

Semiconductors

Book 6

1986

R.F. power transistors and modules

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R.F. POWER TRANSISTORS AND MODULES

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DATA HANDBOOK SYSTEM

Our Data Handbook System comprises more than 60 books with specifications on electronic components, subassemblies and materials. It is made up of four series of handbooks:

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

The contents of each series are listed on pages iv to vii.

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

When ratings or specifications differ from those published in the preceding edition they are indicated with arrows in the page margin. Where application information is given it is advisory and does not form part of the product specification.

Condensed data on the preferred products of Philips Electronic Components and Materials Division is given in our Preferred Type Range catalogue (issued annually).

Information on current Data Handbooks and on how to obtain a subscription for future issues is available from any of the Organizations listed on the back cover.

Product specialists are at your service and enquiries will be answered promptly.

ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks comprises:

- T1** **Tubes for r.f. heating**
- T2a** **Transmitting tubes for communications, glass types**
- T2b** **Transmitting tubes for communications, ceramic types**
- T3** **Klystrons**
- T4** **Magnetrons for microwave heating**
- T5** **Cathode-ray tubes**
Instrument tubes, monitor and display tubes, C.R. tubes for special applications
- T6** **Geiger-Müller tubes**
- T8** **Colour display systems**
Colour TV picture tubes, colour data graphic display tube assemblies, deflection units
- T9** **Photo and electron multipliers**
- T10** **Plumbicon camera tubes and accessories**
- T11** **Microwave semiconductors and components**
- T12** **Vidicon and Newvicon camera tubes**
- T13** **Image intensifiers and infrared detectors**
- T15** **Dry reed switches**
- T16** **Monochrome tubes and deflection units**
Black and white TV picture tubes, monochrome data graphic display tubes, deflection units

SEMICONDUCTORS (RED SERIES)

The red series of data handbooks comprises:

- S1 Diodes**
Small-signal silicon diodes, voltage regulator diodes (< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes
- S2a Power diodes**
- S2b Thyristors and triacs**
- S3 Small-signal transistors**
- S4a Low-frequency power transistors and hybrid modules**
- S4b High-voltage and switching power transistors**
- S5 Field-effect transistors**
- S6 R.F. power transistors and modules**
- S7 Surface mounted semiconductors**
- S8a Light-emitting diodes**
- S8b Devices for optoelectronics**
Optocouplers, photosensitive diodes and transistors, infrared light-emitting diodes and infrared sensitive devices, laser and fibre-optic components
- S9 Power MOS transistors**
- S10 Wideband transistors and wideband hybrid IC modules**
- S11 Microwave transistors**
- S12 Surface acoustic wave devices**
- S13 Semiconductor sensors**
- *S14 Liquid Crystal Displays**

*To be issued shortly.

INTEGRATED CIRCUITS (PURPLE SERIES)

The NEW SERIES of handbooks is now completed. With effect from the publication date of this handbook the "N" in the handbook code number will be deleted. Handbooks to be replaced during 1986 are shown below.

The purple series of handbooks comprises:

IC01	Radio, audio and associated systems Bipolar, MOS	new issue 1986 IC01N 1985
IC02a/b	Video and associated systems Bipolar, MOS	new issue 1986 IC02Na/b 1985
IC03	Integrated circuits for telephony Bipolar, MOS	new issue 1986 IC03N 1985
IC04	HE4000B logic family CMOS	new issue 1986 IC4 1983
IC05N	HE4000B logic family – uncased ICs CMOS	published 1984
IC06N	High-speed CMOS: PC74HC/HCT/HCU Logic family	published 1986
IC08	ECL 10K and 100K logic families	New issue 1986 IC08N 1984
IC09N	TTL logic series	published 1986
IC10	Memories MOS, TTL, ECL	new issue 1986 IC7 1982
IC11N	Linear LSI	published 1985
Supplement to IC11N	Linear LSI	published 1986
IC12	I²C-bus compatible ICs	not yet issued
IC13	Semi-custom Programmable Logic Devices (PLD)	new issue 1986 IC13N 1985
IC14N	Microprocessors, microcontrollers and peripherals Bipolar, MOS	published 1985
IC15	FAST TTL logic series	new issue 1986 IC15N 1985
IC16	CMOS integrated circuits for clocks and watches	first issue 1986
IC17	Integrated Services Digital Networks (ISDN)	not yet issued
IC18	Microprocessors and peripherals	new issue 1986*

* The Microprocessors were included in handbook IC14N 1985, so IC18 will replace that part of IC14N.

COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks comprises:

- C2** Television tuners, coaxial aerial input assemblies, surface acoustic wave filters
- C3** Loudspeakers
- C4** Ferroxcube potcores, square cores and cross cores
- C5** Ferroxcube for power, audio/video and accelerators
- C6** Synchronous motors and gearboxes
- C7** Variable capacitors
- C8** Variable mains transformers
- C9** Piezoelectric quartz devices
- C11** Varistors, thermistors and sensors
- C12** Potentiometers, encoders and switches
- C13** Fixed resistors
- C14** Electrolytic and solid capacitors
- C15** Ceramic capacitors
- C16** Permanent magnet materials
- C17** Stepping motors and associated electronics
- C18** Direct current motors
- C19** Piezoelectric ceramics
- C20** Wire-wound components for TVs and monitors
- C22** Film capacitors

SELECTION GUIDE
TYPE NUMBER SURVEY
LINE-UPS

SELECTION GUIDE

The following tables present our complete range of transmitting transistors and modules, grouped according to main r.f. power application area. The data in each table is further grouped according to voltage and (within each voltage group) arranged in order of increasing power.

P_L (P.E.P.) W	V_{CE} V	G_p dB	envelope	type number	page
10	13,5	18	SOT-48/2	BLY88A	983
10	13,5	18	SOT-120	BLY88C	991
10	13,5	18	SOT-123	BLV11	263
15	13,5	18	SOT-56	BLY89A	999
15	13,5	18	SOT-120	BLY89C	1009
15	13,5	18	SOT-123	BLW87	703
30	12,5	18	SOT-56	BLW60	559
30	12,5	18	SOT-120	BLW60C	573
30	12,5	18	SOT-123	BLW85	669
80	12,5	12,5	SOT-121	BLW99	767
10	28	20	SOT-48/2	BLY92A	1041
10	28	20	SOT-120	BLY92C	1049
10	28	20	SOT-123	BLV21	279
25	28	18	SOT-56	BLX13	773
25	28	18	SOT-120	BLX13C	785
25	28	18	SOT-123	BLW83	651
40	28	17	SOT-120	BLX39	825
45	28	17	SOT-123	BLW86	681
50	28	13	SOT-55	BLX14	795
80	28	13	SOT-121	BLW76	585
100	28	19	SOT-121	BLW78	613
130	28	12	SOT-121	BLW77	599
175	28	11,5	SOT-121	BLW97	749
50	50	18	SOT-123	BLW50F	549
150	50	14	SOT-55	BLX15	809
160	50	14	SOT-121	BLW95	727
200	50	13,5	SOT-121	BLW96	737

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

SELECTION GUIDE

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

P_L (P.E.P.) W	V_{CE} V	G_p dB	envelope	type number	page
1	12	18	SOT-48/2	BLY87A	967
1	12	18	SOT-120	BLY87C	975
1	12	18	SOT-123	BLV10	255
2	12	18	SOT-48/2	BLY88A	983
2	12	18	SOT-120	BLY88C	991
2	12	18	SOT-123	BLV11	263
6	12	18	SOT-56	BLY89A	999
6	12	18	SOT-120	BLY89C	1009
6	12	18	SOT-123	BLW87	695
1,3	26	20	SOT-48/2	BLY91A	1025
1,3	26	20	SOT-120	BLY91C	1033
1,3	26	20	SOT-123	BLV20	271
2,5	26	20	SOT-48/2	BLY92A	1041
2,5	26	20	SOT-120	BLY92C	1049
2,5	26	20	SOT-123	BLV21	279
8	26	18	SOT-56	BLX13	773
8	26	20	SOT-120	BLX13C	785
10	26	20	SOT-123	BLW83	651
15	26	18	SOT-120	BLX39	825
17	26	20	SOT-123	BLW86	681
30	26	18	SOT-121	BLW78	613
16	45	19,5	SOT-123	BLW50F	549
50	40	19	SOT-121	BLW96	737

SELECTION GUIDE

	P_L W	V_{CE} V	f MHz	Gp dB	envelope	type number	page
v.h.f. base stations; class-B operation	1	28	175	15	TO-39/1	2N3866	1097
	4	28	175	10	TO-39/1	BFS23A	67
	8	28	175	12	SOT-48/2	BLY91A	1025
	8	28	175	12	SOT-120	BLY91C	1033
	8	28	175	12	SOT-123	BLV20	271
	15	28	175	10	SOT-48/2	BLY92A	1041
	15	28	175	10	SOT-120	BLY92C	1049
	15	28	175	10	SOT-123	BLV21	279
	25	28	175	9	SOT-56	BLY93A	1057
	25	28	175	9	SOT-120	BLY93C	1065
	25	28	175	9	SOT-123	BLW84	661
	45	28	175	7,5	SOT-120	BLX39	825
	45	28	175	7,5	SOT-123	BLW86	681
	50	28	175	7	SOT-55	BLY94	1073
	80	28	175	6,5	SOT-121	BLV80/28	407
	80	28	108	8	SOT-121	BLW76	585
	100	28	150	6	SOT-121	BLW78	613
	130	28	87,5	7,5	SOT-121	BLW77	599
	150	50	108	7,5	SOT-55	BLX15	809
	160	50	108	7	SOT-121	BLW95	727
200	50	108	6,5	SOT-121	BLW96	737	
v.h.f. mobile transmitters; class-B operation	1	12	175	10	TO-39/1	2N4427	1097
	2	13,5	175	11	TO-39/1	BFQ42	41
	4	13,5	175	8	TO-39/1	BFS22A	59
	4	13,5	175	12	TO-39/3	BFQ43	51
	4	13,5	175	12	TO-39/3	BFQ43S	51
	8	13,5	175	9	SOT-48/2	BLY87A	967
	8	13,5	175	12	SOT-120	BLY87C	975
	8	13,5	175	9	SOT-123	BLV10	255
	15	13,5	175	10	SOT-120	BLW29	503
	15	13,5	175	7,5	SOT-48/2	BLY88A	983
	15	13,5	175	7,5	SOT-120	BLY88C	991
	15	13,5	175	7,5	SOT-123	BLV11	263
	25	13,5	175	6	SOT-56	BLY89A	999
	25	13,5	175	6	SOT-120	BLY89C	1009
	25	13,5	175	6	SOT-123	BLW87	695
	28	13,5	175	9	SOT-120	BLW31	511
	45	12,5	175	6,5	SOT-119	BLV45/12	365
	45	12,5	175	5	SOT-56	BLW60	559
	45	12,5	175	5	SOT-120	BLW60C	573
	45	12,5	175	4,5	SOT-123	BLW85	669
50	12,5	175	5	SOT-55	BLY90	1017	
75	12,5	175	6,5	SOT-119	BLV75/12	397	

