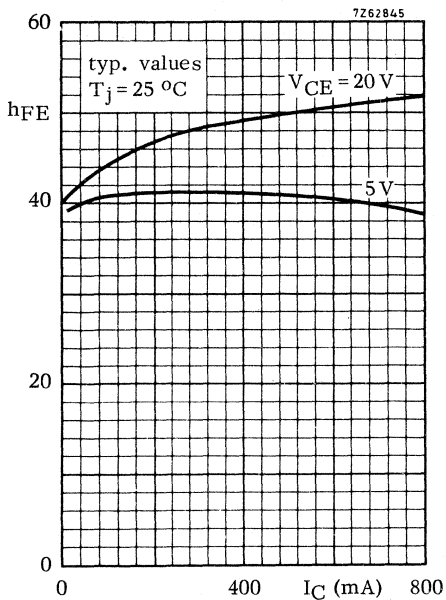
$I_C = 20\text{ mA}; V_{CE} = 20\text{ V}; T_{mb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 7 pF

Collector-stud capacitance

C_{cs} typ. 2 pF



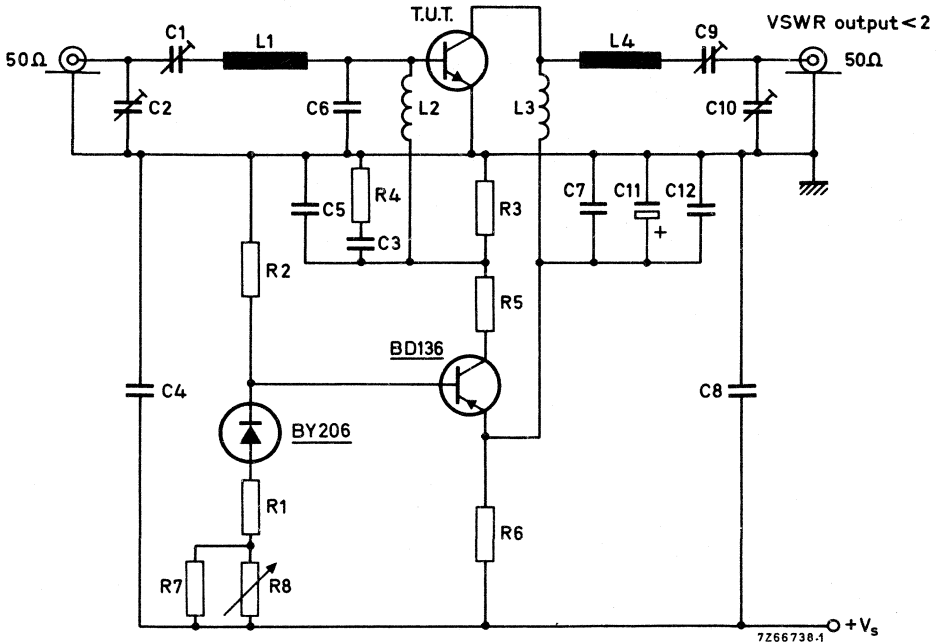


APPLICATION INFORMATION

d_{im} (dB) *	f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	G_p (dB)	P_o sync (W) *	T_h (°C)
-60	860	25	500	> 5,5	> 1,0	25
-60	860	25	500	typ. 6,5	typ. 1,1	25

*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

Test circuit at $f_{vision} = 860$ MHz



List of components: (see also page 6)

- C1 = C2 = C10 = 2 to 9 pF film dielectric trimmers
- C3 = C4 = C12 = 100 nF polyester capacitors
- C5 = C7 = C8 = 100 pF feed-through capacitors
- C6 = 2 x 2,7 pF in parallel, chip capacitors
- C9 = 2 to 18 pF film dielectric trimmer
- C11 = 10 μF/40 V solid aluminium electrolytic capacitor

- R1 = 220 Ω
- R2 = 4,7 kΩ
- R3 = 100 Ω
- R4 = 10 Ω
- R5 = 470 Ω (1 W)
- R6 = 3 x 22 Ω in parallel; (1 W)
- R7 = 12 kΩ
- R8 = 1 kΩ

APPLICATION INFORMATION (continued)

List of components: (continued)

L1 = stripline (14,8 mm x 4,3 mm)

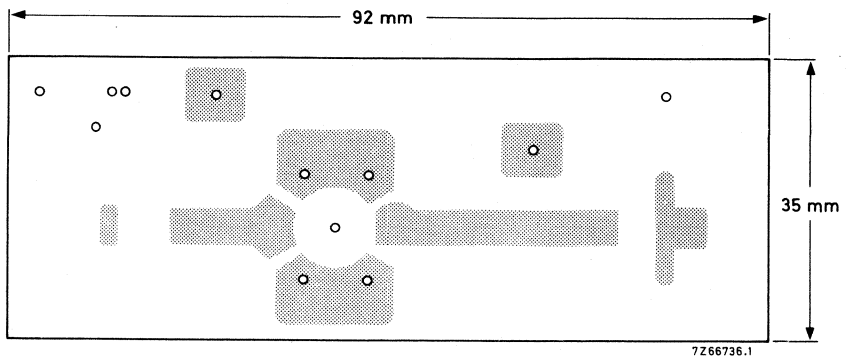
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4,5 mm; leads 2 x 5 mm

L4 = stripline (29,5 mm x 4,3 mm)

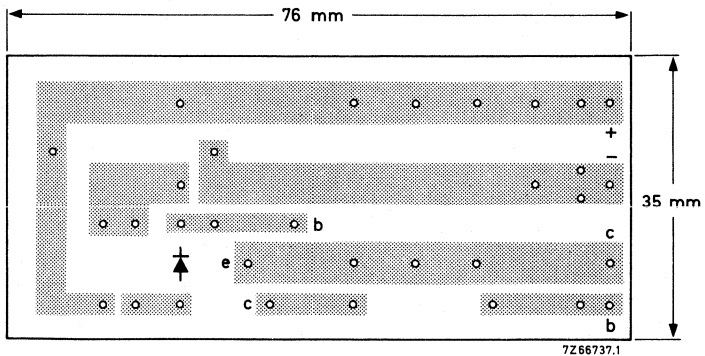
L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,45 mm.

Layout of printed-circuit board for 860 MHz test circuit.

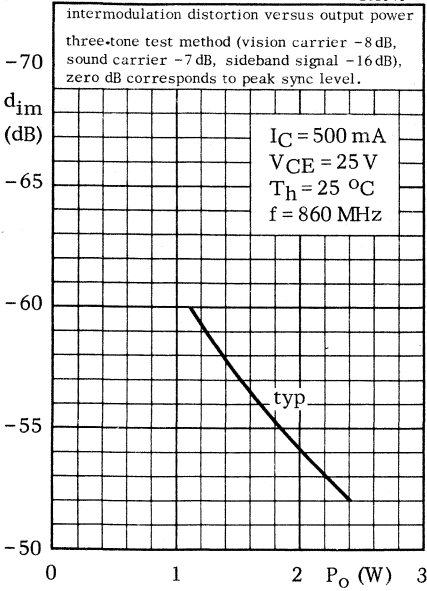


The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

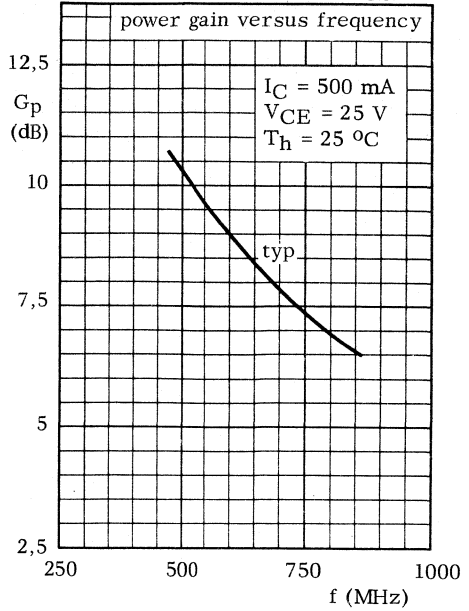
Layout of printed board bias circuit.



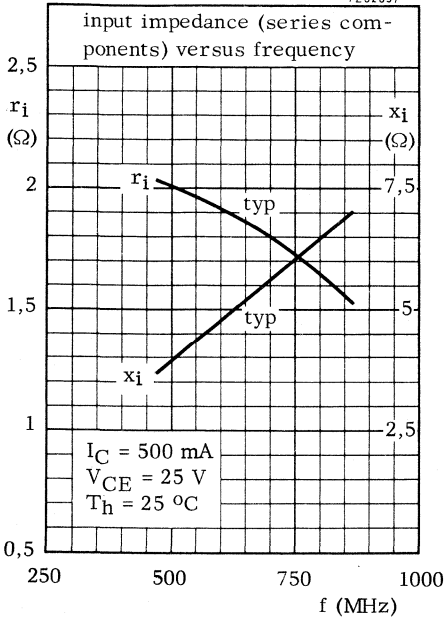
7Z62840



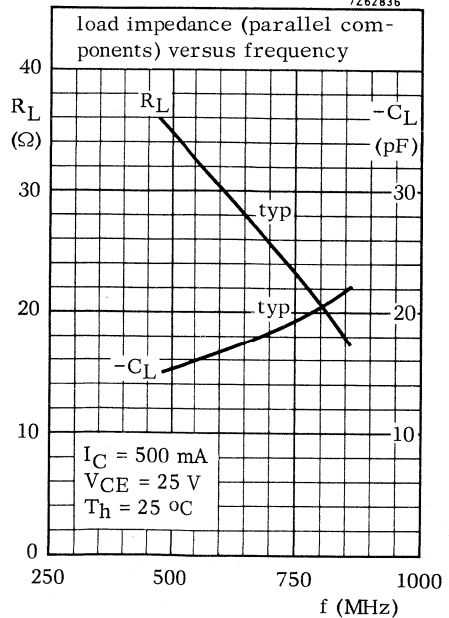
7Z62834



7Z62837



7Z62836



U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor assembled in a plastic encapsulated stripline package all leads of which are isolated from the stud. Excellent d.c. dissipation properties have been obtained by means of internal emitter-ballasting resistors and gold metalization. Detailed information is presented for application of this device in preamplifiers for television transposers and transmitters in band IV - V.

QUICK REFERENCE DATA

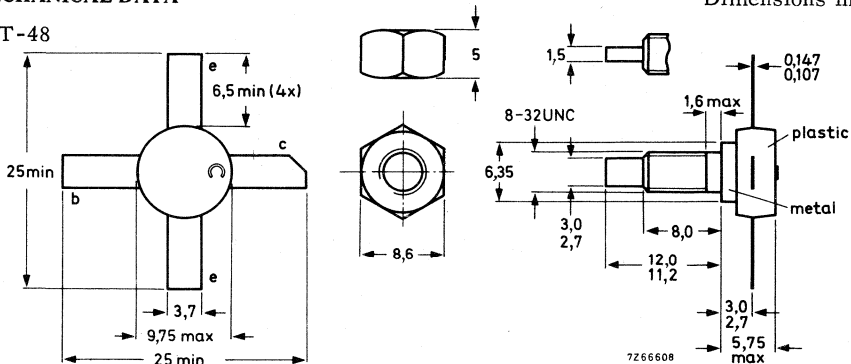
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	50 V
Collector-emitter voltage (open base)	V_{CEO}	max.	27 V
Collector current (peak value)	I_{CM}	max.	4 A
Junction temperature	T_j	max.	200 °C
Thermal resistance from junction to mounting base	$R_{th\ j-mb}$	=	5,5 °C/W
Transition frequency	f_T	typ.	2,5 GHz
$I_C = 1\text{ A}; V_{CE} = 25\text{ V}$			
Output power at $f_{vision} = 860\text{ MHz}$ *)	$P_o\ sync$	>	3,5 W
$I_C = 850\text{ mA}; V_{CE} = 25\text{ V}; T_h = 70\text{ °C}; d_{im} = -60\text{ dB}$			
Power gain at $f_{vision} = 860\text{ MHz}$	G_p	>	5,0 dB
$I_C = 850\text{ mA}; V_{CE} = 25\text{ V}; T_h = 70\text{ °C}$			

*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

SOT-48

Dimensions in mm



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max.
4,17 mm.

Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not
chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

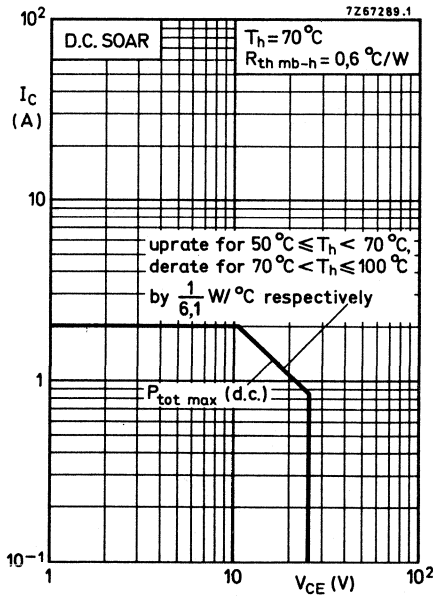
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	50	V
Collector-emitter voltage (open base)	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V

Currents

Collector current (d. c.)	I_C	max.	2	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	4	A

Power dissipation

Total power dissipation at $T_h = 70$ °C	P_{tot}	max.	21,5	W
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Temperatures

Storage temperature	T_{stg}	-65 to +200	°C
Junction temperature	T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	5,5	°C/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,6	°C/W

CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specifiedBreakdown voltages

Collector-base voltage open emitter; $I_C = 10\text{ mA}$	$V_{(BR)CBO}$	>	50	V
--	---------------	---	----	---

Collector-emitter voltage open base; $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	27	V
--	---------------	---	----	---

Emitter-base voltage open collector; $I_E = 5\text{ mA}$	$V_{(BR)EBO}$	>	3,5	V
---	---------------	---	-----	---

Saturation voltage

$I_C = 500\text{ mA}; I_B = 100\text{ mA}$	V_{CEsat}	<	0,75	V
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D. C. current gain

$I_C = 1\text{ A}; V_{CE} = 25\text{ V}$	h_{FE}	>	15	
		typ.	40	

Transition frequency

$I_C = 1\text{ A}; V_{CE} = 25\text{ V}$	f_T	typ.	2,5	GHz
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Collector capacitance at $f = 1\text{ MHz}$

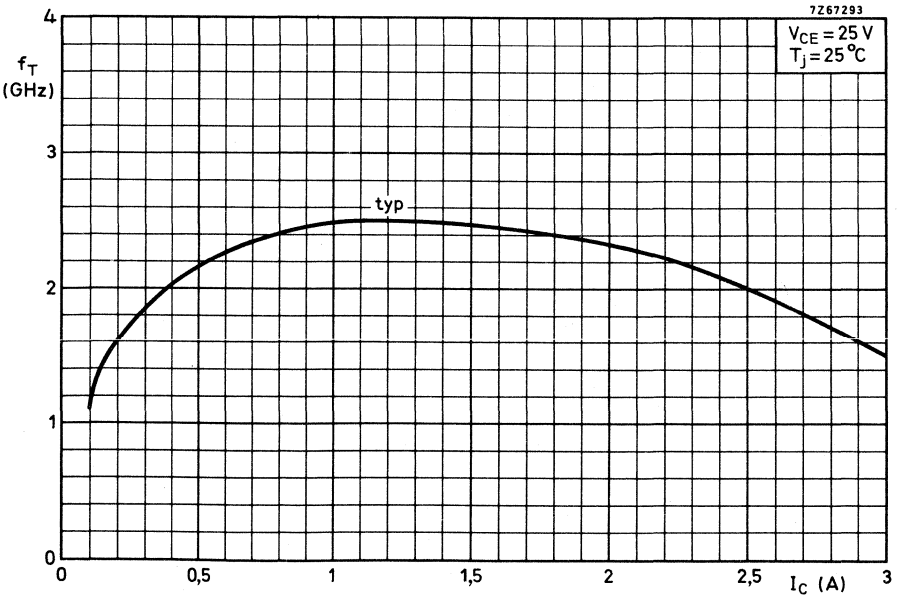
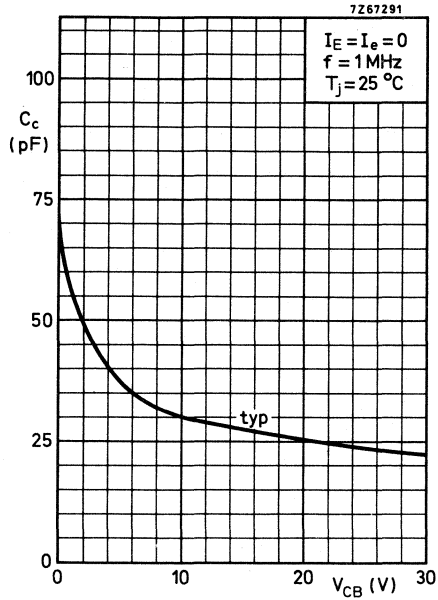
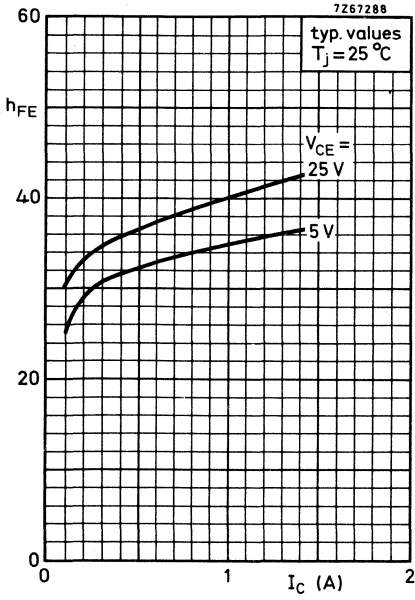
$I_E = I_e = 0; V_{CB} = 25\text{ V}$	C_c	typ.	24	pF
		<	30	pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 50\text{ mA}; V_{CE} = 25\text{ V}; T_{mb} = 25\text{ }^\circ\text{C}$	C_{re}	typ.	15	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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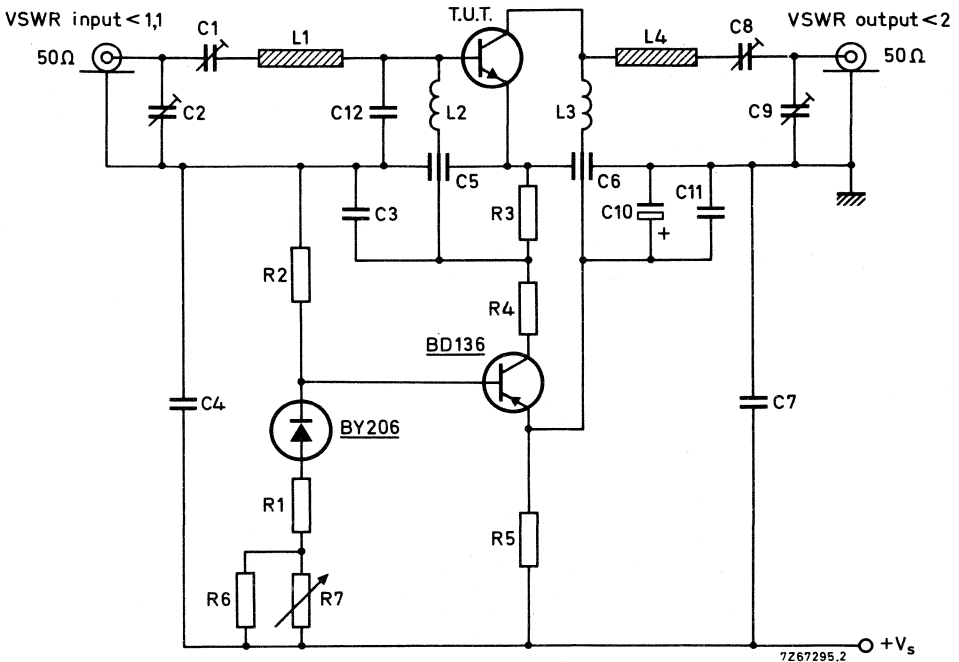


APPLICATION INFORMATION

d_{im} (dB) *	f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	G_p (dB)	P_o sync (W) *	T_h (°C)
-60	860	25	850	> 5,0	> 3,5	70
-60	860	25	850	typ. 5,5	typ. 4.0	70

*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

Test circuit at $f_{vision} = 860$ MHz



List of components : (see also page 6)

- C1 = C2 = 1, 4 to 5,5 pF film dielectric trimmers (2222 809 09001)
- C3 = C4 = 100 nF polyester capacitors
- C5 = C6 = 1 nF feed-through capacitors
- C7 = 5,6 pF ceramic capacitor
- C8 = 2 to 18 pF film dielectric trimmer (2222 809 09003)
- C9 = 2 to 9 pF film dielectric trimmer (2222 809 09002)
- C10 = 10 μF/40 V solid aluminium electrolytic capacitor
- C11 = 470 nF polyester capacitor
- C12 = 2 x 3,3 pF chip capacitors (in parallel)

APPLICATION INFORMATION (continued)

List of components: (continued)

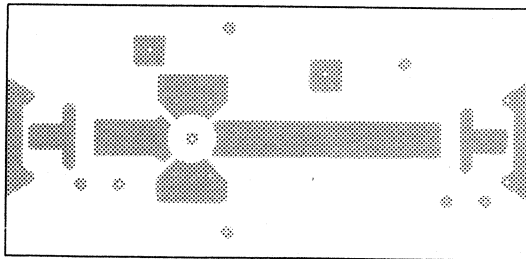
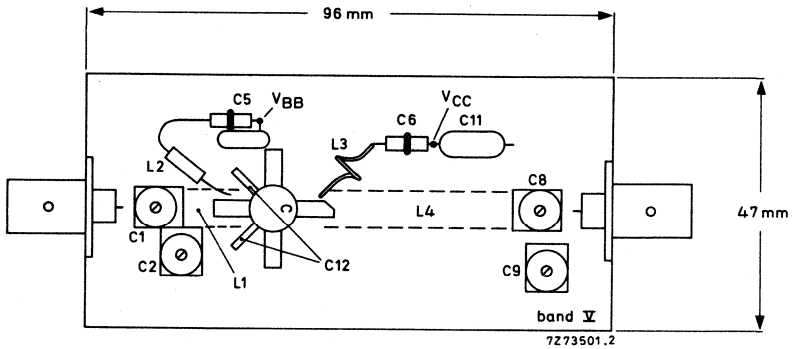
- R1 = 150 Ω
- R2 = 1,8 kΩ
- R3 = 33 Ω
- R4 = 220 Ω (1 W)

- R5 = 4 x 12 Ω in parallel (4 x 1 W)
- R6 = 1 kΩ
- R7 = 220 Ω (potentiometer)

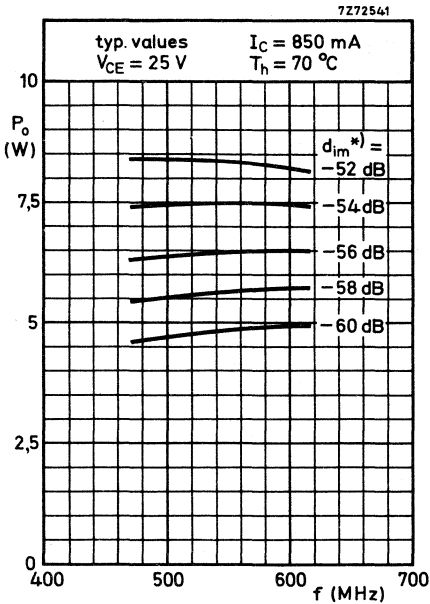
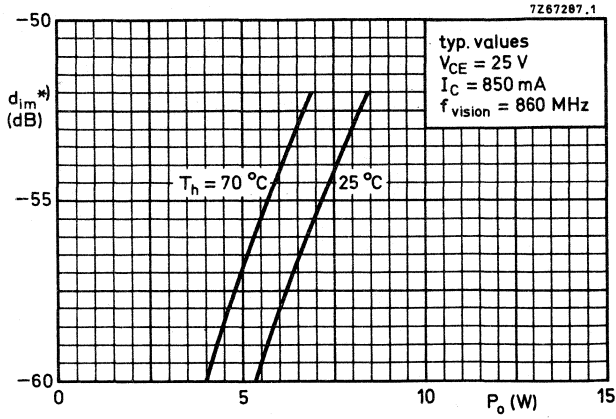
- L1 = stripline (13,6 mm x 6,9 mm)
- L2 = micro choke 0,47 μH (cat. no. 4322 057 04770)
- L3 = 1 turn Cu wire (1 mm); internal diameter 5,5 mm; leads 2 x 5 mm
- L4 = stripline (40,8 mm x 6,9 mm)

L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,45 mm.

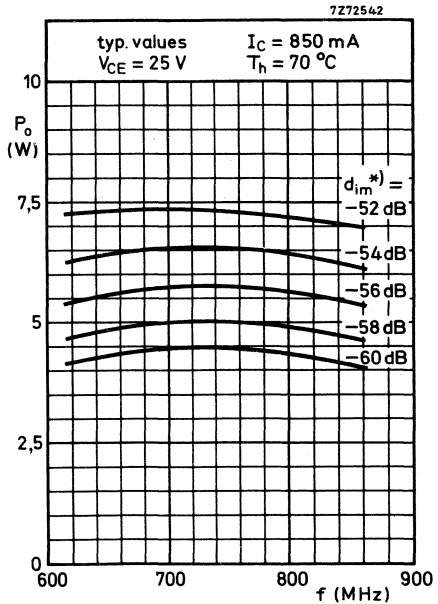
Component layout and printed-circuit board for 860 MHz test circuit.



The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



Measured in a TV band IV circuit.



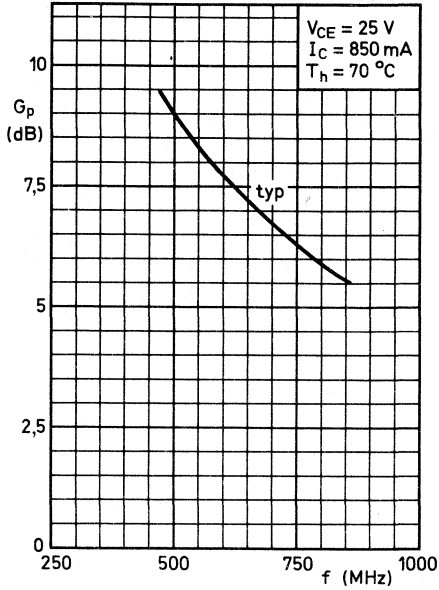
Measured in a TV band V circuit.

Detailed information concerning these circuits, available on request.

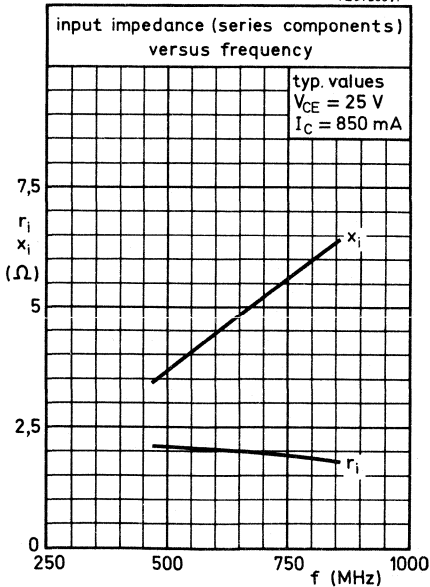
*) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

Intermodulation distortion of input signal $\leq -75\text{ dB}$.

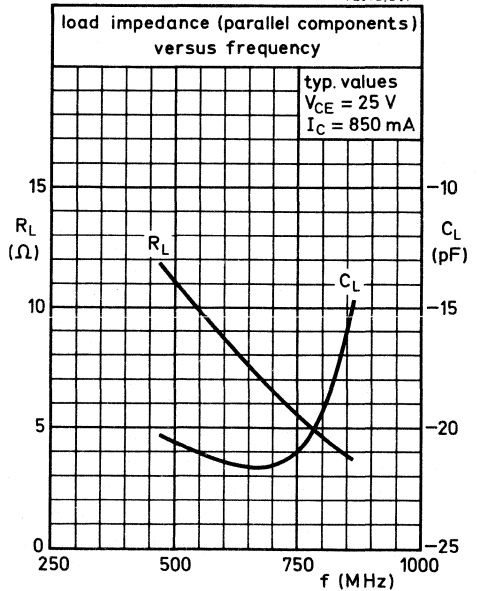
727254.3



7267290.1



7267292.1



BLY87A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V

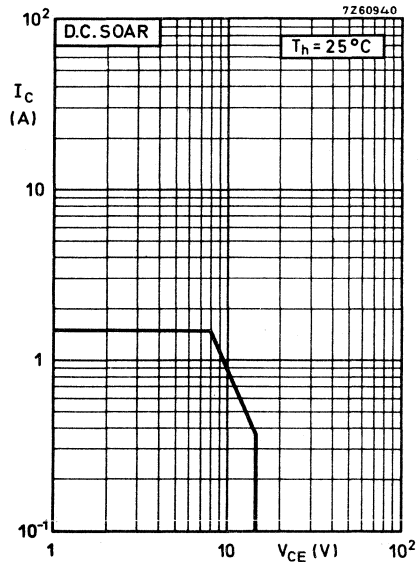
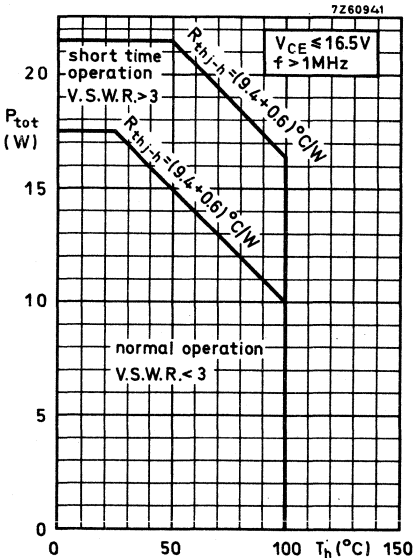
Currents

Collector current (average)	$I_{C(AV)}$	max.	1.25 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	3.75 A

Power dissipation

Total power dissipation up to $T_h = 25^\circ\text{C}$
 $f > 1$ MHz

P_{tot} max. 17.5 W



Temperature

Storage temperature	T_{stg}	-30 to +200 °C
Operating junction temperature	T_j	max. 200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	9.4 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6 °C/W

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 14\text{V}$ $I_{CEO} < 5 \text{ mA}$

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 1 \text{ mA}$ $V_{(BR)CBO} > 36 \text{ V}$

Collector-emitter voltage
open base, $I_C = 10 \text{ mA}$ $V_{(BR)CEO} > 18 \text{ V}$

Emitter-base voltage
open collector, $I_E = 1 \text{ mA}$ $V_{(BR)EBO} > 4 \text{ V}$

Transient energy

$L = 25 \text{ mH}; f = 50 \text{ Hz}$

open base	E	$>$	0.5	mWs
$-V_{BE} = 1.5 \text{ V}; R_{BE} = 33 \Omega$	E	$>$	0.5	mWs

D. C. current gain

$I_C = 500 \text{ mA}; V_{CE} = 5 \text{ V}$ $h_{FE} > 5$

Transition frequency

$I_C = 500 \text{ mA}; V_{CE} = 10 \text{ V}$ $f_T \text{ typ. } 700 \text{ MHz}$

Collector capacitance at $f = 1 \text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15 \text{ V}$ $C_c \text{ typ. } 15 \text{ pF}$
 $< 20 \text{ pF}$

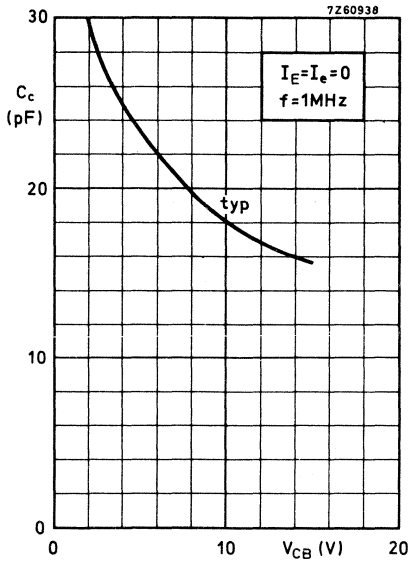
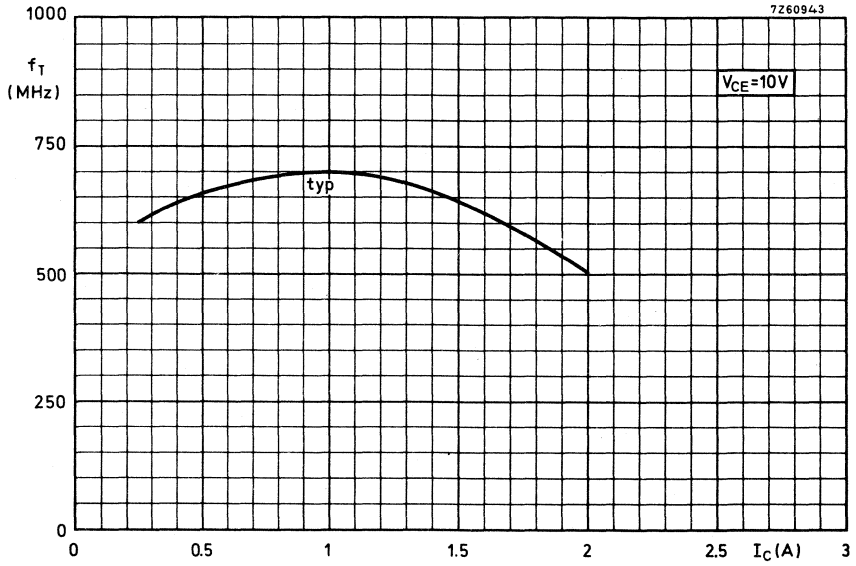
Feedback capacitance at $f = 1 \text{ MHz}$

$I_C = 100 \text{ mA}; V_{CE} = 15 \text{ V}$ $C_{re} \text{ typ. } 11 \text{ pF}$

Collector-stud capacitance

$C_{cs} \text{ typ. } 2 \text{ pF}$





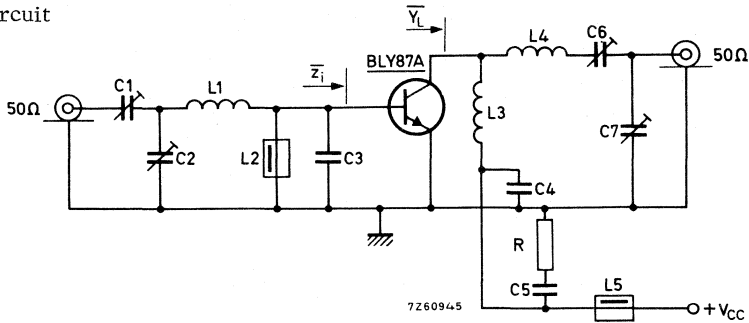
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralised common-emitter class B circuit)

$f = 175 \text{ MHz}$; T_{mb} up to 25°C

$V_{CC}(\text{V})$	$P_S(\text{W})$	$P_L(\text{W})$	$I_C(\text{A})$	$G_p(\text{dB})$	$\eta(\%)$	$Z_1(\Omega)$	$\bar{Y}_L(\text{mA/V})$
13.5	< 1.0	8	< 0,85	> 9	> 70	$2.8 + j1.2$	$76 - j16$
12.5	typ. 1.0	8	typ. 0.91	typ. 9	typ. 70	—	—

Test circuit



C1 = 2.5 to 20 pF film dielectric trimmer (code number 2222 809 07004)

C2 = C6 = C7 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)

C3 = 47 pF ceramic

C4 = 100 pF ceramic

C5 = 150 nF polyester

L1 = 0.5 turn enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

L2 = L5 = ferroxcube choke (code number 4312 020 36640)

L3 = 2.5 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

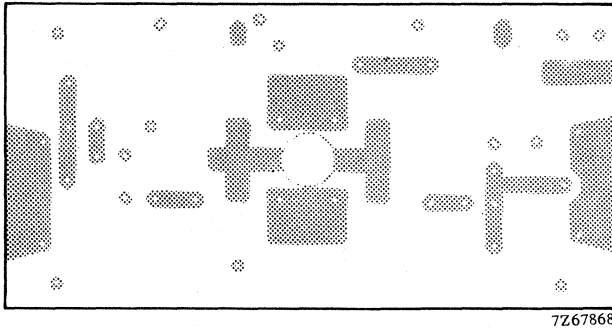
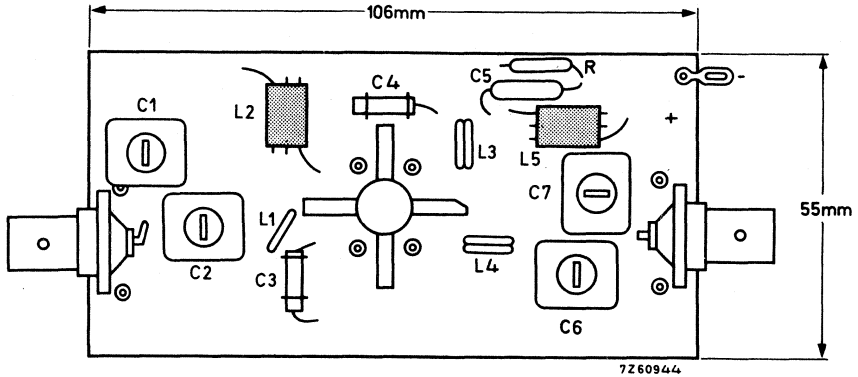
L4 = 4.5 turns enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

R = 10 Ω carbon

Component lay-out for 175 MHz test circuit see page 6

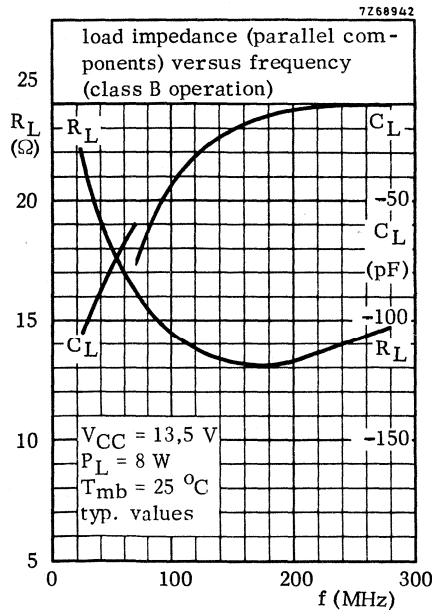
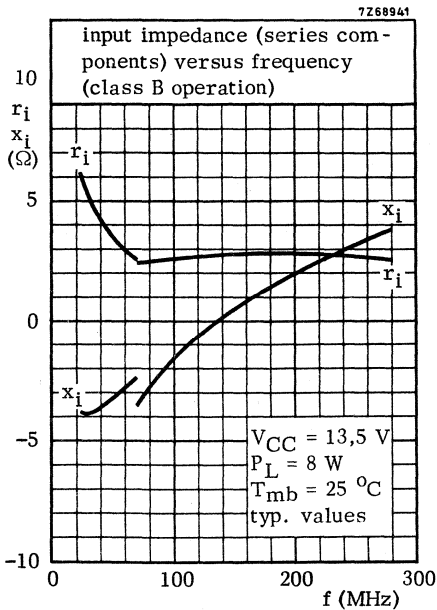
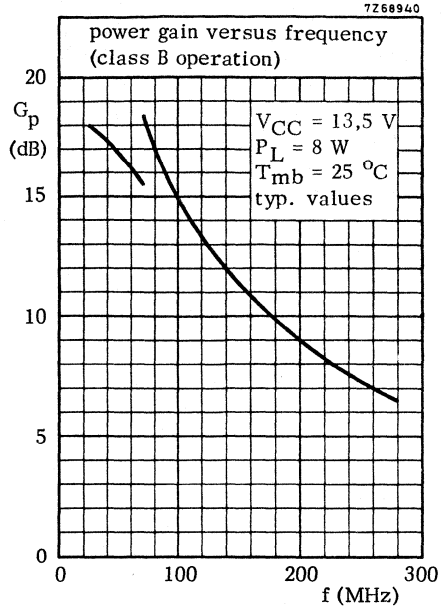
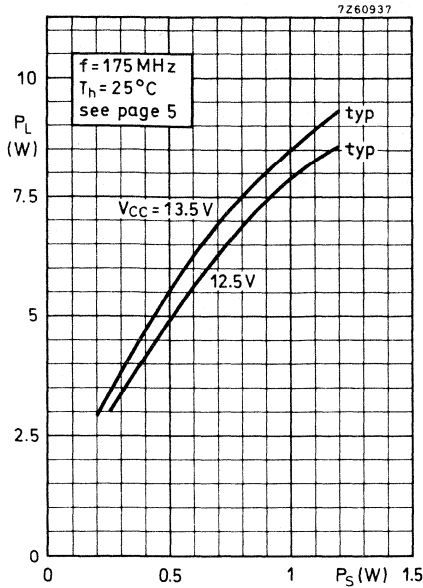
APPLICATION INFORMATION (continued)

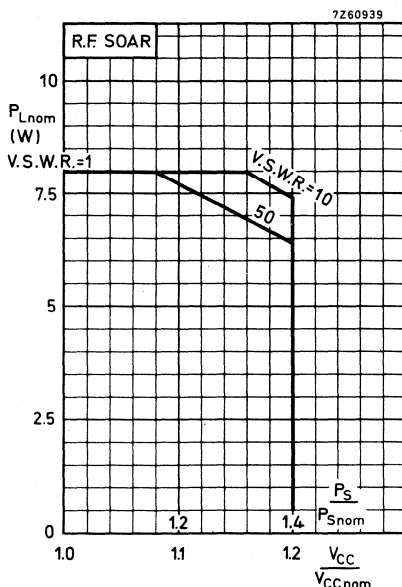
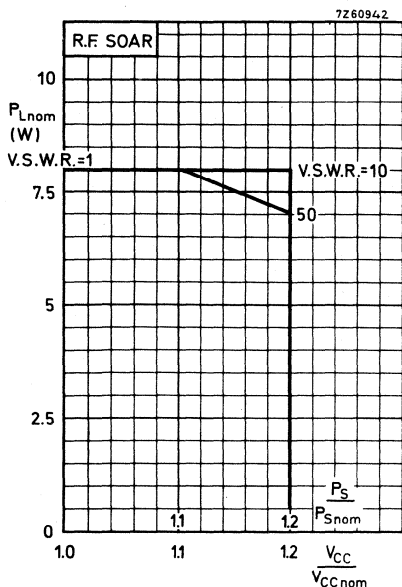
Component lay-out and printed circuit board for 175 MHz test circuit.



The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

OPERATING NOTE Below 70 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.





Conditions for R.F. SOAR:

$f = 175 \text{ MHz}$ $P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and $V.S.W.R. = 1$
 $T_h = 70^\circ\text{C}$ $R_{th mb-h} = 0.6 \text{ }^\circ\text{C/W}$
 $V_{CCnom} = 12.5 \text{ or } 13.5 \text{ V}$ see also page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs above for safe operation at supply voltages other than the nominal. The graphs show the allowable output power under nominal conditions, as a function of the supply overvoltage ratio, with V.S.W.R. as parameter.

The left hand graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.

The right hand graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).

Depending on the operating conditions, the appropriate derating factor may lie in the region between the linear and the square-law functions.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

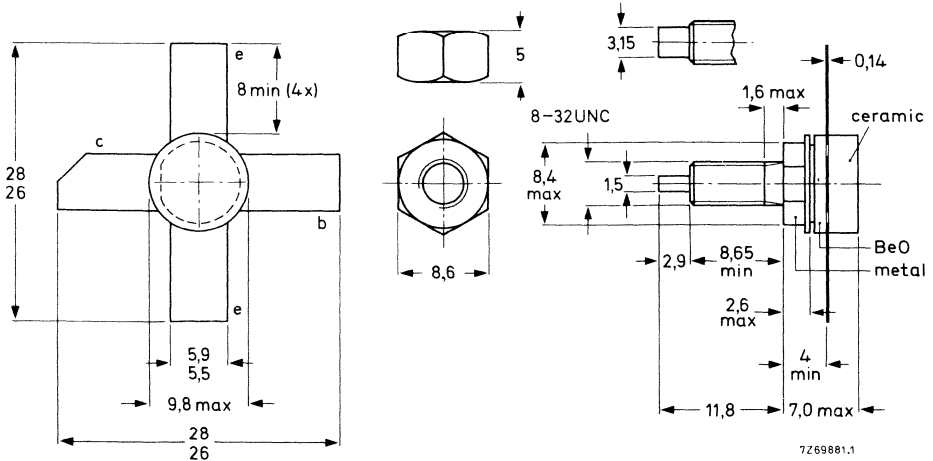
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	13,5	175	8	> 12,0	> 60	2,2 + j0,4	96 - j28
c.w.	12,5	175	8	typ. 11,5	typ. 65	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_C(AV)$	max.	1,5 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	4,0 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	20 W

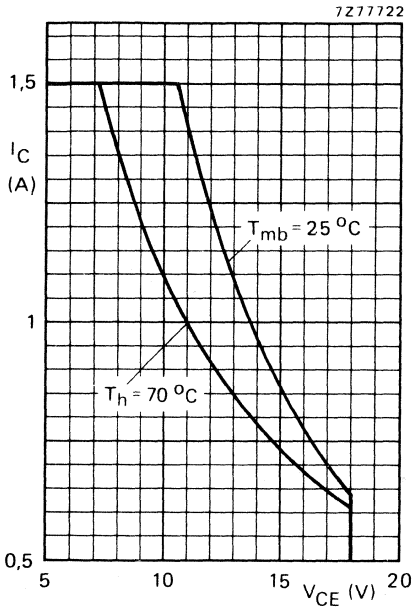


Fig. 2 D.C. SOAR.

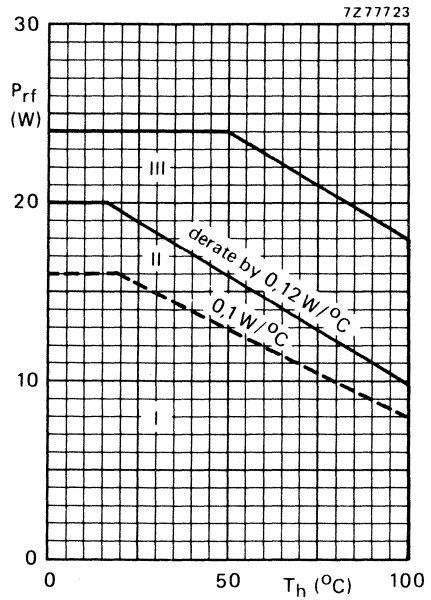


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

Storage temperature	T_{stg}	-65 to + 150 °C
Operating junction temperature	T_j	max. 200 °C

THERMAL RESISTANCE (dissipation = 8 W; $T_{mb} = 73,5$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th j-mb(dc)}$	=	10,7 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th j-mb(rf)}$	=	8,6 °C/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,45 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 5\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 1\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 2\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 0,5\text{ mJ}$ $R_{BE} = 10\text{ }\Omega$ $E_{SBR} > 0,5\text{ mJ}$

D.C. current gain *

 $I_C = 0,75\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 100

Collector-emitter saturation voltage *

 $I_C = 2\text{ A}; I_B = 0,4\text{ A}$ V_{CEsat} typ. 0,85 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 0,75\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 950 MHz $-I_E = 2\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 850 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 13,5\text{ V}$ C_c typ. 16,5 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 13,5\text{ V}$ C_{re} typ. 12 pF

Collector-stud capacitance

 C_{cs} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

7Z77724

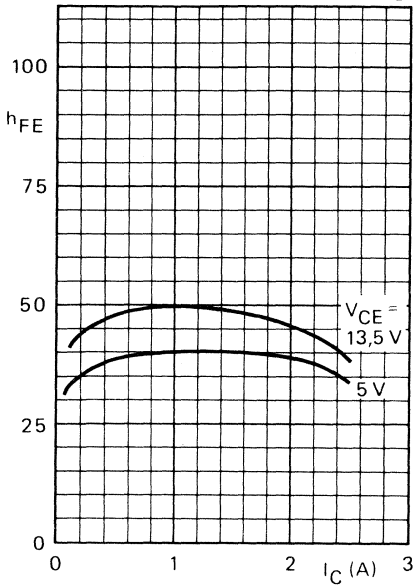


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

7Z77725

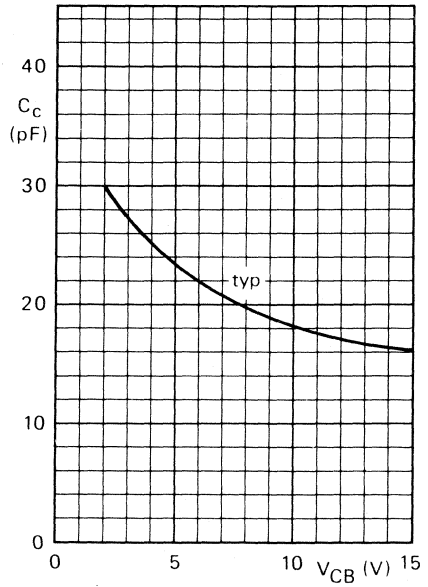


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

7Z77732

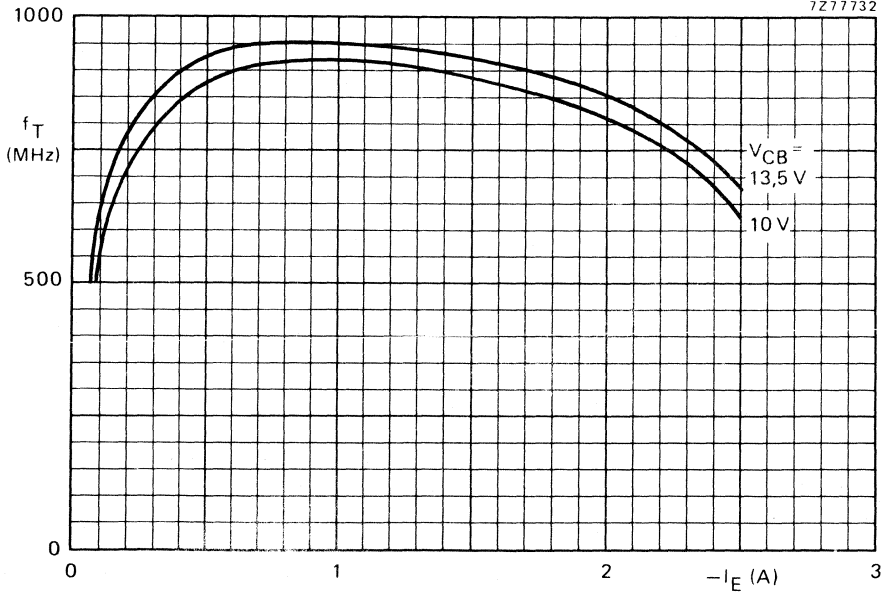


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	8	< 0,5	> 12,0	< 0,99	> 60	$2,2 + j0,4$	$96 - j28$
175	12,5	8	—	typ. 11,5	—	typ. 65	—	—

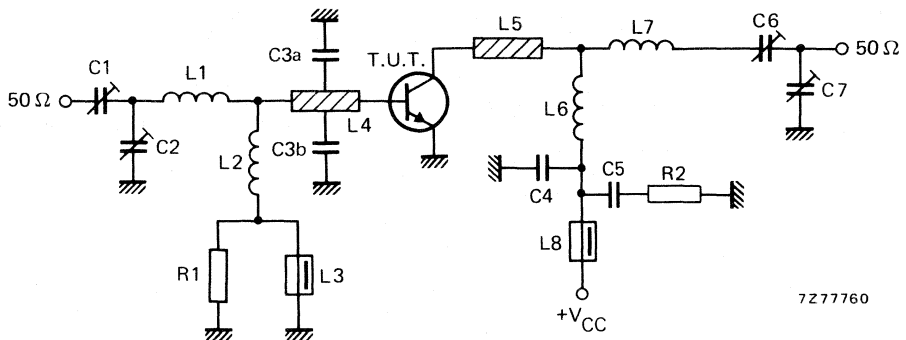


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 5,7 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = L8 = Ferroxcube choke coil (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 7,5 mm; leads 2 x 5 mm

L7 = 3 turns Cu wire (1,6 mm); int. dia. 6,5 mm; length 7,4 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistorR2 = 4,7 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.

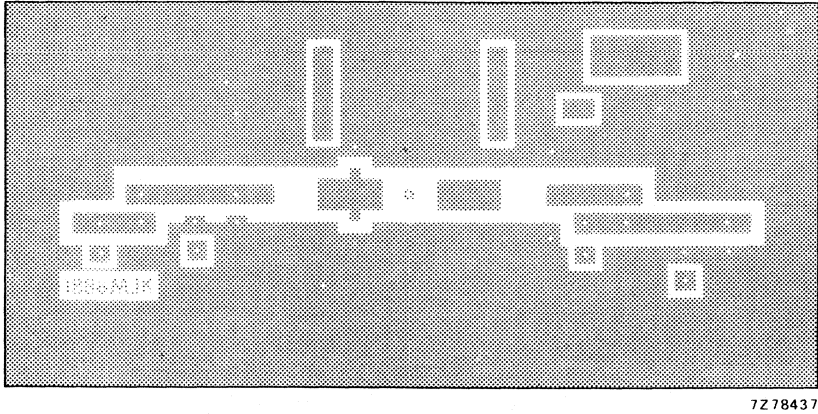
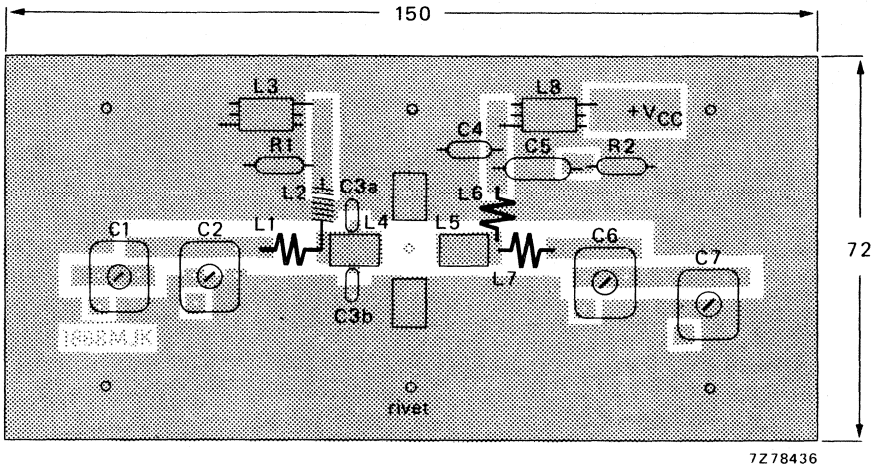


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

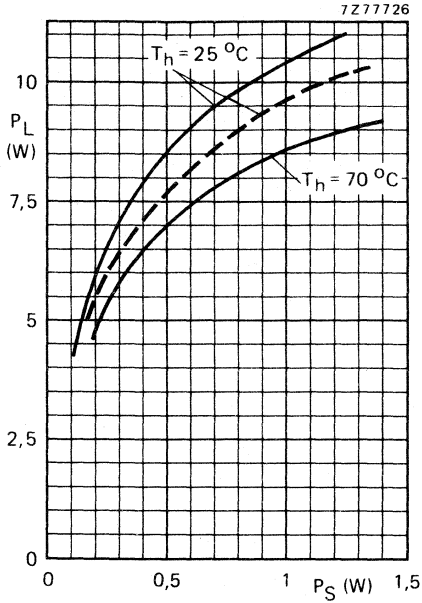


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

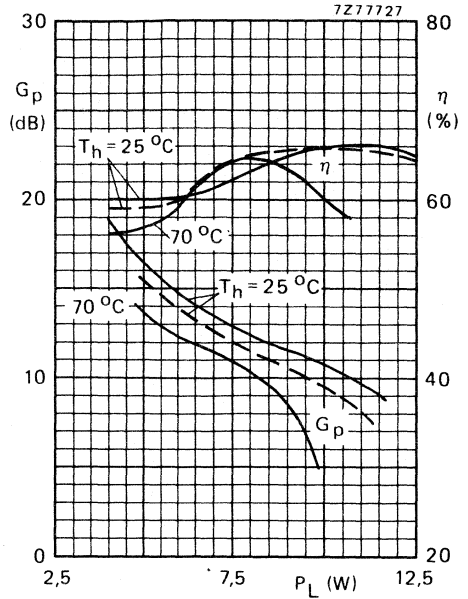


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

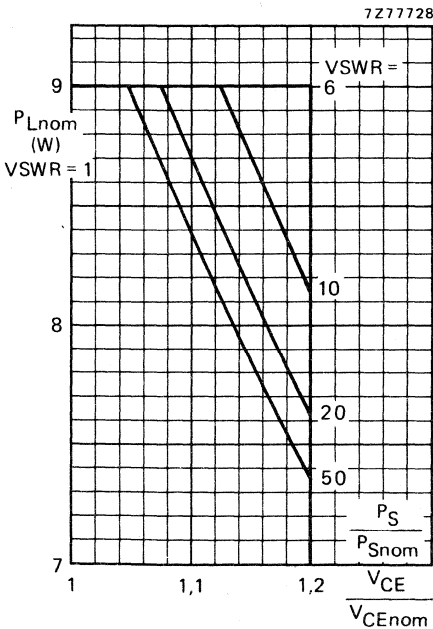


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,45 \text{ }^\circ\text{C/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

Note to Fig. 11:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($VSWR = 1$), as a function of the expected supply over-voltage ratio with $VSWR$ as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

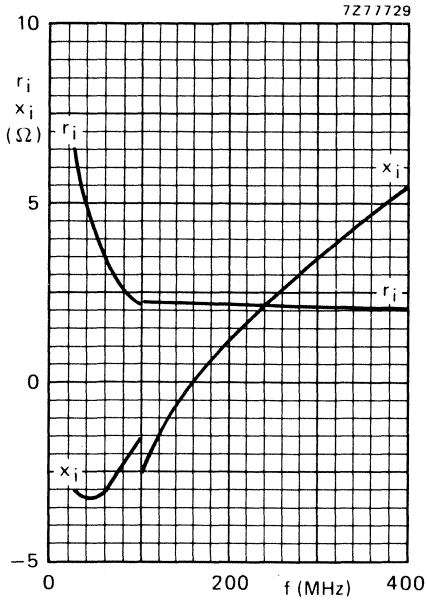


Fig. 12 Input impedance (series components).

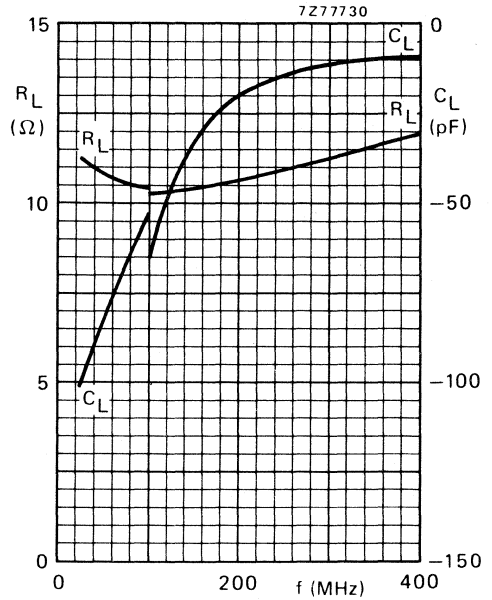


Fig. 13 Load impedance (parallel components).

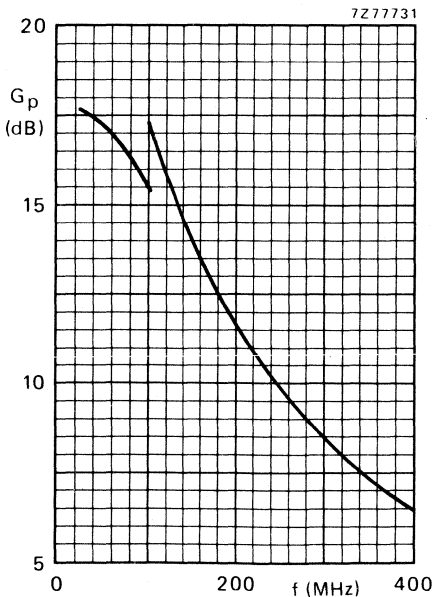


Fig. 14.

Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 13,5 \text{ V}$; $P_L = 8 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of $10 \text{ } \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13.5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply overvoltage to 16.5 V. It has a $\frac{1}{4}$ " capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

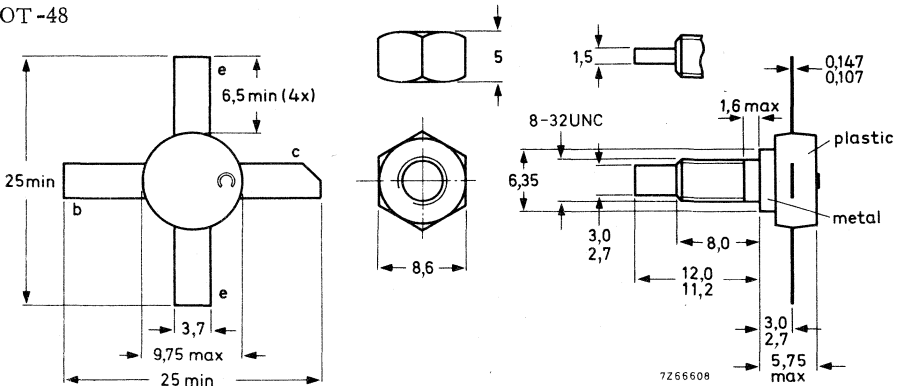
R. F. performance up to $T_{mb} = 25^{\circ}\text{C}$ in an unneutralised common-emitter class B circuit.

Mode of operation	V _{CC} (V)	f (MHz)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	13.5	175	< 2.65	15	< 1.71	> 7.5	> 65	2.3+j2.2	128-j4.4
c. w.	12.5	175	typ. 2.65	15	typ. 1.85	typ. 7.5	typ. 65	-	-

MECHANICAL DATA

SOT-48

Dimensions in mm



Torque on nut: min. 7.5 kg cm
(0.75 Newton metres)
max. 8.5 kg cm
(0.85 Newton metres)

Diameter of clearance hole in heatsink: max. 4.17 mm.

Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required, an adhesive instead of a lock washer is preferred.

BLY88A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

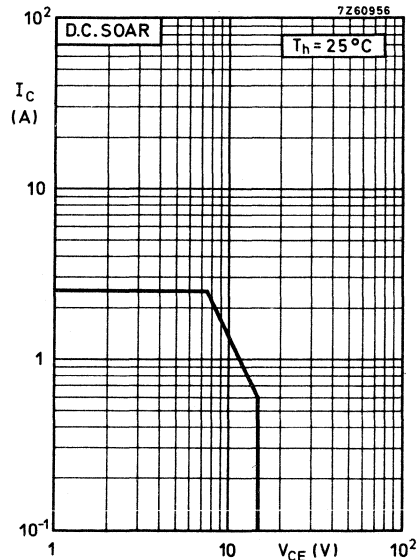
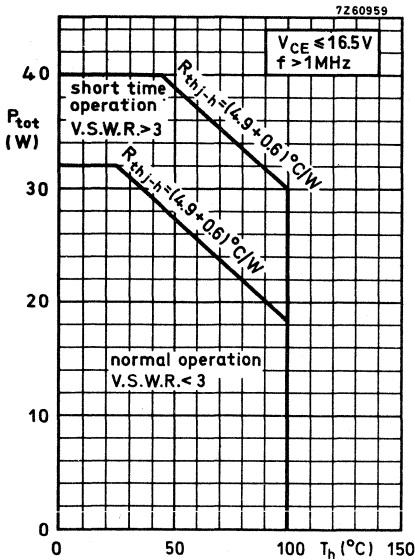
Currents

Collector current (average)	$I_{C(AV)}$	max.	2.5	A
Collector (peak value) $f > 1\text{MHz}$	I_{CM}	max.	7.5	A

Power dissipation

Total power dissipation up to $T_h = 25^\circ\text{C}$
 $f > 1\text{MHz}$

P_{tot}	max.	32	W
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Temperature

Storage temperature	T_{stg}	-30 to +200	$^\circ\text{C}$
Operating junction temperature	T_j	max. 200	$^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	4.9	$^\circ\text{C/W}$
From mounting base to heatsink	R_{mb-h}	=	0.6	$^\circ\text{C/W}$

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 14\text{ V}$

$I_{CEO} < 10\text{ mA}$

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 3\text{ mA}$

$V_{(BR)CBO} > 36\text{ V}$

Collector-emitter voltage
open base, $I_C = 25\text{ mA}$

$V_{(BR)CEO} > 18\text{ V}$

Emitter-base voltage
open collector; $I_E = 3\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$

open base
 $-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$

$E > 2.0\text{ mWs}$
 $E > 4.5\text{ mWs}$

D. C. current gain

$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE} > 5$

Transition frequency

$I_C = 1\text{ A}; V_{CE} = 10\text{ V}$

f_T typ. 700 MHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15\text{ V}$

C_c typ. 34 pF
< 40 pF

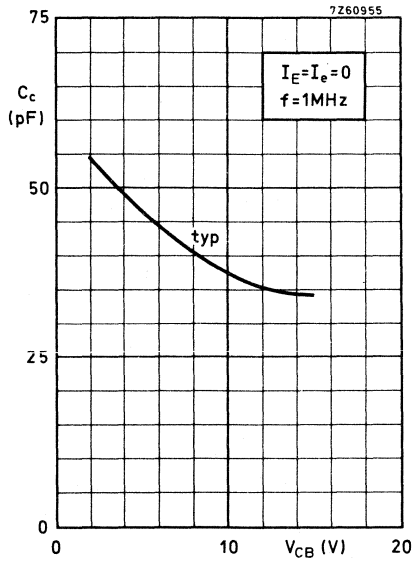
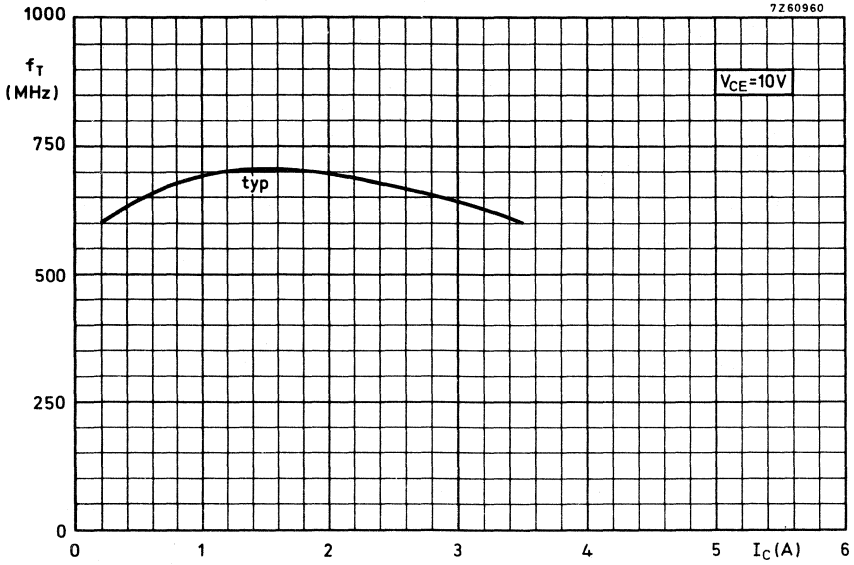
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 15\text{ V}$

C_{re} typ. 25 pF

Collector-stud capacitance

C_{cs} typ. 2 pF



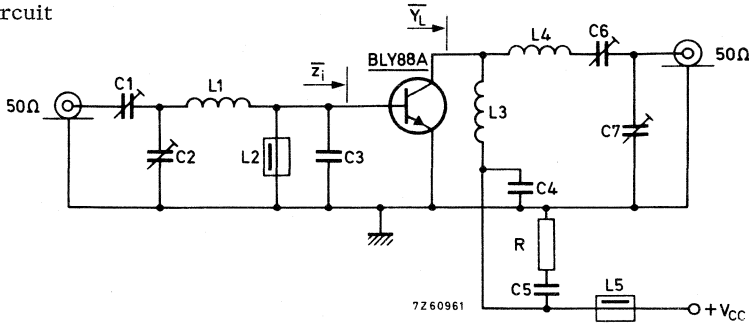
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralised common-emitter class B circuit)

$f = 175 \text{ MHz}$; T_{mb} up to 25°C

$V_{CC}(V)$	$P_S(W)$	$P_L(W)$	$I_C(A)$	$G_p(dB)$	$\eta(\%)$	$\bar{z}_i(\Omega)$	$\bar{Y}_L(mA/V)$
13.5	< 2.65	15	< 1.71	> 7.5	> 65	$2.3 + j2.2$	$128 - j4.4$
12.5	typ. 2.65	15	typ. 1.85	typ. 7.5	typ. 65	—	—

Test circuit



- C1= 2.5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
- C2=C6=C7= 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
- C3= 47 pF ceramic
- C4= 100 pF ceramic
- C5= 150 nF polyester

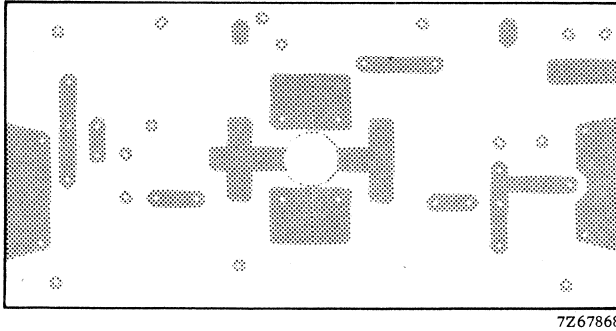
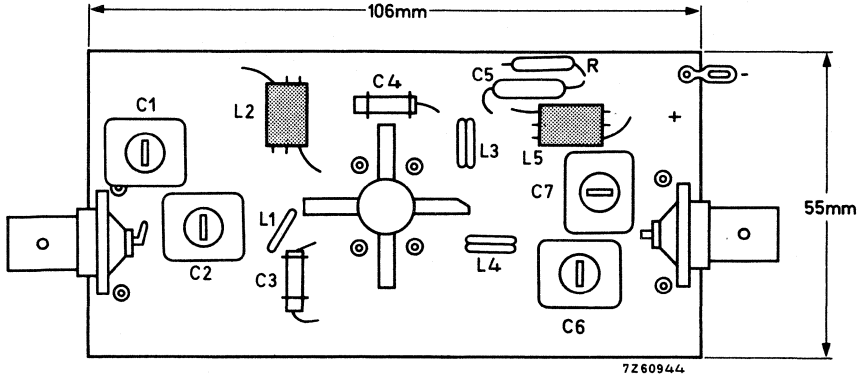
- L1= 0.5 turn enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm
- L2=L5= ferroxcube choke (code number 4312 020 36640)
- L3= 2.5 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm
- L4= 2.5 turns enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

R = 10Ω carbon

Component lay-out for 175 MHz test circuit see page 6.

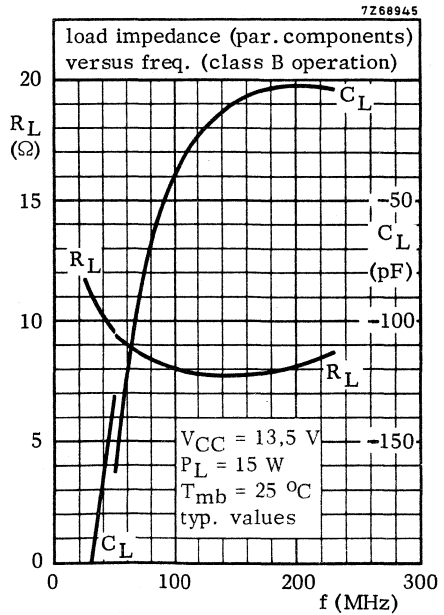
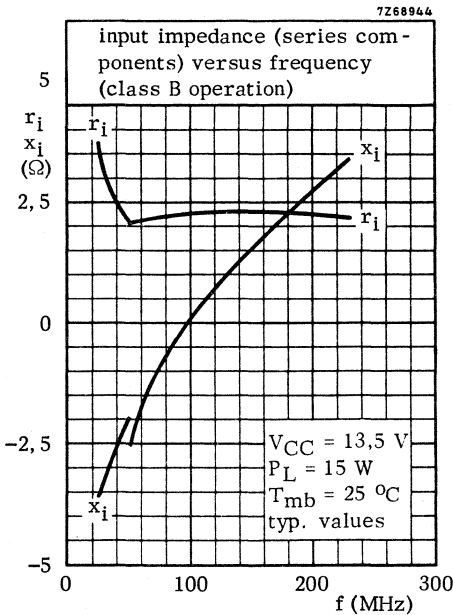
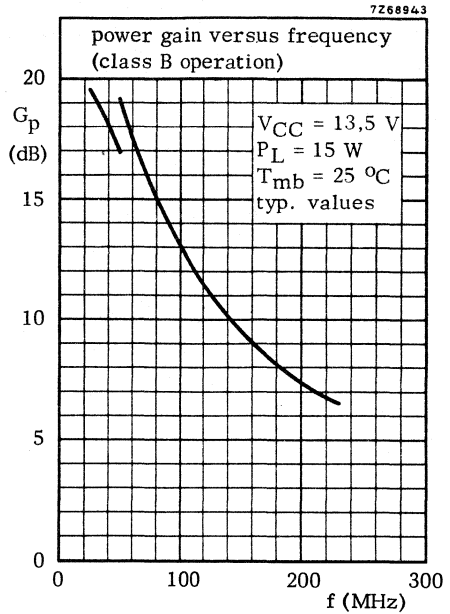
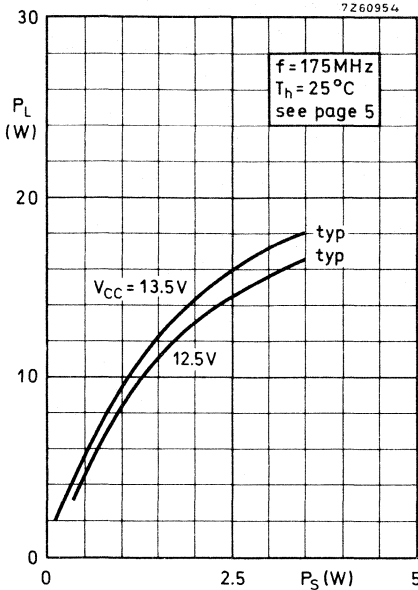
APPLICATION INFORMATION (continued)

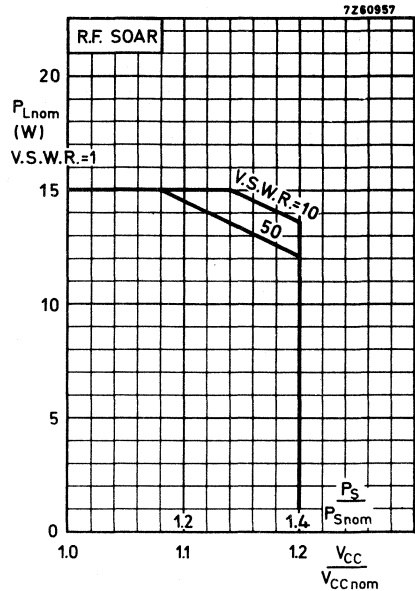
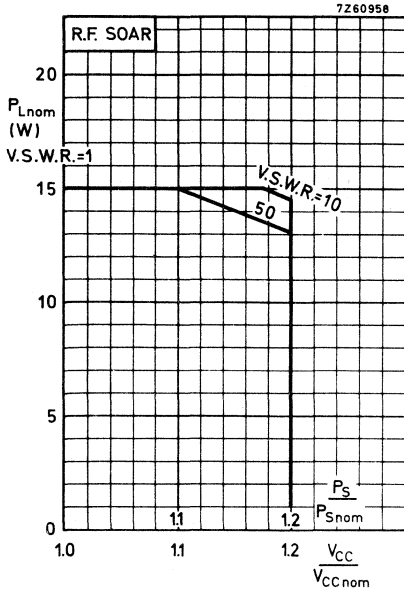
Component lay-out and printed circuit board for 175 MHz test circuit.



The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

OPERATING NOTE Below 50 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.





Conditions for R. F. SOAR:

$f = 175 \text{ MHz}$ $P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and $V.S.W.R. = 1$
 $T_h = 70 \text{ }^\circ\text{C}$ $R_{th mb-h} = 0.6 \text{ }^\circ\text{C/W}$
 $V_{CCnom} = 12.5 \text{ or } 13.5 \text{ V}$ see also page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs above for safe operation at supply voltages other than the nominal. The graphs show the allowable output power under nominal conditions, as a function of the supply overvoltage ratio, with V. S. W. R. as parameter.

The left hand graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.

The right hand graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).

Depending on the operating conditions, the appropriate derating factor may lie in the region between the linear and the square-law functions.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

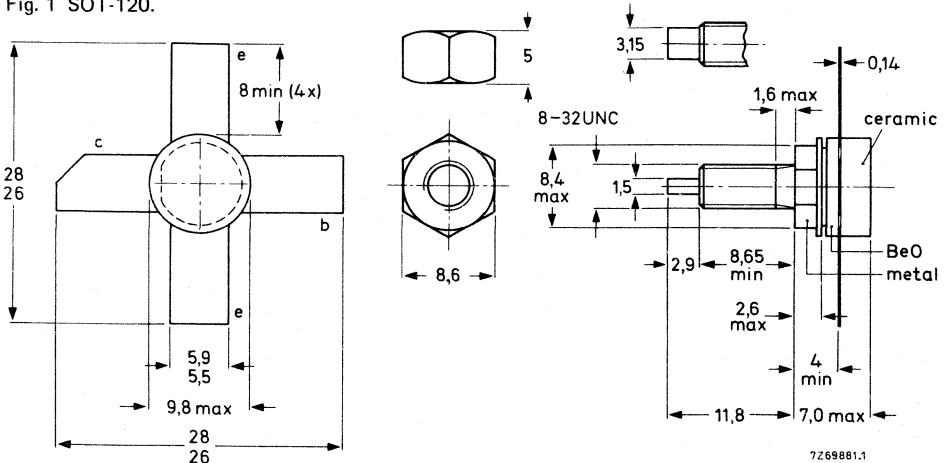
R.F. performance up to $T_H = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{V}_L mA/V
c.w.	13,5	175	15	> 3,0	> 60	2,3 + j2,2	130 - j4,4
c.w.	12,5	175	15	typ. 7,5	typ. 67	-	-

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM} max.	36 V
Collector-emitter voltage (open base)	V_{CEO} max.	18 V
Emitter-base voltage (open collector)	V_{EBO} max.	4 V
Collector current (average)	$I_{C(AV)}$ max.	3 A
Collector current (peak value); $f > 1$ MHz	I_{CM} max.	8 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf} max.	36 W
Storage temperature	T_{stg}	-65 to +150 °C
Operating junction temperature	T_j	max. 200 °C

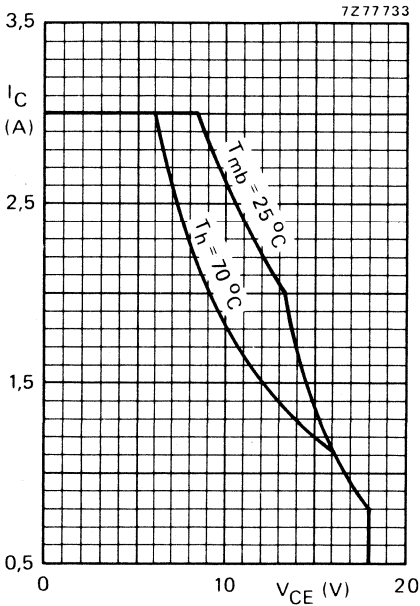


Fig. 2 D.C. SOAR.

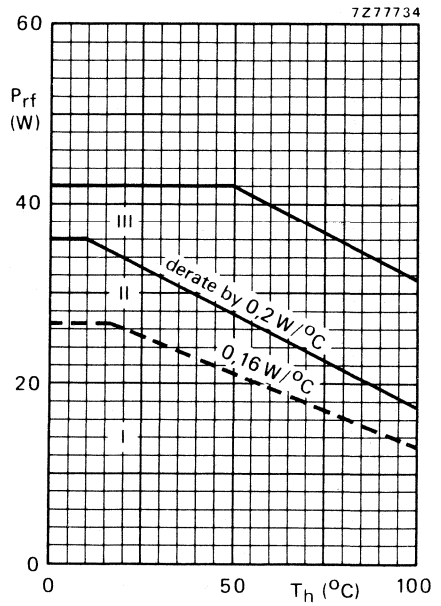


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 15 W; $T_{mb} = 77$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j-mb(dc)}$	= 6,55 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	= 4,95 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	= 0,45 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 10\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 4\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 4\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $E_{SBO} > 2,5\text{ mJ}$ $E_{SBR} > 2,5\text{ mJ}$

D.C. current gain*

 $I_C = 1,5\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 100

Collector-emitter saturation voltage*

 $I_C = 4,5\text{ A}; I_B = 0,9\text{ A}$ V_{CEsat} typ. 1,0 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 1,5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 850 MHz $-I_E = 4,5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 800 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 13,5\text{ V}$ C_c typ. 32 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 200\text{ mA}; V_{CE} = 13,5\text{ V}$ C_{re} typ. 23 pF

Collector-stud capacitance

 C_{cs} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

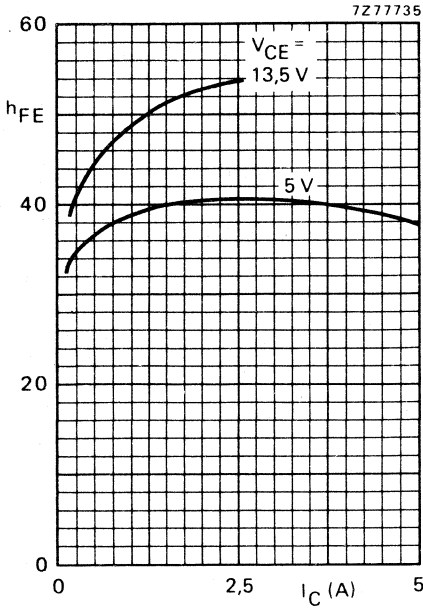


Fig. 4 Typical values; $T_j = 25^\circ\text{C}$.

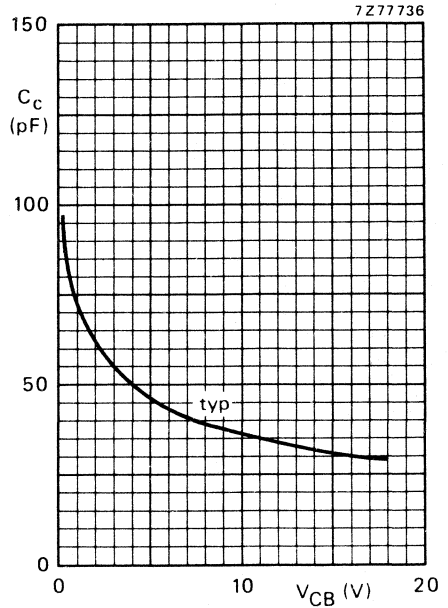


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ\text{C}$.

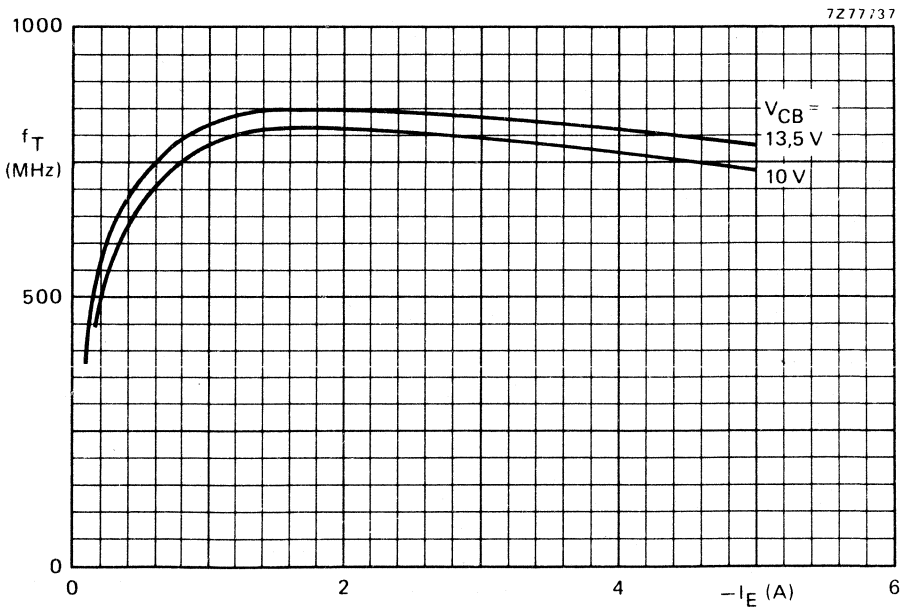


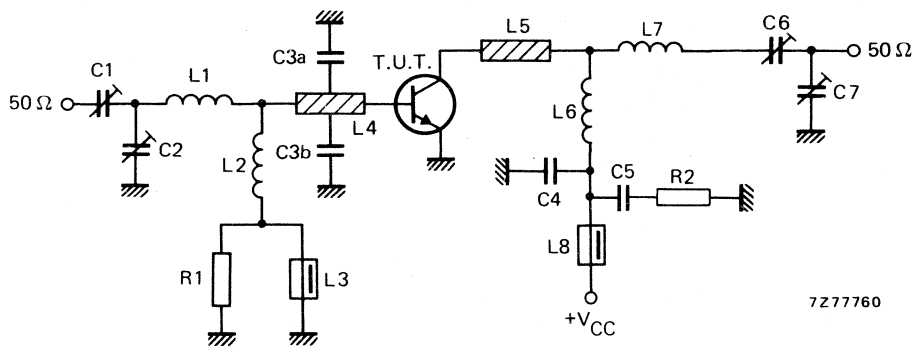
Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	15	< 2,4	> 8,0	< 1,85	> 60	2,3 + j2,2	130 - j4,4
175	12,5	15	-	typ. 7,5	-	typ. 67	-	-



7Z17760

Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 5,7 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = L8 = Ferroxcube choke coil (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 7,5 mm; leads 2 x 5 mm

L7 = 3 turns Cu wire (1,6 mm); int. dia. 6,5 mm; length 7,4 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistorR2 = 4,7 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.