SELECTION GUIDE

v.h.f. modules for mobile transmitters

P _L W	V _B V	f MHz	G _p dB	envelope	type number	page
2	9,5	68- 88	17,5	SOT-182	BGY93A	141
2	9,6	136-156	17,5	SOT-182	BGY93B	141
2	9,6	148-174	17,5	SOT-182	BGY93C	141
5	9,6	68- 88	21,5	SOT-182	BGY94A	143
5	9,6	132-156	21,5	SOT-182	BGY94B	143
5	9,6	148-174	21,5	SOT-182	BGY94C	143
13	12,5	148-174	19,4	SOT-132B	BGY43	109
18	12,5	68- 88	22,6	SOT-132B	BGY32	91
18	12,5	80-108	22,6	SOT-132B	BGY33	91
18	12,5	132-156	20,8	SOT-132B	BGY35	91
18	12,5	148-174	20,8	SOT-132B	BGY36	91
30	12,5	68- 88	20,0	SOT-183	BGY45A	117
30	12,5	148-174	20,0	SOT-183	BGY45B	121

u.h.f. modules for mobile transmitters

1,4	9,6	400-440	15,0	SOT-181	BGY46A	125
1,4	9,6	430-470	15,0	SOT-181	BGY46B	125
3,2	9,6	400-440	18,0	SOT-181	BGY47A	127
3,2	9,6	460-512	18,0	SOT-181	BGY47F	127
2,5	12,5	420-480	17,0	SOT-75A	BGY22A	75
2,5	13,5	380-512	17,0	SOT-75A	BGY22	75
2,5	7,5	825-845	21,0	SOT-200	BGY95A	147
2,5	7,5	890-915	21,0	SOT-200	BGY95B	147
2,5	9,6	825-845	21,0	SOT-200	BGY96A	149
2,5	9,6	890-915	21,0	SOT-200	BGY96B	149
5,0	9,6	400-440	21,5	SOT-182	BGY48A	129
5,0	9,6	430-470	21,5	SOT-182	BGY48B	129
5,0	9,6	460-512	21,5	SOT-182	BGY48C	129
7	13,5	380-480	4,5	SOT-75A	BGY23	83
7	12,5	420-480	4,5	SOT-75A	BGY23A	83
7,5	12,5	400-440	18,8	SOT-132C	BGY40A	101
7,5	12,5	400-470	18,8	SOT-132C	BGY40B	101
7,5	12,5	806-890	15,7	SOT-197	BGY90A	133
7,5	12,5	870-950	15,7	SOT-197	BGY90B	137
13	12,5	400-440	19,4	SOT-132C	BGY41A	101
13	12,5	440-470	19,4	SOT-132C	BGY41B	101

air communication class-B transmitters (225-400 MHz)

P _L W	V _{CE} V	f MHz	G _p dB	envelope	type number	page
30	28	400	10	SOT-161	BLU50	209
45	28	400	9	SOT-161	BLU51	211
60	28	400	8	SOT-161	BLU52	213
100	28	400	6	SOT-161	BLU53	215

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	P _L W	V _{CE} V	f MHz	G _p dB	envelope	type number	page
u.h.f. base stations class-B operation	1	28	470	7	TO-39/1	2N3866	1097
	1	28	470	11	SOT-48/3	BLX91A	887
	2	28	470	12	SOT-122	BLW89	703
	2,5	28	470	11	SOT-48/3	BLX92A	901
	4	28	470	11	SOT-122	BLW90	711
	7	28	470	8,5	SOT-48/3	BLX93A	911
	10	28	470	9	SOT-122	BLW91	719
	25	28	470	6	SOT-48	BLX94A	921
	25	28	470	6,5	SOT-122	BLX94C	921
	40	28	470	4,5	SOT-56	BLX95	931

	P _L W	V _{CE} V	f MHz	G _p dB	envelope	type number	page
u.h.f. mobile transmitters class-B operation	2	12,5	470	6	TO-39/1	BLX65	839
	2	12,5	470	9	TO-39/3	BLX65E	851
	2	12,5	470	9	SOT-122	BLW79	627
	2,5	12,5	470	8,5	SOT-48/3	BLX67	855
	4	12,5	470	8	SOT-122	BLW80	635
	5	12,5	470	10,5	SOT-122	BLU99	243
	7	12,5	470	8,5	SOT-122	BLU97	227
	7	12,5	470	5	SOT-48/3	BLX68	867
	10	12,5	470	6	SOT-122	BLW81	643
	20	12,5	470	6,5	SOT-119	BLU20/12	185
	20	13,5	470	4	SOT-48/2	BLX69A	879
	30	12,5	470	5,7	SOT-119	BLU30/12	193
	45	12,5	470	4,8	SOT-119	BLU45/12	201
	60	12,5	470	4,4	SOT-119	BLU60/12	219

	P _L W	V _{CE} V	f MHz	G _p dB	envelope	type number	page
900 MHz base stations class-B operation	2	24	900	9	SOT-172	BLV99	495
	14	24	900	8,5	SOT-171	BLV98	487
	30	24	900	7	SOT-171	BLV97	479
900 MHz mobile transmitters class-B operation	0,5	12,5	900	8,5	SOT-103	BLU98	235
	0,75	7,5	900	7,0	SOT-172	BLT90/SL	167
	1	12,5	900	7,5	SOT-172	BLV90	417
	1,5	7,5	900	6,0	SOT-172	BLT91/SL	175
	2	12,5	900	6,5	SOT-172	BLV91	433
	3	7,5	900	7,0	SOT-122	BLT92/SL	183
	4	12,5	900	7,0	SOT-122	BLU99	243
	4	12,5	900	7,5	SOT-171	BLV92	449
	8	12,5	900	6,5	SOT-171	BLV93	457
	15	12,5	900	6	SOT-171	BLV94	467
	22	12,5	900	5,5	SOT-171	BLV95	477

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f.m. broadcast transmitters class-B operation

P_L W	V_{CE} V	f MHz	G_p dB	envelope	type number	page
1	28	87,5-108	18	TO-39/3	2N3866	1097
4	28	87,5-108	20	SOT-122	BLW90	711
15	28	87,5-108	15	SOT-123	BLV21	279
45	28	87,5-108	11	SOT-120	BLX39	825
45	28	87,5-108	11	SOT-123	BLW86	681
100	28	87,5-108	8	SOT-121	BLW78	613
175	28	87,5-108	10,5	SOT-119	BLV25	287

TV transposer circuits; band III; class-A operation

P_o sync W	V_{CE} V	f MHz	G_p dB	d_{im} dB	I_C mA	envelope	type number	page
0,25	24	225	17	-60	200	SOT-115	BGY55	**)
0,45	24	225	17	-55	200	SOT-115	BGY55	**)
1,5	25	225	18	-60	460	SOT-122	BLV30	295
5	25	225	15	-58	800	SOT-122	BLV31	307
10	25	225	16	-55	1500	SOT-160	BLV32F	317
16	25	225	13,5	-55	3200	SOT-119	BLV33F	339
19	25	225	9	-55	3200	SOT-147	BLV33	327

TV transmitter circuits; band III; class-AB operation

85*	28	225	10,5	-	4250	SOT-119	BLV33F	339
90*	28	225	6,5	-	4460	SOT-147	BLV33	327
120	28	225	10	-	2x3900	SOT-161	BLV36	353

TV transposer circuits; band IV-V; class-A operation

0,12	10	860	10	-60	70	SOT-37	BFR96S	**)
0,3	15	860	11	-60	120	SOT-122	BFQ34	**)
0,5	25	860	11	-60	150	SOT-122	BLW32	519
0,7	15	860	10	-60	240	SOT-122	BFQ68	**)
1,0	25	860	10	-60	300	SOT-122	BLW33	529
1,8	25	860	9	-60	600	SOT-122	BLW34	539
3,5	25	860	6,5	-60	850	SOT-122	BLW98	757
6	25	860	8	-60	2x850	SOT-161	BLV57	373

TV transmitter circuits; band IV-V; class-AB operation

30*	25	860	7,0	-	3000	SOT-171	BLV59	387
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R.F. power MOSFET

P_L (P.E.P.) W	V_{DS} V	G_p dB	envelope	f MHz	type number	page
5	28	> 13	SOT-123	175	BLF242	155
15	28	> 13	SOT-123	175	BLF244	159
30	28	> 13	SOT-123	175	BLF245	163
80	28	> 18	SOT-121	28	BLF146	151