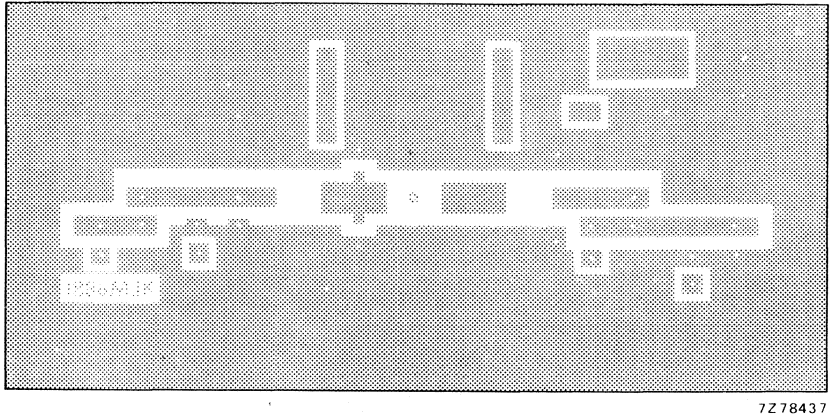
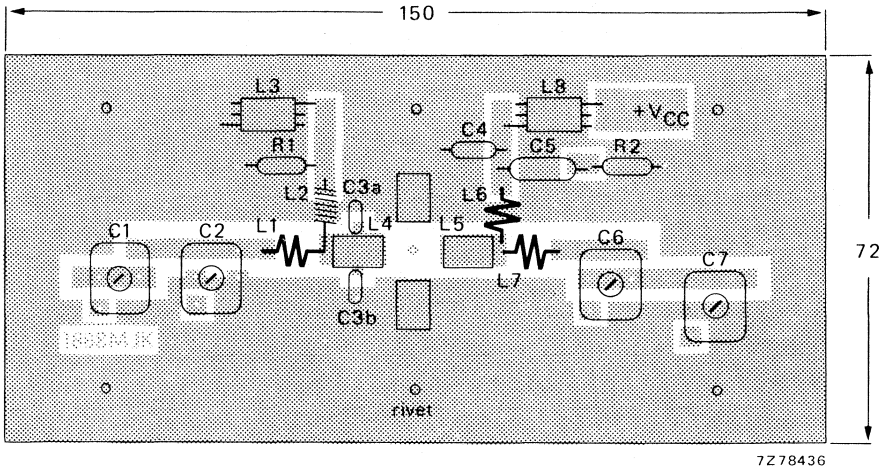


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

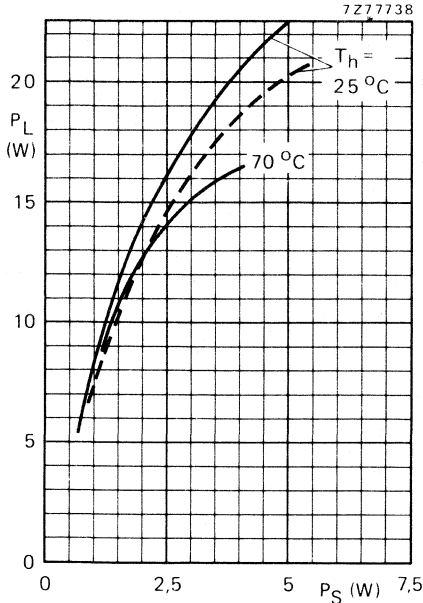


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

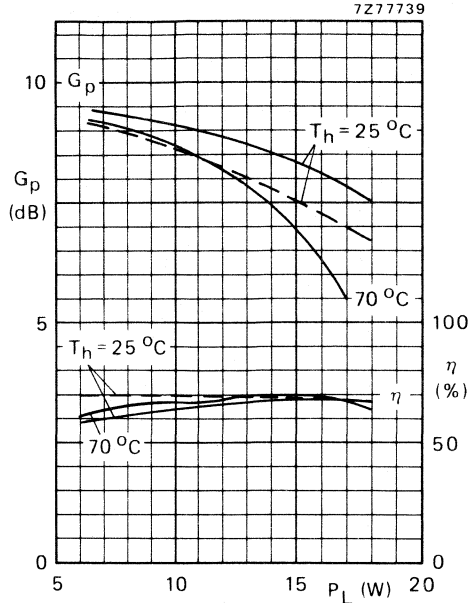


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

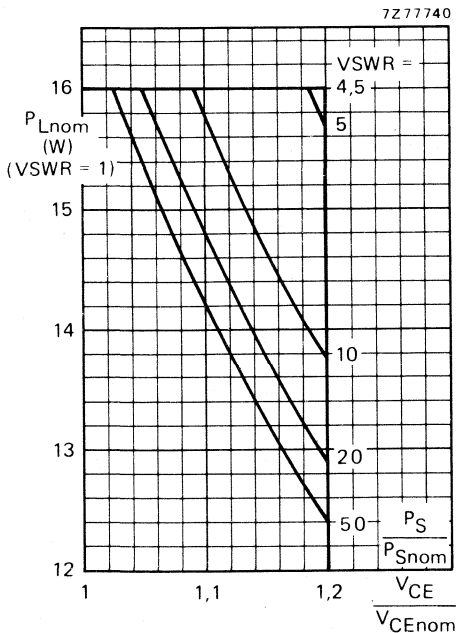


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th\text{ mb-h}} = 0,45 \text{ }^\circ\text{C/W}$; $V_{CE\text{ nom}} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{S\text{ nom}}$ at $V_{CE\text{ nom}}$ and $V_{SWR} = 1$.

Note to Fig. 11:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($V_{SWR} = 1$), as a function of the expected supply over-voltage ratio with V_{SWR} as parameter.

The graph applies to the situation in which the drive ($P_S/P_{S\text{ nom}}$) increases linearly with supply over-voltage ratio.

7Z68944.1

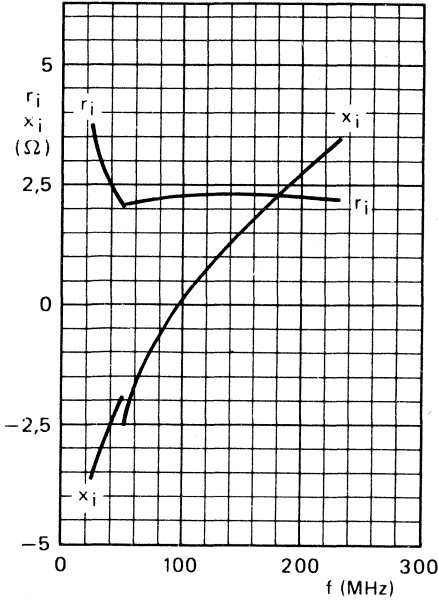


Fig. 12 Input impedance (series components).

7Z68945.1

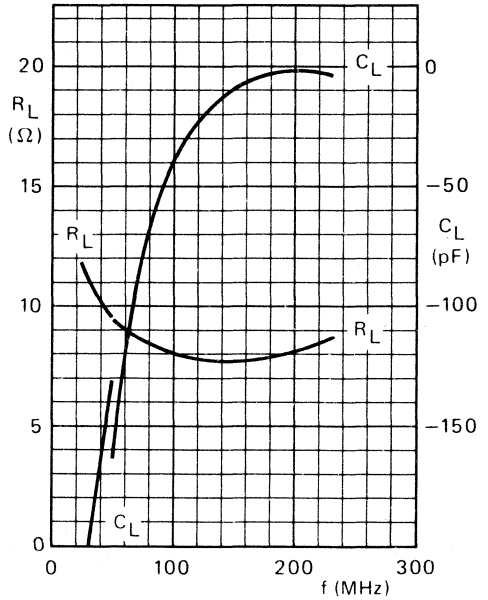


Fig. 13 Load impedance (parallel components).

7Z68943.1

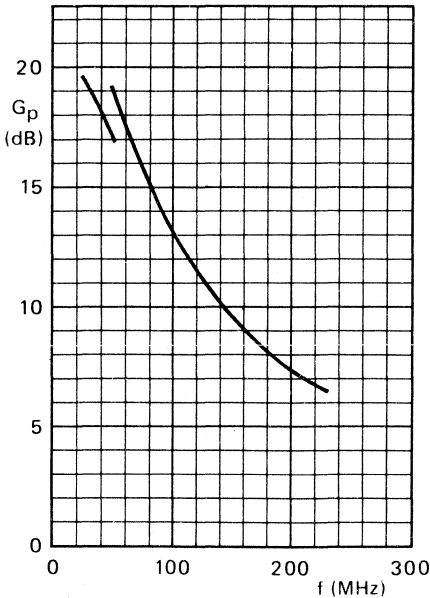


Fig. 14.

Conditions for Figs 12, 13 and 14:
 Typical values: $V_{CE} = 13,5 \text{ V}$; $P_L = 15 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

OPERATING NOTE

Below 50 MHz a base-emitter resistor of $10 \text{ } \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13,5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply over-voltage to 16,5 V. It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

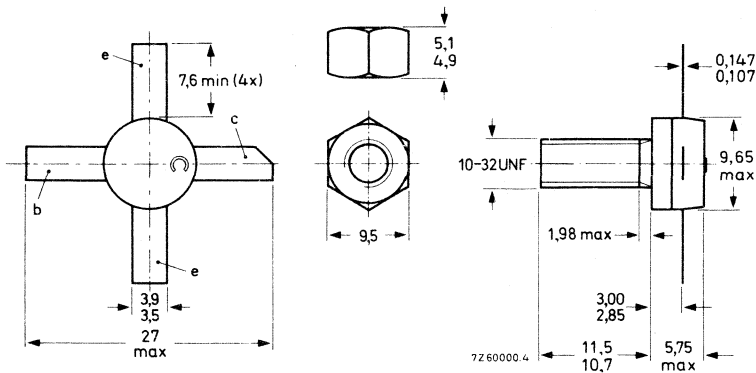
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	\bar{Z}_i Ω	\bar{Y}_L mA/V
c.w.	13,5	175	< 6,25	25	< 2,64	> 6	> 70	$1,6 + j1,4$	$213 + j5,5$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 5,0 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

BLY89A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

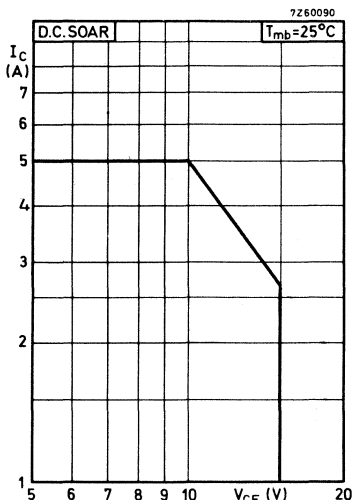
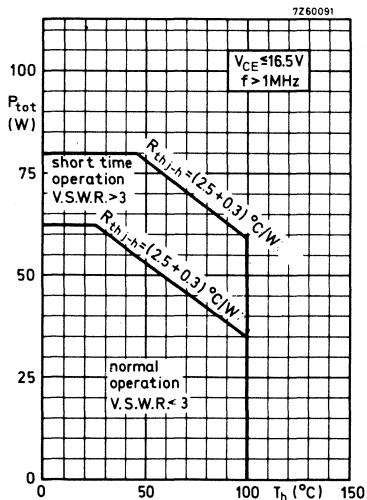
Currents

Collector current (average)	$I_{C(AV)}$	max.	5	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	10	A

Power dissipation

Total power dissipation up to $T_{mb} = 25^\circ\text{C}$
 $f > 1$ MHz

P_{tot}	max.	70	W
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Temperature

Storage temperature	T_{stg}	-30 to +200	$^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	2.5	$^\circ\text{C/W}$
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.3	$^\circ\text{C/W}$

$T_j = 25^\circ\text{C}$ unless otherwise specified

CHARACTERISTICS

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 50\text{ mA}$ $V_{(BR)CBO} > 36\text{ V}$

Collector-emitter voltage
open base, $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base voltage
open collector; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$

open base $E > 8\text{ mWs}$
 $-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$ $E > 8\text{ mWs}$

D. C. current gain

$I_C = 1\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} $\text{typ. } 50$
 $10\text{ to } 120$

Transition frequency

$I_C = 4\text{ A}; V_{CE} = 10\text{ V}$ f_T $\text{typ. } 650\text{ MHz}$

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_C $\text{typ. } 65\text{ pF}$
 $< 90\text{ pF}$

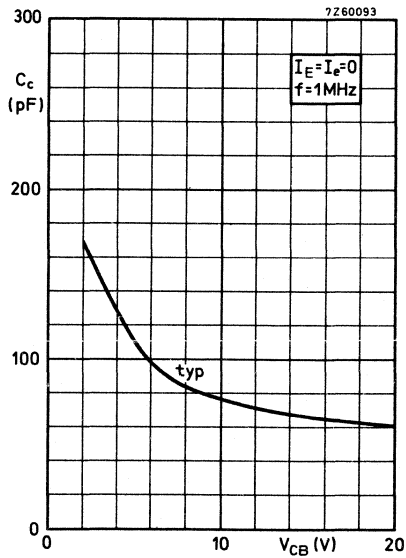
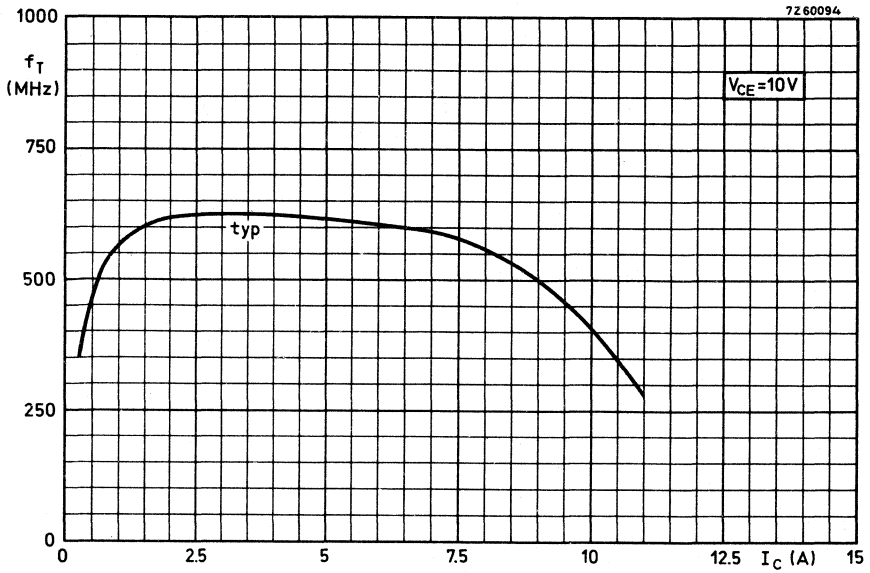
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 15\text{ V}$ C_{re} $\text{typ. } 41\text{ pF}$

Collector-stud capacitance

C_{CS} $\text{typ. } 2\text{ pF}$





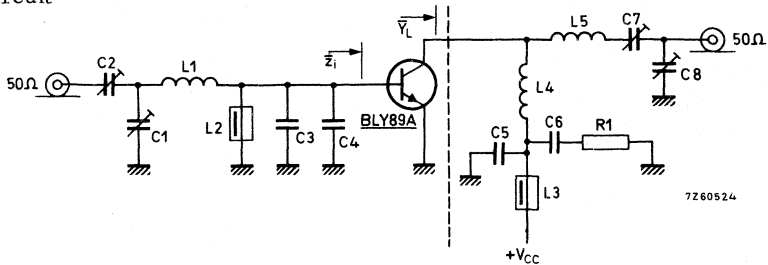
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralised common-emitter class B circuit)

$V_{CC} = 13.5 \text{ V}$; T_{mb} up to 25°C

f(MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	< 6.25	25	< 2.64	> 6	> 70	$1.6 + j1.4$	$213 + j5.5$

Test circuit



- C1 = 4 to 44 pF film dielectric trimmer (code number 2222 809 07008)
- C2 = 2 to 22 pF film dielectric trimmer (code number 2222 809 07004)
- C3 = C4 = 47 pF ceramic
- C5 = 100 pF ceramic
- C6 = 150 nF polyester
- C7 = 4 to 104 pF film dielectric trimmer (code number 2222 809 07015)
- C8 = 4 to 64 pF film dielectric trimmer (code number 2222 809 07011)

L1 = 0.5 turn enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm

L2 = L3 = ferroxcube choke (code number 4312 020 36640)

L4 = 3.5 turns closely wound enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm

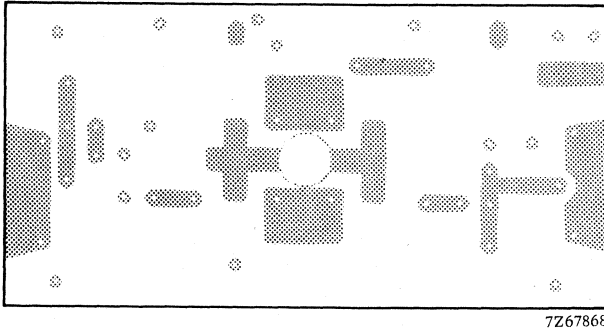
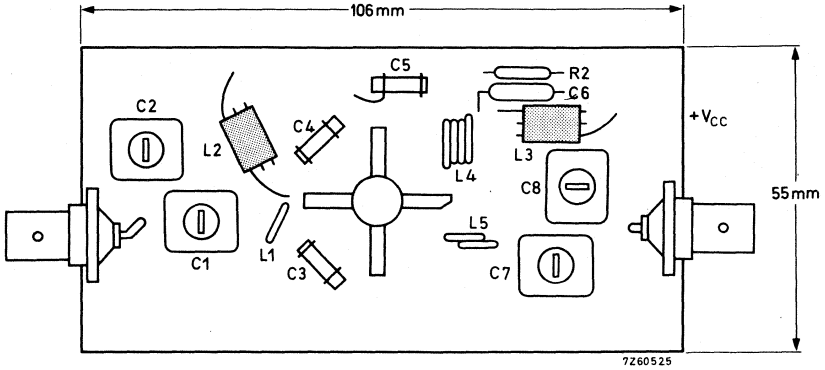
L5 = 1 turn enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm

R1 = 10 Ω carbon

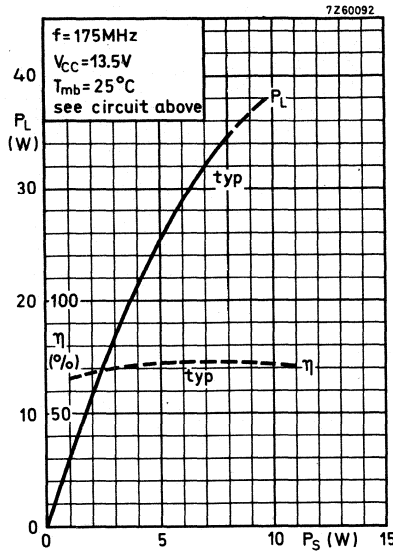
Component lay-out for 175 MHz see page 6.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.



The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



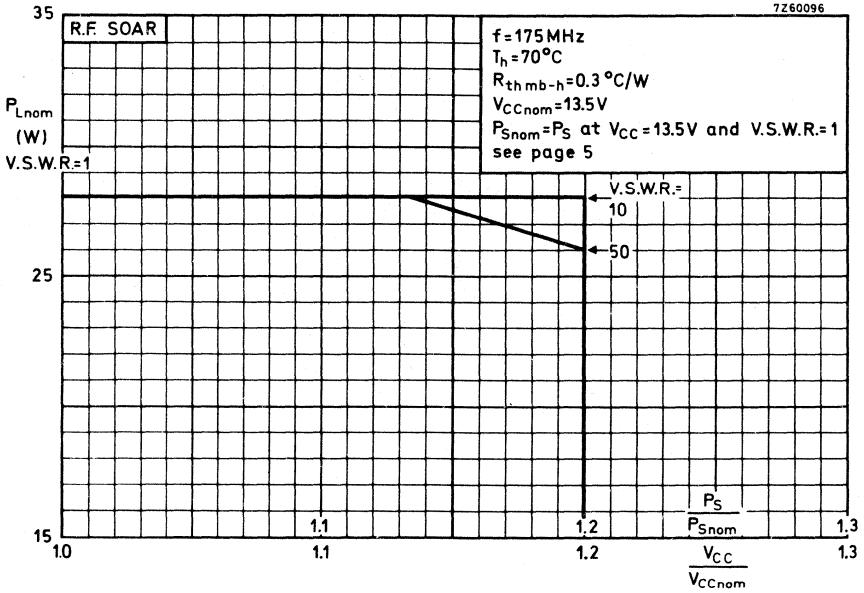
The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs on page 8 for safe operation at supply voltages other than the nominal. The graphs show the allowable output power under nominal conditions, as a function of the supply overvoltage ratio, with V.S.W.R. as parameter

The upper graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.

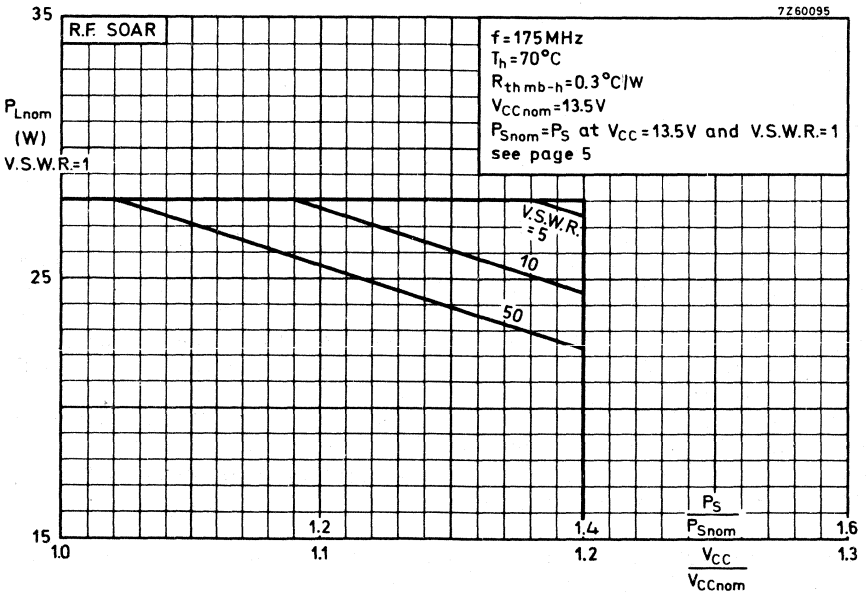
The lower graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).

Depending on the operating conditions, the appropriate derating factor may lie in the region between the linear and the square-law functions.

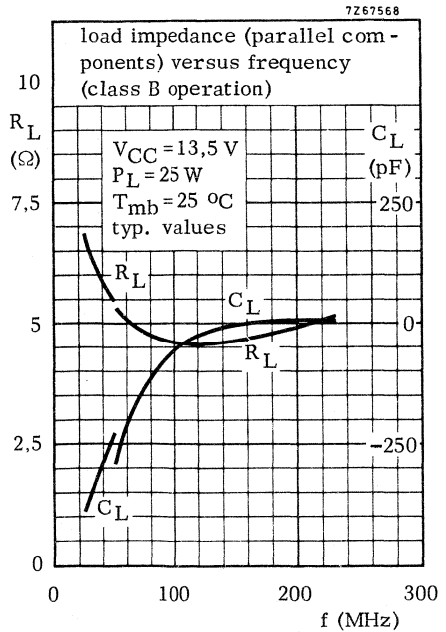
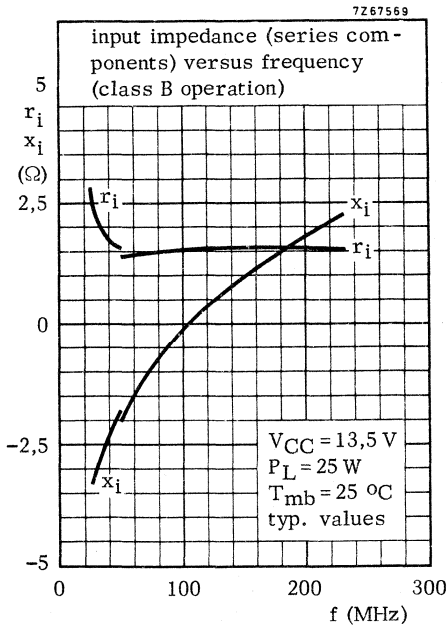
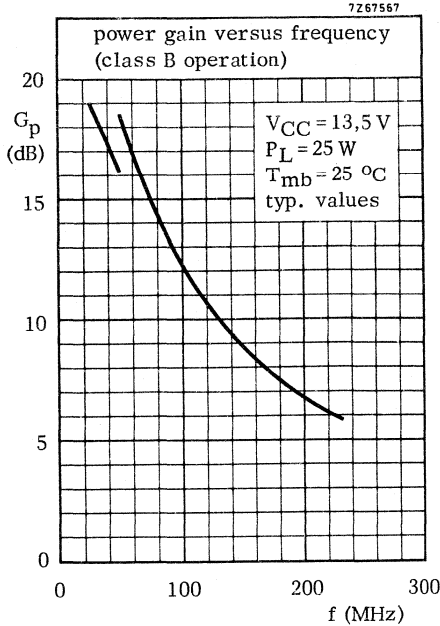
7260096



7260095



OPERATING NOTE Below 50 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d. c. and r. f.



V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

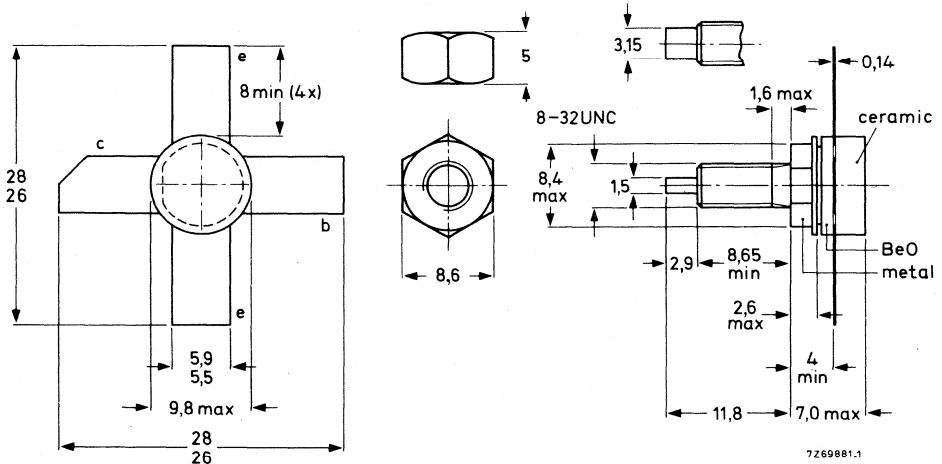
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	13,5	175	25	> 6	> 70	$1,6 + j1,4$	$210 + j5,5$

MECHANICAL DATA

Dimensions in mm

SOT-120



Torque on nut: min 0,75 Nm
(7,5 kg cm)
max 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink:
max 4,2 mm.

Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not
chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max 36 V

Collector-emitter voltage (open base)

V_{CEO} max 18 V

Emitter-base voltage (open collector)

V_{EBO} max 4 V

Currents

Collector current (average)

$I_C(AV)$ max 6 A

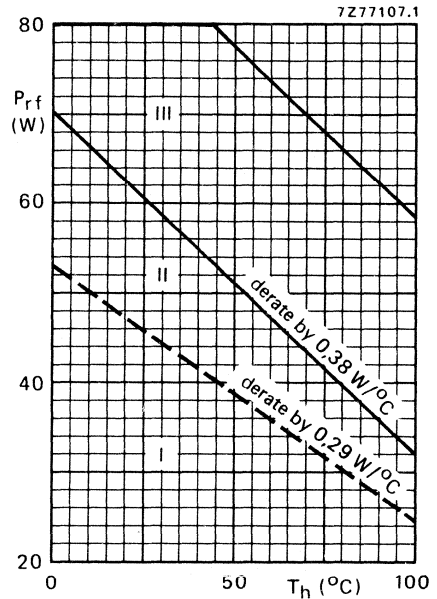
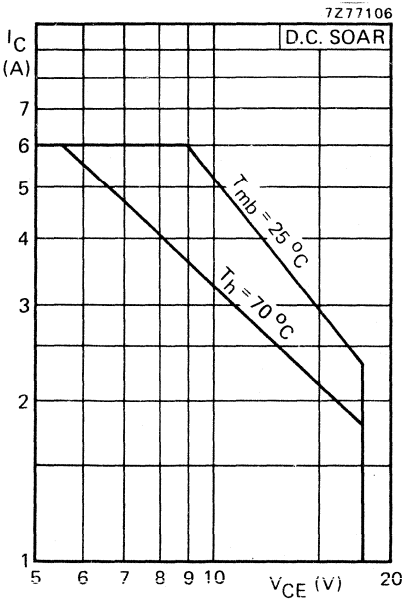
Collector current (peak value); $f > 1$ MHz

I_{CM} max 12 A

Power dissipation

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max 73 W



R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

→ **THERMAL RESISTANCE** (dissipation 20 W; $T_{mb} = 79$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb(dc)}$ = 3,1 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb(rf)}$ = 2,3 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,45 °C/W

CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ **Breakdown voltage**

Collector-emitter voltage

 $V_{BE} = 0; I_C = 25\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

Collector-emitter voltage

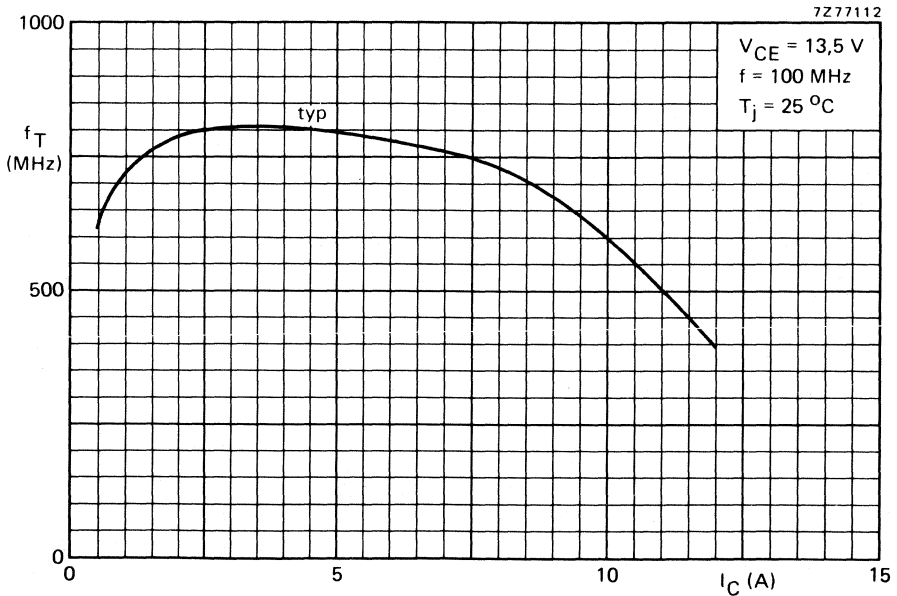
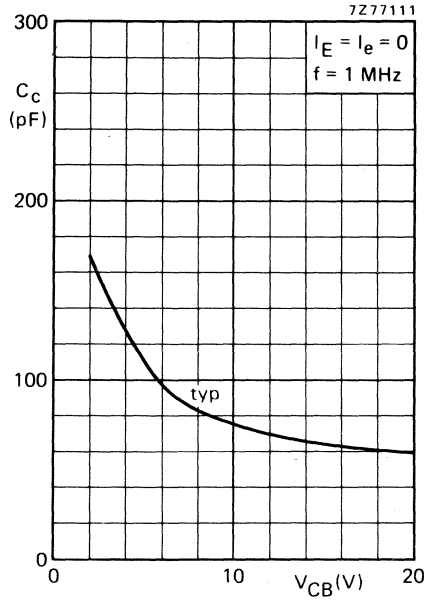
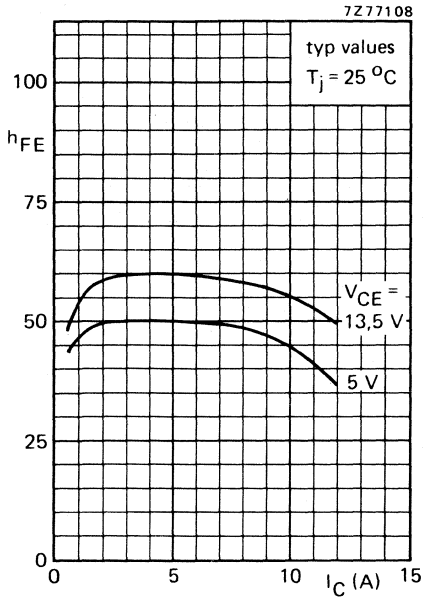
open base; $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base voltage

open collector; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$ **Collector cut-off current** $V_{BE} = 0; V_{CE} = 18\text{ V}$ $I_{CES} < 10\text{ mA}$ **Transient energy** $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $-V_{BE} = 1,5\text{ V}; R_{BE} = 33\text{ }\Omega$ $E > 8\text{ mWs}$ $E > 8\text{ mWs}$ **D.C. current gain*** $I_C = 2,5\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ 50
10 to 80**Collector-emitter saturation voltage*** $I_C = 7,5\text{ A}; I_B = 1,5\text{ A}$ V_{CEsat} typ 1,7 V**Transition frequency at $f = 100\text{ MHz}$ *** $I_C = 2,5\text{ A}; V_{CE} = 13,5\text{ V}$ $I_C = 7,5\text{ A}; V_{CE} = 13,5\text{ V}$ f_T typ 800 MHz f_T typ 750 MHz**Collector capacitance at $f = 1\text{ MHz}$** $I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_C typ 65 pF
< 90 pF**Feedback capacitance at $f = 1\text{ MHz}$** $I_C = 100\text{ mA}; V_{CE} = 15\text{ V}$ C_{re} typ 41 pF**Collector-stud capacitance** C_{cs} typ 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



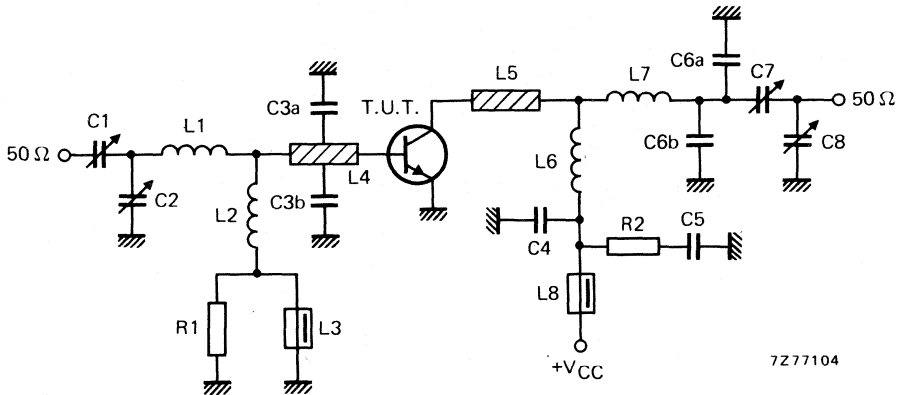
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25^\circ\text{C}$

f (MHz)	V_{CC} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	13,5	25	< 6,25	> 6	< 2,64	> 70	$1,6 + j1,4$	$210 + j5,5$
175	12,5	25	—	typ 6,6	—	typ 75	—	—

Test circuit for 175 MHz



7277104

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6a = C6b = 8,2 pF ceramic capacitor (500 V)

C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 1 turn enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = L8 = Ferroxcube choke coil (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 6,0 mm; leads 2 x 5 mm

L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

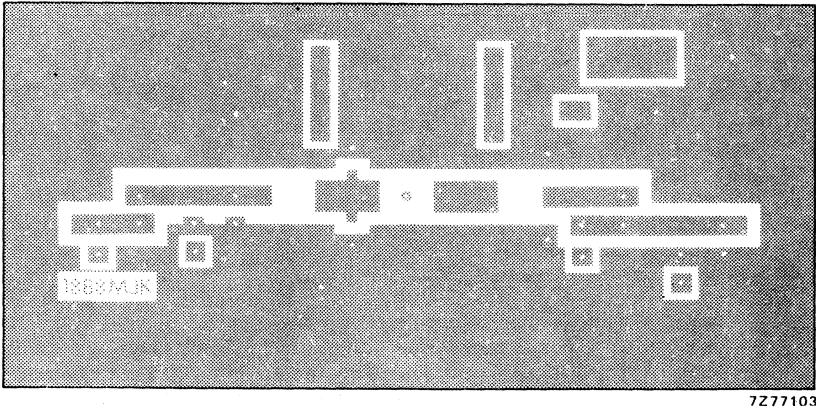
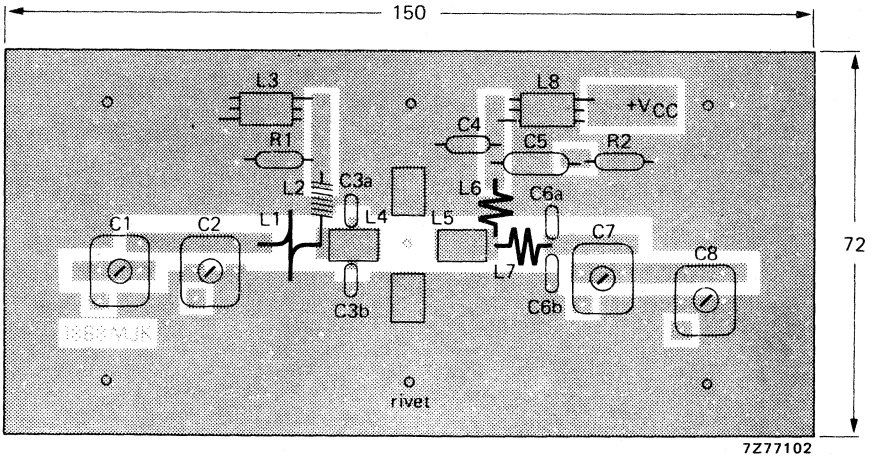
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω ($\pm 10\%$) carbon resistorR2 = 4,7 Ω ($\pm 5\%$) carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit on page 6.

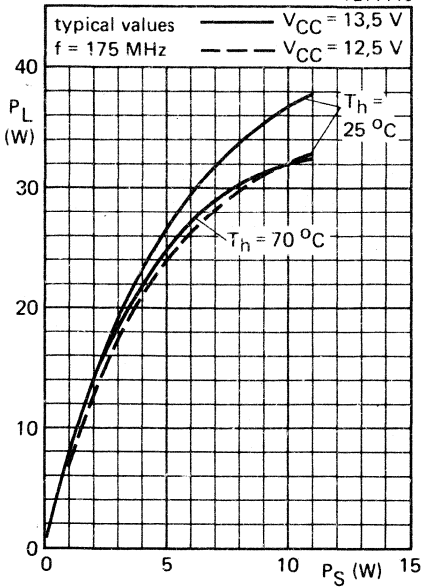
APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 175 MHz test circuit.

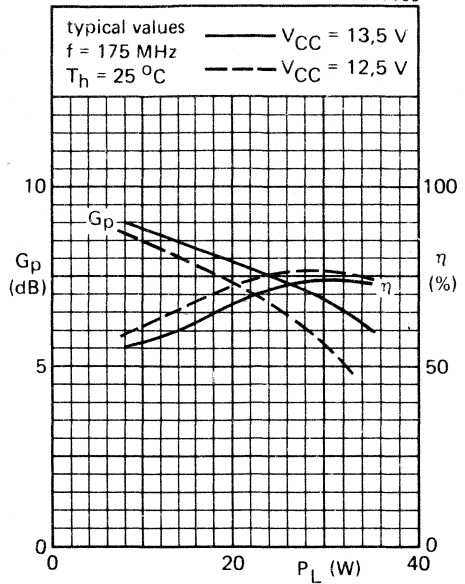


The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

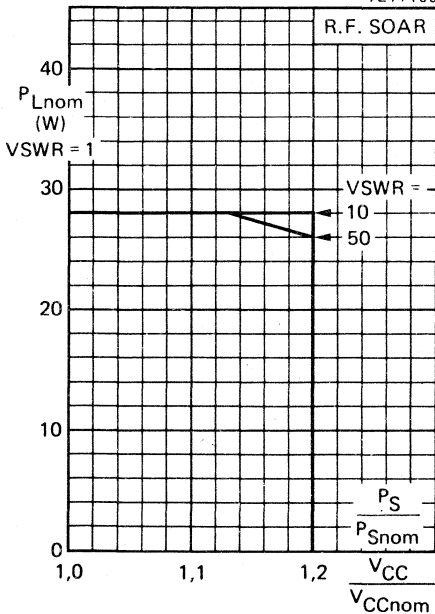
7Z77110



7Z77109



7Z77105



Conditions for R.F. SOAR

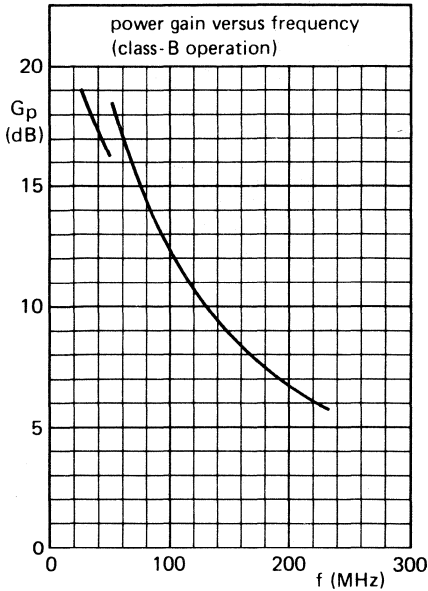
$f = 175 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,45 \text{ }^\circ\text{C/W}$
 $V_{CCnom} = 13,5 \text{ V}$
 $P_S = P_{Snom}$ at $V_{CCnom} = 13,5 \text{ V}$ and $V_{SWR} = 1$
 see page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions ($V_{SWR} = 1$), as a function of the expected supply over-voltage ratio with V_{SWR} as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

7Z67567



Measuring conditions for the graphs on this page

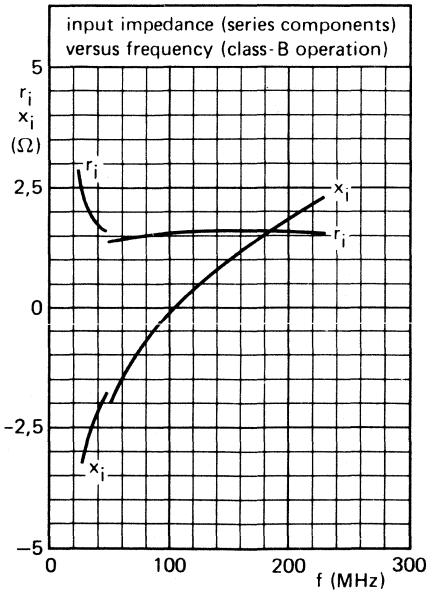
$V_{CC} = 13,5 \text{ V}$

$P_L = 25 \text{ W}$

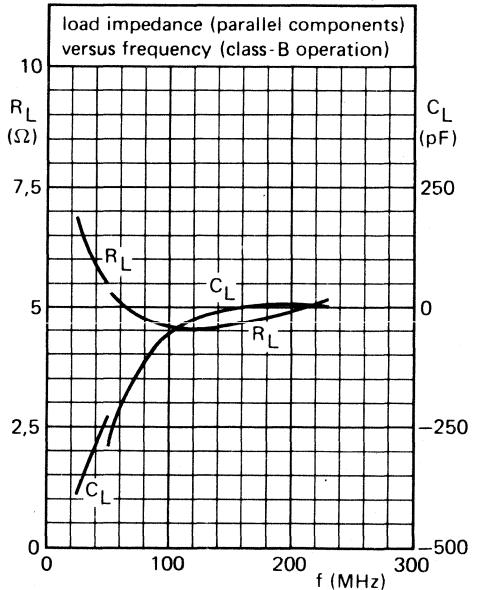
$T_h = 25 \text{ }^\circ\text{C}$

typical values

7Z67569



7Z67568



V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 12,5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply over-voltage to 15 V. It has a plastic encapsulated stripline package. All leads are isolated from the stud.

QUICK REFERENCE DATA

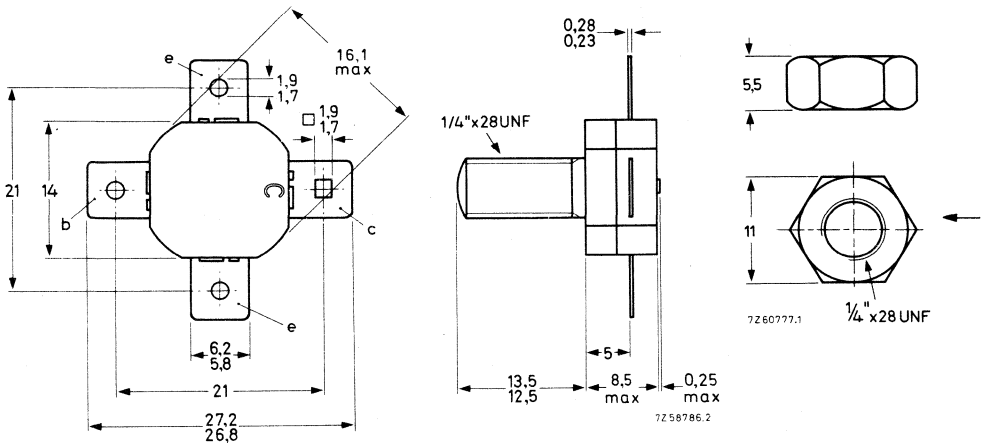
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	12,5	175	< 15,8	50	< 5,33	> 5,0	> 75	$1,3 + j1,6$	$270 + j170$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-55.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

Diameter of clearance hole in heatsink: max. 6,5 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

BLY90

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

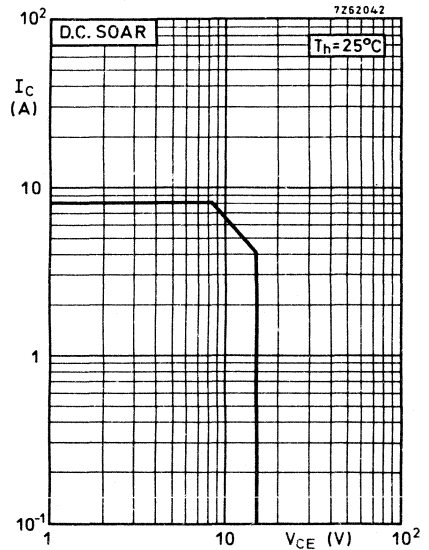
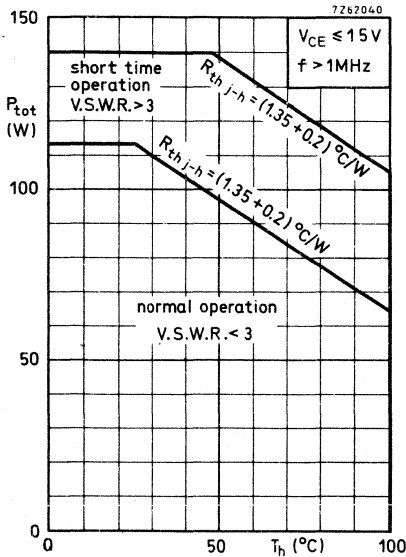
Currents

Collector current (average)	$I_C(AV)$	max.	8	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	20	A

Power dissipation

Total power dissipation up to $T_{mb} = 25^\circ C$
 $f > 1$ MHz

P_{tot}	max.	130	W
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Temperature

Storage temperature	T_{stg}	-65 to +200	$^\circ C$
Operating junction temperature	T_j	max. 200	$^\circ C$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	1.35	$^\circ C/W$
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.2	$^\circ C/W$

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 100\text{ mA}$	$V_{(BR)CBO} >$	36	V
Collector-emitter voltage open base, $I_C = 100\text{ mA}$	$V_{(BR)CEO} >$	18	V
Emitter-base voltage open collector, $I_E = 25\text{ mA}$	$V_{(BR)EBO} >$	4	V

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$

open base	E	>	8	mWs
$-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$	E	>	8	mWs

D. C. current gain

$I_C = 1\text{ A}; V_{CE} = 5\text{ V}$	$h_{FE} >$	10
	typ.	50

Transition frequency

$I_C = 6\text{ A}; V_{CE} = 10\text{ V}$	f_T typ.	550	MHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15\text{ V}$	C_c typ.	130	pF
	<	160	pF

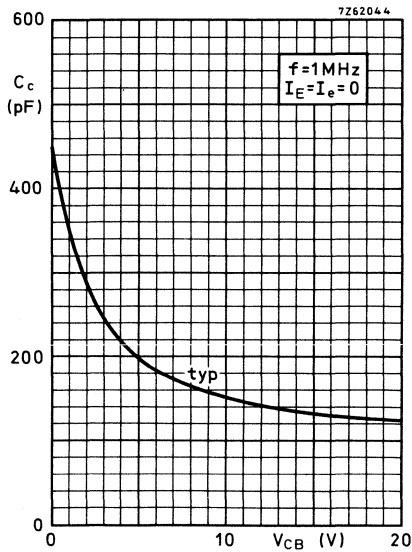
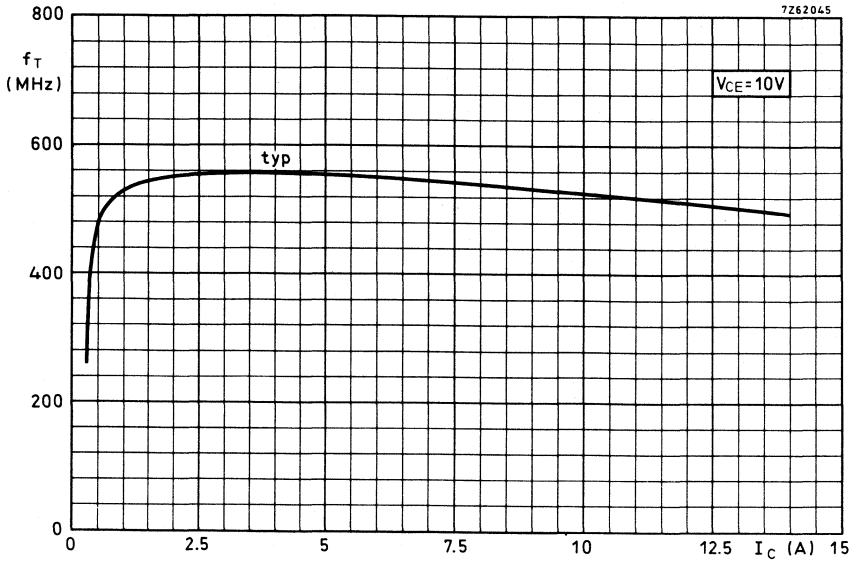
Feedback capacitance

$I_C = 200\text{ mA}; V_{CE} = 15\text{ V}$	C_{re} typ.	82	pF
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Collector-stud capacitance

	C_{cs} typ.	3.5	pF
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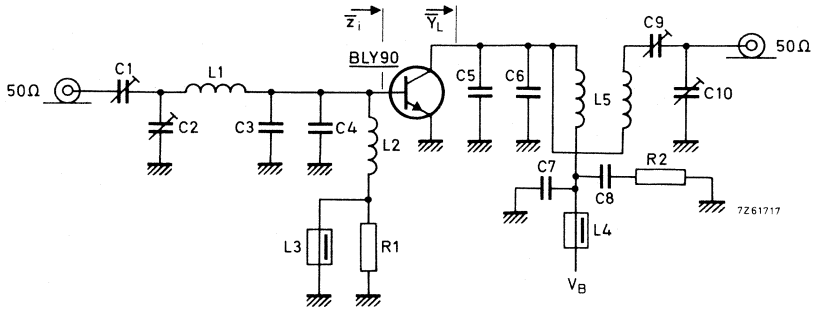
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralized common-emitter class-B circuit)

$f = 175 \text{ MHz}$; T_h up to $25 \text{ }^\circ\text{C}$

V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
12,5	< 15,8	50	< 5,33	> 5,0	> 75	$1,3 + j 1,6$	$270 + j 170$

Test circuit for 175 MHz:

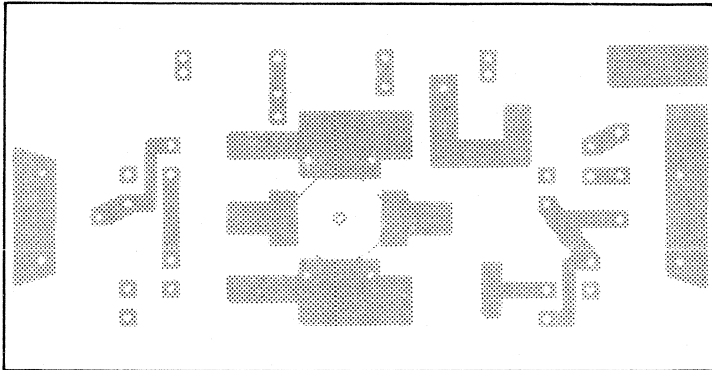
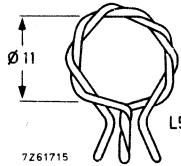
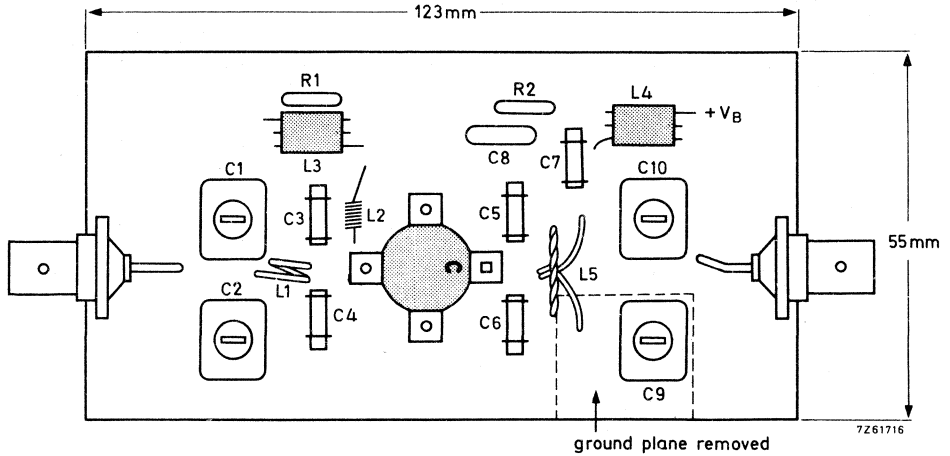


- C1 = 2 to 20 pF film dielectric trimmer
- C2 = 4 to 40 pF film dielectric trimmer
- C3 = C4 = 27 pF ceramic capacitor
- C5 = C6 = 56 pF ceramic capacitor
- C7 = 100 pF ceramic capacitor
- C8 = 100 nF polyester capacitor
- C9 = 4 to 80 pF film dielectric trimmer
- C10 = 4 to 60 pF film dielectric trimmer
- L1 = 1,5 turns enamelled Cu wire (1,5 mm); int. dia. 6 mm; length 4 mm; leads 2 x 5 mm
- L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
- L3 = L4 = Ferroxcube choke (code number 4312 020 36640)
- L5 = bifilar wound enamelled Cu wire (1,0 mm); see figure on page 6
- R1 = 10 Ω carbon resistor
- R2 = 4,7 Ω carbon resistor

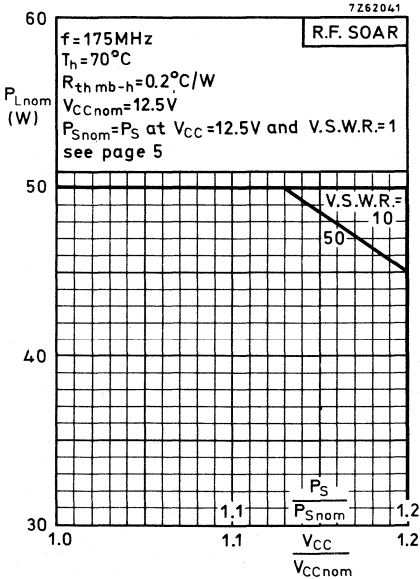
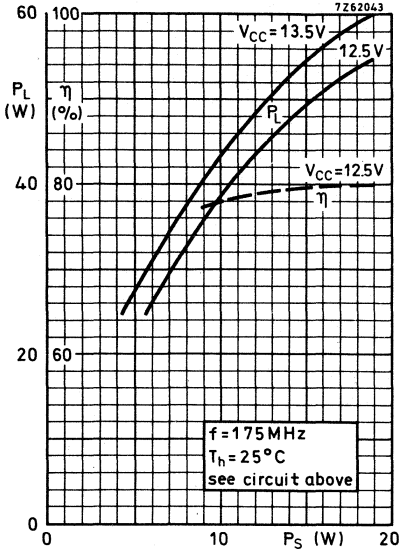
Component layout and printed-circuit board for 175 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

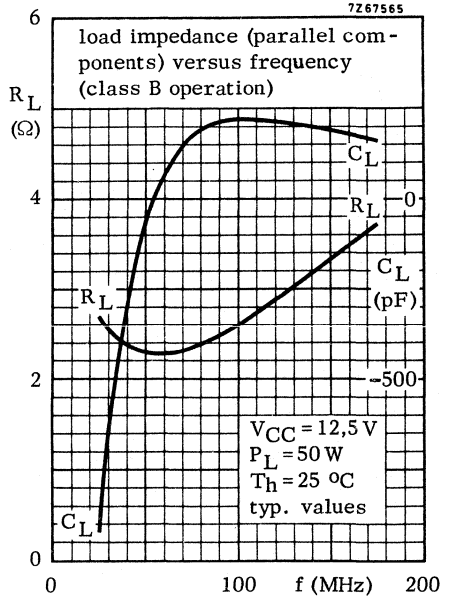
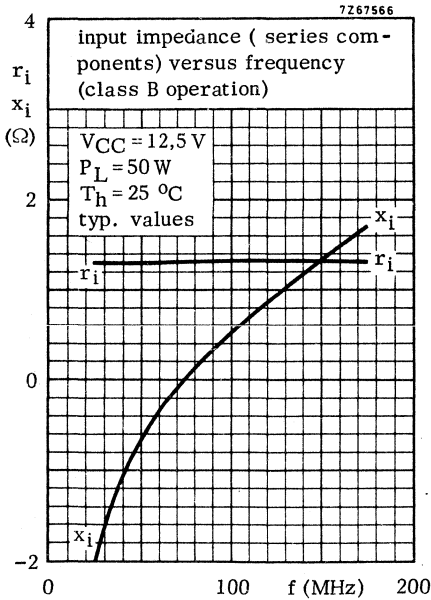
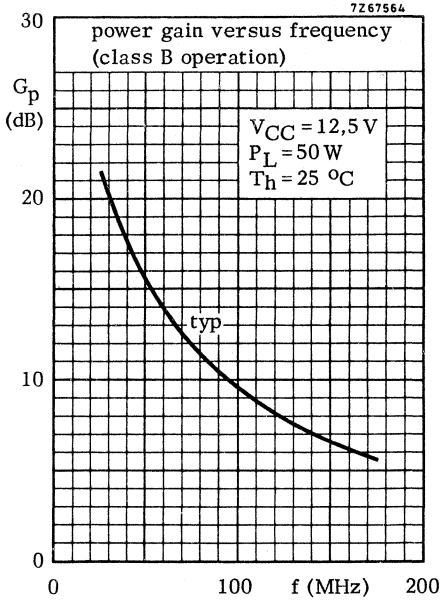
Component lay-out and printed circuit board for 175 MHz test circuit.



The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power (P_{Lnom}) must be derated in accordance with the adjacent graph for safe operation at supply voltage other than the nominal. The graph shows the allowable output power under nominal conditions, as a function of the supply overvoltage ratio with V.S.W.R. as parameter. The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio (V_{CC}/V_{CCnom}).



V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class A, B and C operated mobile, industrial and military transmitters with a supply voltage of 28 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions. It has a $\frac{1}{4}$ " capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

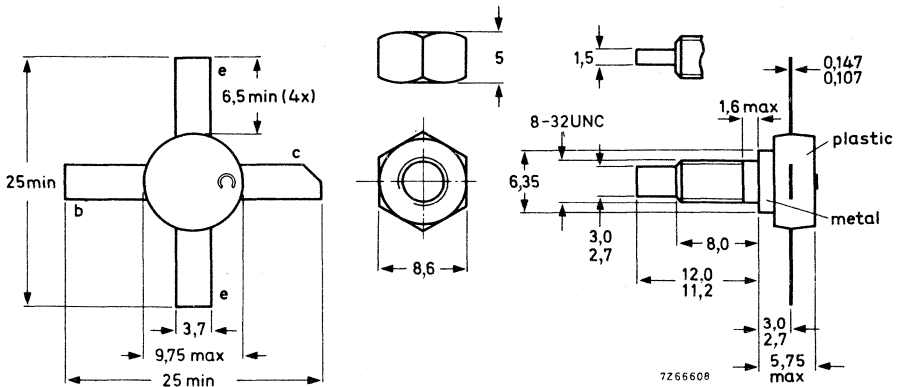
R. F. performance up to $T_{mb} = 25^{\circ}\text{C}$ in an unneutralised common-emitter class B circuit

Mode of operation	V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	28	175	< 0.50	8	< 0.44	> 12	> 65	$1.8 + j0.7$	$18 - j20$

MECHANICAL DATA

Dimensions in mm

SOT-48



Torque on nut: min. 7.5 kg cm
(0.75 Newton metres)
max. 8.5 kg cm
(0.85 Newton metres)

Diameter of clearance hole in heatsink: max. 4.17 mm

Mounting hole to have no burrs at either end
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required, an adhesive instead of a lock washer is preferred.

BLY91A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter) peak value	V_{CBOM} max.	65	V
Collector-emitter voltage (open base)	V_{CEO} max.	36	V
Emitter-base voltage (open collector)	V_{EBO} max.	4	V

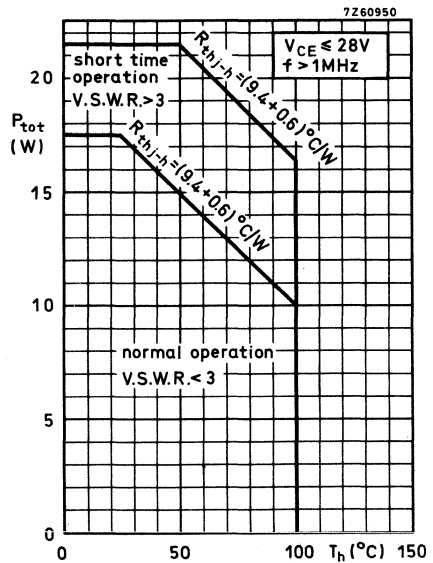
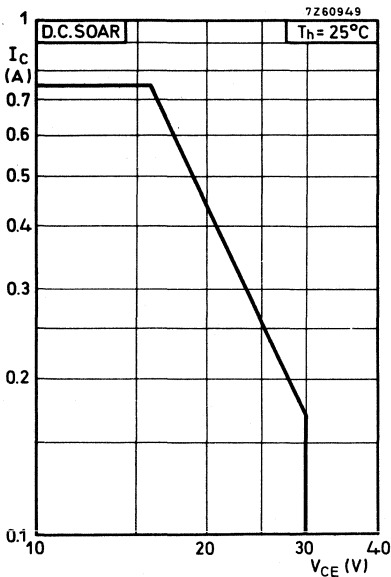
Currents

Collector current (average)	$I_{C(AV)}$ max.	0.75	A
Collector current (peak value) $f > 1$ MHz	I_{CM} max.	2.25	A

Power dissipation

Total power dissipation up to $T_h = 25^\circ\text{C}$
 $f > 1$ MHz

P_{tot} max. 17.5 W



Temperatures

Storage temperature	T_{stg}	-30 to +200	$^\circ\text{C}$
Operating junction temperature	T_j	max. 200	$^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	9.4	$^\circ\text{C/W}$
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6	$^\circ\text{C/W}$

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 28\text{ V}$ $I_{CEO} < 5\text{ mA}$

Breakdown voltages

Collector-base voltage
open emitter; $I_C = 1\text{ mA}$ $V_{(BR)CBO} > 65\text{ V}$

Collector-emitter voltage
open base, $I_C = 10\text{ mA}$ $V_{(BR)CEO} > 36\text{ V}$

Emitter-base voltage
open collector; $I_E = 1\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$
open base $E > 0.5\text{ mWs}$
 $-V_{BE} = 1.5\text{ V}; R_{BE} = 33\text{ }\Omega$ $E > 0.5\text{ mWs}$

D.C. current gain

$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$ $h_{FE} > 5$

Transition frequency

$I_C = 400\text{ mA}; V_{CE} = 20\text{ V}$ f_T typ. 500 MHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 30\text{ V}$ C_c typ. 10 pF
 $< 15\text{ pF}$

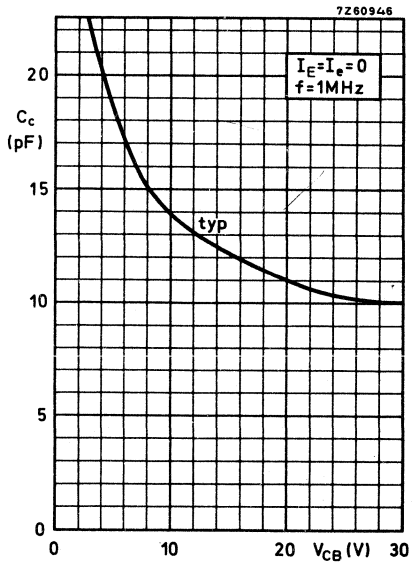
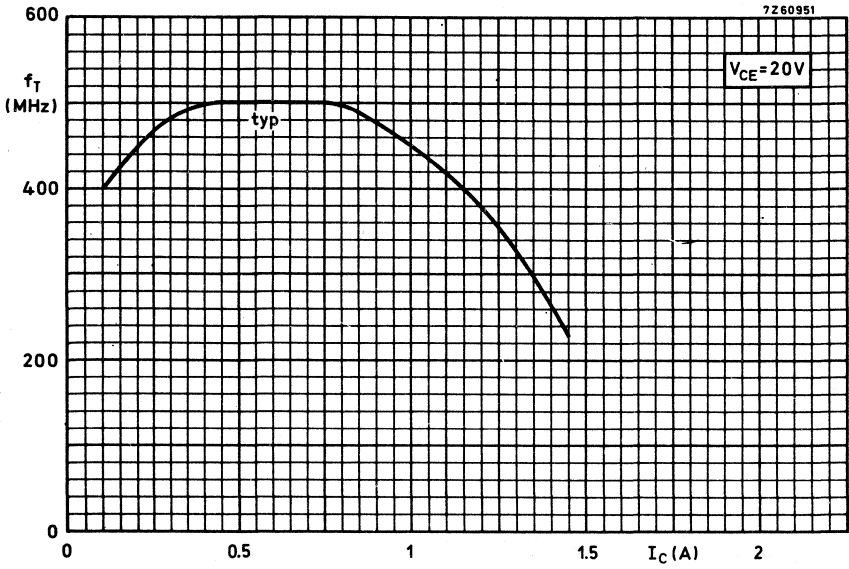
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 50\text{ mA}; V_{CE} = 30\text{ V}$ C_{re} typ. 7.5 pF

Collector-stud capacitance

C_{cs} typ. 2 pF





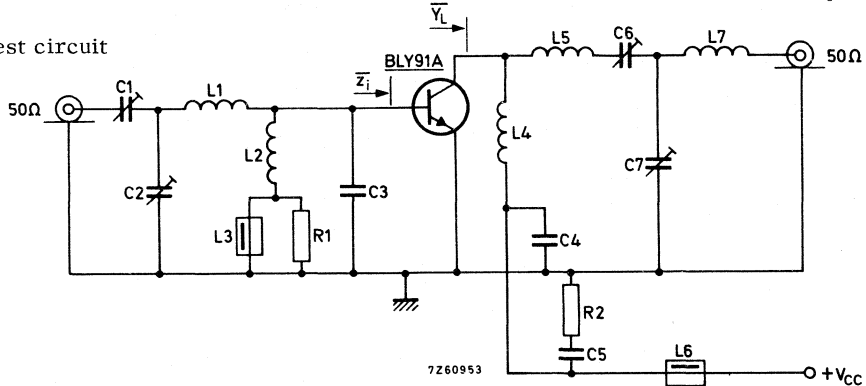
APPLICATION INFORMATION

R.F. performance in c. w. operation (unneutralised common-emitter class B circuit)

$$V_{CC} = 28 \text{ V}; T_{mb} \text{ up to } 25 \text{ }^\circ\text{C}$$

f(MHz)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	\bar{z}_i (Ω)	\bar{y}_L (mA/V)
175	< 0.50	8	< 0.44	> 12	> 65	1.8 + j0.7	18 - j20

Test circuit



- C1 = 2.5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
- C2 = C6 = C7 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
- C3 = 47 pF ceramic
- C4 = 100 pF ceramic
- C5 = 150 nF polyester

L1 = 0.5 turn enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

L2 = 6.5 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 5 mm

L3 = L6 = ferroxcube choke (code number 4312 020 36640)

L4 = 7.5 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 5 mm

L5 = 4.5 turns enamelled Cu wire (0.7 mm); int. diam. 6 mm; leads 2 x 7 mm

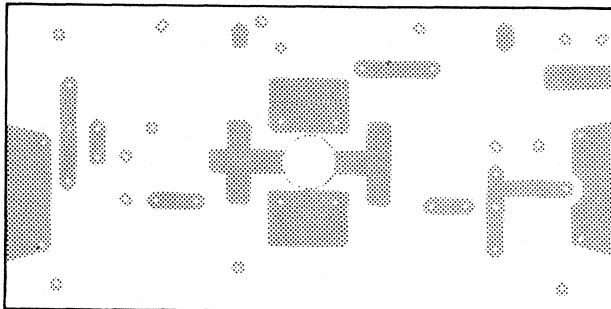
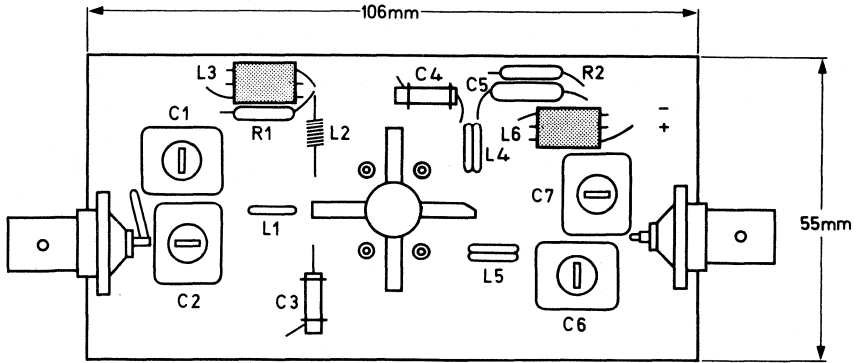
L7 = 3.5 turns enamelled Cu wire (0.7 mm); int. diam. 6 mm; leads 2 x 7 mm

R1 = R2 = 10 Ω carbon

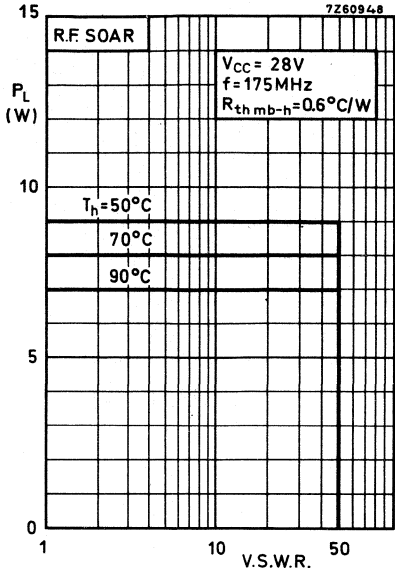
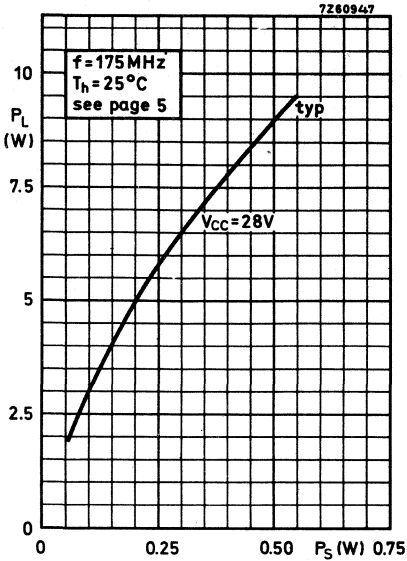
Component lay-out for 175 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.



The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

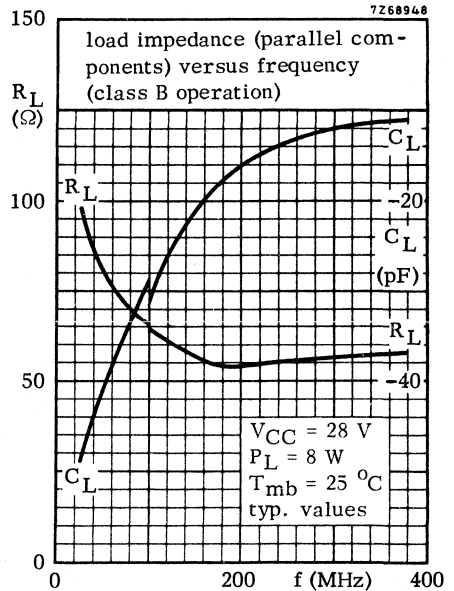
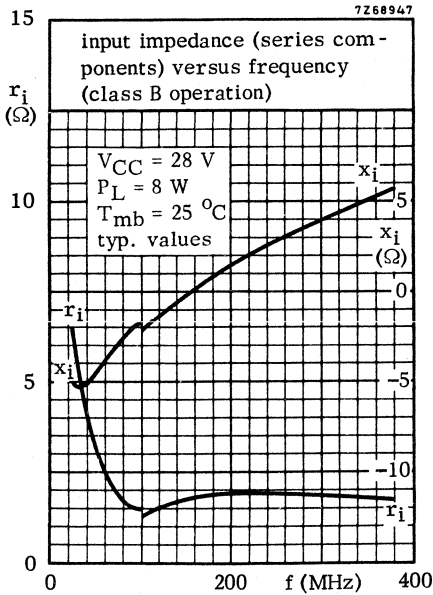
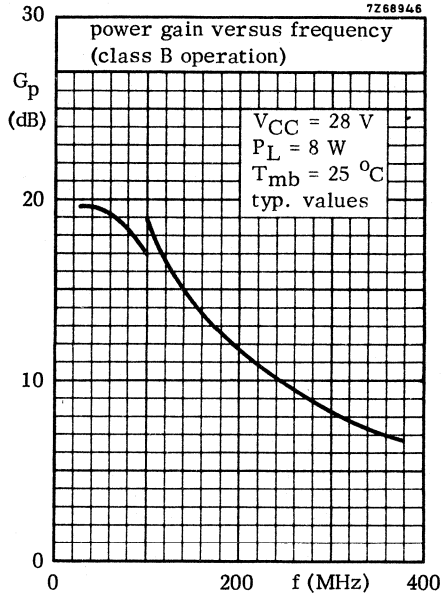


For high voltage operation, a stabilized power supply is generally used. The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.



BLY91A

OPERATING NOTE Below 100 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)

peak value

V_{CESM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 0,9 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 2,5 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 20 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

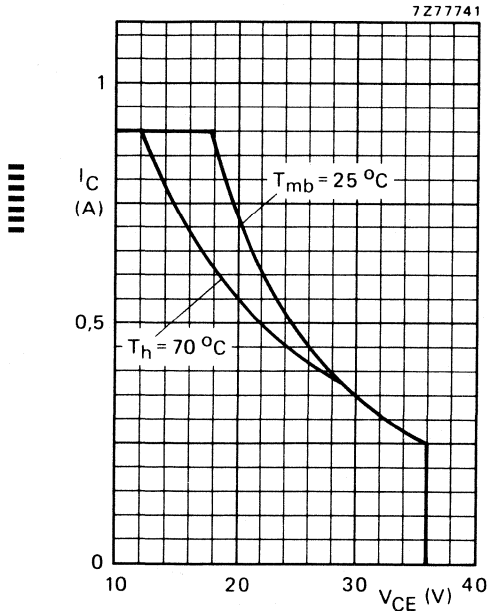


Fig. 2 D.C. SOAR.

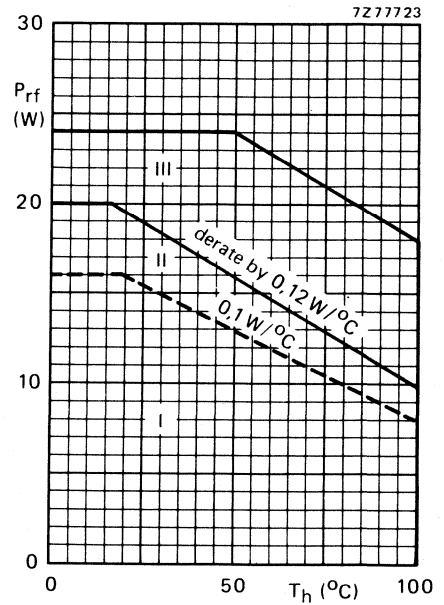


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 8 W; $T_{mb} = 73,6$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j-mb(dc)}$	=	10,7 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	8,6 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,45 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 2\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 10\text{ mA}$ $V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 1\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 36\text{ V}$ $I_{CES} < 1\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\ \Omega$ $E_{SBO} > 0,5\text{ mJ}$ $E_{SBR} > 0,5\text{ mJ}$

D.C. current gain*

 $I_C = 0,4\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 50
10 to 100

Collector-emitter saturation voltage*

 $I_C = 1,25\text{ A}; I_B = 0,25\text{ A}$ V_{CEsat} typ. 0,8 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 0,4\text{ A}; V_{CB} = 28\text{ V}$ $-I_E = 1,25\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 600 MHz
typ. 525 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ C_C typ. 10 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 28\text{ V}$ C_{re} typ. 7,1 pF

Collector-stud capacitance

 C_{cs} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

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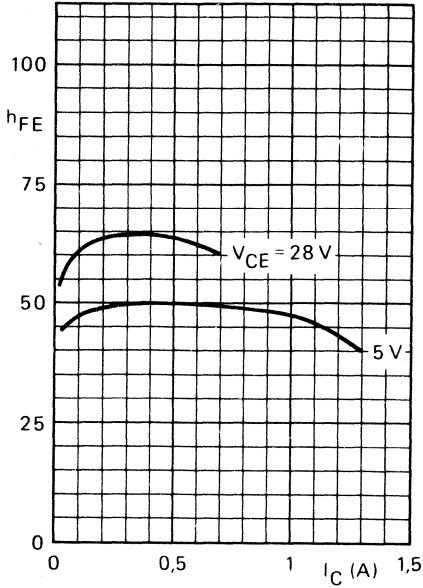


Fig. 4 Typical values; $T_j = 25^\circ C$.

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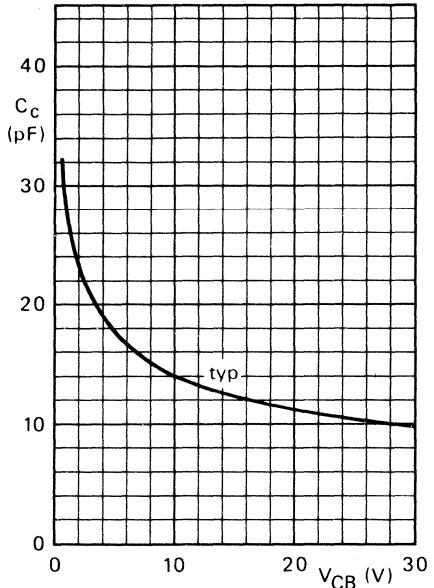


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

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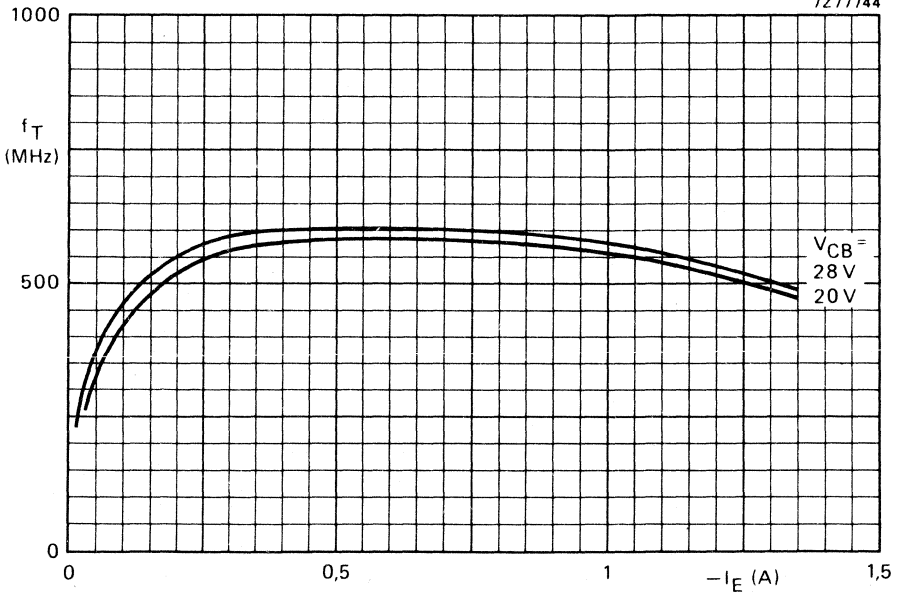


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ C$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	28	8	< 0,5	> 12	< 0,44	> 65	$1,8 + j0,7$	$18 - j20$

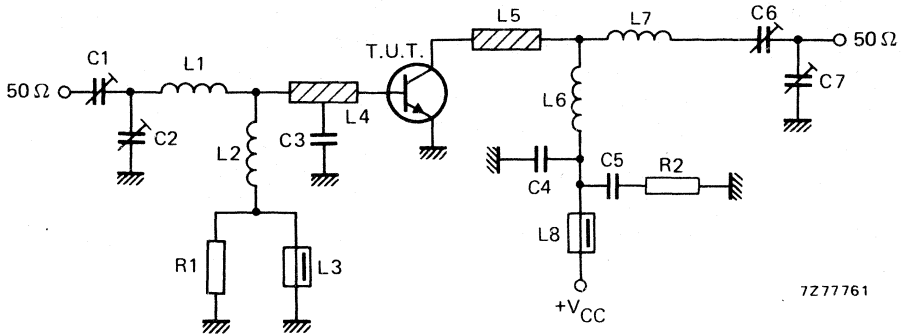


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C6 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = L8 = Ferroxcube choke coil (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor

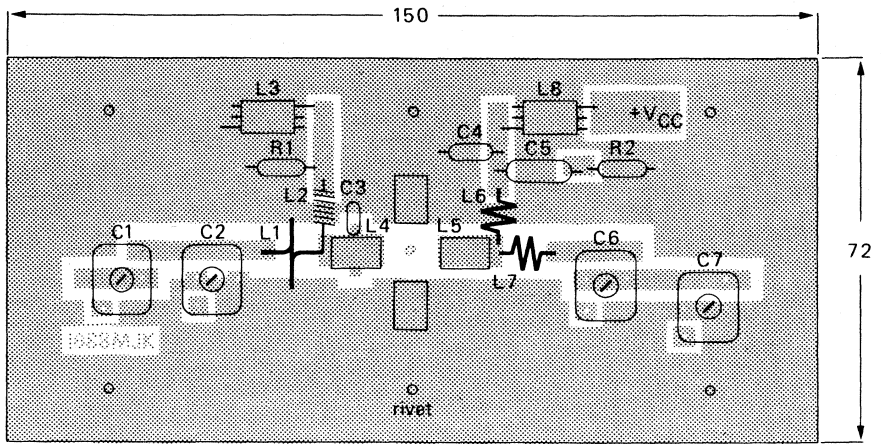
L6 = 6 turns enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; length 9,2 mm; leads 2 x 5 mm

L7 = 4 turns enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; length 5,0 mm; leads 2 x 5 mm

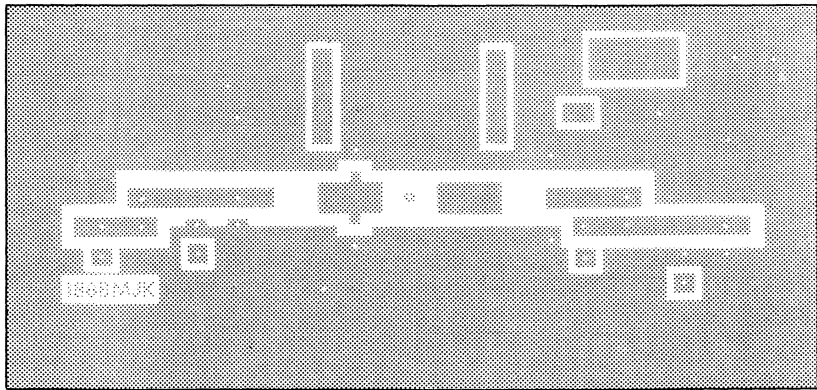
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistorR2 = 4,7 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



7Z78434



7Z78435

Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

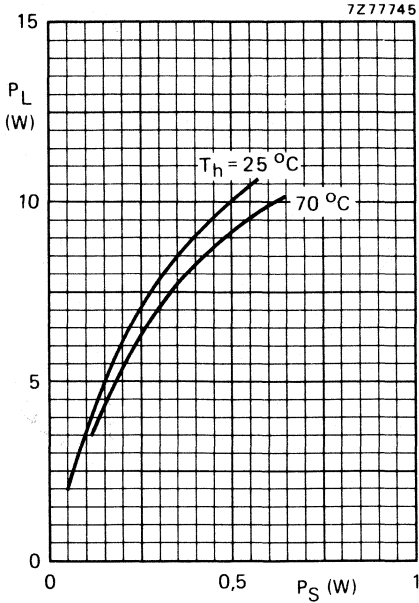


Fig. 9 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

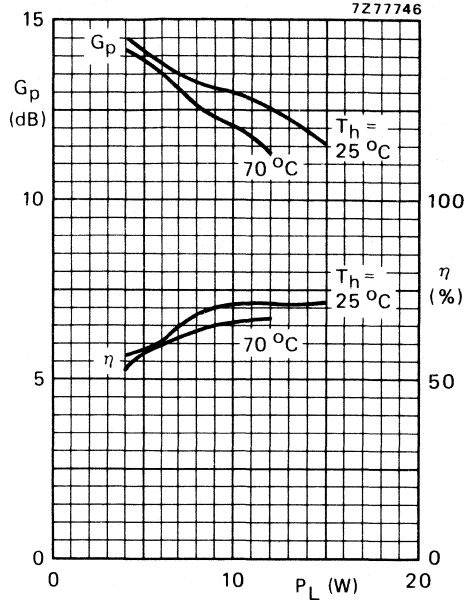


Fig. 10 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

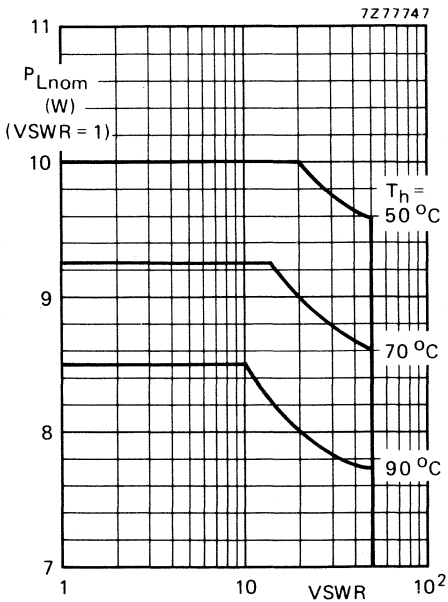


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175\text{ MHz}$; $V_{CE} = 28\text{ V}$; $R_{th\text{ mb-h}} = 0,45^\circ\text{C/W}$. The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

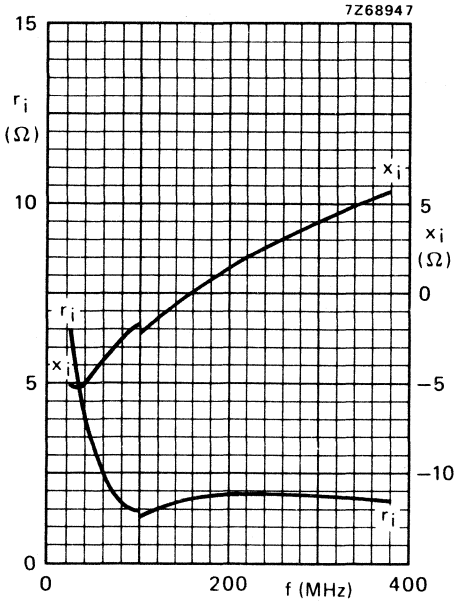


Fig. 12 Input impedance (series components).

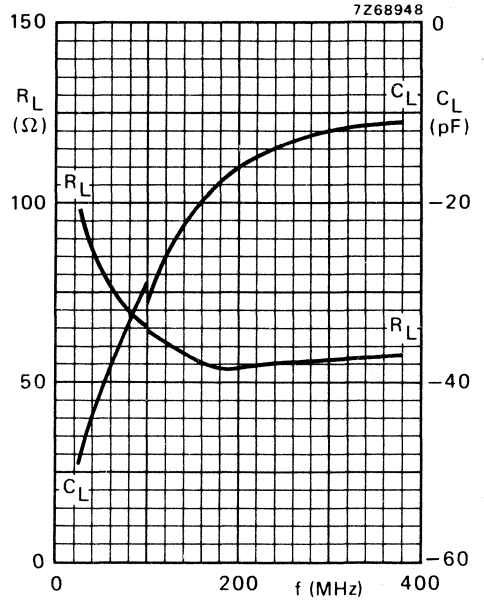


Fig. 13 Load impedance (parallel components).