* At 1 dB power gain compression

** See Handbook "Wideband transistors and hybrids".

TYPE NUMBER SURVEY

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

type	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB	page
BFQ42	TO-39/1	c.w.; class-B	13,5	175	2	> 11	41
			12,5	175	2	typ. 10,5	
BFQ43	TO-39/3	c.w.; class-B	13,5	175	4	> 12	51
			12,5	175	4	typ. 12	
BFQ43S	TO-39/3	c.w.; class-B	13,5	175	4	> 12	51
			12,5	175	4	typ. 12	
BFS22A	TO-39/1	c.w.; class-B	13,5	175	4	> 8	59
			12,5	175	4	typ. 8	
BFS23A	TO-39/1	c.w.; class-B	28	175	4	> 10	67
BGY ...	see Modules page 15						
BLF ...	see MOSFETs page 14						
BLT90/SL	SOT-172	c.w.; class-B	7,5	900	0,75	> 7,0	167
BLT91/SL	SOT-172	c.w.; class-B	7,5	900	1,5	> 6,0	175
BLT92/SL	SOT-122	c.w.; class-B	7,5	900	3	> 7,0	183
BLU20/12	SOT-119	c.w.; class-B	12,5	470	20	> 6,5	185
BLU30/12	SOT-119	c.w.; class-B	12,5	470	30	> 5,7	193
BLU45/12	SOT-119	c.w.; class-B	12,5	470	45	> 4,8	201
BLU50	SOT-161	c.w.; class-B	28	400	30	> 10	209
BLU51	SOT-161	c.w.; class-B	28	400	45	> 9	211
BLU52	SOT-161	c.w.; class-B	28	400	60	> 8	213
BLU53	SOT-161	c.w.; class-C	28	400	100	> 7	215
BLU60/12	SOT-119	c.w.; class-B	12,5	470	60	> 4,4	219
BLU97	SOT-122	c.w.; class-B	12,5	470	7	> 8,5	227
BLU98	SOT-103	c.w.; class-B	12,5	900	0,5	> 8,0	235
BLU99	SOT-122	c.w.; class-B	12,5	470	5	> 10,5	243
			12,5	900	4	typ. 7,0	
BLV10	SOT-123	c.w.; class-B	13,5	175	8	> 9	255
			12,5	175	8	typ. 10,5	
			12	28	1	(note 3) 18	
BLV11	SOT-123	c.w.; class-B	13,5	175	15	> 8,0	263
			12,5	175	15	typ. 7,5	
		s.s.b.; class-A	12	28	2	(note 3) 18	
			13,5	28	10	(note 4) 18	
BLV20	SOT-123	c.w.; class-B	28	175	8	> 12	271
		s.s.b.; class-A	26	28	1,3	(note 3) 20	
BLV21	SOT-123	c.w.; class-B	28	175	15	> 10	279
		s.s.b.; class-A	26	28	2,3	(note 3) 20	
BLV25	SOT-119	c.w.; class-B					287
		narrow band	28	108	175	> 10	

Notes: see next page.

TYPE NUMBER SURVEY

type	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB	page
BLV30	SOT-122	lin. ampl., class-A	25	225	1,5 (note 1)	> 18	295
			25	225	1,7 (note 1)	typ. 20	
BLV31	SOT-122	lin. ampl., class-A	25	225	5 (note 1)	> 15	307
			25	225	7 (note 1)	typ. 16,5	
BLV32F	SOT-160	lin. ampl., class-A	25	225	10 (note 2)	> 16	317
			25	225	12,5 (note 2)	typ. 17,2	
BLV33	SOT-147	lin. ampl., class-A	25	225	19 (note 2)	> 9	327
			25	225	26 (note 2)	typ. 9,7	
			class-AB	28	225	90 (note 2)	
BLV33F	SOT-119	lin. ampl., class-A	25	225	16 (note 2)	> 13,5	339
			25	225	22 (note 2)	typ. 14,8	
			class-AB	28	225	85 (note 2)	
BLV36	SOT-161	lin. ampl., class-AB	28	225	115	> 10	353
			28	225	115	typ. 13,0	
			12,5	175	8	typ. 10,5	
BLV45/12	SOT-119	c.w.; class-B	12,5	175	45	> 6,5	365
BLV57	SOT-161	lin. ampl., class-A	25	860	6 (note 2)	> 8,0	373
			25	860	12 (note 2)	typ. 9	
		c.w.; class-AB	25	860	38	typ. 6,5	
BLV59	SOT-161	lin. ampl., class-AB	25	860	35 (note 2)	8	387
BLV75/12	SOT-119	c.w.; class-B	12,5	175	75	> 6,5	397
BLV80/28	SOT-121	c.w.; class-B	28	175	80	> 6,5	407
BLV90	SOT-172	c.w.; narrow band	12,5	900	1	> 7,5	417
BLV90/SL	SOT-172	c.w.; narrow band	12,5	900	1	> 7,5	425
BLV91	SOT-172	c.w.; narrow band	12,5	900	2	> 6,5	433
BLV91/SL	SOT-172	c.w.; narrow band	12,5	900	2	> 6,5	441
BLV92	SOT-171	c.w.; narrow band	12,5	900	4	> 7,5	449
BLV93	SOT-171	c.w.; narrow band	12,5	900	8	> 6,5	457
BLV94	SOT-171	c.w.; narrow band	12,5	900	15	> 6,0	467
BLV95	SOT-171	c.w.; narrow band	12,5	900	22	> 5,5	477
BLV97	SOT-171	c.w.; narrow band	24	900	30	> 7,0	479
BLV98	SOT-171	c.w.; narrow band	24	900	14	> 8,5	487
BLV99	SOT-172	c.w.; narrow band	24	900	2	> 8,0	495

Notes

1. P_{o sync} at d_{im} < -60 dB.
2. P_{o sync} at d_{im} < -55 dB.

3. P.E.P. at d₃ < -40 dB.
4. P.E.P. at d₃ typ. -30 dB.

TYPE NUMBER SURVEY

type	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB	page
BLW29	SOT-120	c.w.; class-B	13,5 12,5	175	15	> 10 typ. 10,5	503
BLW31	SOT-120	c.w.; class-B	13,5 12,5	175 175	28 28	> 9 typ. 9,5	511
BLW32	SOT-122	lin. ampl., class-A	25 25	860 860	0,5 (note 1) 0,63 (note 1)	> 11 typ. 12,2	519
BLW33	SOT-122	lin. ampl., class-A	25 25	860 860	1,0 (note 1) 1,15 (note 1)	> 10 typ. 10,5	529
BLW34	SOT-122	lin. ampl., class-A	25 25	860 860	1,8 (note 1) 2,15 (note 1)	> 9 typ. 10,2	539
BLW50F	SOT-123	s.s.b.; class-A s.s.b.; class-AB	45 50	1,6-28 1,6-28	0-16 (note 3) 10-65 (note 4)	> 19,5 typ. 18	549
BLW60	SOT-56	c.w.; class-B s.s.b.; class-AB	12,5 12,5	175 1,6-28	45 3-30 (note 4)	> 5,0 typ. 19,5	559
BLW60C	SOT-120	c.w.; class-B s.s.b.; class-AB	12,5 12,5	175 1,6-28	45 3-30 (note 4)	> 5 typ. 19,5	573
BLW76	SOT-121	s.s.b.; class-AB c.w.; class-B	28 28	1,6-28 108	8-80 (note 4) 80	> 13 typ. 7,9	585
BLW77	SOT-121	s.s.b.; class-AB c.w.; class-B	28 28	1,6-28 87,5	15-130 (note 4) 130	> 12 typ. 7,5	599
BLW78	SOT-121	c.w.; class-B s.s.b.; class-A s.s.b.; class-AB	28 26 28	150 28 28	100 35 (note 3) 100 (note 4)	> 6 typ. 19,5 typ. 19,0	613
BLW79	SOT-122	c.w.; class-B	12,5 12,5	470 175	2 2	> 9,0 typ. 13,5	627
BLW80	SOT-122	c.w.; class-B	12,5 12,5	470 175	4 4	> 8,0 typ. 15	635
BLW81	SOT-122	c.w.; class-B	12,5 12,5	470 175	10 10	> 6,0 typ. 13,5	643
BLW83	SOT-123	s.s.b.; class-A s.s.b.; class-AB	26 28	1,6-28 1,6-28	0-10 (note 3) 3-30 (note 4)	> 20 typ. 21	651
BLW84	SOT-123	c.w.; class-B	28	175	25	> 9	661
BLW85	SOT-123	c.w.; class-AB s.s.b.; class-AB	12,5 12,5	175 1,6-28	45 3-30 (note 4)	> 4,5 typ. 19,5	669
BLW86	SOT-123	c.w.; class-B s.s.b.; class-AB s.s.b.; class-A	28 28 26	175 1,6-28 1,6-28	45 5-47 (note 4) 17 (note 3)	> 7,5 typ. 19 typ. 22	681

Notes

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3. P.E.P. at d₃ < -40 dB.
4. P.E.P. at d₃ typ. -30 dB.

TYPE NUMBER SURVEY

type	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB	page
BLW87	SOT-123	c.w.; class-B	13,5	175	25	> 6	695
BLW89	SOT-122	c.w.; class-B	28	470	2	> 12	703
BLW90	SOT-122	c.w.; class-B	28	470	4	> 11	711
BLW91	SOT-122	c.w.; class-B	28	470	10	> 9	719
BLW95	SOT-121	s.s.b.; class-AB	50	1,6-2,5	20-160 (note 4)	> 14	727
BLW96	SOT-121	s.s.b.; class-AB	50	1,6-28	25-200 (note 4)	> 13,5	737
		c.w.; class-B	50	108	200	typ. 6,5	
		s.s.b.; class-A	40	28	50 (note 3)	typ. 19	
BLW97	SOT-121	s.s.b.; class-AB	28	1,6-28	175 (note 4)	> 11,5	749
BLW98	SOT-122	lin. ampl., class-A	25	860	3,5 (note 1)	> 6,5	757
			25	860	4,4 (note 1)	typ. 7,0	
BLW99	SOT-121	s.s.b.; class-AB	12,5	1,6-28	80 (note 4)	> 12,5	767
BLX13	SOT-56	s.s.b.; class-A	26	28	0-8 (note 3)	> 18	773
		s.s.b.; class-AB	28	28	25 (note 4)	> 18	
		c.w.; class-B	28	70	25	typ. 17	
BLX13C	SOT-120	s.s.b.; class-A	26	1,6-28	0-8 (note 3)	> 20	785
		s.s.b.; class-AB	28	1,6-28	3-25 (note 4)	typ. 21	
BLX14	SOT-55	s.s.b.; class-A	28	1,6-28	25 (note 3)	> 13	795
		s.s.b.; class-AB	28	1,6-28	7,5-50 (note 4)	> 13	
		c.w.; class-B	28	70	50	> 7,5	
		c.w.; class-B	28	30	50	typ. 16	
		c.w.; class-B	50	108	150	typ. 7,4	
BLX15	SOT-55	s.s.b.; class-AB	50	1,6-28	20-150 (note 4)	> 14	809
		s.s.b.; class-A	40	1,6-28	30 (note 3)	> 14	
		c.w.; class-B	50	70	150	> 10	
		c.w.; class-B	50	108	150	typ. 7,4	
BLX39	SOT-120	c.w.; class-B	28	175	45	> 7,5	825
		s.s.b.; class-AB	28	1,6-28	5-42,5 (note 4)	typ. 19	
		s.s.b.; class-A	26	1,6-28	15 (note 3)	typ. 20	
BLX65	TO-39/1	c.w.; class-B	13,8	470	2	typ. 7	839
			12,5	470	2	> 6	
			12,5	175	2	typ. 12	
BLX65E	TO-39/3	c.w.; class-B	12,5	175	2	typ. 16	851
			12,5	470	2	> 9	
BLX65ES	TO-39/3	c.w.; class-B	12,5	175	2	typ. 16	851
			12,5	470	2	> 9	
BLX67	SOT-48/3	c.w.; class-B	13,8	470	1,5	typ. 10	855
			13,8	470	3,0	typ. 9,3	
			12,5	470	2,5	> 8,5	
			12,5	175	3,0	typ. 20	

Notes

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3. P.E.P. at d₃ < -40 dB.
4. P.E.P. at d₃ typ. -30 dB.