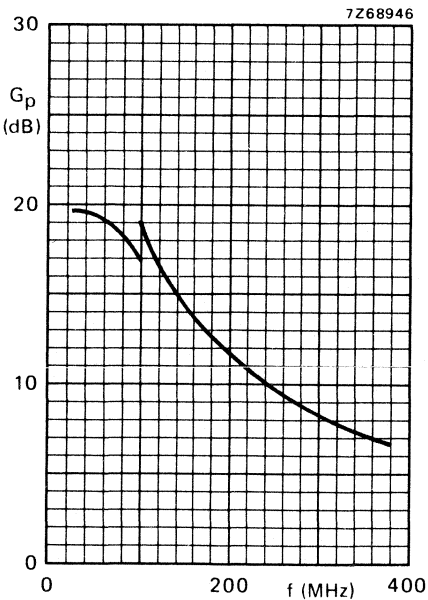


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; $V_{CE} = 28$ V; $P_L = 8$ W;

$T_h = 25$ °C.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class A, B and C operated mobile, industrial and military transmitters with a supply voltage of 28 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions. It has a $\frac{1}{4}$ " capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

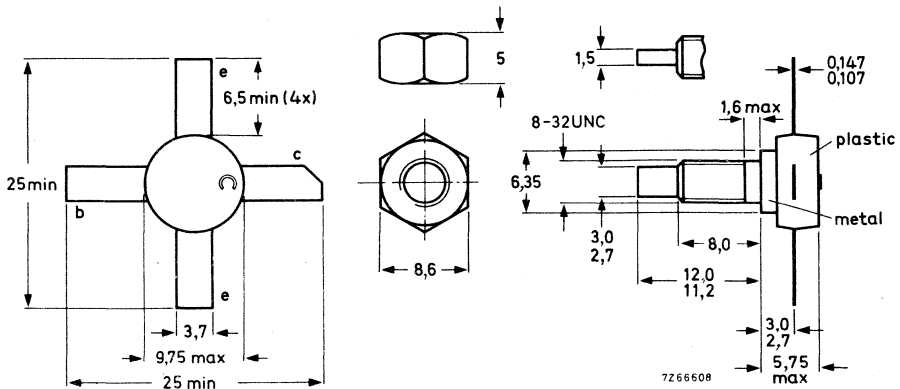
R.F. performance up to $T_{mb} = 25^\circ\text{C}$ in an unneutralised common-emitter class B circuit

Mode of operation	V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_D (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
c. w.	28	175	< 1.5	15	< 0.83	> 10	> 65	$1.4 + j1.85$	$33 - j27.5$

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required, an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0.75 Nm
(7.5 kg cm)
max. 0.85 Nm
(8.5 kg cm)

Diameter of clearance hole in heatsink: max. 4.17 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

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RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

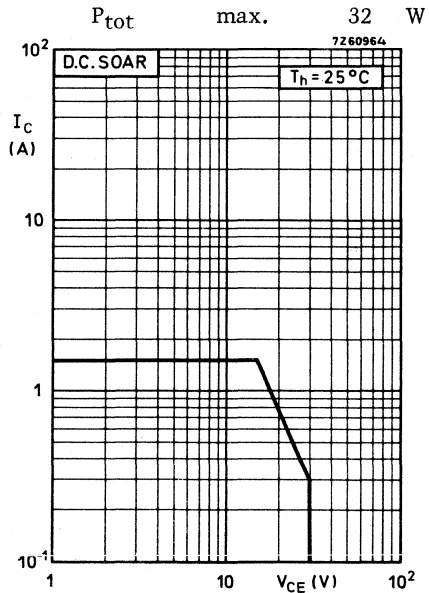
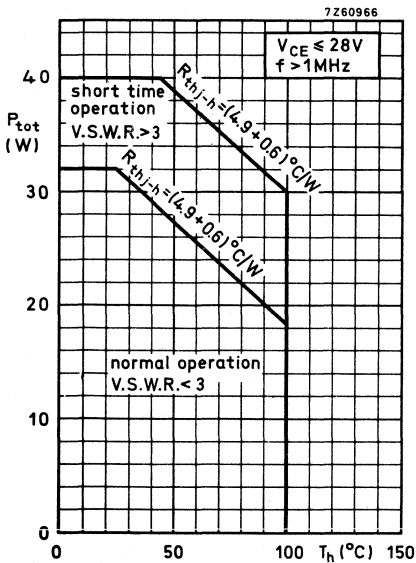
Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65 V
Collector-emitter voltage (open base)	V_{CEO}	max.	36 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V

Currents

Collector current (average)	$I_{C(AV)}$	max.	1.5 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	4.5 A

Power dissipation

Total power dissipation up to $T_h = 25^\circ\text{C}$
 $f > 1$ MHz



Temperatures

Storage temperature	T_{stg}	-30 to +200 °C
Operating junction temperature	T_j	max. 200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	4.9 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6 °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 28\text{ V}$ $I_{CEO} < 10\text{ mA}$

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 3\text{ mA}$ $V_{(BR)CBO} > 65\text{ V}$

Collector-emitter voltage
open base, $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 36\text{ V}$

Emitter-base voltage
open collector; $I_E = 3\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$

open base $E > 2.0\text{ mWs}$
 $-V_{BE} = 1.5\text{ V}; R_{BE} = 33\text{ }\Omega$ $E > 4.5\text{ mWs}$

D.C. current gain

$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$ $h_{FE} > 5$

Transition frequency

$I_C = 600\text{ mA}; V_{CE} = 20\text{ V}$ f_T typ. 500 MHz

Collector capacitance at $f = 1\text{ MHz}$

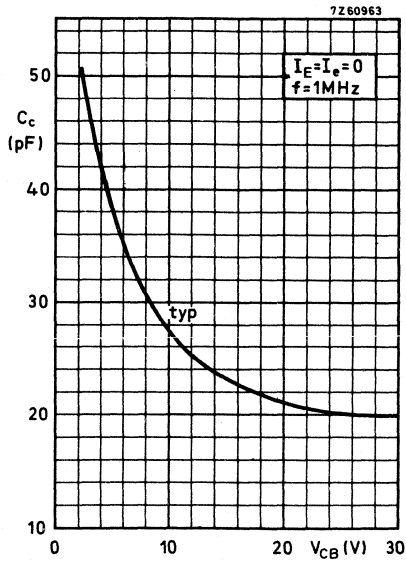
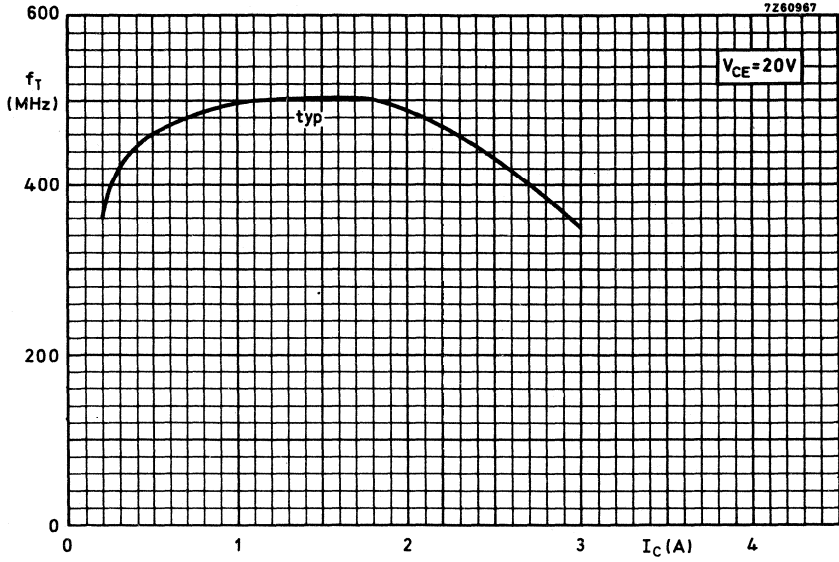
$I_E = I_e = 0; V_{CB} = 30\text{ V}$ C_c typ. 20 pF
< 30 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 30\text{ V}$ C_{re} typ. 15 pF

Collector-stud capacitance

C_{cs} typ. 2 pF



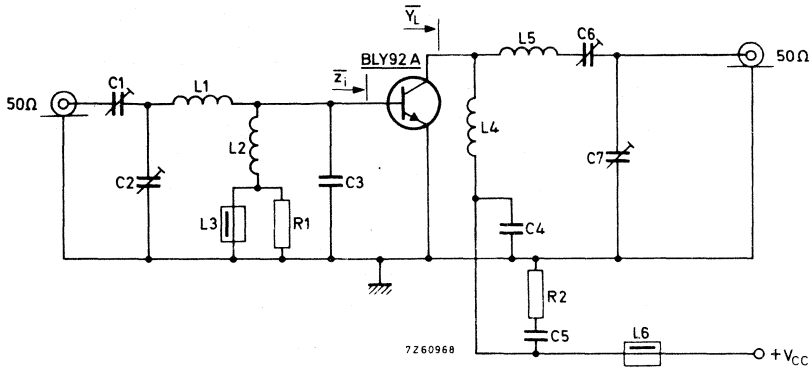
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $V_{CE} = 28 \text{ V}$; T_{mb} up to $25 \text{ }^\circ\text{C}$

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{y}_L (mA/V)
175	< 1,5	15	< 0,83	> 10	> 65	$1,4 + j1,85$	$33 - j27,5$

Test circuit: 175 MHz; c.w. class-B.



C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C6 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C3 = 47 pF ceramic capacitor

C4 = 100 pF ceramic capacitor

C5 = 150 nF polyester capacitor

L1 = 0,5 turn enamelled Cu wire (1,6 mm); int. dia. 6 mm; leads 2 x 10 mm

L2 = 6,5 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 4 mm; leads 2 x 5 mm

L3 = L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = 2,5 turns enamelled Cu wire (0,7 mm); int. dia. 6 mm; leads 2 x 7 mm

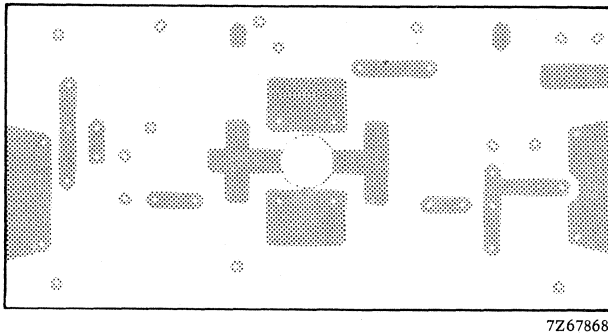
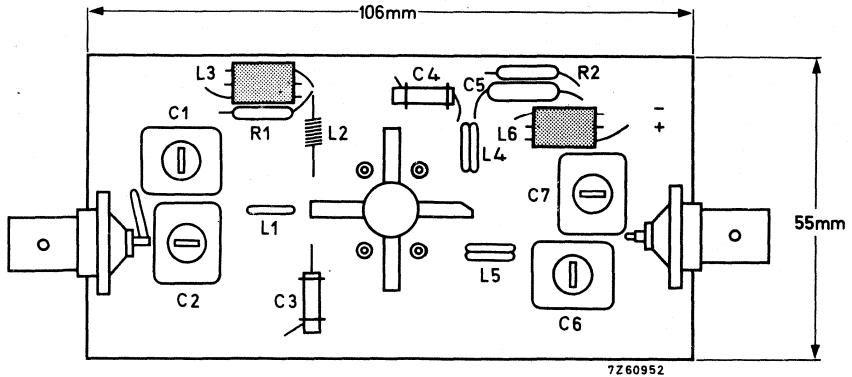
L6 = 4,5 turns enamelled Cu wire (0,7 mm); int. dia. 6 mm; leads 2 x 7 mm

R1 = R2 = 10 Ω carbon resistor

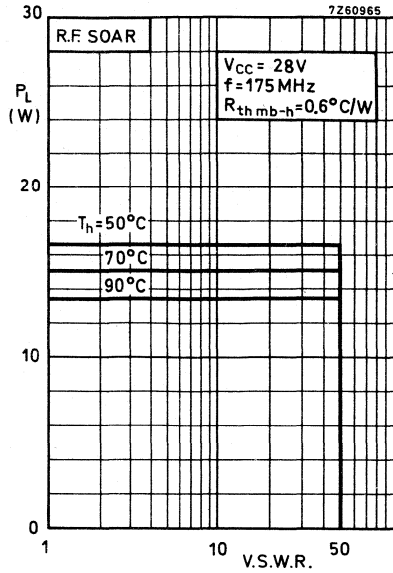
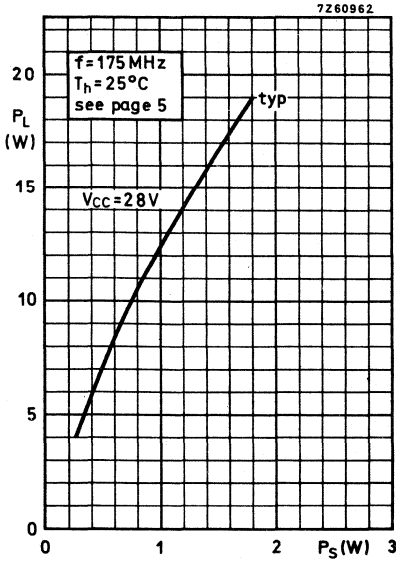
Component layout and printed-circuit board for 175 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

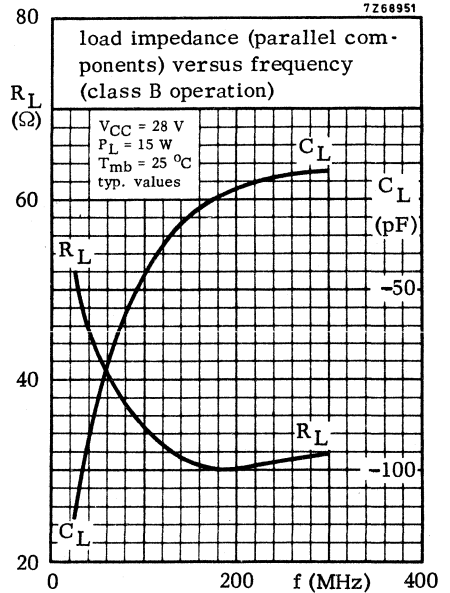
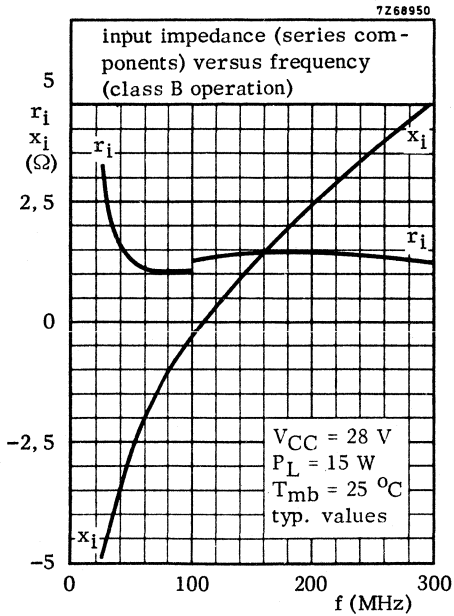
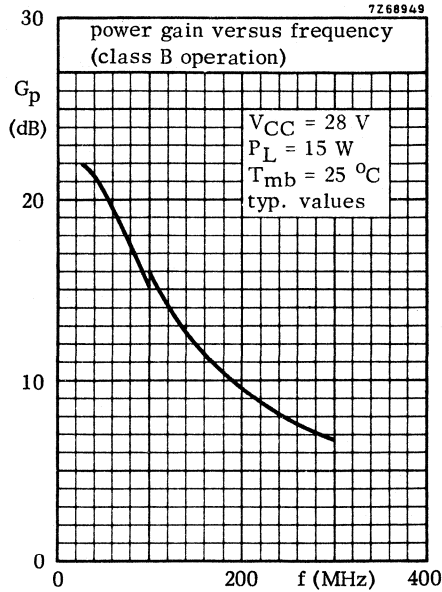


The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



For high voltage operation, a stabilized power supply is generally used. The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below .100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

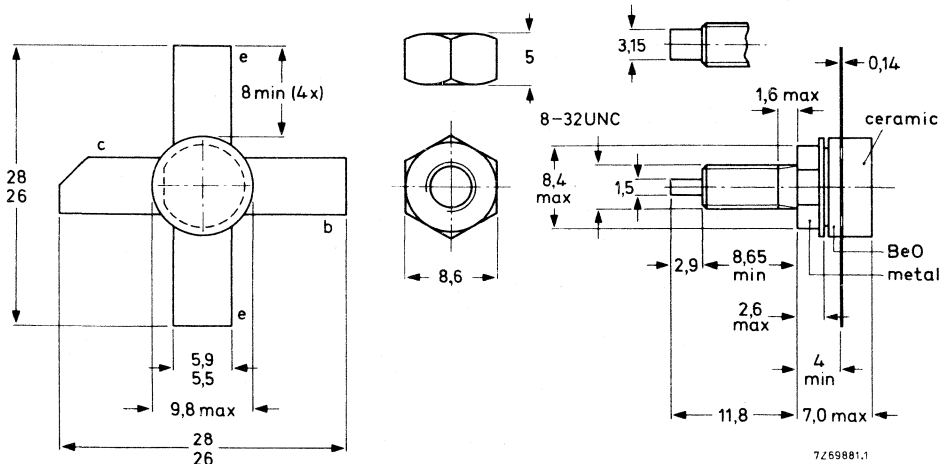
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	28	175	15	> 10	> 65	$1,4 + j1,85$	$33 - j27,5$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	65 V
Collector-emitter voltage (open base)	V_{CEO}	max.	36 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	1,75 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	5,0 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	36 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

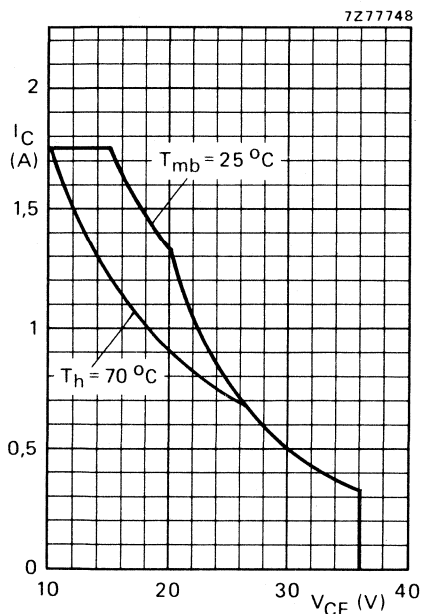


Fig. 2 D.C. SOAR.

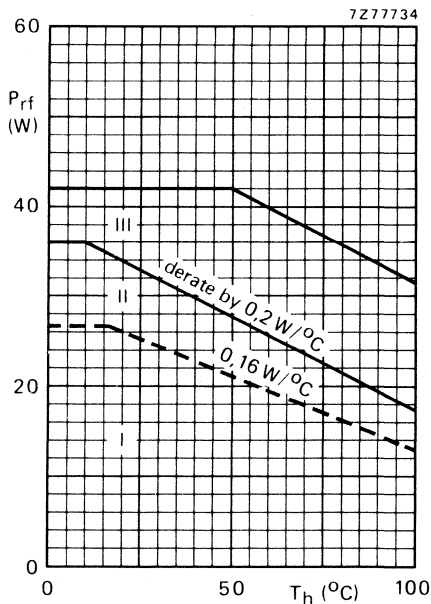


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 15 W; $T_{mb} = 77$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j-mb(dc)}$	=	6,55 °C/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	4,95 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,45 °C/W

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 5\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 2\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 36\text{ V}$ $I_{CES} < 2\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $ESBO > 2,5\text{ mJ}$ $ESBR > 2,5\text{ mJ}$

D.C. current gain*

 $I_C = 0,7\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 50
10 to 100

Collector-emitter saturation voltage*

 $I_C = 2\text{ A}; I_B = 0,4\text{ A}$ V_{CEsat} typ. 0,65 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 0,7\text{ A}; V_{CB} = 28\text{ V}$ $-I_E = 2\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 650 MHz f_T typ. 625 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ C_c typ. 18 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$ C_{re} typ. 12,8 pF

Collector-stud capacitance

 C_{cs} typ. 2 pF* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

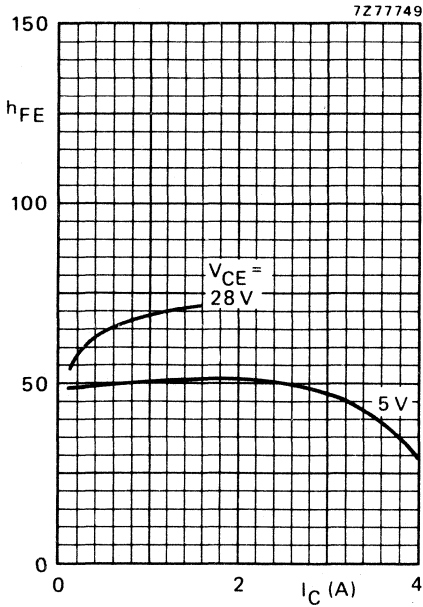


Fig. 4 Typical values; $T_j = 25^\circ C$.

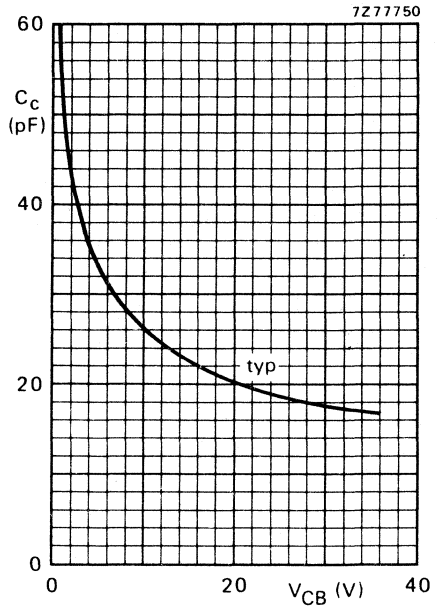


Fig. 5 $I_E = I_e = 0$; $f = 1 MHz$; $T_j = 25^\circ C$.

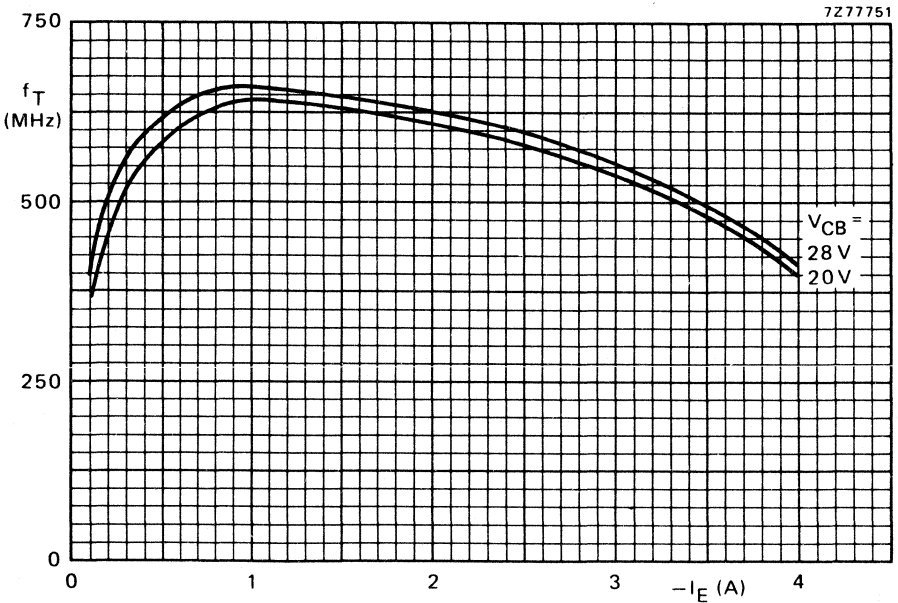


Fig. 6 Typical values; $f = 100 MHz$; $T_j = 25^\circ C$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
175	28	15	< 1,5	> 10	< 0,83	> 65	$1,4 + j1,85$	$33 - j27,5$

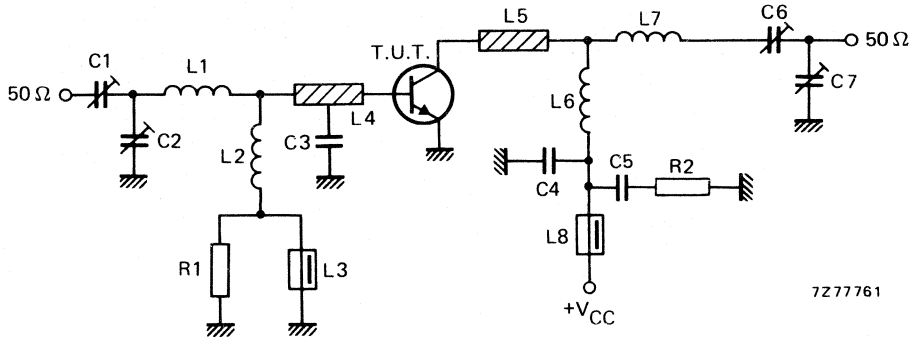


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C6 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

L3 = L8 = Ferroxcube choke coil (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor

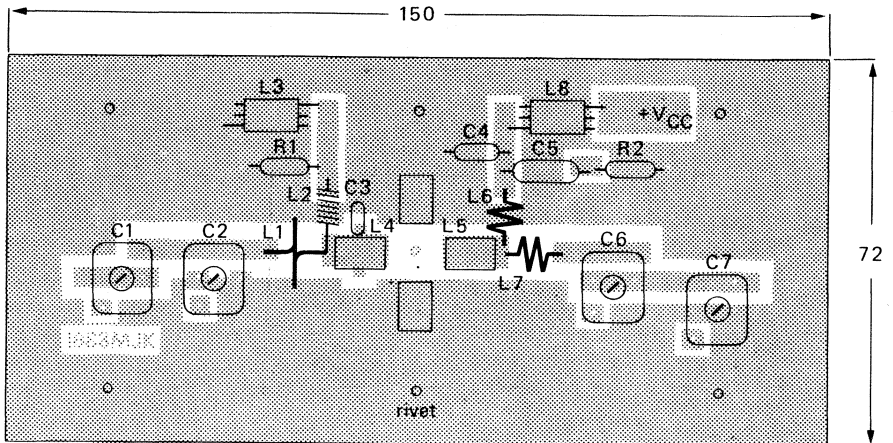
L6 = 6 turns enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; length 9,2 mm; leads 2 x 5 mm

L7 = 4 turns enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; length 5,0 mm; leads 2 x 5 mm

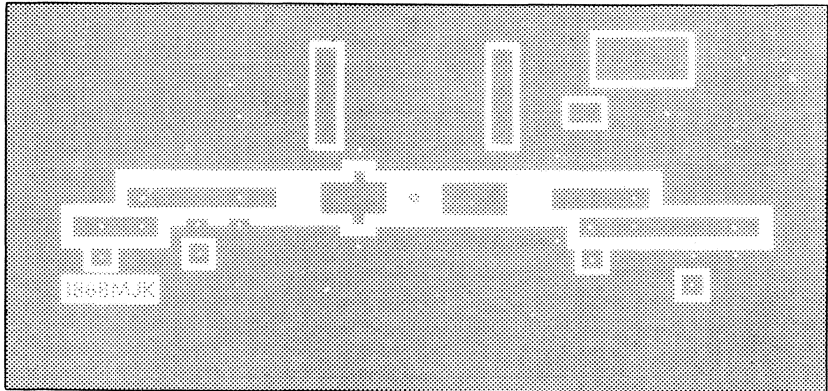
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistorR2 = 4,7 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



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7278435

Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

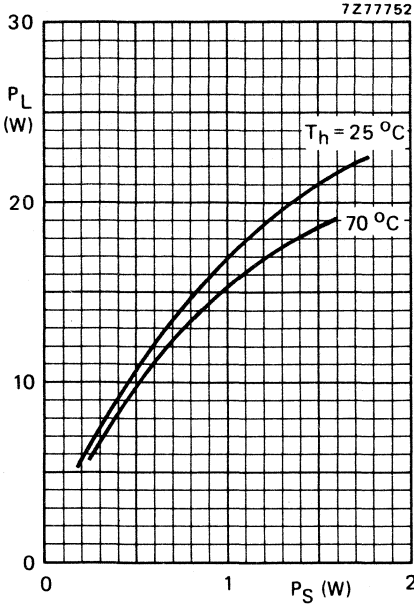


Fig. 9 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

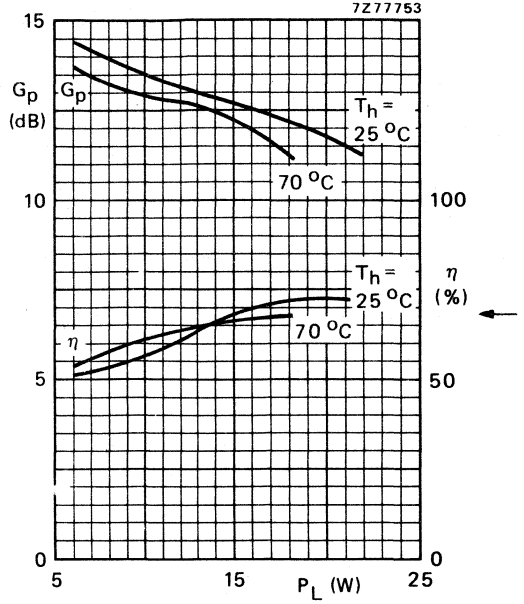


Fig. 10 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

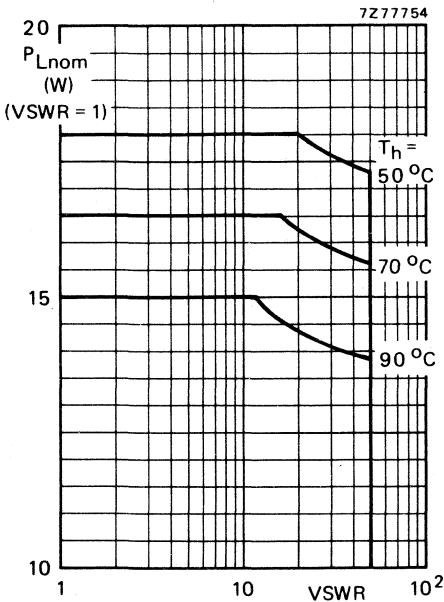


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175\text{ MHz}$; $V_{CE} = 28\text{ V}$; $R_{th\text{ mb-h}} = 0,45\text{ }^\circ\text{C/W}$. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

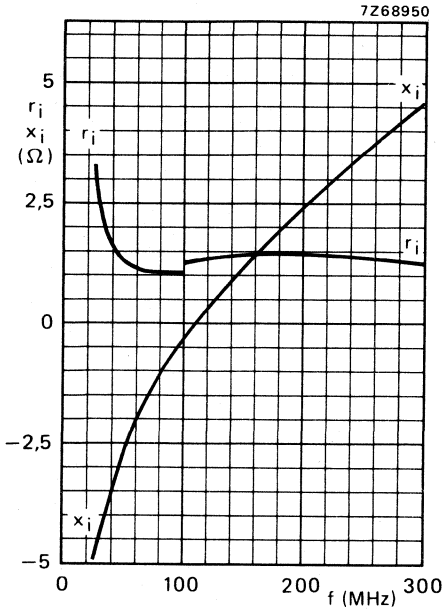


Fig. 12 Input impedance (series components).

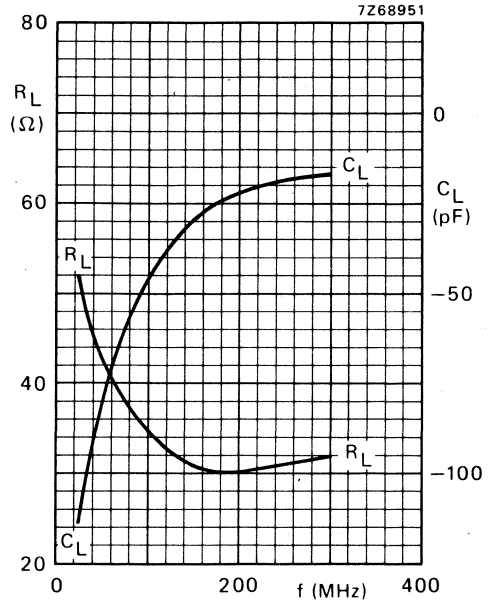


Fig. 13 Load impedance (parallel components).

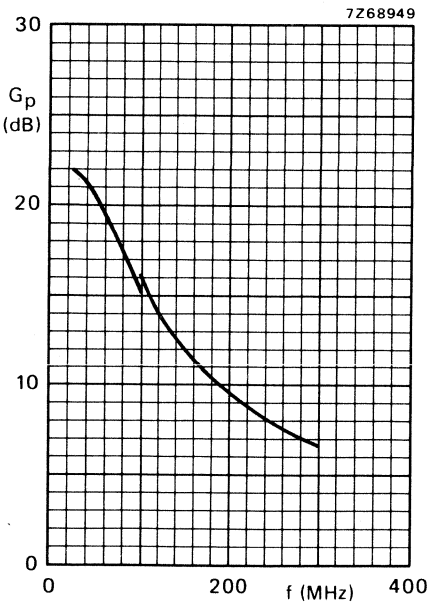


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; $V_{CE} = 28$ V; $P_L = 15$ W;
 $T_h = 25$ °C.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 28 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions. It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

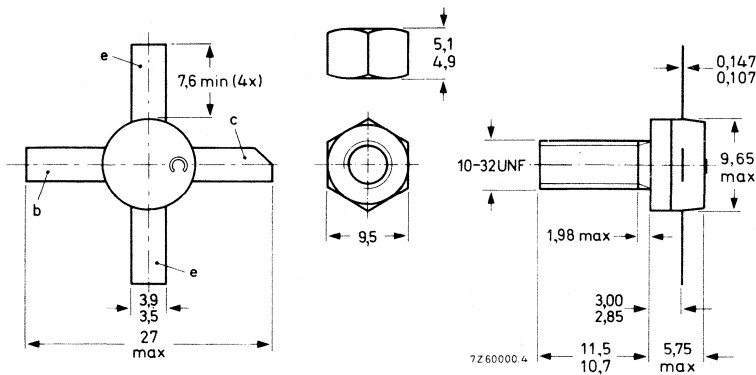
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mA/V
c.w.	28	175	< 3,1	25	< 1,5	> 9	> 60	$1,0 + j1,2$	$58,8 - j53,8$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 5,0 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

BLY93A

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter)
peak value

V_{CBOM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Currents

Collector current (average)

$I_{C(AV)}$ max. 3 A

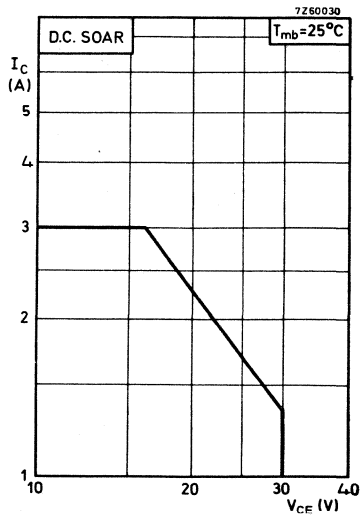
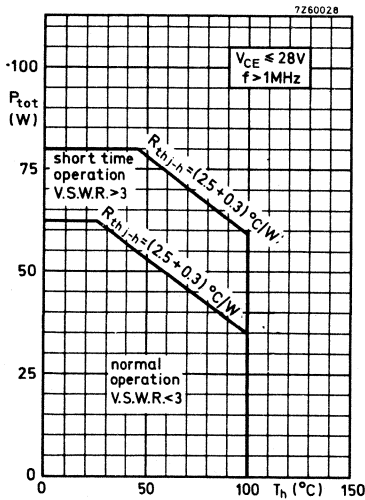
Collector current (peak value) $f > 1$ MHz

I_{CM} max. 9 A

Power dissipation

Total power dissipation up to $T_{mb} = 25$ °C
 $f > 1$ MHz

P_{tot} max. 70 W



Temperature

Storage temperature

T_{stg} -30 to +200 °C

Operating junction temperature

T_j max. 200 °C

THERMAL RESISTANCE

From junction to mounting base

$R_{th j-mb} = 2.5$ °C/W

From mounting base to heatsink

$R_{th mb-h} = 0.3$ °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 50\text{ mA}$	$V_{(BR)CBO}$	>	65 V
Collector-emitter voltage open base, $I_C = 50\text{ mA}$	$V_{(BR)CEO}$	>	36 V
Emitter-base voltage open collector; $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	4 V

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$

open base	E	>	8 mWs
$-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$	E	>	8 mWs

D. C. current gain

$I_C = 1\text{ A}; V_{CE} = 5\text{ V}$

h_{FE}	typ. 50
	10 to 120

Transition frequency

$I_C = 3\text{ A}; V_{CE} = 20\text{ V}$

f_T	typ. 500 MHz
-------	--------------

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 30\text{ V}$

C_c	typ. 50 pF
	< 65 pF

Feedback capacitance at $f = 1\text{ MHz}$

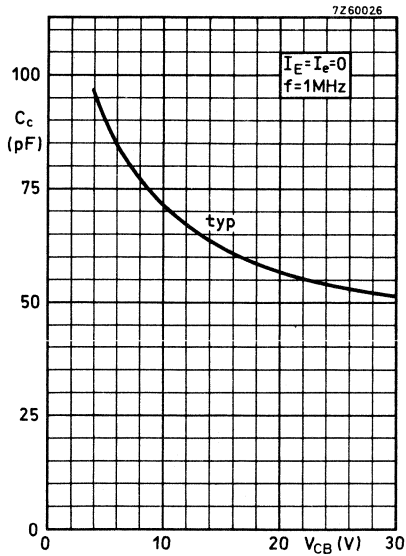
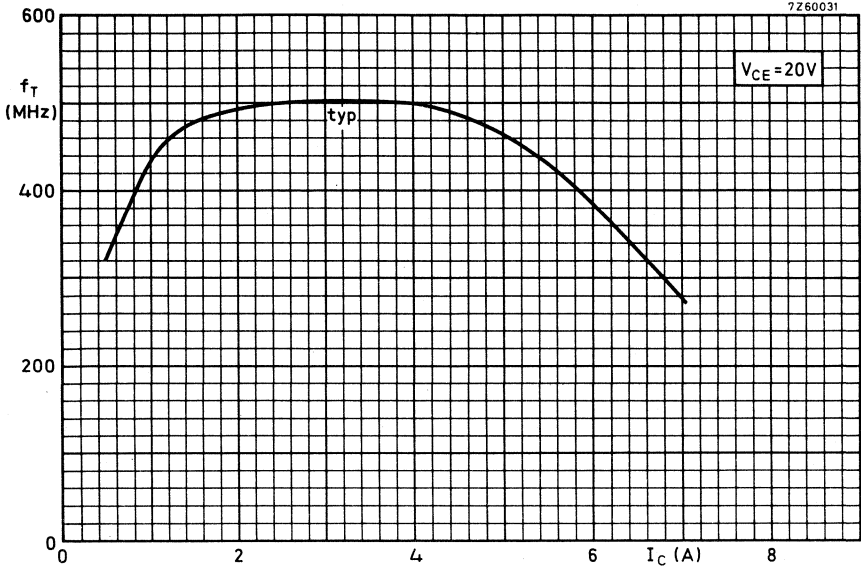
$I_C = 100\text{ mA}; V_{CE} = 30\text{ V}$

C_{re}	typ. 31 pF
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Collector-stud capacitance

C_{cs}	typ. 2 pF
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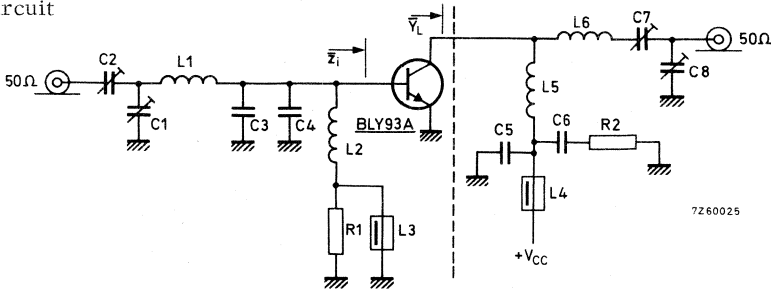
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralised common-emitter class B circuit)

$$V_{CC} = 28 \text{ V}; T_{mb} = 25 \text{ }^\circ\text{C}$$

f(MHz)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	Z _i (Ω)	Y _L (mA/V)
175	< 3.1	25	< 1.5	> 9	> 60	1.0 + j1.2	58.8 - j53.8

Test circuit



- C1 = 4 to 44 pF film dielectric trimmer (code number 2222 809 07008)
- C2 = 2 to 22 pF film dielectric trimmer (code number 2222 809 07004)
- C3 = C4 = 47 pF ceramic
- C5 = 100 pF ceramic
- C6 = 150 nF polyester
- C7 = 4 to 104 pF film dielectric trimmer (code number 2222 809 07015)
- C8 = 4 to 64 pF film dielectric trimmer (code number 2222 809 07011)

L1 = 0.5 turn enamelled Cu wire (1.5 mm); int.diam.6 mm; leads 2x6 mm

L2 = 6 turns closely wound enamelled Cu wire (0.7 mm); int.diam.4 mm; leads 2x4 mm

L3 = L4 = ferroxcube choke (code number 4312 020 36640)

L5 = 3.5 turns enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm

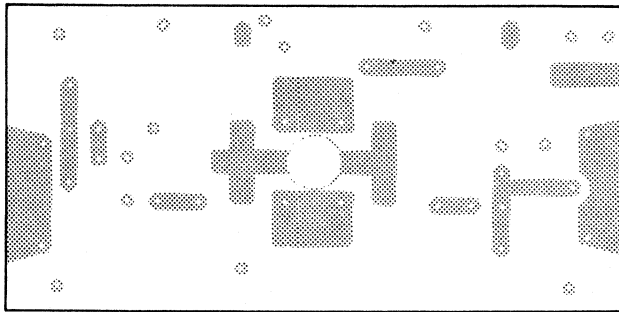
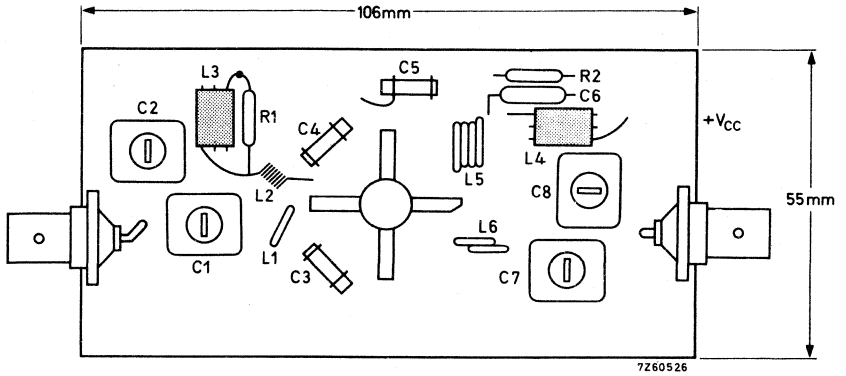
L6 = 1.5 turns enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm

R1 = R2 = 10 Ω carbon

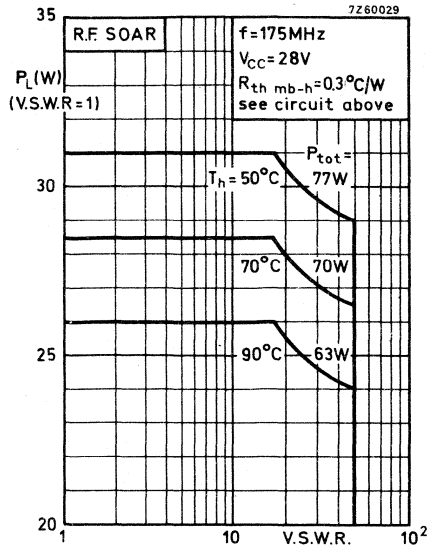
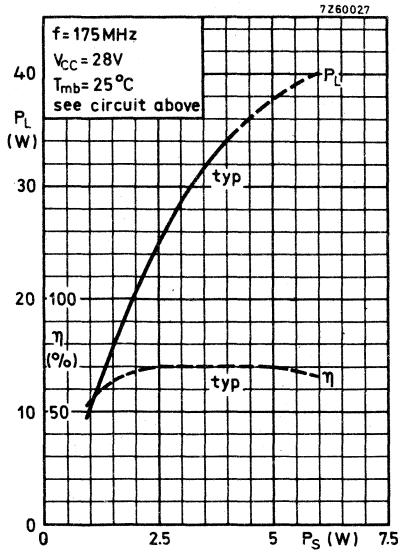
Component lay-out for 175 MHz see page 6.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

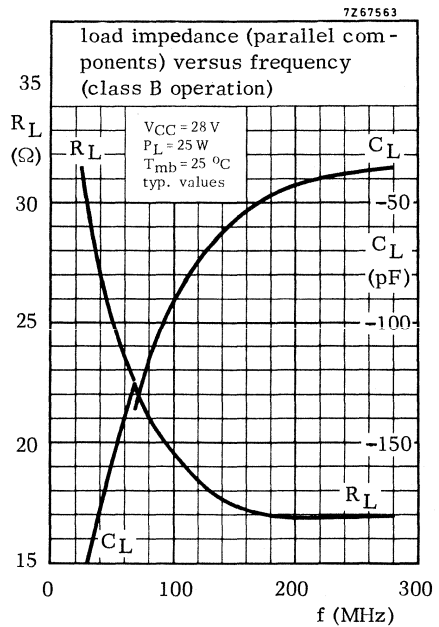
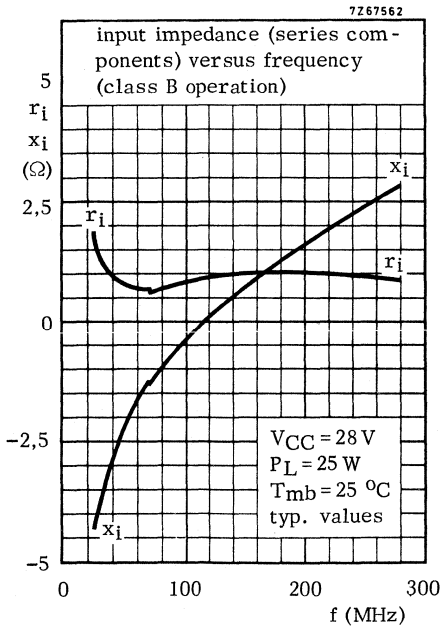
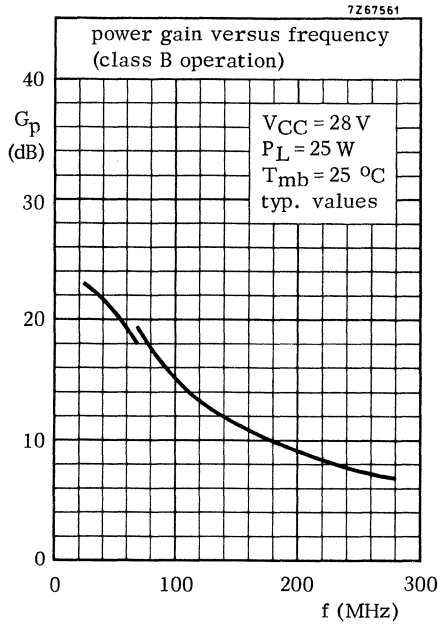


The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



For high voltage operation, a stabilized power supply is generally used. The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below 70 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

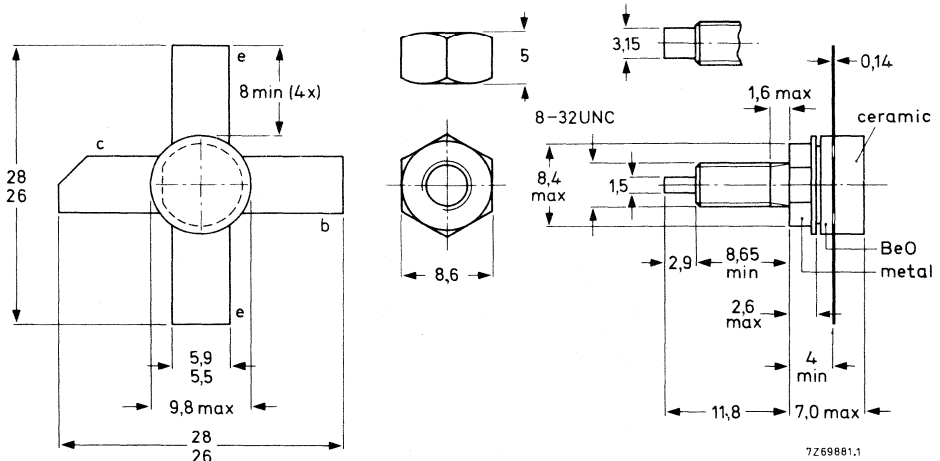
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{y}_L mA/V
c.w.	28	175	25	> 9	> 60	$1,0 + j1,2$	59-j54

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or
countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)
peak value

V_{CESM} max. 65 V

Collector-emitter voltage (open base)

V_{CEO} max. 36 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_C(AV)$ max. 3 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 9 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C

P_{rf} max. 70 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

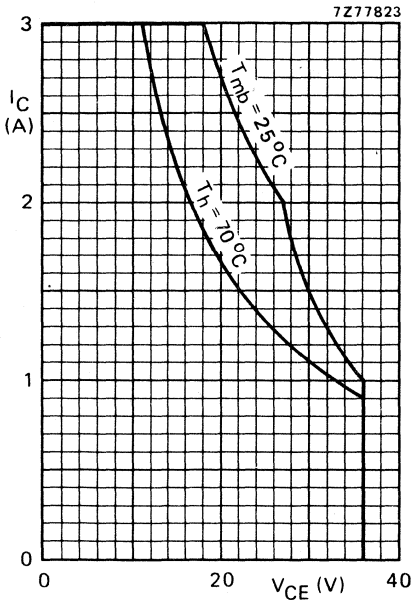


Fig. 2 D.C. SOAR.