TYPE NUMBER SURVEY

type	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB	page
BLX68	SOT-48/3	c.w.; class-B	13,8	470	7	> 5,4	867
			13,8	470	7,8	typ. 5,9	
			12,5	470	7,0	> 5,0	
			12,5	175	7,2	typ. 12,6	
BLX69A	SOT-48/2	c.w.; class-B	13,5	470	20	> 4	879
			12,5	470	17	> 4	
			12,5	175	17	typ. 11	
BLX91A	SOT-48/3	c.w.; class-B	24	470	0,85	typ. 12,3	887
			28	470	1,0	> 11	
			28	470	1,45	typ. 12,6	
			28	1000	1,4	typ. 5,4	
BLX91CB	SOT-48/3	video cathode driver	28	"V _{CESM} max. 65 V; C _c typ. 3 pF"		897	
BLX92A	SOT-48/3	c.w.; class-B	24	470	2,4	typ. 10,8	901
			28	470	2,5	> 11	
			28	470	3,0	typ. 11,7	
			28	1000	2,5	typ. 5,5	
BLX93A	SOT-48/3	c.w.; class-B	24	470	7,0	typ. 8,5	911
			28	470	7,0	> 8,5	
			28	470	8,0	typ. 9,0	
			28	1000	5,0	typ. 5,2	
BLX94A	SOT-48/2	c.w.; class-B	28	470	25	> 6	921
BLX94C	SOT-122	c.w.; class-B	28	470	25	> 6,5	921
BLX95	SOT-56	c.w.; class-B	28	470	40	< 4,5	931
			28	175	40	typ. 11	
BLX96	SOT-48/3	class-A	25	860	0,5 (note 1)	> 6	941
			25	860	0,6 (note 1)	typ. 7	
BLX97	SOT-48/3	class-A	25	860	1,0 (note 1)	> 5,5	949
			25	860	1,1 (note 1)	typ. 6,5	
BLX98	SOT-48/2	class-A	25	860	3,5 (note 1)	> 5,0	957
			25	860	4,0 (note 1)	typ. 5,5	

Notes

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3. P.E.P. at d₃ < -40 dB.
4. P.E.P. at d₃ typ. -30 dB.

TYPE NUMBER SURVEY

type	envelope	mode of operation	V _{CE} V	frequency MHz	output power W	power gain dB	page
BLY87A	SOT-48/2	c.w.; class-B	13,5 12,5	175 175	8 8	> 9 typ. 9	967
BLY87C	SOT-120	c.w.; class-B	13,5 12,5	175 175	8 8	> 12 typ. 11,5	975
BLY88A	SOT-48/2	c.w.; class-B	13,5 12,5	175 175	15 15	> 7,5 typ. 7,5	983
BLY88C	SOT-120	c.w.; class-B	13,5 12,5	175 175	15 15	> 8,0 typ. 7,5	991
BLY89A	SOT-56	c.w.; class-B	13,5	175	25	> 6	999
BLY89C	SOT-120	c.w.; class-B	13,5	175	25	> 6	1009
BLY90	SOT-55	c.w.; class-B	12,5	175	50	> 5,0	1017
BLY91A	SOT-48/2	c.w.; class-B	28	175	8	> 12	1025
BLY91C	SOT-120	c.w.; class-B	28	175	8	> 12	1033
BLY92A	SOT-48/2	c.w.; class-B	28	175	15	> 10	1041
BLY92C	SOT-120	c.w.; class-B	28	175	15	> 10	1049
BLY93A	SOT-56	c.w.; class-B	28	175	25	> 9	1057
BLY93C	SOT-120	c.w.; class-B	28	175	25	> 9	1065
BLY94	SOT-55	c.w.; class-B	28	175	50	> 7	1073
2N3375	TO-60	c.w.; class-B	28 28	100 400	7,5 > 3	> 8,8 > 4,8	1081
2N3553	TO-39/1	c.w.; class-B	28	175	2,5	> 10	1081
2N3632	TO-60	c.w.; class-B	28	175	> 13,5	> 5,9	1081
2N3866	TO-39/1	c.w.; class-B	28	400	1	> 10	1097
2N3924	TO-39/1	c.w.; class-B	13,5	175	4	> 6	1105
2N3926	TO-60	c.w.; class-B	13,5	175	7	> 5,4	1105
2N3927	TO-60	c.w.; class-B	13,5	175	12	> 4,8	1105
2N4427	TO-39/1	c.w.; class-B	12	175	1	> 10	1097

type (MOSFETs)	envelope	mode of operation	V _{DS} V	frequency MHz	output power W	power gain dB	page
BLF146	SOT-121	S.S.B.; class-A-B	28	28	80	> 18	151
BLF242	SOT-123	c.w.; class-B	28	175	5	> 13	155
BLF244	SOT-123	c.w.; class-C	28	175	15	> 13	159
BLF245	SOT-123	c.w.; class-B	28	175	30	> 13	163

TYPE NUMBER SURVEY

type (modules)	envelope	mode of operation	V _{S1,S2} V	frequency MHz	output power W	power gain dB	page
BGY22	SOT-75A	c.w.	13,5	380-512	> 2,5	17	75
BGY22A	SOT-75A	c.w.	12,5	420-480	> 2,5	17	75
BGY23	SOT-75A	c.w.	13,5	380-480	> 7,0	4,5	83
BGY23A	SOT-75A	c.w.	12,5	420-480	> 7,0	4,5	83
BGY32	SOT-132	c.w.	12,5	68-88	> 18	22,6	91
BGY33	SOT-132	c.w.	12,5	80-108	> 18	22,6	91
BGY35	SOT-132	c.w.	12,5	132-156	> 18	20,6	91
BGY36	SOT-132	c.w.	12,5	148-174	> 18	20,8	91
BGY40A	SOT-132	c.w.	12,5	400-440	> 11,5	18,8	101
BGY40B	SOT-132	c.w.	12,5	440-470	> 10	18,8	101
BGY41A	SOT-132	c.w.	12,5	400-440	> 15,6	19,4	101
BGY41B	SOT-132	c.w.	12,5	440-470	> 15	19,4	101
BGY43	SOT-132	c.w.	12,5	148-174	> 13	19,4	109
BGY45A	SOT-183	c.w.	12,5	68-88	> 30	20,0	117
BGY45B	SOT-183	c.w.	12,5	148-174	> 30	20,0	121
BGY46A	SOT-181	c.w.	9,6	400-440	> 1,4	15,0	125
BGY46B	SOT-181	c.w.	9,6	430-470	> 1,4	15,0	125
BGY47A	SOT-181	c.w.	9,6	400-470	> 3,2	18,0	127
BGY47F	SOT-181	c.w.	9,6	460-512	> 3,2	18,0	127
BGY48A	SOT-182	c.w.	9,6	400-440	> 5,0	21,5	129
BGY48B	SOT-182	c.w.	9,6	430-470	> 5,0	21,5	129
BGY48C	SOT-182	c.w.	9,6	460-512	> 5,0	21,5	129
BGY90A	SOT-197	c.w.	12,5	806-890	> 7,5	15,7	133
BGY90B	SOT-197	c.w.	12,5	870-950	> 7,5	15,7	137
BGY93A	SOT-182	c.w.	9,6	68-88	> 2,0	17,5	141
BGY93B	SOT-182	c.w.	9,6	136-156	> 2,0	17,5	141
BGY93C	SOT-182	c.w.	9,6	148-174	> 2,0	17,5	141
BGY94A	SOT-182	c.w.	9,6	68-88	> 5,0	21,5	143
BGY94B	SOT-182	c.w.	9,6	132-156	> 5,0	21,5	143
BGY94C	SOT-182	c.w.	9,6	148-174	> 5,0	21,5	143
BGY95A	SOT-200	c.w.	7,5	825-845	> 2,5	21,0	147
BGY95B	SOT-200	c.w.	7,5	890-915	> 2,5	21,0	147
BGY96A	SOT-200	c.w.	9,6	825-845	> 2,5	21,0	149
BGY96B	SOT-200	c.w.	9,6	890-915	> 2,5	21,0	149

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
140	2 x BLW87 *	2 x BLW99		150	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
220	2 x BLW86 *	2 x BLW97		300	28	F
500	2 x BLW86 *	4 x BLW77		450	28	F
680	2 x BLW78 *	4 x BLW97		600	28	F
300	2 x BLX13C **	2 x BLX15		250	50	S
300	2 x BLW83 **	2 x BLW96		350	50	F
600	2 x BLX39 **	4 x BLX15		500	50	S
600	2 x BLW50F *	4 x BLW95		500	50	F
40	BLY91C **	2 x BLW78**	8 x BLX15	1000	50	S/F
40	BLV20 **	4 x BLW50F	8 x BLW96	1200	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
5	BFR96 ● *	2 x BFO42		2	7,5	—
15	2N4427 *	2 x BLW80		6	13	S
50	BLW79 *	2 x BLW29		25	13	S
50	BLW89 *	2 x BLY92C		25	28	S
20	2N3866 *	2 x BLY91C	2 x BLX39	90	28	S
20	2N3866 *	2 x BLV20	2 x BLW86	90	28	F

- See Handbook wideband transistors and hybrids.
- * 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
190	BLV10	BLV75/12		75	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	BLW90	BLX39		50	28	S
40	2N3866	BLV21	BLW78	100	28	F
100	BLW90	BLW86	2 x BLV25	300	28	F
500	BLV21	BLW78	4 x BLV25	500	28	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 small signal transistors.