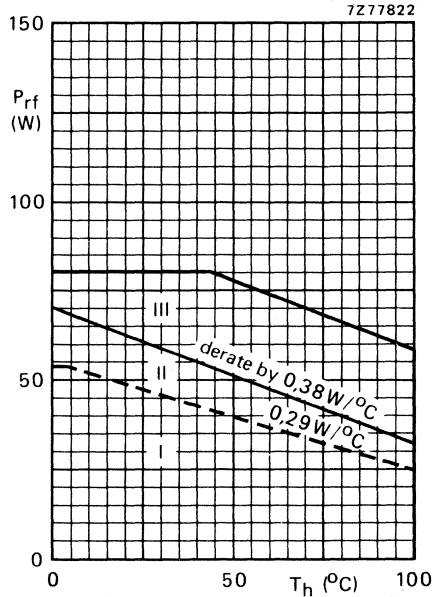


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

- I Continuous d.c. operation
- II Continuous r.f. operation
- III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 20 W; $T_{mb} = 79$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)

$R_{th\ j-mb\ (dc)}$ = 3,1 °C/W

From junction to mounting base (r.f. dissipation)

$R_{th\ j-mb\ (rf)}$ = 2,3 °C/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,45 °C/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage
 $V_{BE} = 0; I_C = 10\text{ mA}$

$V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage
 open base; $I_C = 50\text{ mA}$

$V_{(BR)CEO} > 36\text{ V}$

Emitter-base breakdown voltage
 open collector; $I_E = 10\text{ mA}$

$V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 36\text{ V}$

$I_{CES} < 4\text{ mA}$

Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$
 open base
 $R_{BE} = 10\text{ }\Omega$

$E_{SBO} > 8\text{ mJ}$

$E_{SBR} > 8\text{ mJ}$

D.C. current gain *
 $I_C = 1,25\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 45
 10 to 100

Collector-emitter saturation voltage *
 $I_C = 3,75\text{ A}; I_B = 0,75\text{ A}$

V_{CEsat} typ. 1,5 V

Transition frequency at $f = 100\text{ MHz}$ *
 $-I_E = 1,25\text{ A}; V_{CB} = 28\text{ V}$
 $-I_E = 3,75\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 625 MHz

f_T typ. 625 MHz

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = I_e = 0; V_{CB} = 28\text{ V}$

C_c typ. 45 pF

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$

C_{re} typ. 28 pF

Collector-stud capacitance

C_{cs} typ. 2 pF



* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

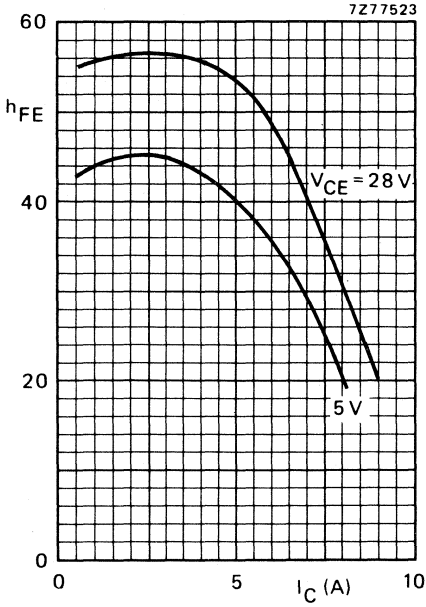


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

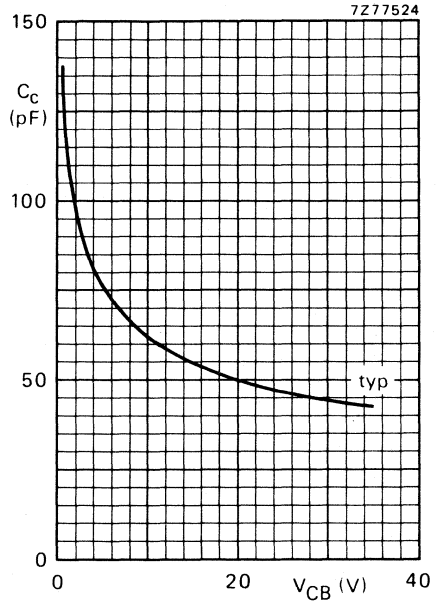


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

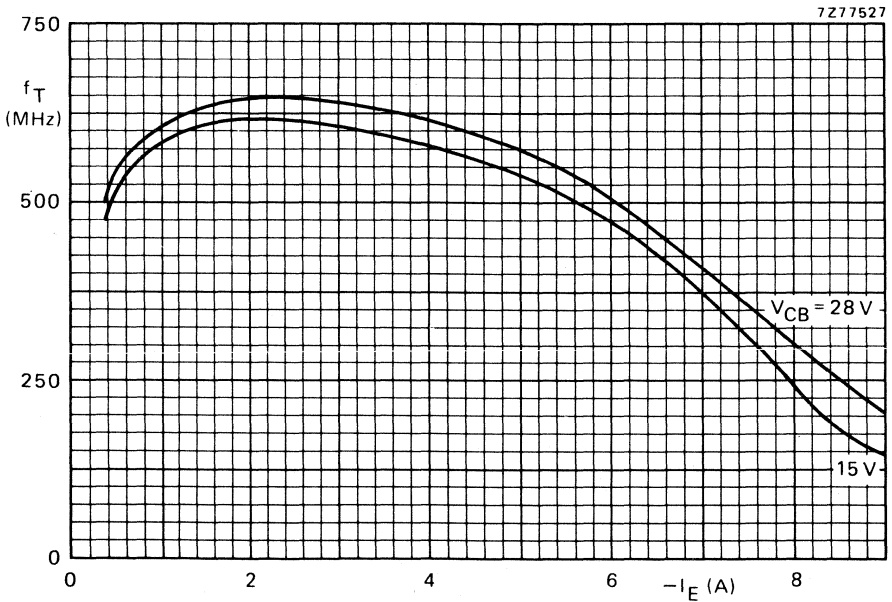


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

 $T_h = 25\text{ }^\circ\text{C}$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{V}_L (mA/V)
175	28	25	< 3,15	> 9	< 1,5	> 60	$1,0 + j1,2$	$59 - j54$

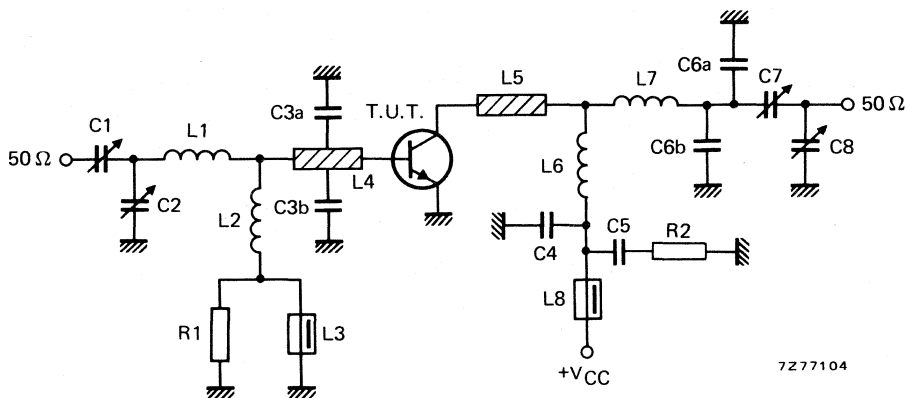


Fig. 7 Test circuit; c.w. class-B.

List of components

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3a = C3b = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor

C5 = 100 nF polyester capacitor

C6a = 2,2 pF ceramic capacitor (500 V)

C6b = 1,8 pF ceramic capacitor (500 V)

C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 14 nH; 1 turn Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm

L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor

L6 = 80 nH; 3 turns Cu wire (1,6 mm); int. dia. 9,0 mm; length 8,0 mm; leads 2 x 5 mm

L7 = 62 nH; 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor (0,25 W)

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.

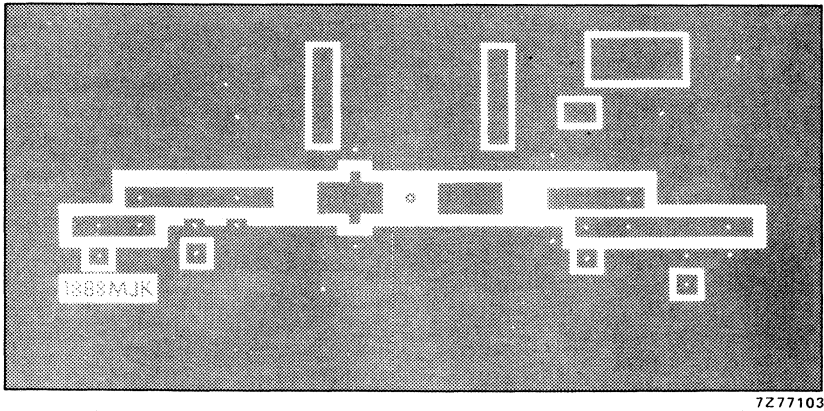
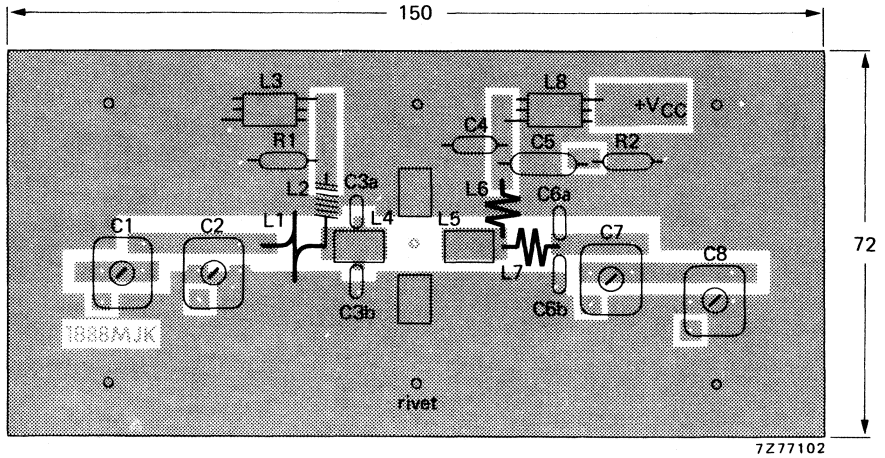


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

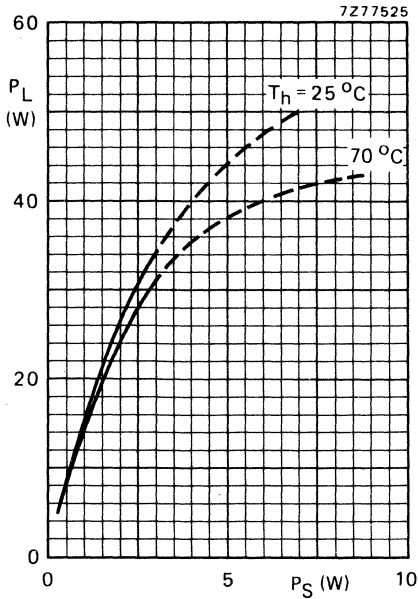


Fig. 9 $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$; typical values.

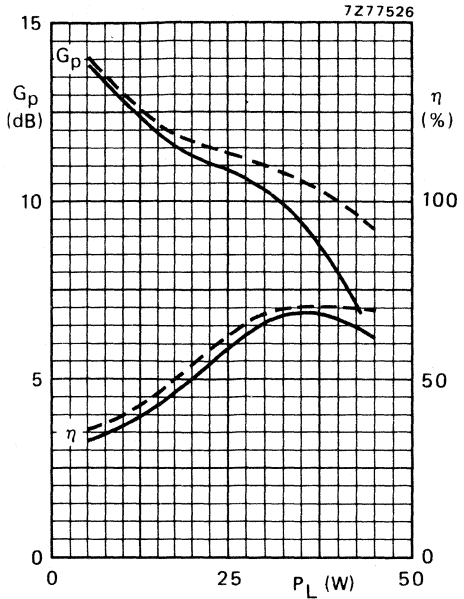


Fig. 10 $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$; typical values; --- $T_h = 25 \text{ }^\circ\text{C}$; — $T_h = 70 \text{ }^\circ\text{C}$.

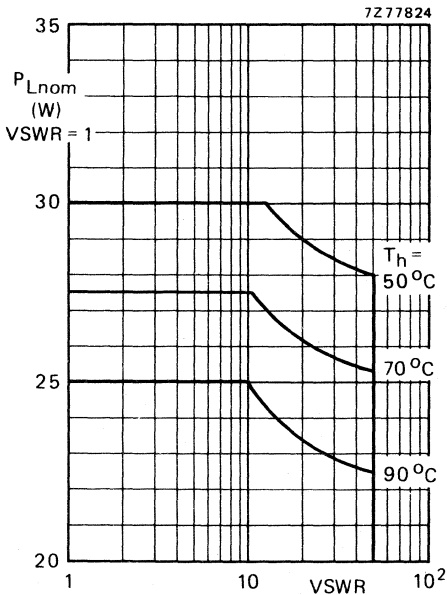


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $R_{th\text{ mb-h}} = 0,45 \text{ }^\circ\text{C/W}$. The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

7Z77529

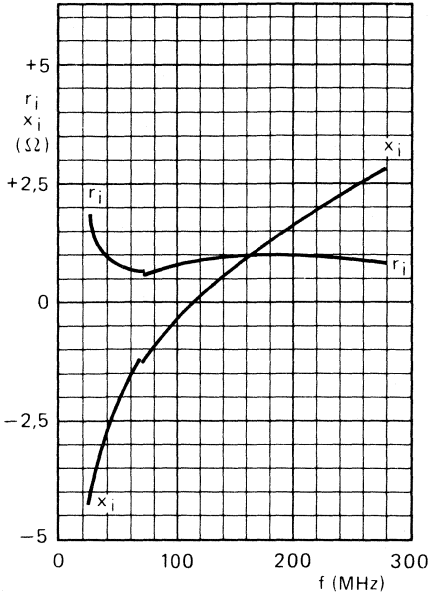


Fig. 12 Input impedance (series components).

7Z77530

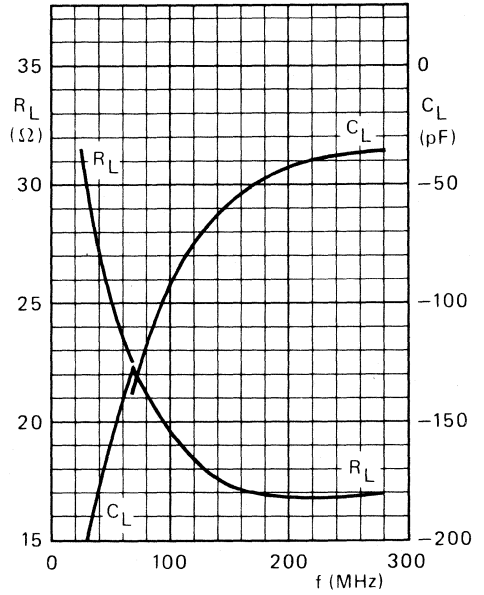


Fig. 13 Load impedance (parallel components).

7Z77531

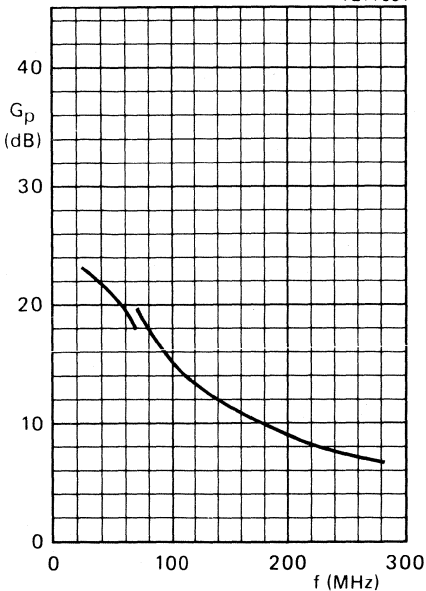


Fig. 14 Power gain versus frequency.

OPERATING NOTE

Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 28$ V; $P_L = 25$ W;
 $T_h = 25$ $^{\circ}$ C.

V.H.F. POWER TRANSISTOR

N-P-N planar epitaxial transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 28 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions. It has a plastic encapsulated stripline package. All leads are isolated from the stud.

QUICK REFERENCE DATA

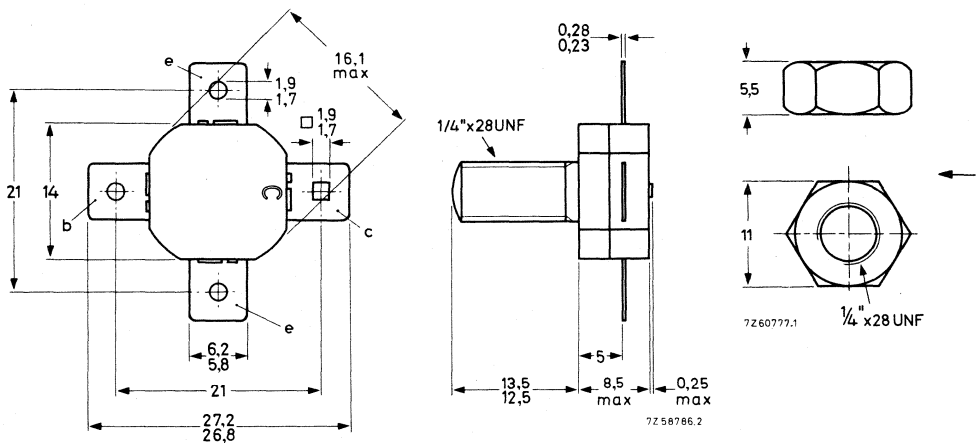
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	\bar{Z}_i Ω	\bar{Y}_L mA/V
c.w.	28	175	< 10	50	< 2,75	> 7	> 65	$0,8 + j1,45$	$125 - j66$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-55.



When locking is required an adhesive is preferred instead of a lock washer.

Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

Diameter of clearance hole in heatsink: max. 6,5 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

BLY94

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

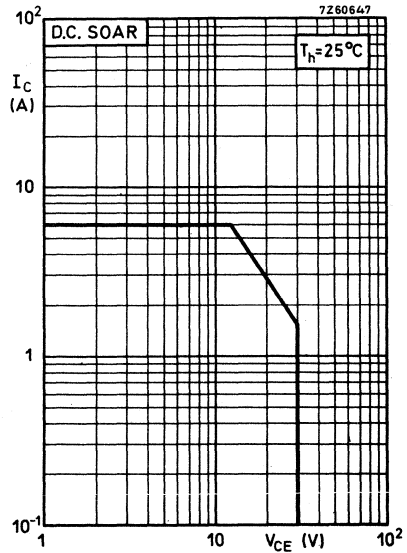
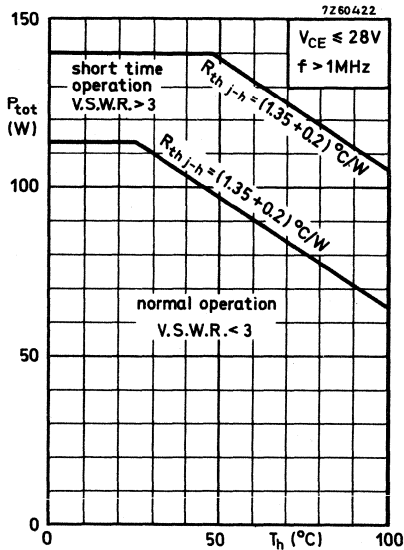
Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65 V
Collector-emitter voltage (open base)	V_{CEO}	max.	36 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V

Currents

Collector current (average)	$I_{C(AV)}$	max.	6 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	12 A

Power dissipation

Total power dissipation up to $T_{mb} = 25^\circ\text{C}$ $f > 1$ MHz	P_{tot}	max.	130 W
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Temperature

Storage temperature	T_{stg}	-65 to +200 °C
Operating junction temperature	T_j	max. 200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th(j-mb)}$	=	1.35 °C/W
From mounting base to heatsink	$R_{th(mb-h)}$	=	0.2 °C/W

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector-base voltage open emitter, $I_C = 100\text{ mA}$	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, $I_C = 100\text{ mA}$	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; $I_E = 25\text{ mA}$	$V_{(BR)EBO}$	>	4	V

Transient energy

$L = 25\text{ mH}; f = 50\text{ Hz}$

open base	E	>	8	mWs
$-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$	E	>	8	mWs

D. C. current gain

$I_C = 1\text{ A}; V_{CE} = 5\text{ V}$	h_{FE}	10 to 120
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Transition frequency

$I_C = 6\text{ A}; V_{CE} = 20\text{ V}$	f_T	typ. 500	MHz
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Collector capacitance at $f = 1\text{ MHz}$

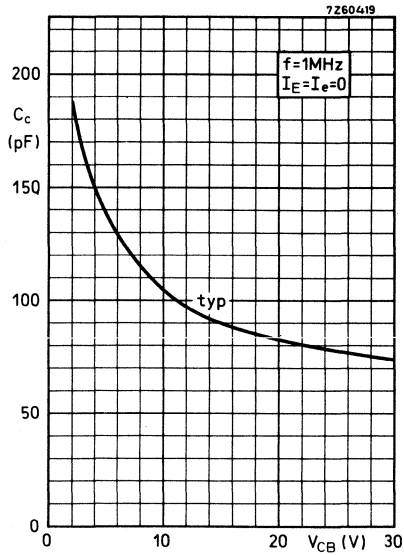
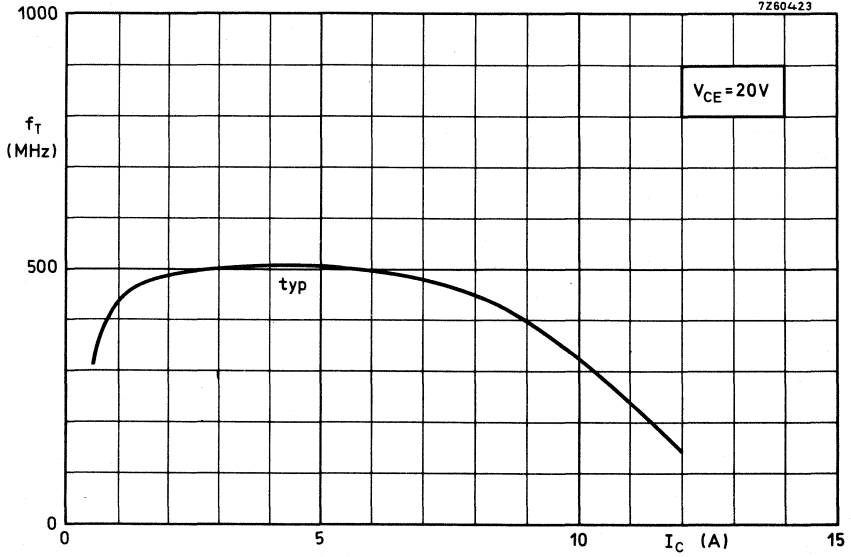
$I_E = I_e = 0; V_{CB} = 30\text{ V}$	C_c	typ. 75	pF
		< 130	pF

Feedback capacitance

$I_C = 100\text{ mA}; V_{CE} = 30\text{ V}$	C_{re}	typ. 47	pF
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Collector-stud capacitance

	C_{cs}	typ. 3.5	pF
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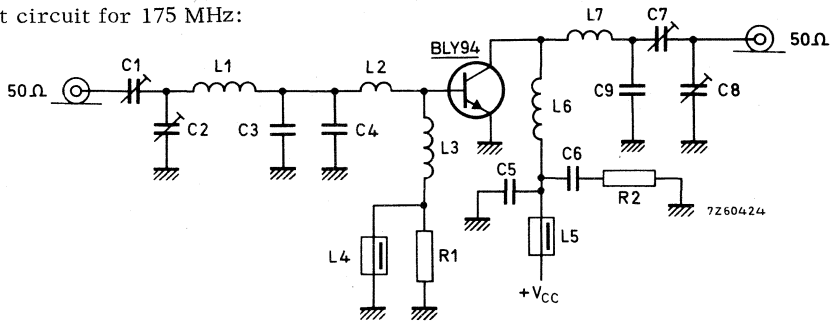
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralised common-emitter class B circuit)

$f = 175 \text{ MHz}$; T_{mb} up to 25°C

V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mA/V)
28	< 10	50	< 2.75	> 7	> 65	$0.8 + j1.45$	$125 - j66$

Test circuit for 175 MHz:



List of components:

C1 = 2 to 20 pF film dielectric trimmer (code number 2222 809 07004)

C2 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)

C3=C4 = 56 pF ceramic

C5 = 100 pF ceramic

C6 = 100 nF polyester

C7 = 4 to 60 pF film dielectric trimmer (code number 2222 809 07011)

C8 = 4 to 100 pF film dielectric trimmer (code number 2222 809 07015)

C9 = 6.8 pF ceramic

L1 = 36 nH; 2 turns enamelled Cu wire (1.5 mm); int. diam. 7 mm; length 5 mm; lead length 2 x 5 mm

L2 = formed by the metallization on the p. c. board; see component lay-out

L3 = 100 nH; 7 turns closely wound enamelled Cu wire (0.5 mm); int. diam 3 mm; lead length 2 x 5 mm

L4=L5 =ferroxcube choke (code number 4 312 020 36640)

L6 = 53 nH; 2 turns enamelled Cu wire (1.5 mm); int. diam. 10 mm; length 5.2 mm; lead length 2 x 5 mm

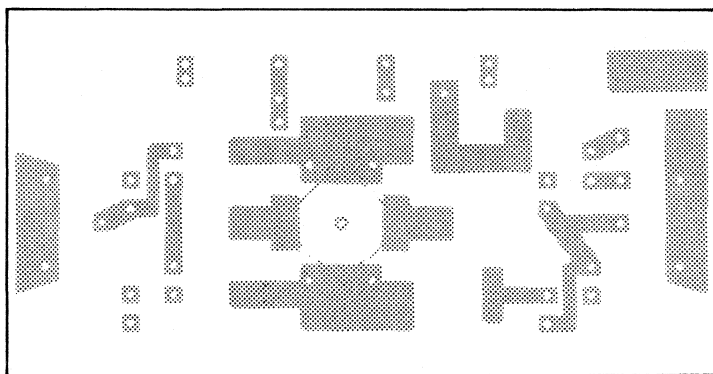
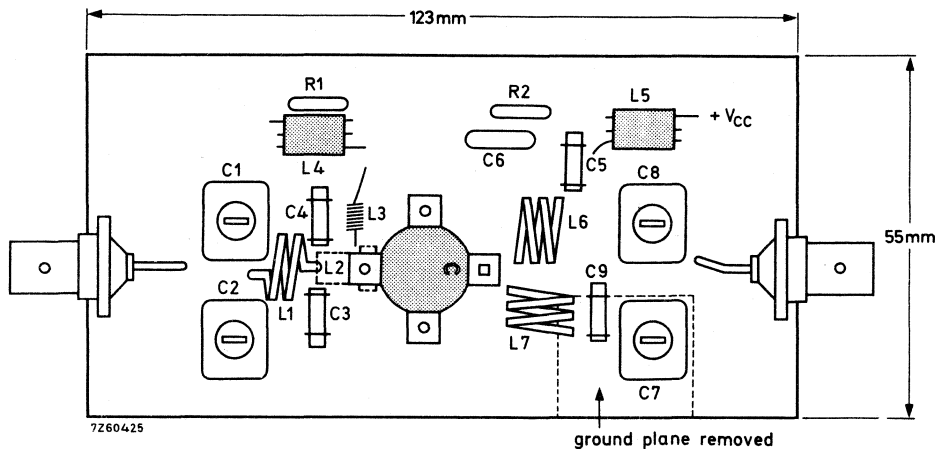
L7 = 46 nH; 2 turns enamelled Cu wire (1.5 mm); int. diam. 9 mm; length 5.4 mm; lead length 2 x 5 mm

R1=R2 = 10 Ω carbon

Component lay-out see page 6

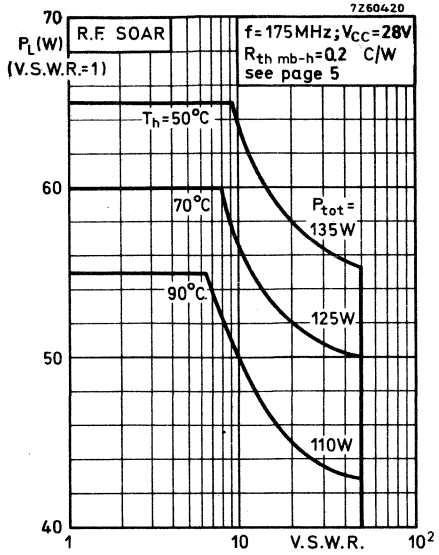
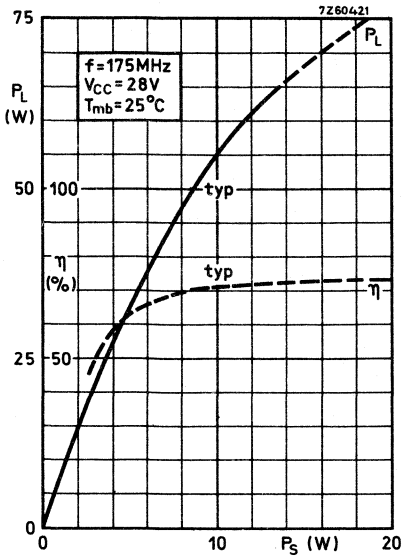
APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.



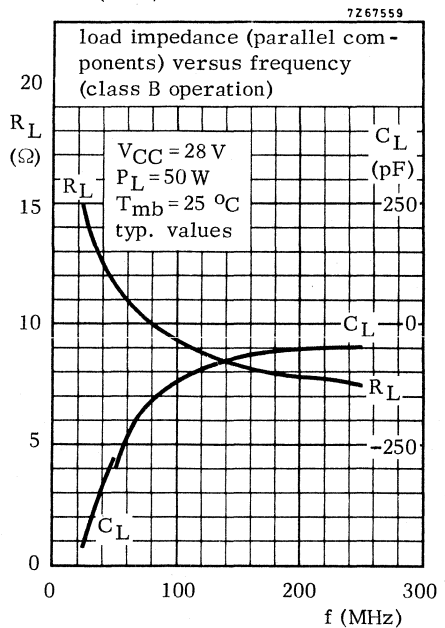
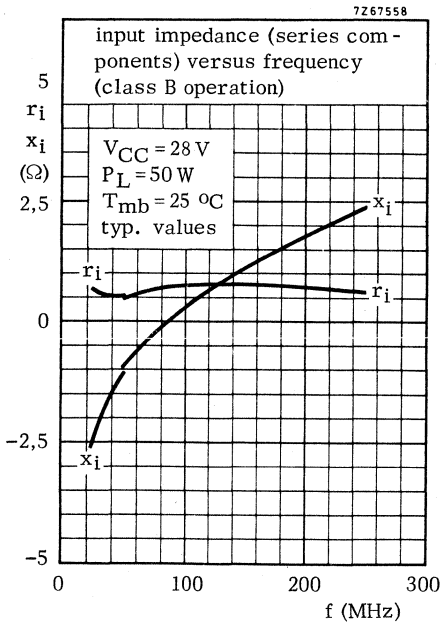
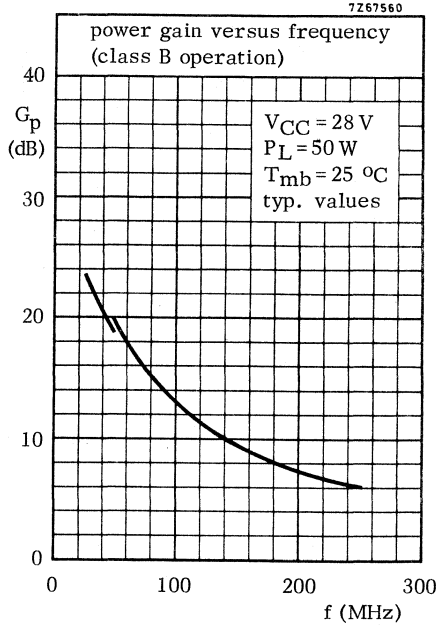
7Z67867

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



For high voltage operation, a stabilized power supply is generally used. The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below 50 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



SILICON EPITAXIAL PLANAR OVERLAY TRANSISTORS

The **2N3553** is an n-p-n overlay transistor in a TO-39 metal envelope with the collector connected to the case. The **2N3375** and the **2N3632** are n-p-n overlay transistors in TO-60 metal envelopes with the electrodes insulated from the studs.

The **2N3553** and the **2N3375** are intended for v.h.f./u.h.f. and the **2N3632** for v.h.f. transmitting applications.

QUICK REFERENCE DATA

		2N3553	2N3375	2N3632	
Collector-emitter voltage -V _{BE} = 1,5 V	V _{CEX} max.	65	65	65	V
Collector-emitter voltage (open base)	V _{CEO} max.	40	40	40	V
Collector current (peak value)	I _{CM} max.	1,0	1,5	3,0	A
Total power dissipation up to T _{mb} = 25 °C	P _{tot} max.	7	11,6	23	W
Junction temperature	T _j max.	200	200	200	°C
Transition frequency I _C = 125 mA; V _{CE} = 28 V	f _T typ.	500	500	—	MHz
I _C = 250 mA; V _{CE} = 28 V	f _T typ.	—	—	400	MHz

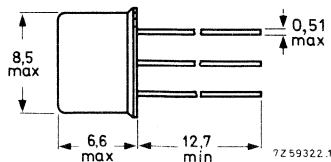
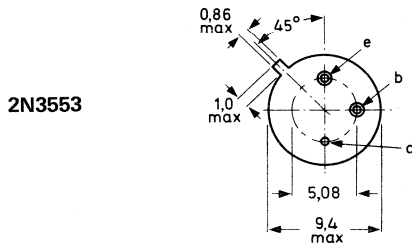
R.F. performance at V_{CE} = 28 V

type number	f (MHz)	P _O (W)	P _i (W)	η (%)
2N3553	175	2,5	< 0,25	> 50
2N3375	100	7,5	< 1	> 65
2N3375	400	> 3	1	> 40
2N3632	175	> 13,5	3,5	> 70

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56218 (package); 56245 (distance disc).

2N3375
2N3553
2N3632

MECHANICAL DATA (continued)

2N3375
2N3632

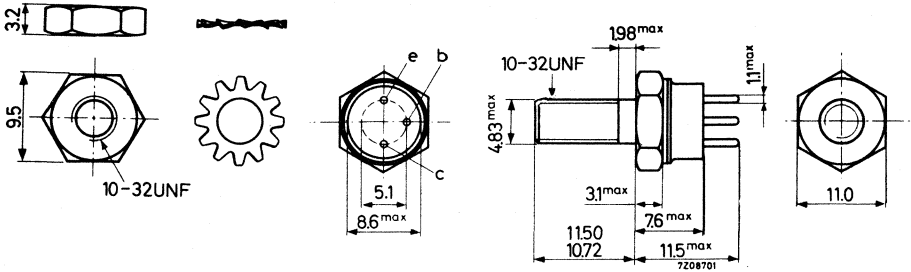
Dimensions in mm

Torque on nut: min. 8 cm kg
max. 17 cm kg

TO-60

The top pins should not be bent

Diameter of hole in heatsink: 4.8 to 5.2 mm



RATINGS (Limiting values) ¹⁾

Voltages ²⁾

Collector-base voltage (open emitter)

V_{CBO} max. 65 V

Collector-emitter voltage

I_C up to 200 mA; $-V_{BE} = 1.5$ V

V_{CEX} max. 65 V

Collector-emitter voltage (open base)

I_C up to 200 mA

V_{CEO} max. 40 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Currents ²⁾

Collector current (d.c.)

		2N3553	2N3375	2N3632
I_C	max.	0.35	0.5	1 A

Collector current (peak value)

I_{CM}	max.	1.0	1.5	3 A
----------	------	-----	-----	-----

Power dissipation ²⁾

Total power dissipation
up to $T_{mb} = 25$ °C

P_{tot}	max.	7	11.6	23 W
-----------	------	---	------	------

Temperatures

Storage temperature

T_{stg} -65 to +200 °C

Junction temperature

T_j max. 200 °C

¹⁾ Limiting values according to the Absolute Maximum System as defined in IEC publication 134.

²⁾ See also areas of permissible operation at pages 10 and 11.

THERMAL RESISTANCE

	2N3553	2N3375	2N3632
From junction to mounting base	$R_{th\ j-mb} = 25$	15	7.5 °C/W
From mounting base to heatsink	$R_{th\ mb-h} =$	0.6	0.6 °C/W
From mounting base to heatsink mounted with top clamping washer of 56218	$R_{th\ mb-h} = 1.0$		°C/W
top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb-h} = 2.5$		°C/W

CHARACTERISTICS

$T_j = 25\text{ °C}$ unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 30\text{ V}$

	2N3553	2N3375	2N3632
I_{CEO}	< 100	100	250 μA

Breakdown voltages

$I_E = 0; I_C = 250\text{ mA}$

$V_{(BR)CBO} >$	65	65	65 V
-----------------	----	----	------

I_C up to 200 mA

$-V_{BE} = 1.5\text{ V}; R_B = 33\ \Omega$ ¹⁾
 $I_B = 0$ ¹⁾

$V_{(BR)CEX} >$	65	65	65 V
$V_{(BR)CEO} >$	40	40	40 V

$I_C = 0; I_E = 250\text{ mA}$

$V_{(BR)EBO} >$	4	4	4 V
-----------------	---	---	-----

Base-emitter voltage

$I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$

$V_{BE} <$	1.5		V
------------	-----	--	---

$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$

$V_{BE} <$		1.5	V
------------	--	-----	---

$I_C = 1000\text{ mA}; V_{CE} = 5\text{ V}$

$V_{BE} <$			1.5 V
------------	--	--	-------

Saturation voltage

$I_C = 250\text{ mA}; I_B = 50\text{ mA}$

$V_{CEsat} <$	1.0		V
---------------	-----	--	---

$I_C = 500\text{ mA}; I_B = 100\text{ mA}$

$V_{CEsat} <$		1.0	V
---------------	--	-----	---

$I_C = 1000\text{ mA}; I_B = 200\text{ mA}$

$V_{CEsat} <$			1.0 V
---------------	--	--	-------

¹⁾ Pulsed through an inductor of 25 mH; $\delta = 0.5$; $f = 50\text{ Hz}$

CHARACTERISTICS (continued)

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

D.C. current gain

$I_C = 125\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE}

>
<

2N3553 2N3375 2N3632

15 15
200 200

$I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE}

>
<

10 10
100 100

10
150

$I_C = 1000\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE}

>
<

5
110

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

C_c

<

10 10 20 pF

Collector-case capacitance

<

6 6 pF

Transition frequency

$I_C = 125\text{ mA}; V_{CE} = 28\text{ V}$

f_T

typ. 500

500

MHz

$I_C = 250\text{ mA}; V_{CE} = 28\text{ V}$

f_T

typ.