** 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	BFQ43		2	7,5	—
100	2N4427	BLY87C		8	13	S
100	2N4427	BLV10		8	13	F
125	BFQ42	BLW29		14	13	S
150	BGY36			18	13	F
250	BFQ43	BLW31		28	13	S
100	2N4427	BLW29	BLV45/12	45	13	S/F
115	BGY43	BLV45/12		45	13	F
120	BFQ42	BLW29	BLV75/12	75	13	S/F

BASE STATIONS (132 MHz – 174 MHz)

input power mW	1st stage	2nd stage	3rd stage	P_L W	V_{CE}	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 TRANSPOSERS (Band III: 174 MHz – 230 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	$P_{o\ sync}$ W	$P_{o\ sat}$ W	V_{CE} V
6	BGY55 ●	2 x BLV31			10	10	25
7	BLV30	2 x BLV32F			20	20	25
3	BGY55 ●	2 x BLV31	2 x BLV33		30	40	25
6	BLV30	2 x BLV33F	4 x BLV33		60	75	25
2	BGY55 ●	2 x BLV31	4 x BLV33	8 x BLV33	100	140	25

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

input power mW	1st stage	2nd stage	3rd stage	$P_{o\ sync}^*$ W	V_{CE} V
8	BGY55 ●	2 x BLV31	2 x BLV33F	130	28
10	BLV30	2 x BLV32F	2 x BLV36	250	28
35	BLV30	2 x BLV33F	4 x BLV36	470	28
75	2 x BLV30	4 x BLV33F	8 x BLV36	900	28

*With linearity correction.

● See handbook wideband transistors and hybrids.

PORTABLE AND MOBILE TRANSMITTERS (400 MHz – 512 MHz)

input power mW	1st stage	2nd stage	3rd stage		P _L W	V _{CE} V	stud S flange F
15	BFR96 ●	BLW79	BLW80		2	7,5	S
45	BLV90	BLU99			3	7,5	S
100	BGY40A				7,5	12,5	F
	BGY40B						
15	BFR96S	BLU99	BLW81		10	13	S
	BGY41A						
150	BGY41B				13	12,5	F
400	BLU99	BLU20/12			20	13	S/F
100	BGY40A/B	BLU30/12			30	13	F
280	BLU99	BLU20/12	BLU45/12		45	13	S/F
400	BLU99	BLU20/12	BLU60/12		60	13	S/F

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
45	BLX91A	BLW91	BLX94C		25	28	S
250	BLW90	BLX94C	BLX95		40	28	S
45	BLX91A	BLW91	BLX94C	2 x BLX95	70	28	S

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

input power mW	1st stage	2nd stage	3rd stage	4th stage	P _O sync W	P _O sat W	V _{CE} V
5	BFQ34 ●	BFQ68 ●	2 x BFQ68 ●		1,4	1,4	15
6	BLW32	BLW33	2 x BLW34		4,4	5,7	25
2	BLW32	BLW33	2 x BLW34	2 x BLW98	8	8	25
3	BLW32	BLW33	2 x BLW34	2 x BLV57	13	15	25
10	BFQ68 ●	2 x BLW34	2 x BLW98	4 x BLV57	23	30	25
14	BFQ68 ●	2 x BLW34	2 x BLV57	8 x BLV57	38	60	25

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

→ input power mW	1st stage	2nd stage	3rd stage	4th stage	P _O sync* W	V _{CE} V
→ 12	BFR96S ●	BFQ68 ●	2 x BLW34	2 x BLV59	60	28
30	BFQ34 ●	2 x BLW33	2 x BLV57	4 x BLV59	120	28
80	BFQ68 ●	2 x BLW34	4 x BLV57	8 x BLV59	240	28

→ *With linearity correction.

● See handbook "Wideband transistors and hybrids".

MOBILE TRANSMITTERS (800 MHz – 960 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	P _L W	V _{CE} V	stud S flange F
60	BLU98	BLV91	BLV93		8	13	S/F
100	BLV90	BLV92	BLV94		15	13	S/F
50	BLU98	BLV91	BLV93	BLV95	22	13	S/F
120	BLV90	BLV92	BLV94	2 x BLV95	40	13	S/F

BASE STATIONS (800 MHz – 960 MHz)

input power mW	1st stage	2nd stage	3rd stage		P _L W	V _{CE} V	stud S flange F
250	BLV99	BLV98	2 x BLV97		60	24	S/F

Notes

1. For TV transposers and transmitters, the input powers quoted relate to the peak sync levels.
2. P_{O sync} for transposers is the peak sync output power for a three-tone intermodulation distortion of -54 dB (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB) without pre-correction.
3. P_{O sync} is the peak sync output power of a transposer before the sound carrier has been added. After addition of the sound carrier the peak output power will be approximately twice P_{O sync}. In transposers with pre-correction the intermodulation distortion is reduced and therefore P_{O sync} can be increased. However there is a limit formed by the saturated output power of the transistor. Taking this into account P_{O sat} is the maximum value of P_{O sync} in pre-corrected systems.
4. In the transmitter line-ups the output stage operates in class-AB, the driver stages in class-A.
5. P_{O sync} for transmitters is the peak sync output power at 1 dB power gain compression.

GENERAL

Type designation

Rating systems

Letter symbols

s-parameters

Mounting recommendations

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.

“Although not all type numbers accord with the Pro Electron system, the following explanation is given for the ones that do.”

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 ($R_{th\ j-mb} > 15\ K/W$)
- D. TRANSISTOR; power, audio frequency ($R_{th\ j-mb} \leq 15\ K/W$)
- E. DIODE; tunnel
- F. TRANSISTOR; low power, high frequency ($R_{th\ j-mb} > 15\ K/W$)
- G. MULTIPLE OF DISSIMILAR DEVICES – MISCELLANEOUS; e.g. oscillator
- H. DIODE; magnetic sensitive
- L. TRANSISTOR; power, high frequency ($R_{th\ j-mb} \leq 15\ K/W$)
- 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 ($R_{th\ j-mb} > 15\ K/W$)
- S. TRANSISTOR; low power, switching ($R_{th\ j-mb} > 15\ K/W$)
- T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j-mb} \leq 15\ K/W$)
- U. TRANSISTOR; power, switching ($R_{th\ j-mb} \leq 15\ K/W$)
- 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.

* When these serial numbers are exhausted the serial number for consumer types may be extended to four figures, and that for industrial types to three figures.

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

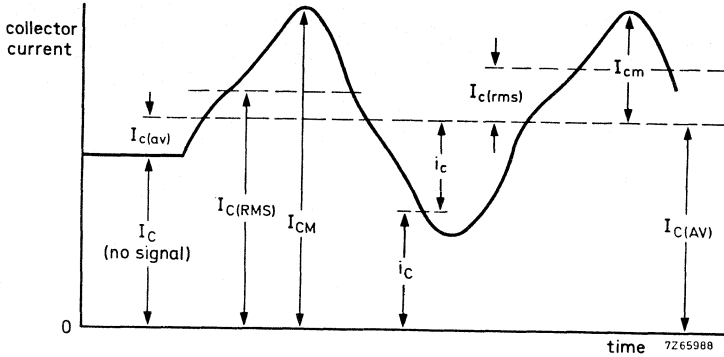
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

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 PARAMETER METERS

Defenition

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_I , 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.

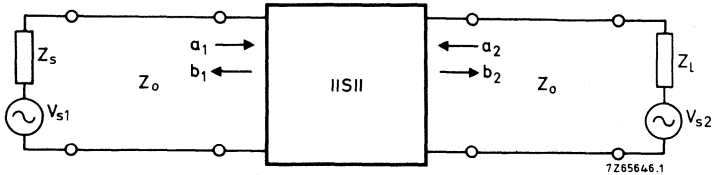
Examples: $Z_i = R_i + jX_i$
 $y_{fe} = g_{fe} + jb_{fe}$

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 .



$$a_1 = \frac{V_{i1}}{\sqrt{Z_0}}$$

$$a_2 = \frac{V_{i2}}{\sqrt{Z_0}}$$

$$b_1 = \frac{V_{r1}}{\sqrt{Z_0}}$$

$$b_2 = \frac{V_{r2}}{\sqrt{Z_0}}$$

1)

Z_0 = 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 $V_{s1} = 0$.

RECOMMENDATIONS FOR MOUNTING
FLANGE R.F. POWER TRANSISTORS

Flange r.f. transistors are easy to mount but for optimum performance we offer the following recommendations:

- Holes or tapped holes in the heatsink should be free from burrs and spaced at 18,42 mm (+ 0,05; -0,05) between centres. They must have a depth of at least 6 mm.
Recommended screw: for SOT-119, SOT-121 and SOT-161 cheese-head 4-40 UNC/2A, for SOT-123 and SOT-160 also M3. A washer to spread the joint pressure is also recommended.
- For transistors dissipating up to 80 W the heatsink thickness should be at least 3 mm copper (> 99,9%, ETP-Cu) or 5 mm aluminium (> 99,0% Al). For transistors dissipating more power, the thickness should be increased proportionally.
- The flatness of the heatsink mounting surface must be > 0,02 mm with a surface roughness $R_a < 0,5 \mu\text{m}$ (preferably by grinding or lapping).
- The sparing use of evenly distributed heatsink compound on the transistor flange is recommended. Suitable heatsink compound brands are: Dow Corning 340, Eccotherm TC-5 (E&C), Wakefield 120.
- The screws through the flange holes should first both be tightened to 0,05 Nm (finger tight), and then tightened to 0,6 to 0,75 Nm, to achieve the published thermal resistance between the mounting base and heatsink.
- When a transistor is removed from the heatsink, the flange will almost certainly have been distorted by the joint pressure. Grinding or lapping of the flange according to the information above is necessary if the transistor is remounted.

RECOMMENDATIONS FOR MOUNTING ¼", ⅜" AND ½" CAPSTAN HEADERS AS USED FOR R.F. POWER TRANSISTORS

A nickel plated brass nut is supplied with each transistor for securing it to a heatsink.

Screw threads, diameter and nuts:

mounting base diameter	thread	maximum diameter of threaded stud	nut thickness
¼"	8-32UNC-2A(B)	4,14 mm	3,5 and 5 mm
⅜"	10-32UNF-2A(B)	4,80 mm	5 mm
½"	¼" x 28UNF-2A(B)	6,33 mm	5,5 mm

To ensure optimum heat transfer and to avoid damage to the threaded stud of the transistor the following recommendations should be observed.