400 MHz

Real part of input impedance at $f = 200\text{ MHz}$

$I_C = 125\text{ mA}; V_{CE} = 28\text{ V}$

$\text{Re}(h_{ie})$

<

20 20 Ω

$I_C = 250\text{ mA}; V_{CE} = 28\text{ V}$

$\text{Re}(h_{ie})$

<

20 Ω

R.F. performance at $V_{CE} = 28\text{ V}$

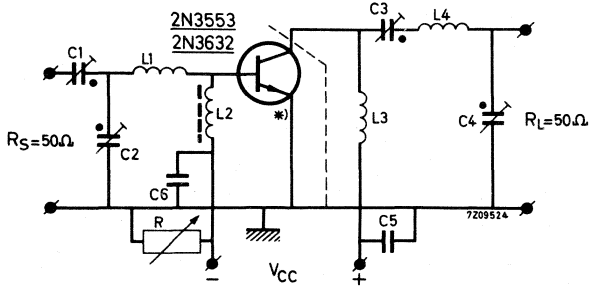
	f (MHz)	P_o (W)	P_i (W)	I_C (mA)	η %	Test circuit at page
2N3553	175	2.5	< 0.25	< 180	> 50	5
2N3375	100	7.5	< 1	< 410	> 65	6
2N3375	400	> 3	1	270	> 40	7
2N3632	175	> 13.5	3.5	690	> 70	5

NOTE

The transistors can withstand an output V.S.W.R. of 3:1 varied through all phases under conditions mentioned in the table above.

CHARACTERISTICS (continued)

Test circuit with the 2N3553 or the 2N3632 at $f = 175 \text{ MHz}$



*) The length of the external emitter wire of the 2N3553 is 1.6 mm.
The emitter of the 2N3632 should be connected to the case as short as possible.

Components

C1 = C2 = C3 = C4 = 4 to 29 pF air trimmer

C5 = 10 nF polyester

C6 = 100 pF ceramic

L1 = 1 turn Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm

L2 = Ferroxcube choke coil. Z (at $f = 175 \text{ MHz}$) = $550 \Omega \pm 20\%$
(code number 4312 020 36640)

L3 = 15 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm

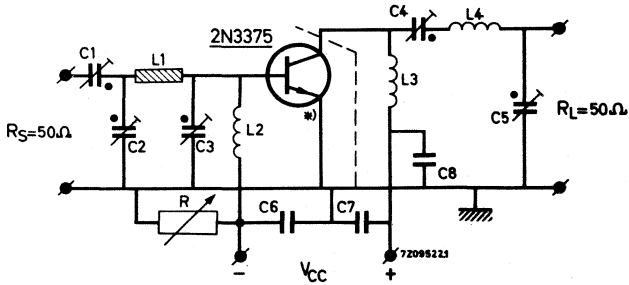
L4 = 3 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 12 mm; leads 2 x 20 mm

R = 0 for the 2N3553

R = 0 to 2 Ω for the 2N3632

CHARACTERISTICS (continued)

Test circuit with the 2N3375 at $f = 400 \text{ MHz}$



*) The emitter should be connected to the case as short as possible.

Components

C1 = C2 =	0.7 to 6.7 pF	ceramic trimmer
C3 =	0.5 to 3.5 pF	ceramic trimmer
C4 = C5 =	3 to 19 pF	air trimmer
C6 = C7 =	15 pF	ceramic
C8 =	4700 pF	ceramic

L1 = 20 mm straight Cu wire; diam. 1.5 mm; spaced 8 mm from chassis

L2 = 17 turns closely wound enamelled Cu wire (0.5 mm); int. diam. 3 mm

L3 = 7 turns closely wound enamelled Cu wire (0.5 mm); int. diam. 3 mm

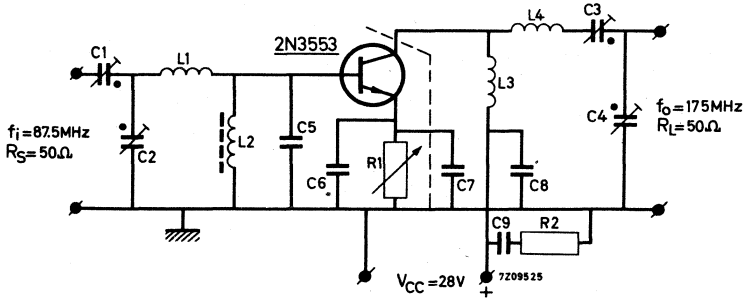
L4 = 1 turn Cu wire (1.5 mm); int. diam. 10 mm; leads 2 x 5 mm

R = 0 to 5 Ω

2N3375
2N3553
2N3632

APPLICATION INFORMATION

The 2N3553 used in a frequency doubler circuit 87.5 - 175 MHz



Components

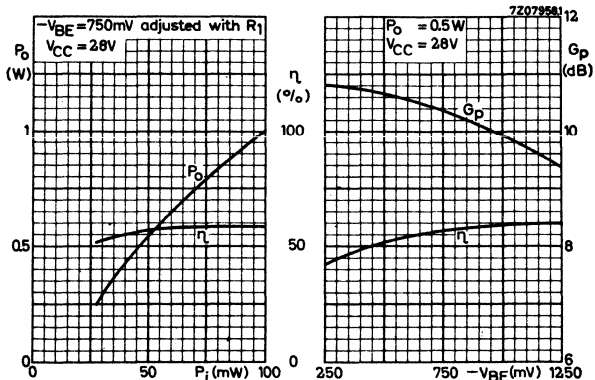
C1 = C2 = C3 =	4 to 29 pF	air trimmer	R1 = 0 to 50 Ω	
C4 =	3.5 to 61.5 pF	air trimmer	R2 = 10 Ω	carbon
C5 =	56 pF	ceramic		
C6 =	680 pF	ceramic		
C7 =	150 pF	ceramic		
C8 =	100 pF	ceramic		
C9 =	10 nF	polyester		

L1 = 5 turns Cu wire (1 mm); winding pitch 1.5 mm; int. diam. 6 mm; leads 2 x 12 mm

L2 = Ferroxcube choke coil; Z (at f = 87.5 MHz) = 750 $\Omega \pm 20\%$
 (code number 4312 020 36640)

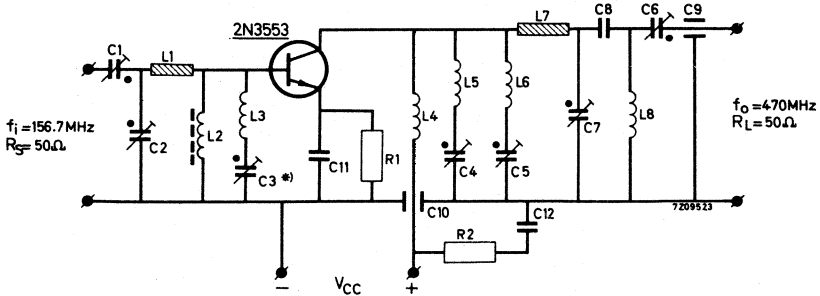
L3 = 15 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm

L4 = 6 turns Cu wire (1 mm); winding pitch 1.5 mm; int. diam. 6 mm; leads 2 x 12 mm



APPLICATION INFORMATION (continued)

The 2N3553 used in a parametric frequency tripler 156.7 - 470 MHz



*) C3 tuned to second harmonic frequency

Components

- | | | | | |
|---------------------|--------------|-----------------------|------------------------|--------|
| C1 = C2 = C3 = C4 = | 4 to 29 pF | air trimmer | R ₁ = 2.2 Ω | carbon |
| C5 = C6 = C7 = | 4 to 10.4 pF | air trimmer | R ₂ = 10 Ω | carbon |
| C8 = | 1.0 pF | ceramic | | |
| C9 = | 12 pF | ceramic; feed through | | |
| C10 = | 100 pF | ceramic; feed through | | |
| C11 = | 1000 pF | ceramic | | |
| C12 = | 15 nF | polyester | | |

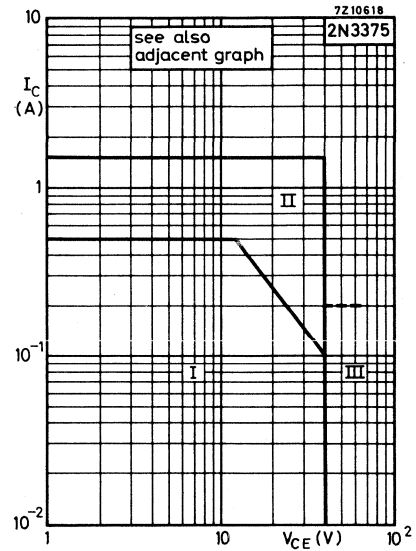
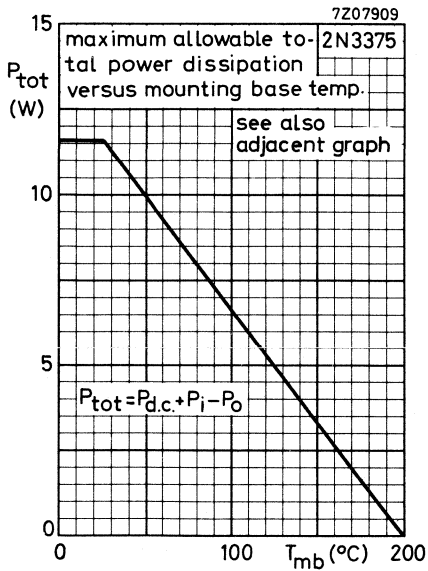
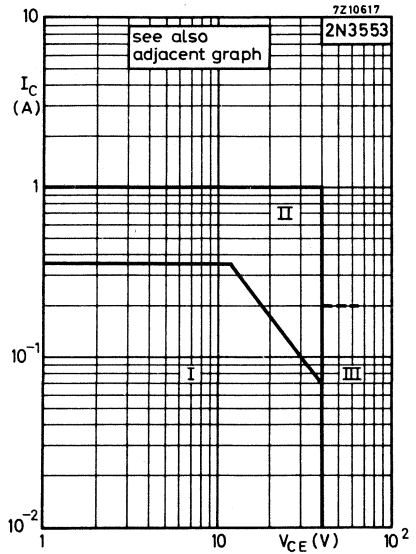
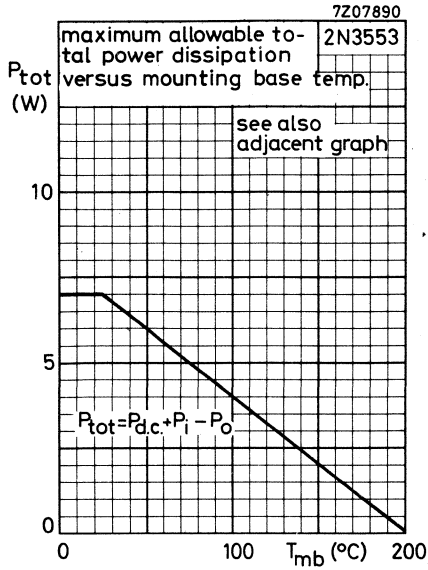
L1 = 35 mm straight Cu wire; diam. 1 mm; spaced 5.5 mm from chassis
 L2 = Ferroxcube choke coil; Z (at f = 156.7 MHz) = 600 Ω ± 20%
 (code number 4312 020 36640)

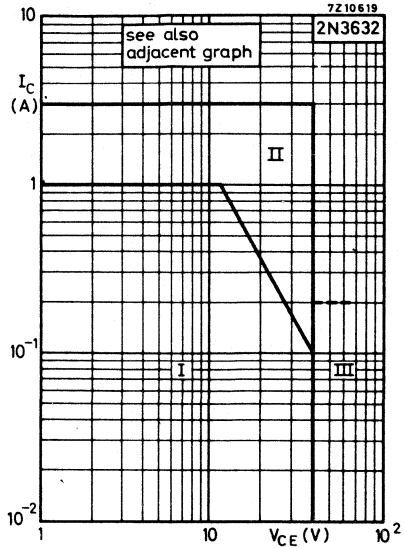
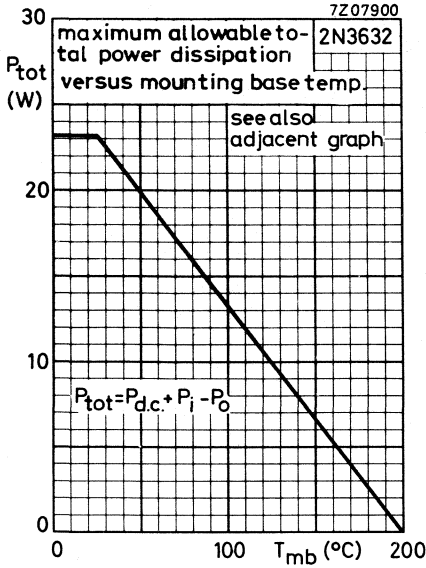
- L3 = 18 mm straight Cu wire; diam. 1 mm; spaced 5.5 mm from chassis
 L4 = 7 turns closely wound enamelled Cu wire (0.5 mm); int. diam. 3.5 mm
 L5 = 3 turns Cu wire (1 mm); winding pitch 1.7 mm; int. diam. 8.5 mm; leads 2 x 10 mm
 L6 = 2 turns Cu wire (1 mm); winding pitch 1.7 mm; int. diam. 7 mm; leads 2 x 10 mm
 L7 = 40 mm straight Cu wire; diam. 1.5 mm; spaced 5.5 mm from chassis
 L8 = 1 turn Cu wire; int. diam. 7 mm; leads 2 x 5 mm

Typical performance at V_{CC} = 28 V

P _O (W)	P _i (W)	G _p (dB)	I _C (mA)	η (%)
1.5	0.27	7.5	125	43
2.0	0.39	7.1	156	46

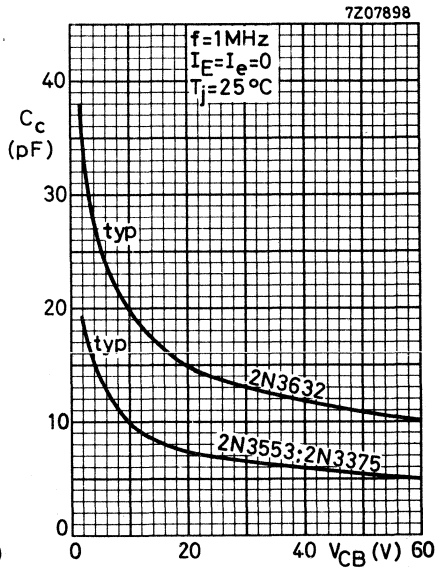
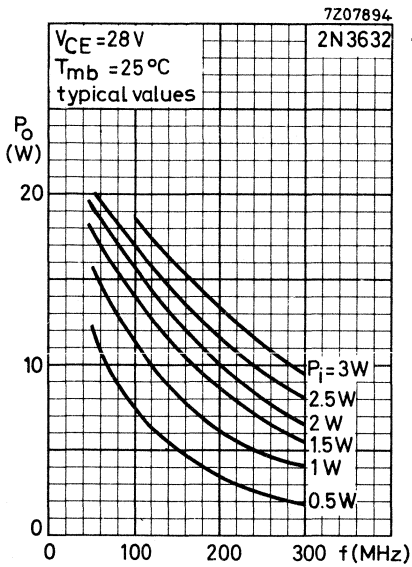
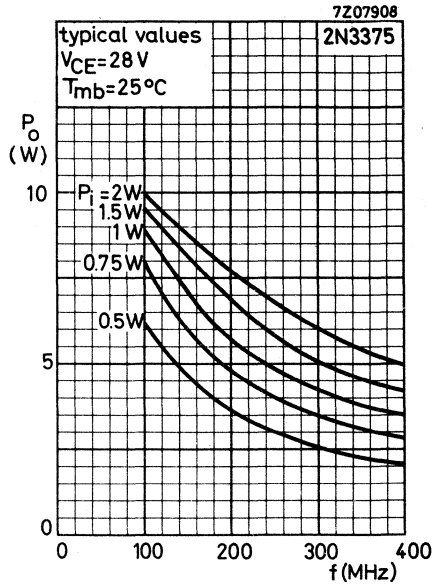
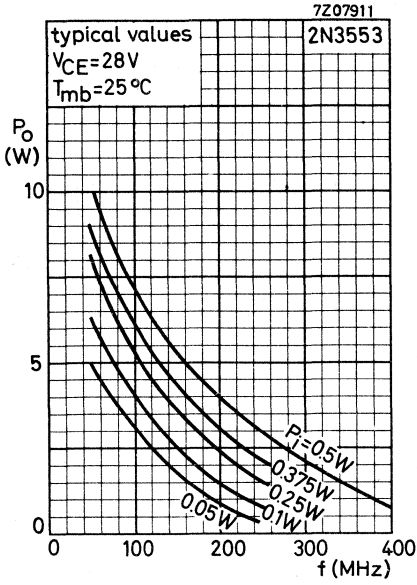
2N3375
2N3553
2N3632

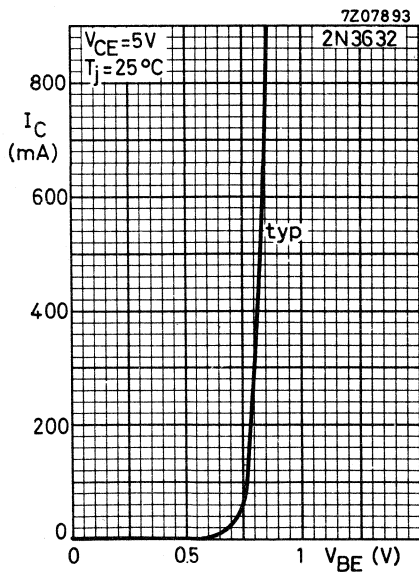
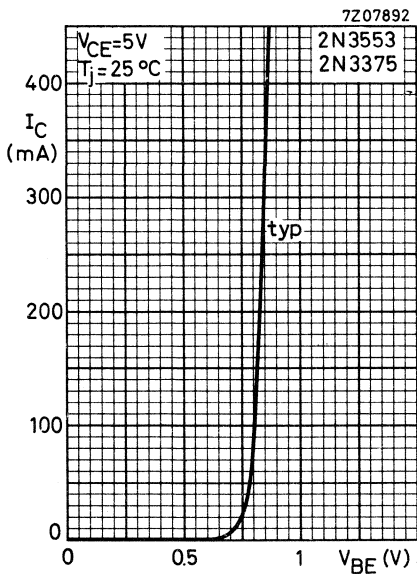
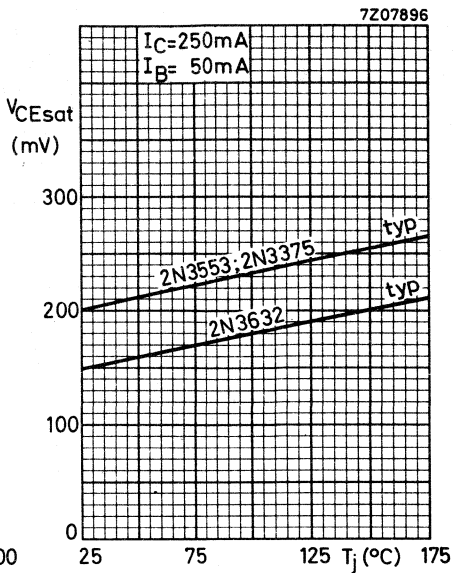
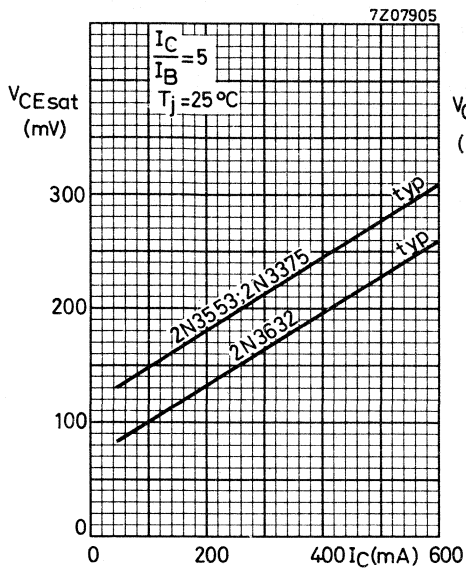




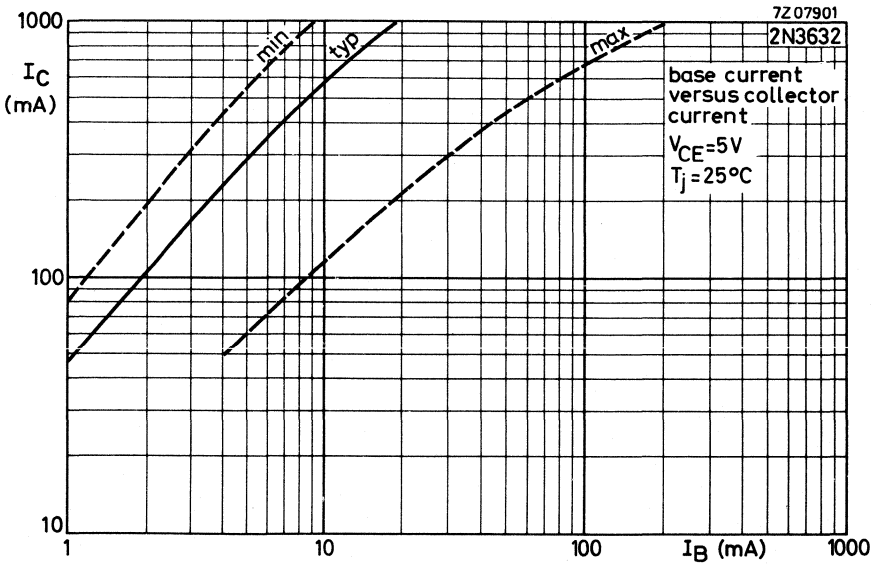
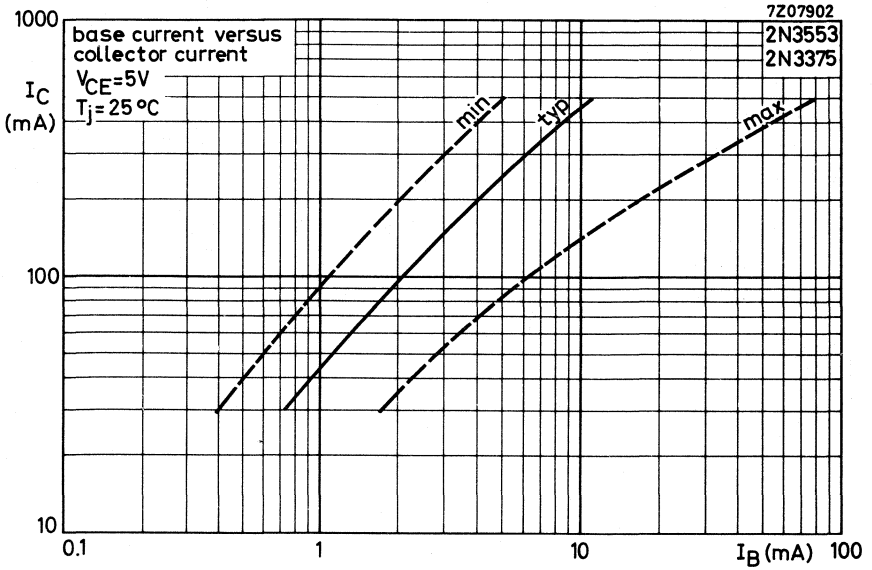
- I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.
- II Additional region of operation at $f \geq 1$ MHz.
 Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias in class A, B or C.
- III Operating during switching off in this region is allowed, provided the transistor is cut-off with $-V_{BE} \leq 1.5$ V and $R_{BE} \geq 33 \Omega$, $I_C \leq 200$ mA and the transient energy does not exceed 0.5 mWs.

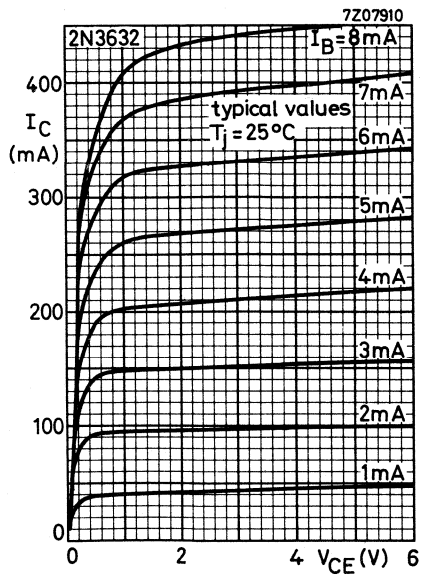
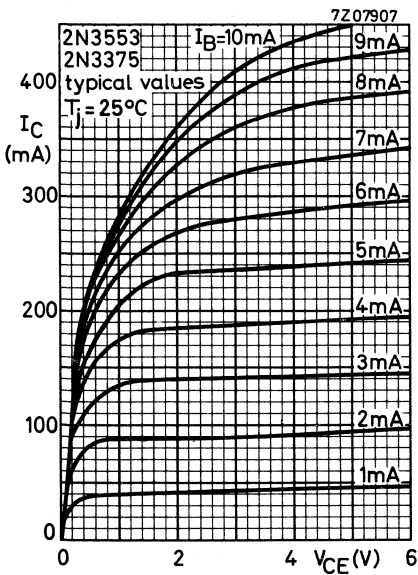
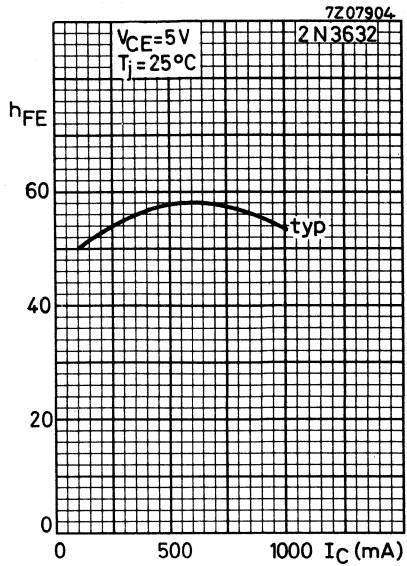
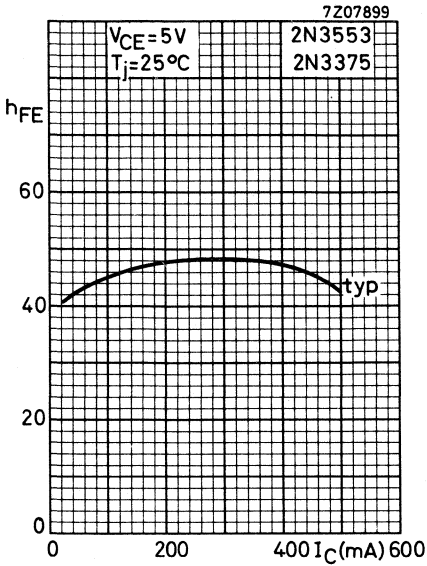
2N3375
2N3553
2N3632



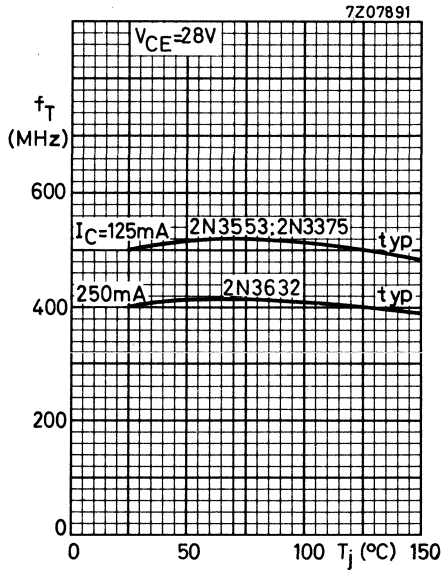
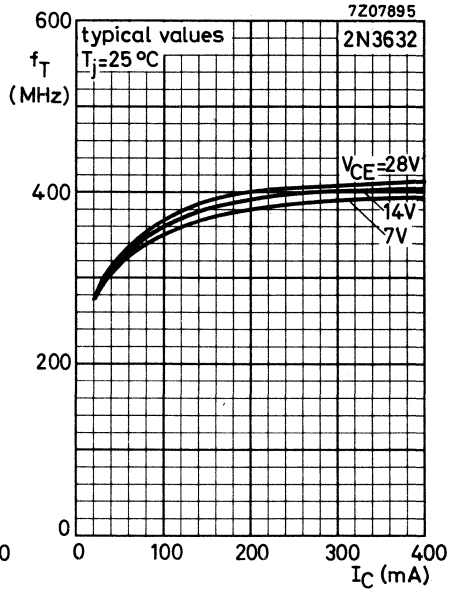
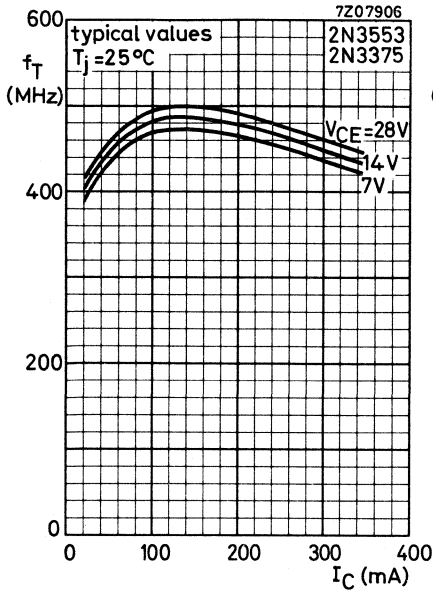


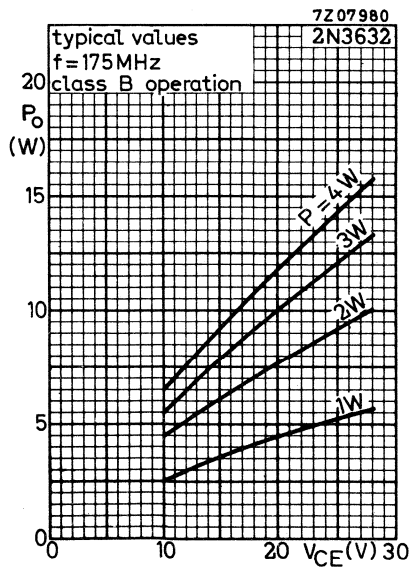
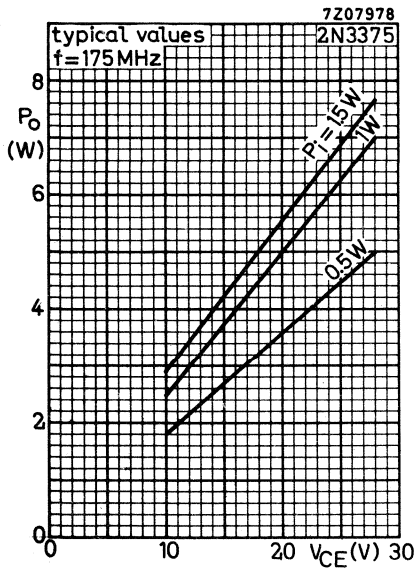
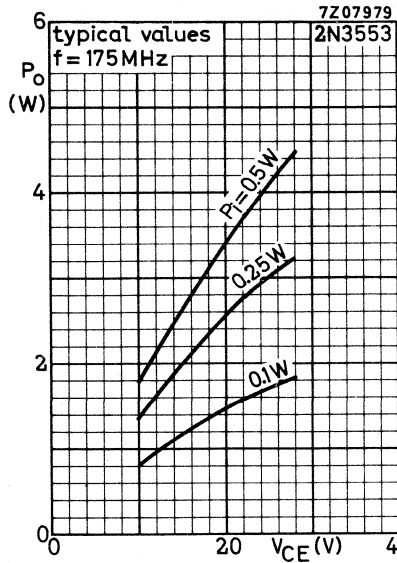
2N3375
2N3553
2N3632





2N3375
2N3553
2N3632





SILICON PLANAR EPITAXIAL OVERLAY TRANSISTORS

N-P-N overlay transistors in TO-39 metal envelopes with the collector connected to the case. The devices are primarily intended for class-A, B or C amplifiers, frequency multiplier and oscillator circuits. The transistors are suitable in output, driver or pre-driver stages in v.h.f. and u.h.f. equipment.

QUICK REFERENCE DATA

		2N3866	2N4427	
Collector-emitter voltage $R_{BE} = 10 \Omega$	V_{CER} max.	55	40	V
Collector-emitter voltage (open base)	V_{CEO} max.	30	20	V
Collector current (d.c. or averaged over any 20 ms period)	I_C max.	0,4	0,4	A
Total power dissipation up to $T_{mb} = 25 \text{ }^\circ\text{C}$	P_{tot} max.	5	3,5	W
Junction temperature	T_j max.	200	200	$^\circ\text{C}$
Transition frequency $I_C = 25 \text{ mA}; V_{CE} = 15 \text{ V}; f = 100 \text{ MHz}$	f_T typ.	700	—	MHz
$I_C = 25 \text{ mA}; V_{CE} = 10 \text{ V}; f = 100 \text{ MHz}$	f_T typ.	—	700	MHz

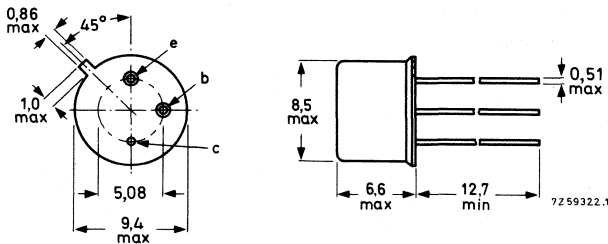
R.F. performance

type number	f (MHz)	V_{CE} (V)	P_o (W)	P_i (W)	η (%)
2N3866	400	28	1	< 0,1	> 45
2N4427	175	12	1	< 0,1	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56218 (package); 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages ¹⁾

		2N3866	2N4427
Collector-base voltage (open emitter)	V_{CBO} max.	55	40 V
Collector-emitter voltage $R_{BE} = 10 \Omega$	V_{CER} max.	55	40 V
Collector-emitter voltage (open base)	V_{CEO} max.	30	20 V
Emitter-base voltage (open collector)	V_{EBO} max.	3.5	2.0 V

Currents ¹⁾

Collector current (d.c. or averaged over any 20 ms period)	I_C max.	0.4	0.4 A
Collector current (peak value)	I_{CM} max.	0.4	0.4 A

Power dissipation ¹⁾

Total power dissipation up to $T_{mb} = 25 \text{ }^\circ\text{C}$	P_{tot} max.	5	3.5 W
--	----------------	---	-------

Temperatures

Storage temperature	T_{stg}	-65 to +200	$^\circ\text{C}$
Junction temperature	T_j	max. 200	$^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th j-a}$	=	200 $^\circ\text{C/W}$
From junction to mounting base	$R_{th j-mb}$	=	35 $^\circ\text{C/W}$
From mounting base to heatsink mounted with top clamping washer of 56218	$R_{th mb-h}$	=	1.0 $^\circ\text{C/W}$
top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th mb-h}$	=	2.5 $^\circ\text{C/W}$

¹⁾ See also areas of permissible operation on page 6 .

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_B = 0; V_{CE} = 28\text{ V}$

$I_{CEO} < 20\text{ }\mu\text{A}$

$I_B = 0; V_{CE} = 12\text{ V}$

$I_{CEO} < 20\text{ }\mu\text{A}$

Breakdown voltages

$I_E = 0; I_C = 100\text{ }\mu\text{A}$

$V_{(BR)CBO} > 55\text{ V}$

$I_C = 5\text{ mA}; R_{BE} = 10\text{ }\Omega$

$V_{(BR)CER} > 55\text{ V}$

$I_B = 0; I_C = 5\text{ mA}$

$V_{(BR)CEO} > 30\text{ V}$

$I_C = 0; I_E = 100\text{ }\mu\text{A}$

$V_{(BR)EBO} > 3.5\text{ V}$

Collector-emitter saturation voltage

$I_C = 100\text{ mA}; I_B = 20\text{ mA}$

$V_{CEsat} < 1.0\text{ V}$

D.C. current gain

$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE} 10\text{ to }200$

$I_C = 100\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE} 10\text{ to }200$

$I_C = 360\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE} > 5$

Transition frequency

$I_C = 25\text{ mA}; V_{CE} = 15\text{ V}; f = 100\text{ MHz}$

$f_T \text{ typ. } 700\text{ MHz}$

$I_C = 25\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$

$f_T \text{ typ. } 700\text{ MHz}$

Collector capacitance

$V_{CB} = 28\text{ V}; I_E = I_e = 0; f = 1\text{ MHz}$

$C_c < 3\text{ pF}$

$V_{CB} = 12\text{ V}; I_E = I_e = 0; f = 1\text{ MHz}$

$C_c < 4\text{ pF}$

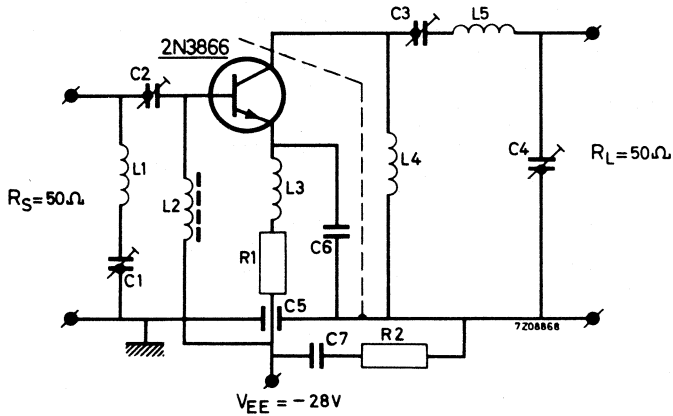
R.F. performance at $T_{mb} = 25\text{ }^\circ\text{C}$

	f (MHz)	V_{CE} (V)	P_o (W)	P_i (W)	I_C (mA)	η (%)	Test circuit on page
2N3866	100	28	1.8	0.05	< 107	> 60	
2N3866	250	28	1.5	0.1	< 107	> 50	
2N3866	400	28	1.0	< 0.1	< 79	> 45	4 *
2N4427	175	12	1.0	< 0.1	< 167	> 50	5 *
2N4427	470	12	0.4	0.1	67	50	

*) The transistor can withstand an output V.S.W.R. of 3:1 varied through all phases for conditions, mentioned in the table above.

CHARACTERISTICS (continued)

Test circuit with the 2N3866 at $f = 400$ MHz



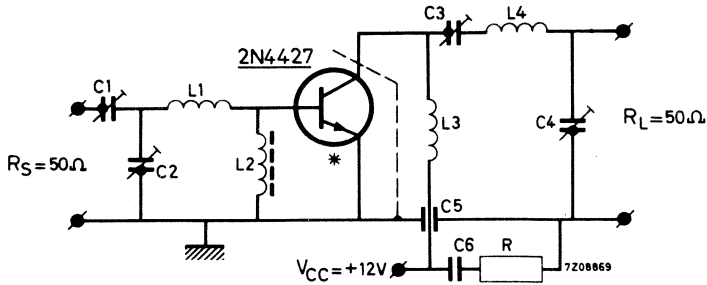
- C1 = C2 = C3 = 4 to 29 pF air trimmer
- C4 = 4 to 14 pF air trimmer
- C5 = 1 nF feed through
- C6 = 12 pF
- C7 = 12 nF

- R1 = 5.6 Ω
- R2 = 10 Ω

- L1 = 2 turns Cu wire (1 mm); int. diam. 6 mm; winding pitch 3 mm
- L2 = Ferroxcube choke coil; Z (at $f = 250$ MHz) = 450 Ω (code number 4312 020 36690)
- L3 = L4 = 6 turns enamelled Cu wire (0.5 mm); int. diam. 3.5 mm (100 nH)
- L5 = 2 turns Cu wire (1 mm); int. diam. 7 mm; winding pitch 2.5 mm; leads 2x15 mm.