– Diameter of the mounting hole in the heatsink:

¼" stud	diameter 4,15 +0,05; –0 mm
⅜" stud	diameter 4,85 +0,05; –0 mm
½" stud	diameter 6,35 +0,05; –0 mm

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

– Mounting nut torque:

¼" nut	minimum 0,75 Nm (7,5 kg cm) maximum 0,85 Nm (8,5 kg cm)
⅜" nut	minimum 1,5 Nm (15 kg cm) maximum 1,7 Nm (17 kg cm)
½" nut	minimum 2,3 Nm (23 kg cm) maximum 2,7 Nm (27 kg cm)

– Recommended distance from the surface of the heatsink to the top surface of the printed-circuit board:

¼" capstan header	2,9 + 0; –0,2 mm
⅜" capstan header	3,8 + 0; –0,2 mm
½" capstan header	4,8 + 0; –0,2 mm

It is important that the above maximum printed-circuit board mounting heights are not exceeded in order to prevent stress being applied to the encapsulation. Upward lead bending, in particular, can damage the encapsulation and impair the sealing of the header.

- Experience indicates that flux or flux solutions can penetrate even hermetically sealed ceramic-capped transistors. To prevent this, tin and wash the printed-circuit boards before mounting the power transistors, then solder the transistors in place without using flux.
- The leads may be tinned by dipping them, full length, into a solder bath at about 230 °C. Note, no flux should be used during tinning.
- The full mounting-nut torque (specified above) should be applied only once during the life of the transistor. For pre-assembly testing, apply no more than two thirds of the specified torque.
- Since locking washers are much harder than most heatsink materials, their locking action might deteriorate during the life of the transistor. The use of locking washers is therefore not recommended. Instead, tighten the nuts to their specified torque, allow about 30 minutes for them to bed down, then re-tighten. After this, apply locking paint.

DEVICE DATA

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 wideband or semi-wideband 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

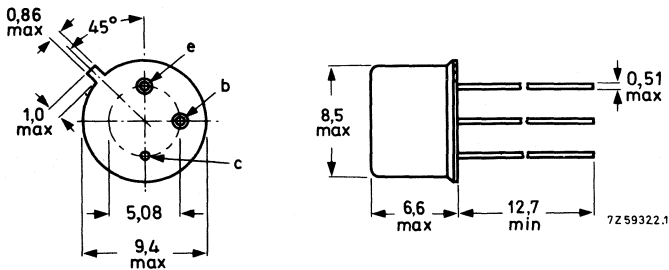
R.F. performance up to $T_{amb} = 25\text{ }^{\circ}\text{C}$; $R_{th\ c-a} = 32\text{ K/W}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

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

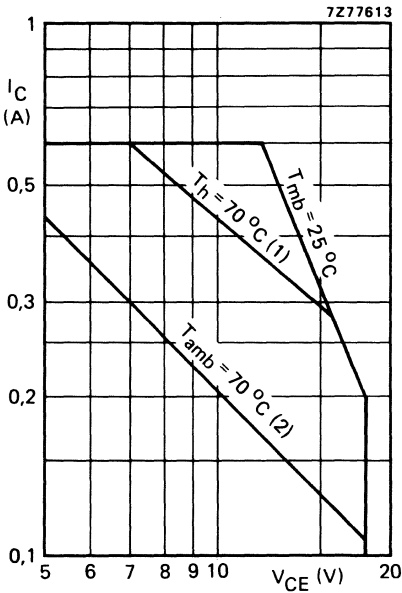
P_{tot} max. 7,2 W

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.

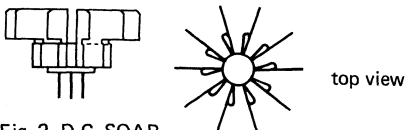
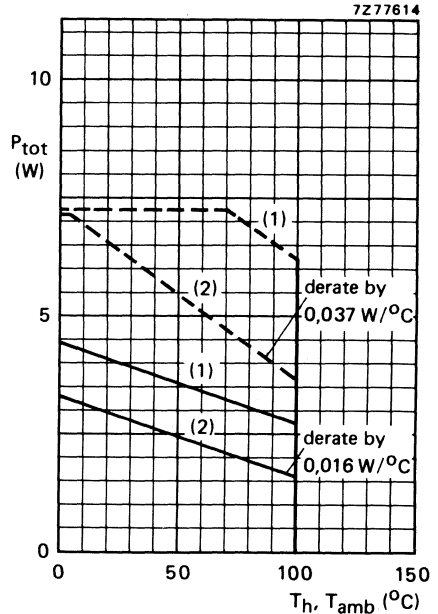


Fig. 2 D.C. SOAR.



(1) Short-time r.f. operation during mismatch;

$R_{th\ mb-h} = 3$ K/W; $R_{th\ c-a} = 32$ K/W;
 $f \geq 1$ MHz.

(2) Continuous d.c. and r.f. operation;

$R_{th\ mb-h} = 3$ K/W; $R_{th\ c-a} = 32$ K/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 K/W.

THERMAL RESISTANCE

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

CHARACTERISTICS

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

Collector-emitter breakdown voltage $V_{BE} = 0; I_C = 2\text{ mA}$	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; $I_E = 1\text{ mA}$	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0; V_{CE} = 18\text{ V}$	I_{CES}	<	1 mA
Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$ open base $R_{BE} = 10\ \Omega$	E_{SBO} E_{SBR}	>	0,5 mJ > 0,5 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 f_T	typ. 750 MHz 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: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

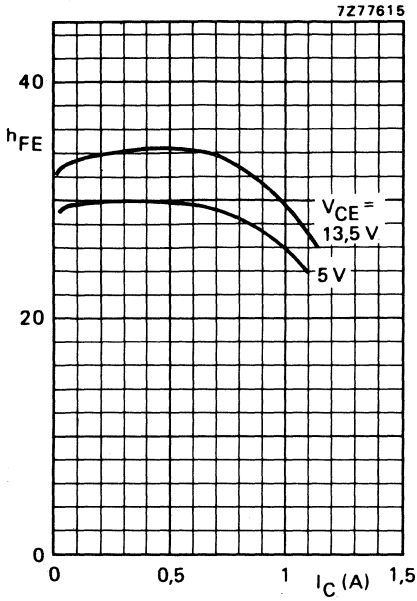


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

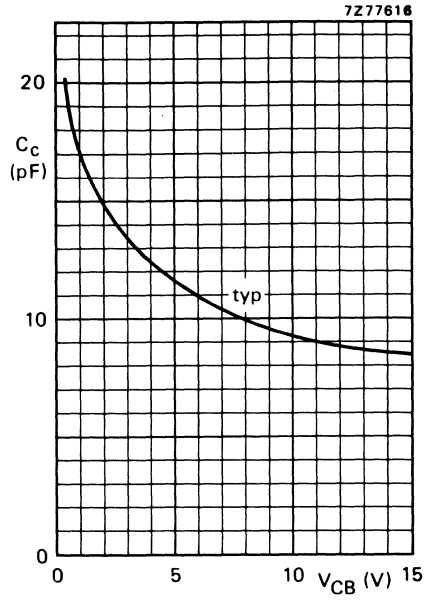


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

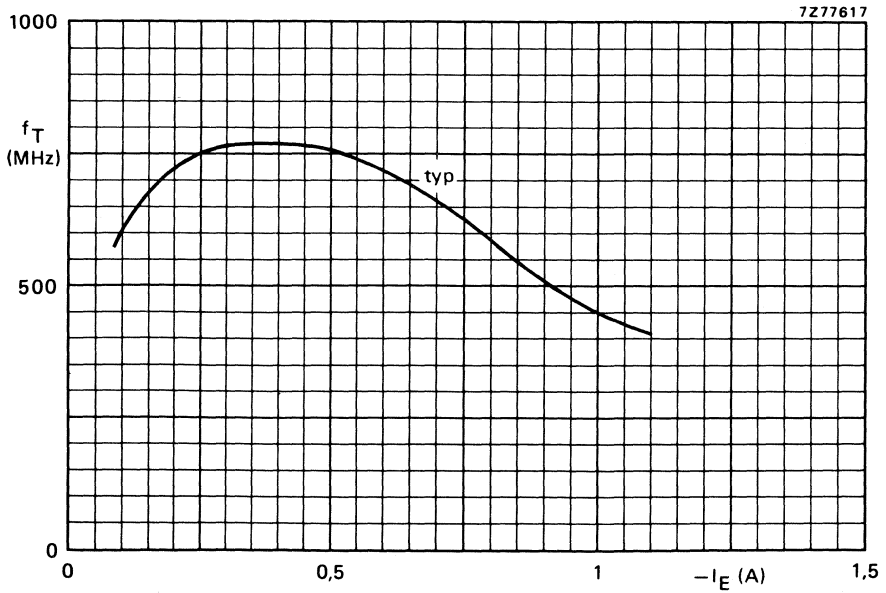


Fig. 6 $V_{CB} = 13.5\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

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

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

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 (mS)
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	—	—

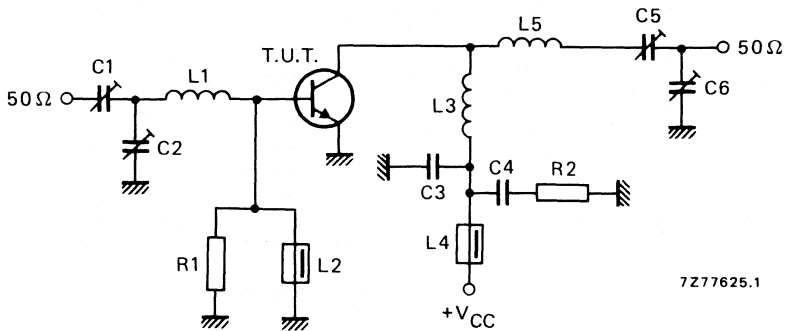


Fig. 7 Test circuit; c.w. class-B.