CHARACTERISTICS (continued)

Test circuit with the 2N4427 at $f = 175 \text{ MHz}$

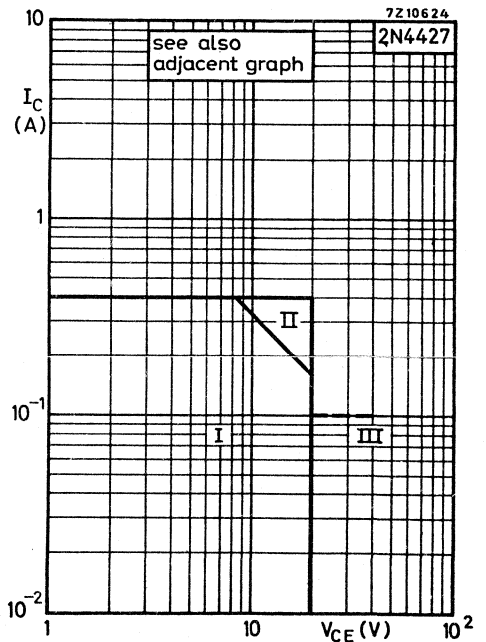
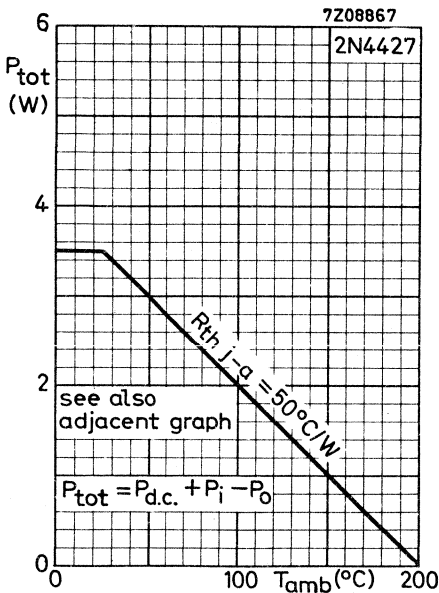
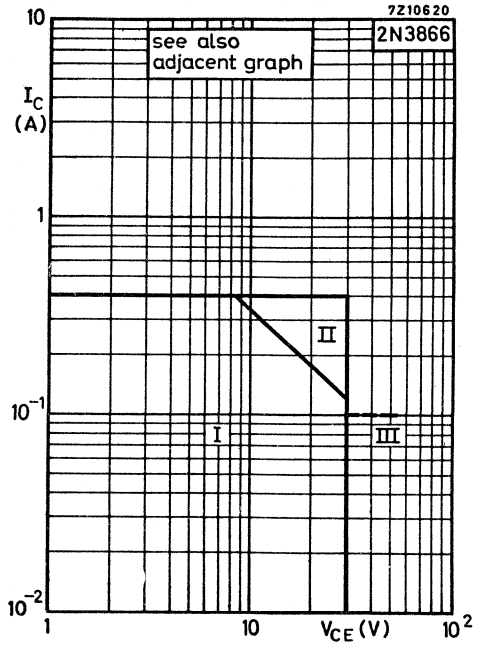
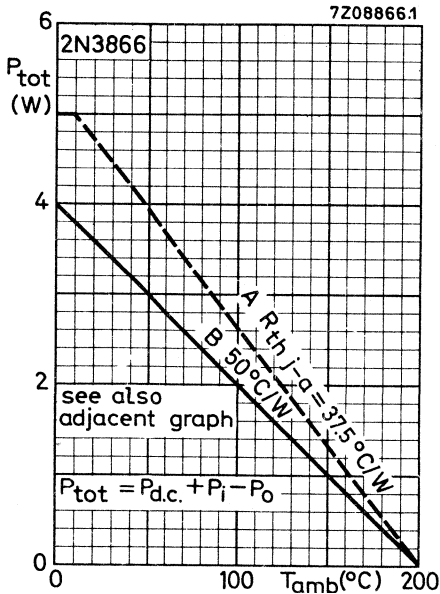


*) The length of the external emitter wire is 1.6 mm

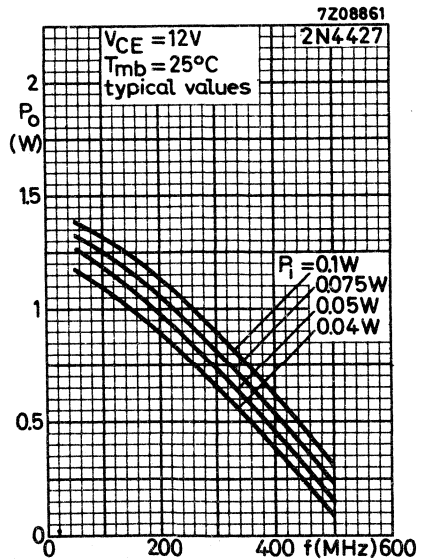
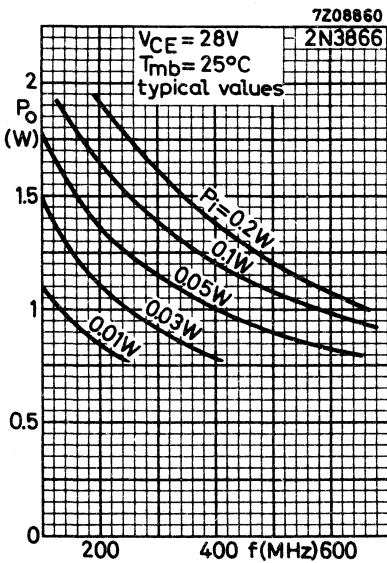
- | | | |
|---------------------|-------------|--------------|
| C1 = C2 = C3 = C4 = | 4 to 29 pF | air trimmer |
| C5 = | 1 nF | feed through |
| C6 = | 12 nF | |
| R = | 10 Ω | |

- L1 = 2 turns Cu wire (1 mm); int. diam. 6 mm; winding pitch 2 mm; leads 2x10 mm
 L2 = Ferroxcube choke coil; Z (at $f = 175 \text{ MHz}$) = 550 Ω (code number 4312 020 **36640**)
 L3 = 2 turns Cu wire (1 mm); int. diam. 5 mm; winding pitch 2 mm; leads 2x10 mm
 L4 = 3 turns Cu wire (1.5 mm); int. diam. 10 mm; winding pitch 2 mm; leads 2x15 mm

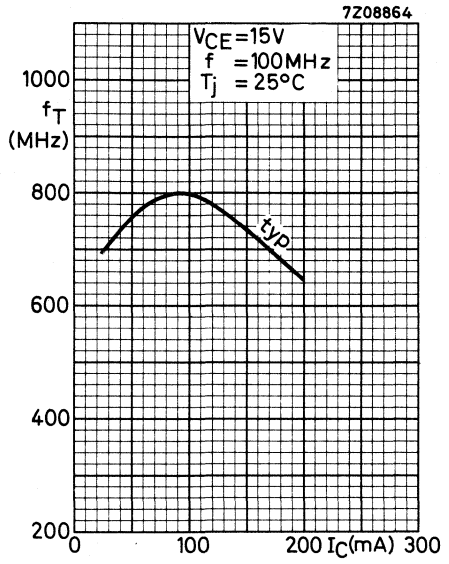
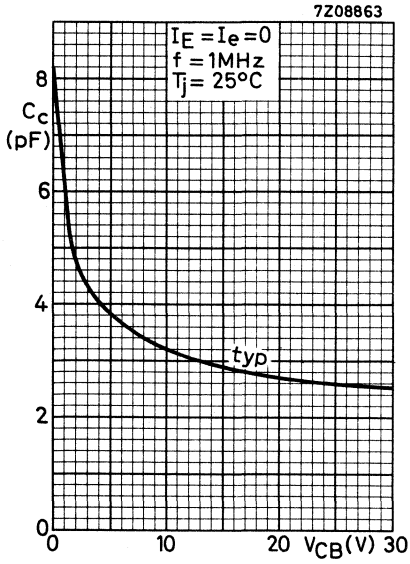
2N3866
2N4427



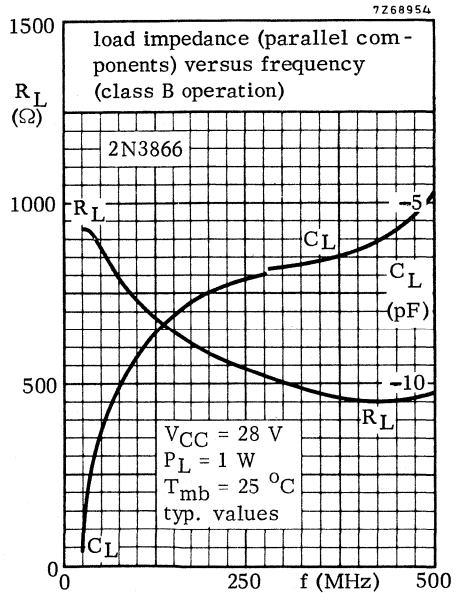
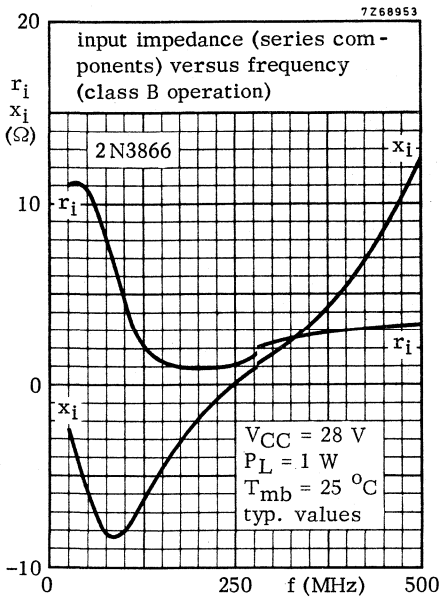
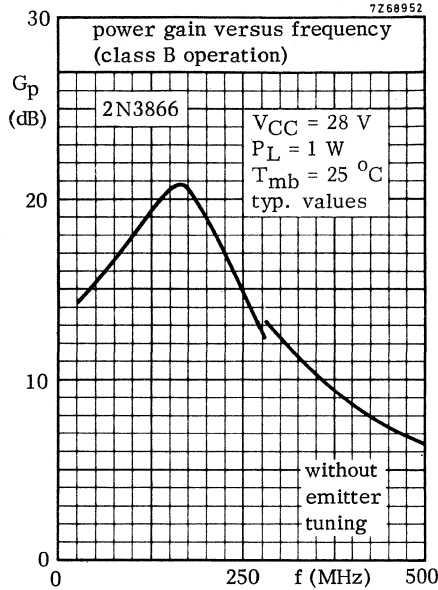
- I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.
- II Additional region of operation at $f \geq 1$ MHz.
Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias in class A, B or C.
- III Operating during switching off in this region is allowed, provided the transistor is cut-off with $-V_{BE} \leq 1.5$ V and $R_{BE} \geq 33 \Omega$, $I_C \leq 100$ mA and the transient energy does not exceed 0.125 mWs.



2N3866
2N4427

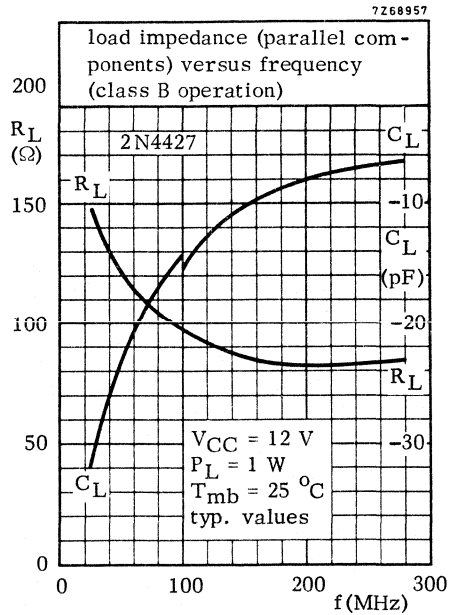
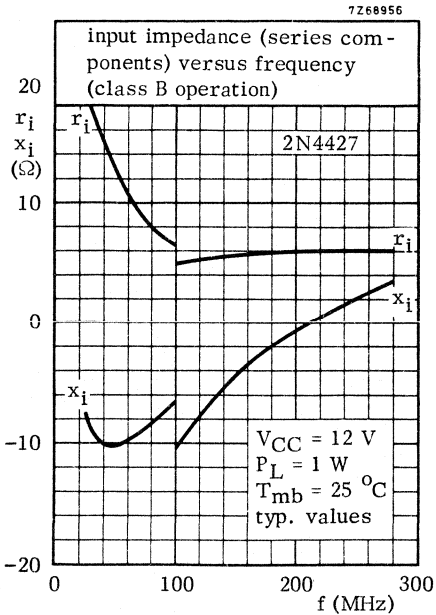
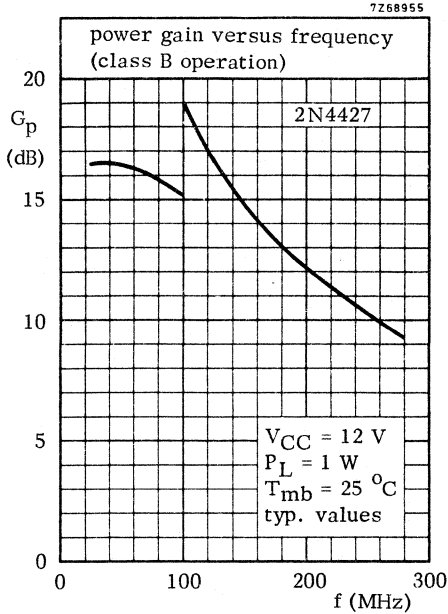


OPERATING NOTE Below 280 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



2N3866
2N4427

OPERATING NOTE Below 100 MHz a base-emitter resistor of $22\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.



SILICON PLANAR EPITAXIAL OVERLAY TRANSISTORS

The **2N3924** is an n-p-n overlay transistor in a TO-39 metal envelope with the collector connected to the case. The **2N3926** and the **2N3927** are n-p-n overlay transistors in TO-60 metal envelopes with the emitter connected to the case. The transistors are intended for v.h.f. transmitting applications.

QUICK REFERENCE DATA

			2N3924	2N3926	2N3927	
Collector-emitter voltage $-V_{BE} = 1,5 \text{ V}$	V_{CEX}	max.	36	36	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	18	18	V
Collector current (peak value)	I_{CM}	max.	1,5	3,0	4,5	A
Total power dissipation up to $T_{mb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	7	11,6	23	W
Junction temperature	T_j	max.	200	200	200	$^\circ\text{C}$
Transition frequency	f_T	$>$	250	250	—	MHz
$I_C = 100 \text{ mA}; V_{CE} = 13,5 \text{ V}$	f_T	$>$	—	—	200	MHz
$I_C = 200 \text{ mA}; V_{CE} = 13,5 \text{ V}$						

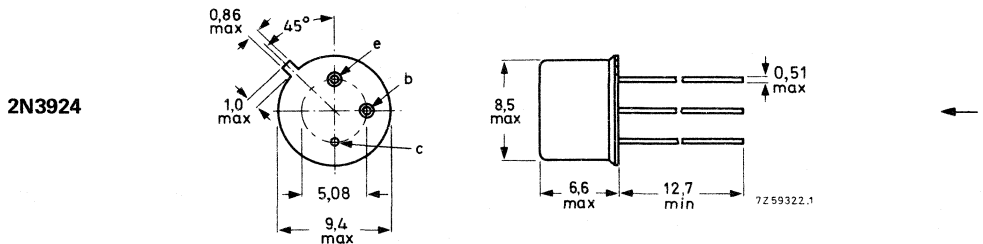
R.F. performance at $V_{CE} = 13,5 \text{ V}; f = 175 \text{ MHz}$

type number	P_O (W)	P_i (W)	η (%)
2N3924	4	< 1	> 70
2N3926	7	< 2	> 70
2N3927	12	< 4	> 80

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56218 (package); 56245 (distance disc).

2N3924
2N3926
2N3927

MECHANICAL DATA (continued)

Dimensions in mm

2N3926
2N3927

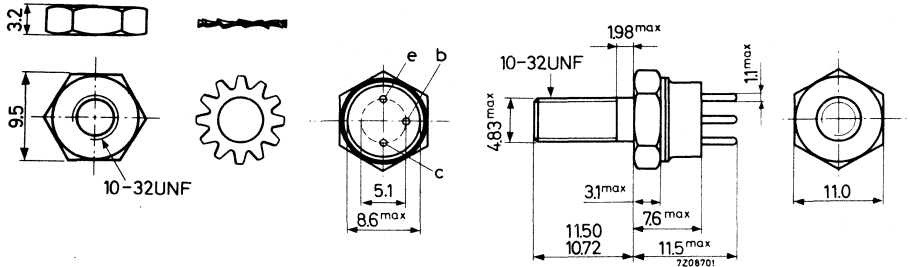
TO-60

The emitter connected to the case
The top pins should not be bent

Diameter of hole in heatsink: 4.8 to 5.2 mm

The device is supplied with nut and lock washer

Torque on nut: min. 8 cm kg
max. 17 cm kg



RATINGS (Limiting values) ¹⁾

Voltages ²⁾

Collector-base voltage (open emitter)

V_{CBO} max. 36 V

Collector-emitter voltage

I_C up to 400 mA; $-V_{BE} = 1.5$ V

V_{CEX} max. 36 V

Collector-emitter voltage (open base)

I_C up to 400 mA

V_{CEO} max. 18 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Currents ²⁾

Collector current (d.c.)

	2N3924	2N3926	2N3927
I_C max.	0.5	1.0	1.5 A
I_{CM} max.	1.5	3.0	4.5 A
P_{tot} max.	7	11.6	23 W

Collector current (peak value)

Power dissipation ²⁾

Total power dissipation

up to $T_{mb} = 25$ °C

Temperatures

Storage temperature

T_{stg} -65 to +200 °C

Junction temperature

T_j max. 200 °C

¹⁾ Limiting values according to the Absolute Maximum System as defined in IEC publication 134.

²⁾ See also areas of permissible operation at pages 8 and 9.

THERMAL RESISTANCE

		2N3924	2N3926	2N3927
From junction to mounting base	$R_{th\ j-mb}$	= 25	15	7.5 °C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6	0.6 °C/W
From mounting base to heatsink mounted with top clamping washer of 56218	$R_{th\ mb-h}$	= 1.0		°C/W
top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb-h}$	= 2.5		°C/W

CHARACTERISTICS

$T_j = 25\text{ °C}$ unless otherwise specified

Collector cut-off current

		2N3924	2N3926	2N3927
$I_E = 0; V_{CB} = 15\text{ V}$	I_{CBO}	< 100	100	250 μA
$I_E = 0; V_{CB} = 15\text{ V}; T_j = 150\text{ °C}$	I_{CBO}	< 5	5	10 mA

Breakdown voltages

$I_E = 0; I_C = 250\ \mu\text{A}$	$V_{(BR)CBO}$	> 36	36	36 V
I_C up to 400 mA	$V_{(BR)CEX}$	> 36	36	36 V
$-V_{BE} = 1.5\text{ V}; R_B = 33\ \Omega$ ¹⁾	$V_{(BR)CEO}$	> 18	18	18 V
$I_B = 0$				
$I_C = 0; I_E = 250\ \mu\text{A}$	$V_{(BR)EBO}$	> 4	4	4 V

Base-emitter voltage

$I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$	V_{BE}	< 1.5		V
$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$	V_{BE}	<	1.5	V
$I_C = 1000\text{ mA}; V_{CE} = 5\text{ V}$	V_{BE}	<		1.5 V

Saturation voltage

$I_C = 250\text{ mA}; I_B = 50\text{ mA}$	V_{CEsat}	< 0.75		V
$I_C = 500\text{ mA}; I_B = 100\text{ mA}$	V_{CEsat}	<	0.75	V
$I_C = 1000\text{ mA}; I_B = 200\text{ mA}$	V_{CEsat}	<		1.0 V

¹⁾ Pulsed through an inductor of 25 mH; $\delta = 0.5$; $f = 50\text{ Hz}$

CHARACTERISTICS (continued)

$T_j = 25^\circ\text{C}$ unless otherwise specified

D.C. current gain

			2N3924	2N3926	2N3927
$I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	$>$	10		
		$<$	150		
$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	$>$		5	
		$<$		150	
$I_C = 1000\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	$>$			5
		$<$			150

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 13.5\text{ V}$	C_c	$<$	20	20	45 pF
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Transition frequency

$I_C = 100\text{ mA}; V_{CE} = 13.5\text{ V}$	f_T	$>$	250	250	MHz
$I_C = 200\text{ mA}; V_{CE} = 13.5\text{ V}$	f_T	$>$			200 MHz

Real part of input impedance at $f = 200\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 13.5\text{ V}$	$\text{Re}(h_{ie})$	$<$	20	20	Ω
$I_C = 200\text{ mA}; V_{CE} = 13.5\text{ V}$	$\text{Re}(h_{ie})$	$<$			20 Ω

R.F. performance at $V_{CE} = 13.5\text{ V}; f = 175\text{ MHz}$

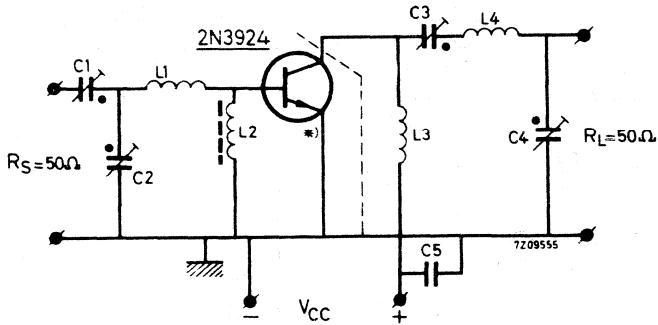
	P_o (W)	P_i (W)	I_C (mA)	η %	Test circuit at page
2N3924	4	< 1	< 420	> 70	5
2N3926	7	< 2	< 740	> 70	6
2N3927	12	< 4	< 1100	> 80	6

NOTE

The transistors can withstand an output V.S.W.R. of 3:1 varied through all phases under conditions mentioned in the table above.

CHARACTERISTICS (continued)

Test circuit with the 2N3924 at $f = 175 \text{ MHz}$



*) The length of the external emitter wire of the 2N3924 is 1.6 mm.

Components

$C1 = C2 = C3 = C4 = 4 \text{ to } 29 \text{ pF}$ air trimmer

$C5 = 10 \text{ nF}$ polyester

$L1 = 1 \text{ turn Cu wire (1.0 mm)}$; int. diam. 10 mm; leads 2 x 10 mm

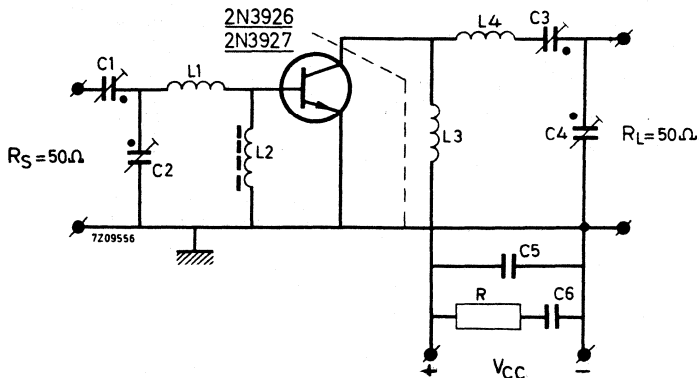
$L2 = \text{Ferroxcube choke coil. } Z \text{ (at } f = 175 \text{ MHz)} = 550 \Omega \pm 20\%$
(code number 4312 020 36640)

$L3 = 15 \text{ turns closely wound enamelled Cu wire (0.7 mm)}$; int. diam. 4 mm

$L4 = 3 \text{ turns closely wound enamelled Cu wire (1.5 mm)}$; int. diam. 12 mm; leads 2 x 20 mm

CHARACTERISTICS (continued)

Test circuit with the 2N3926 or 2N3927 at $f = 175 \text{ MHz}$



Components

$C_1 = C_2 = C_3 = C_4 = 4 \text{ to } 29 \text{ pF}$ air trimmer

$C_5 = 100 \text{ pF}$ ceramic

$C_6 = 10 \text{ nF}$ polyester

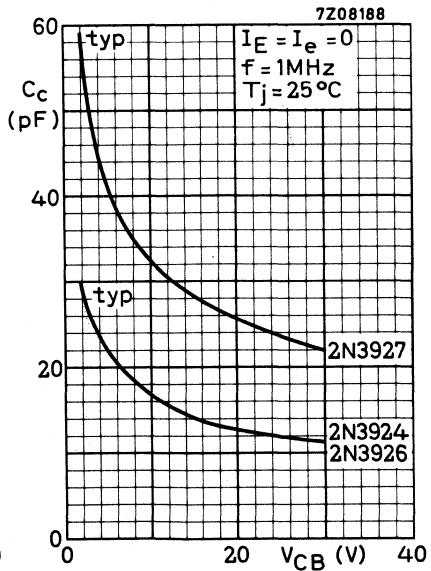
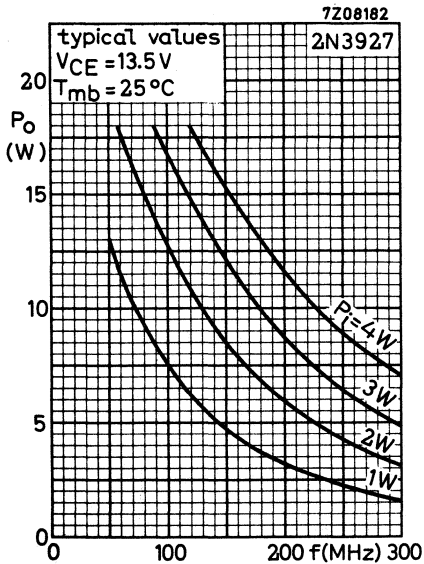
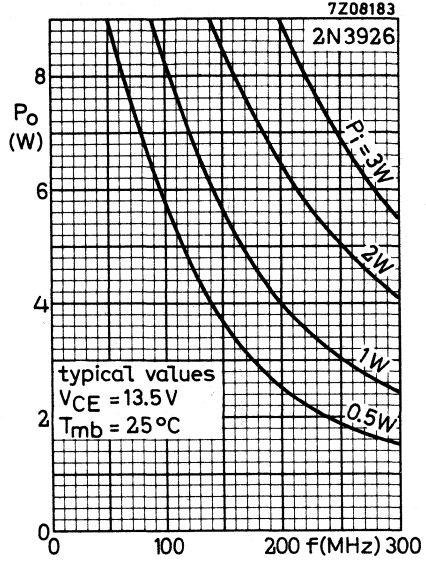
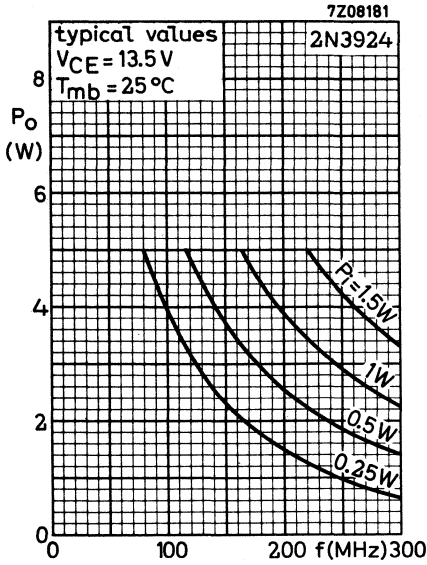
$L_1 = 1 \text{ turn Cu wire (1.0 mm); int. diam. } 10 \text{ mm; leads } 2 \times 10 \text{ mm}$

$L_2 = \text{Ferroxcube choke coil. } Z \text{ (at } f = 175 \text{ MHz)} = 550 \Omega \pm 20\%$
 (code number 4312 020 36640)

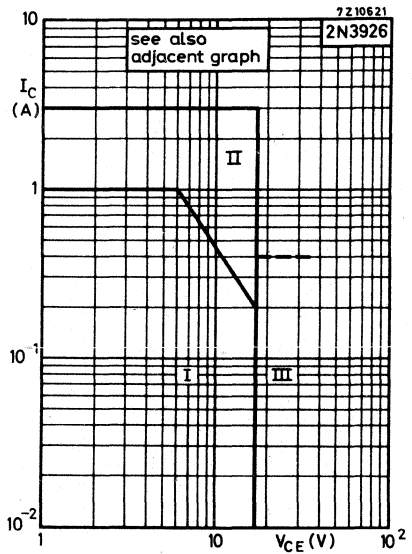
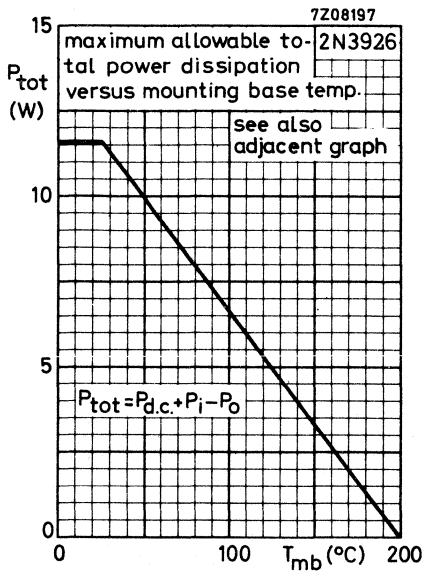
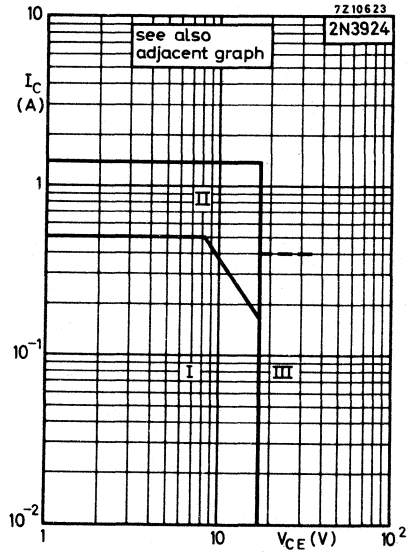
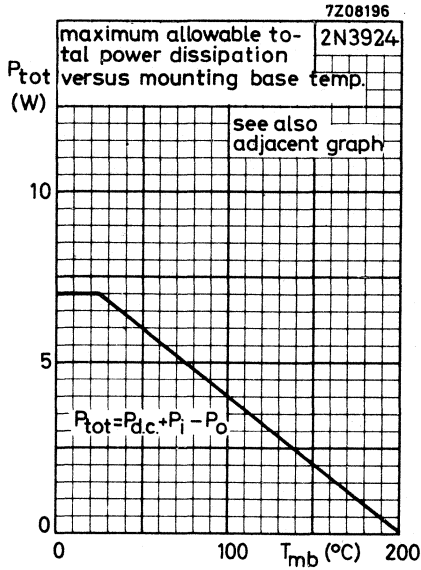
$L_3 = 15 \text{ turns closely wound enamelled Cu wire (0.7 mm); int. diam. } 4 \text{ mm}$

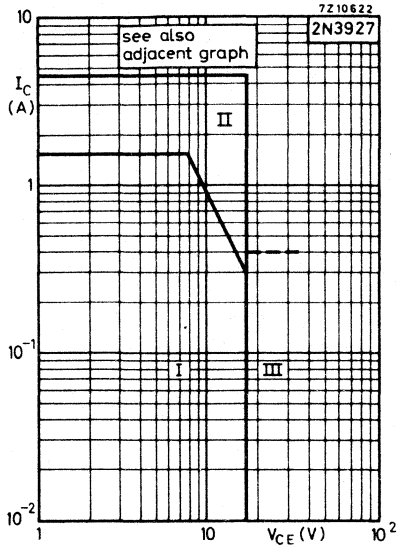
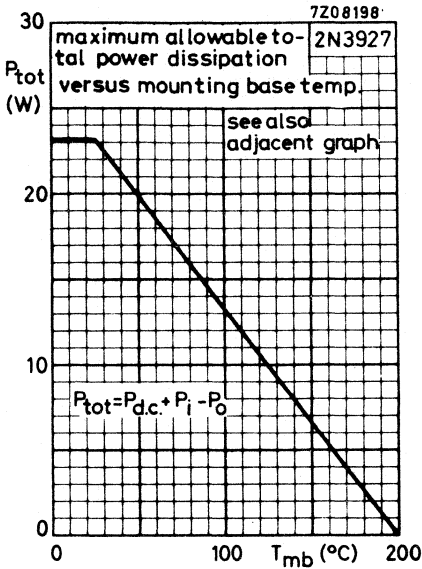
$L_4 = 2 \text{ turns closely wound enamelled Cu wire (1.5 mm); int. diam. } 8.5 \text{ mm; leads } 2 \times 20 \text{ mm}$

$R = 10 \Omega$ carbon



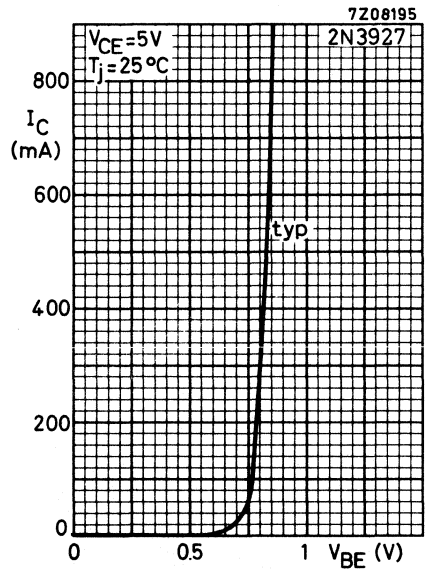
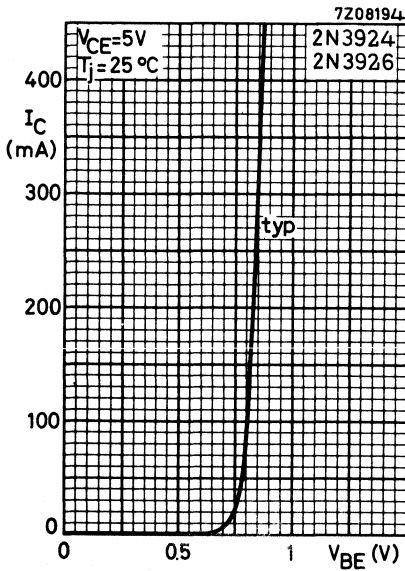
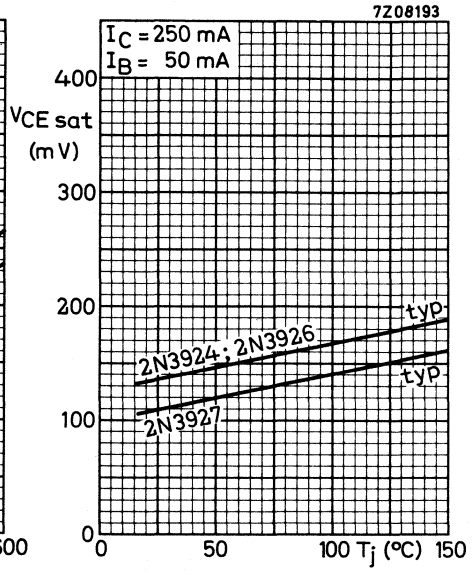
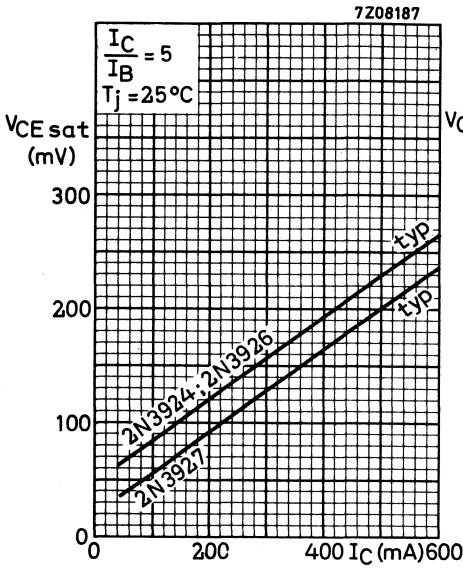
2N3924
2N3926
2N3927

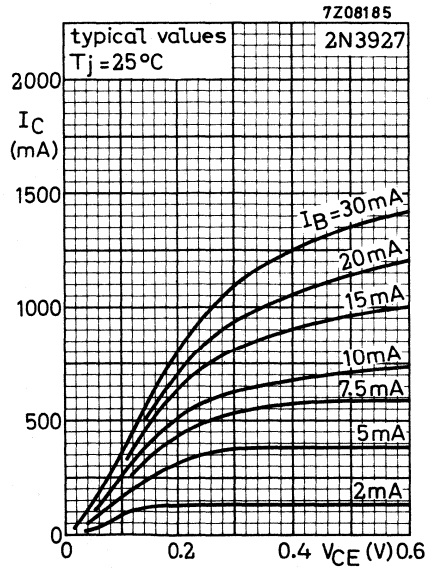
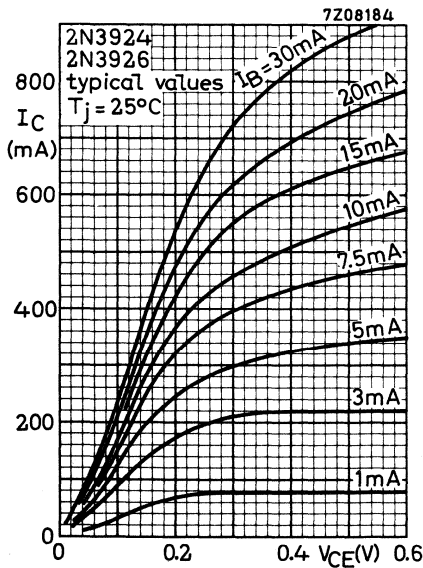
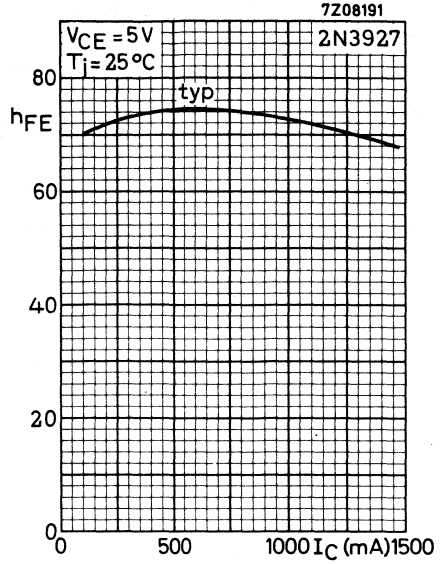
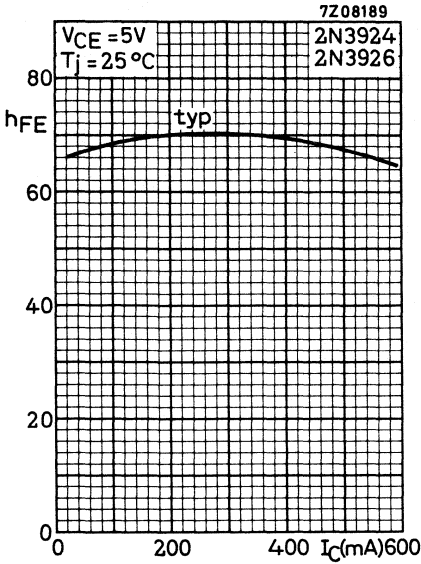




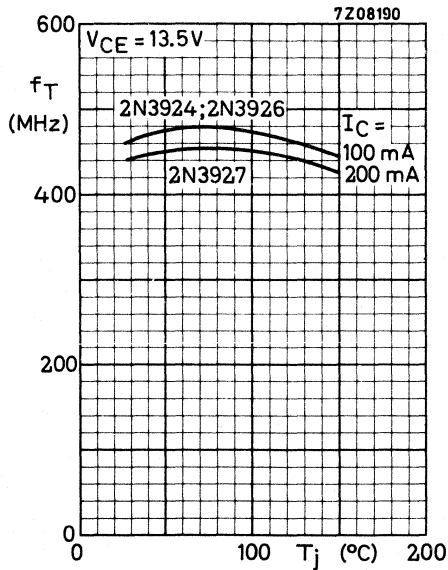
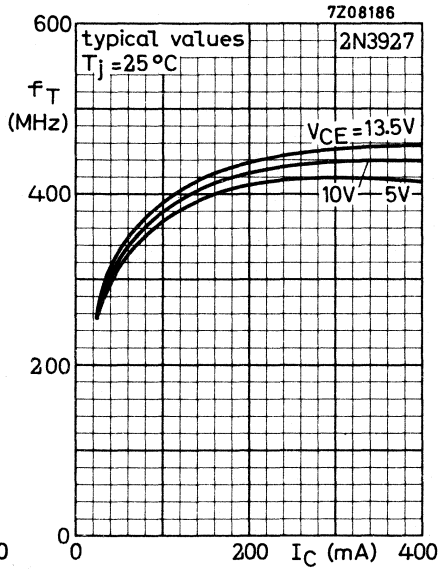
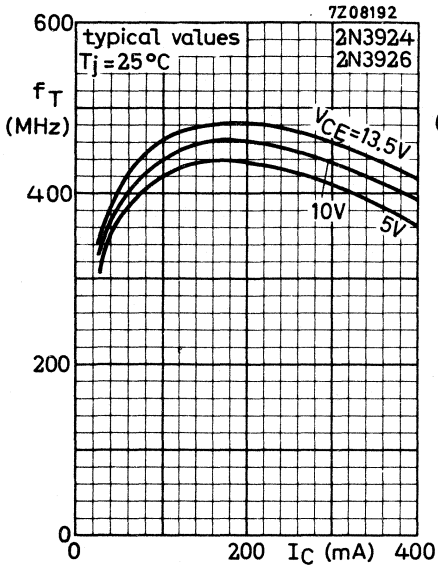
- I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.
- II Additional region of operation at $f \geq 1$ MHz.
Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias in class A, B or C.
- III Operating during switching off in this region is allowed, provided the transistor is cut-off with $-V_{BB} \leq 1.5$ V and $R_{BE} \geq 33 \Omega$, $I_C \leq 400$ mA and the transient energy does not exceed 2 mWs.

2N3924
2N3926
2N3927





2N3924
2N3926
2N3927



SILICON EPITAXIAL PLANAR OVERLAY TRANSISTOR

For data of this transistor please refer to type 2N3866



ACCESSORIES



General note on flat heatsinks

All information on thermal resistances of the accessories combined with flat heatsinks is valid for *square* heatsinks of *1,5 mm blackened aluminium*.

For a few variations the thermal resistance may be derived as follows:

- Rectangular heatsinks (sides a and $2a$)
 - When mounted with long side horizontal, multiply by 0,95.
 - When mounted with short side horizontal, multiply by 1,10.
- Unblackened or thinner heatsinks
 - Multiply by the factor given in Fig. 1 as a function of the heatsink size A .

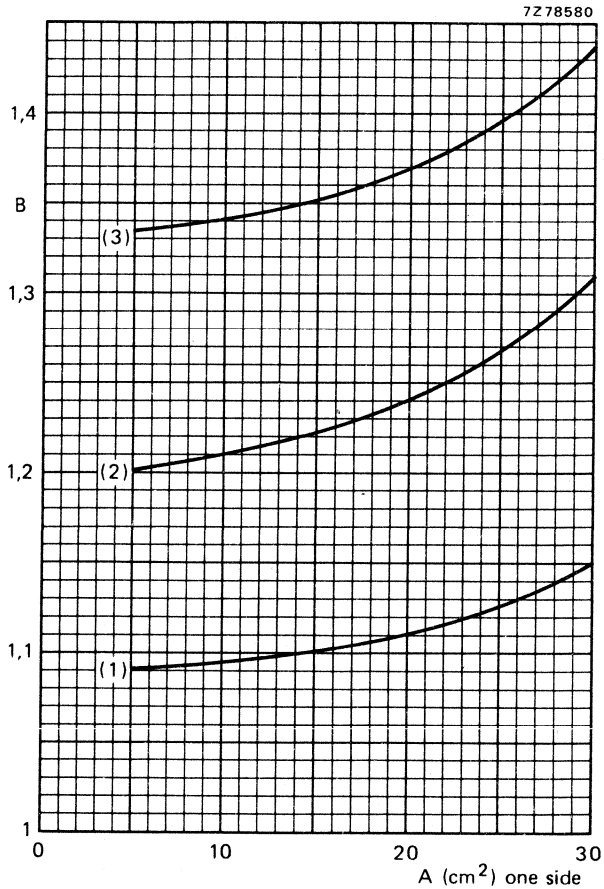


Fig. 1 Multiplication factor (B) as a function of heatsink area (A).

- (1) 1 mm blackened aluminium.
- (2) 1,5 mm unblackened aluminium.
- (3) 1 mm unblackened aluminium.

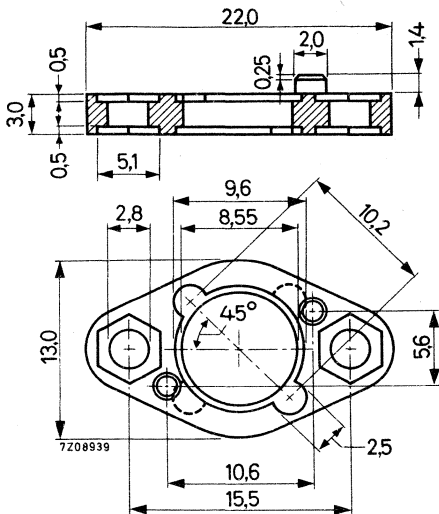
MOUNTING ACCESSORIES

Mounting accessories for TO-5 and TO-39 envelopes; the package consists of:

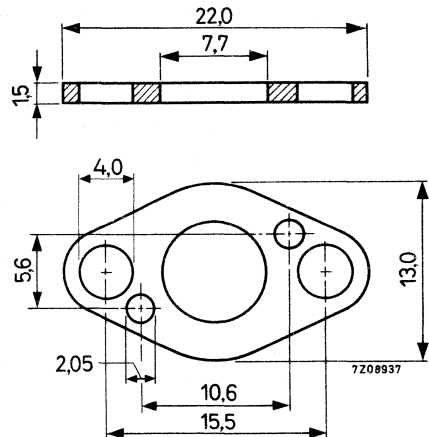
- 1 top clamping piece
- 1 bottom clamping piece
- 1 mylar insulator

MECHANICAL DATA

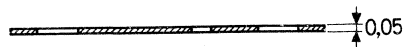
Dimensions in mm



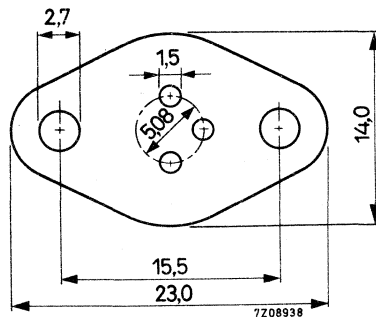
Top clamping piece of insulating material.



Bottom clamping piece; material: brass, tin plated.



Mylar insulator.



56218
56245

56218

TEMPERATURE

Maximum permissible temperature

T_{max} = 100 °C

THERMAL RESISTANCE

From mounting base to heatsink

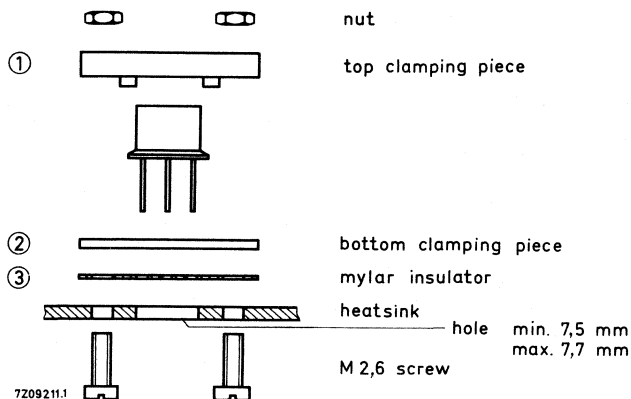
direct mounting

insulated mounting

$R_{th\ mb-h}$ = 3 °C/W
 $R_{th\ mb-h}$ = 6 °C/W

MOUNTING INSTRUCTIONS

Insulated mounting



Direct mounting: without items 2 and 3; item 1 to be mounted upside-down.

56245

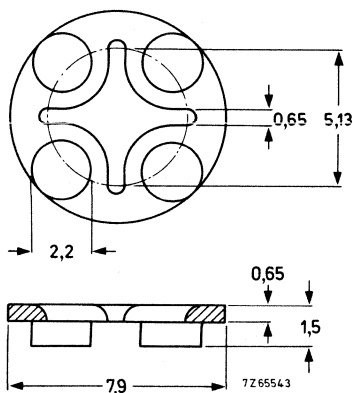
DISTANCE DISC

MECHANICAL DATA

TO-5 or TO-39

Dimensions in mm

Insulating material.





INDEX

GENERAL

TRANSMITTING TRANSISTORS AND MODULES

ACCESSORIES

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