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)

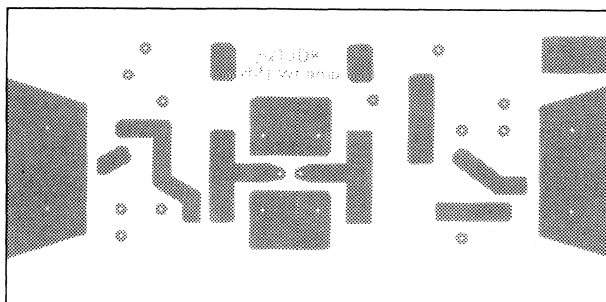
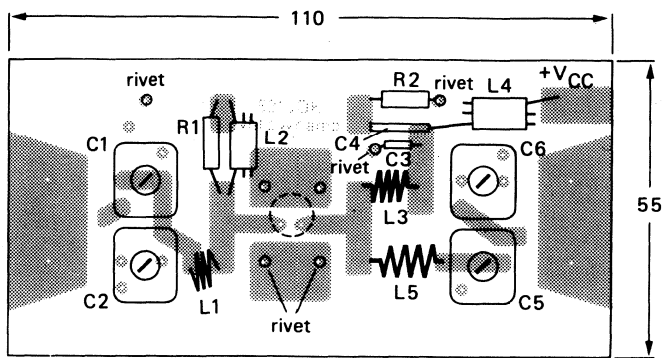


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

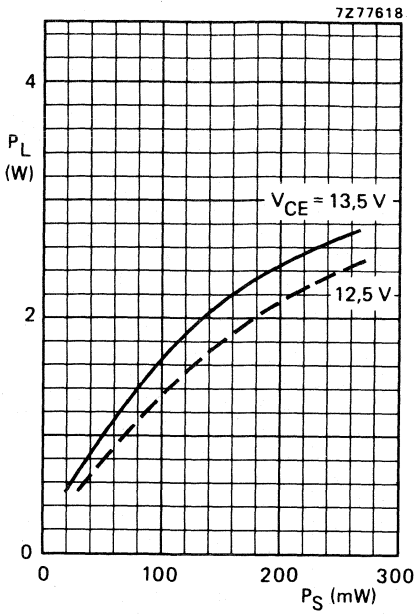


Fig. 9 Typical values; $f = 175$ MHz;
 $T_{amb} = 25$ °C; $R_{th\ c-a} = 32$ K/W.

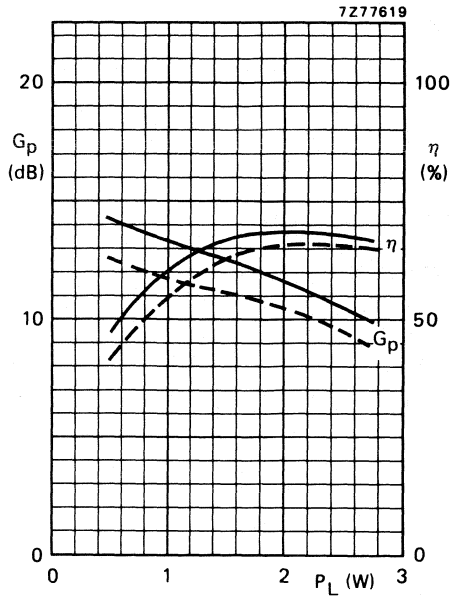


Fig. 10 Typical values; $f = 175$ MHz;
 $T_{amb} = 25$ °C; — $V_{CE} = 13.5$ V;
 --- $V_{CE} = 12.5$ V; $R_{th\ c-a} = 32$ K/W.

APPLICATION INFORMATION (continued)

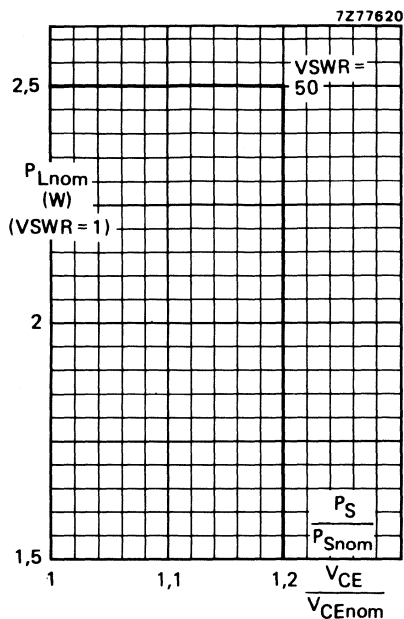


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175$ MHz; $T_h = 70$ °C; $R_{th\ mb-h} = 3$ K/W; $V_{CEnom} = 13,5$ V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

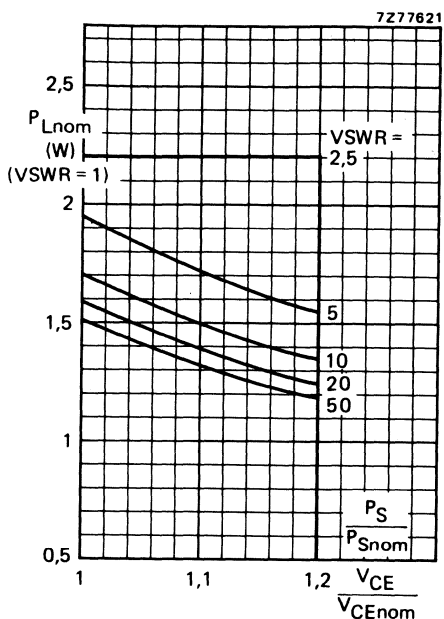


Fig. 12 R.F. SOAR (short-time operation during mismatch); $f = 175$ MHz; $T_{amb} = 70$ °C; $R_{th\ c-a} = 32$ K/W; $V_{CEnom} = 13,5$ V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

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 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

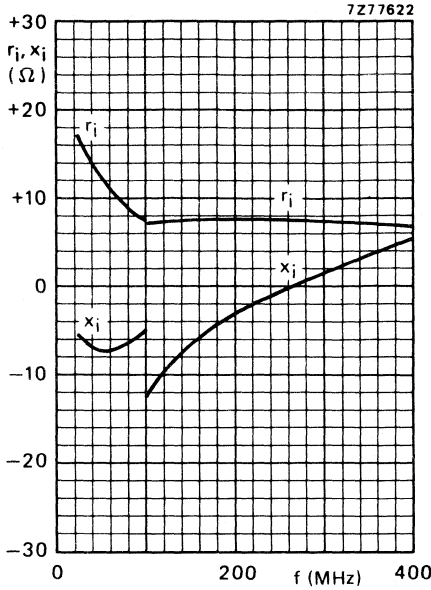


Fig. 13.

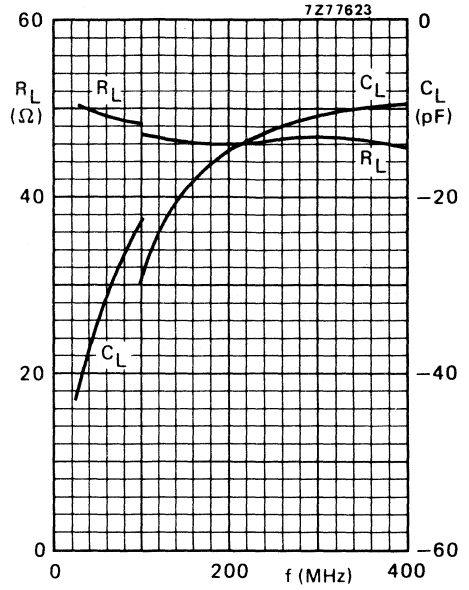
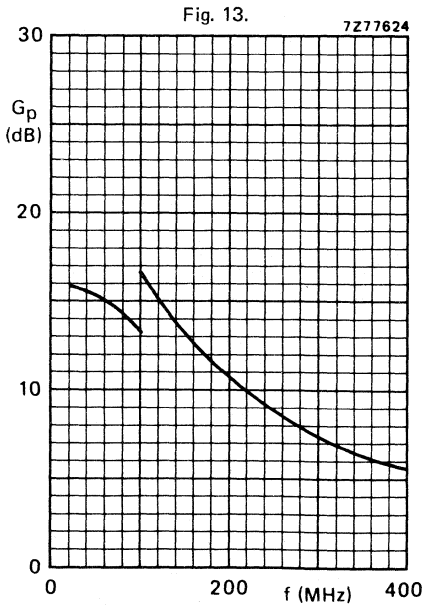


Fig. 14.



Conditions for Figs 13, 14 and 15:

Typical values; $V_{CE} = 13,5$ V; $P_L = 2$ W;

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

Fig. 15.

V.H.F. POWER TRANSISTORS

N-P-N silicon planar epitaxial transistors intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. The transistors are resistance stabilized and guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. The BFQ43 and BFQ43S are especially suited as driver transistors for the BLW31 in a two-stage wideband or semi-wideband v.h.f. amplifier delivering 28 W output power.

The BFQ43 and BFQ43S have a TO-39 metal envelope with the emitter connected to the case which enables excellent heatsinking and emitter grounding.

QUICK REFERENCE DATA

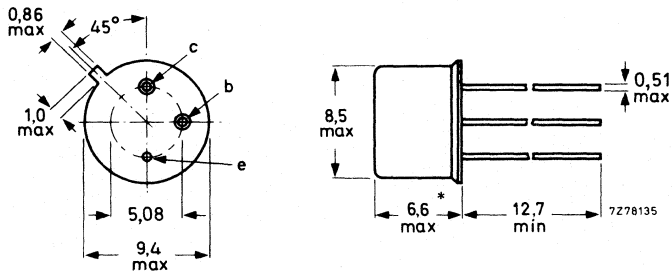
R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

* Max. 4,9 for BFQ43S.

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 + 175 °C
Operating junction temperature	T_j	max.	200 °C

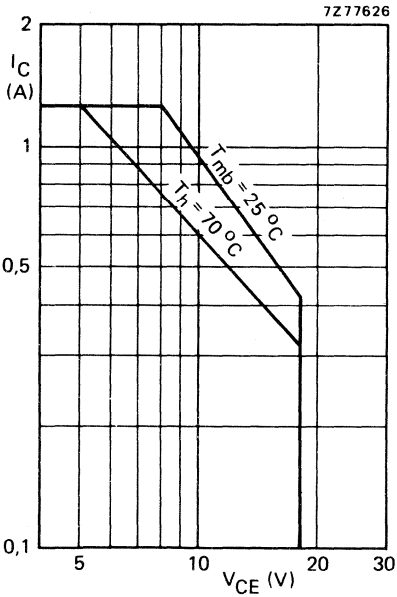
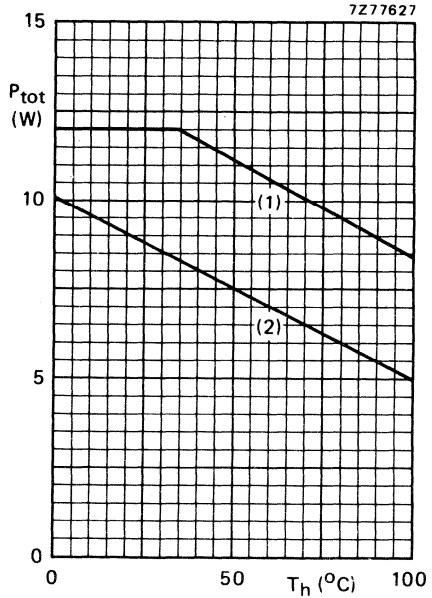


Fig. 2 D.C. SOAR.



- (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

$R_{th\ j-mb} = 18$ K/W

From mounting base to heatsink

$R_{th\ mb-h} = 3$ K/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

 $R_{BE} = 10\ \Omega$ $ESBO > 0,5\text{ mJ}$ $ESBR > 0,5\text{ mJ}$

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 $f = 100\text{ MHz}$ * $-I_E = 0,5\text{ A}; V_{CB} = 13,5\text{ V}$ $-I_E = 1,5\text{ A}; V_{CB} = 13,5\text{ V}$ f_T typ. 750 MHz 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: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

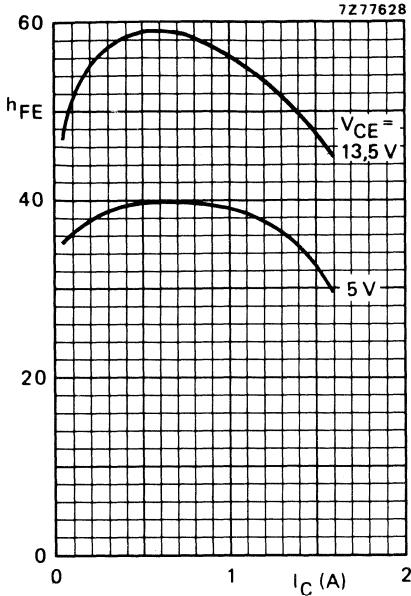


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

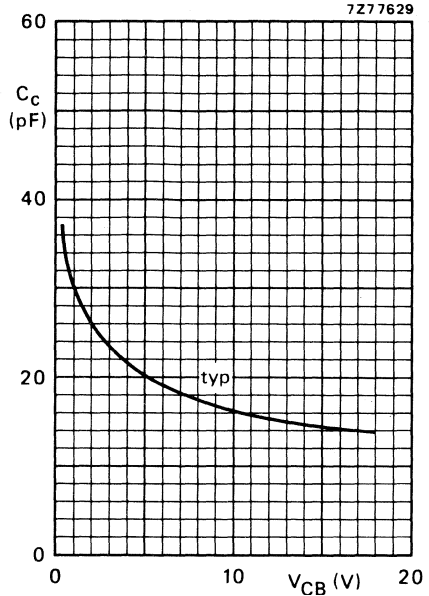


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

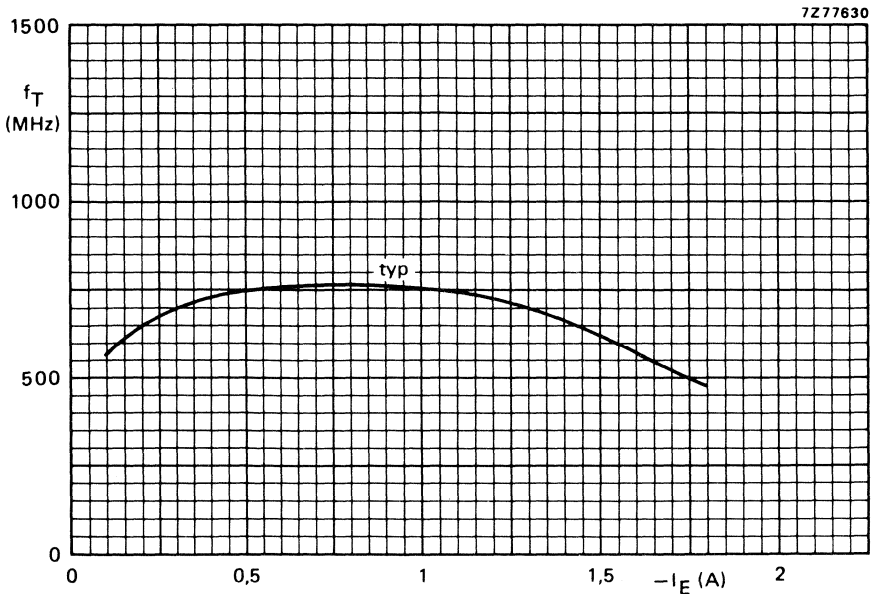


Fig. 6 $V_{CB} = 13,5\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

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

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

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 (mS)
175	13,5	4	< 0,25	> 12	< 0,54	> 55	$3,2 + j0,03$	$53 - j29$
175	12,5	4	—	typ. 12	—	typ. 60	—	—

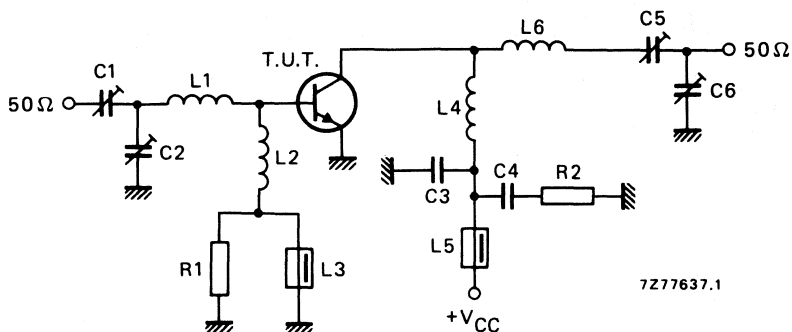


Fig. 7 Test circuit; c.w. class-B.

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)

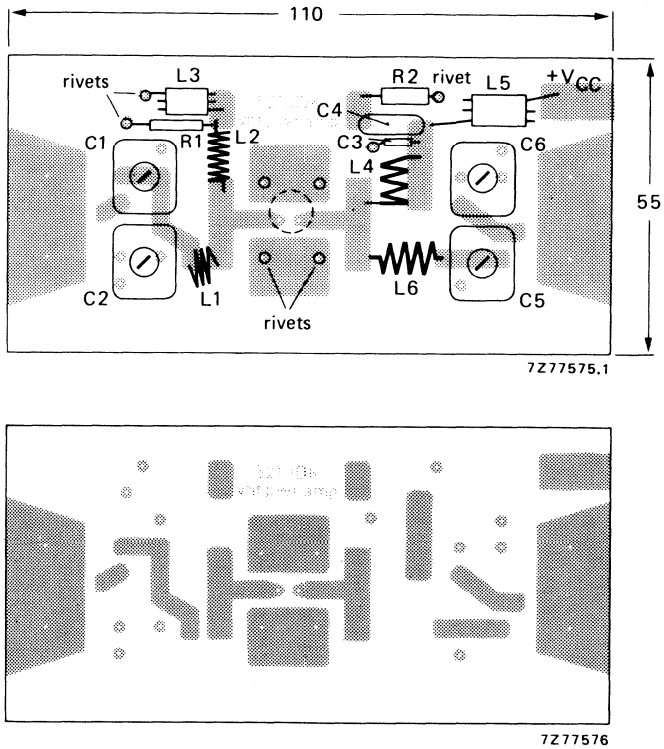


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

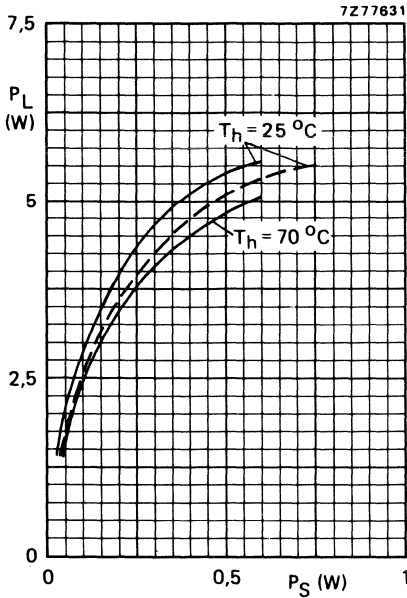


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
— $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

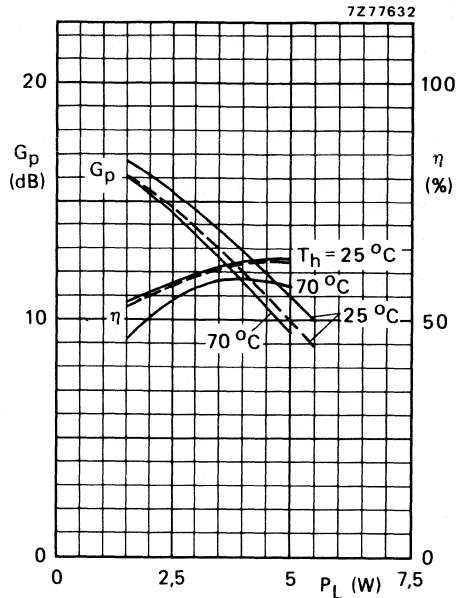


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
— $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

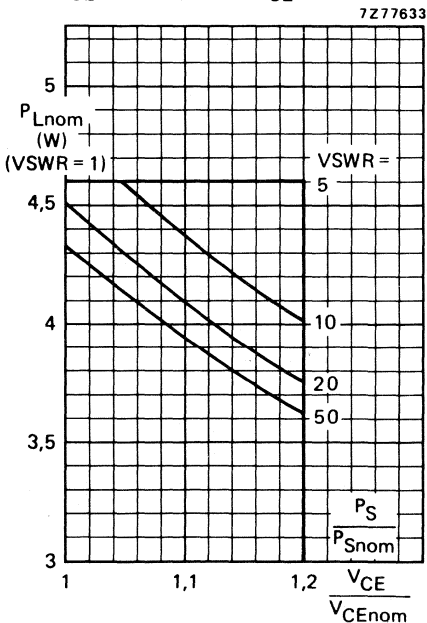


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$.
 $R_{th \text{ mb-h}} = 3 \text{ K/W}$; $V_{CEnom} = 13,5 \text{ or } 12,5 \text{ V}$;
 $P_S = P_{Snom}$ at V_{CEnom} and $V_{SWR} = 1$.

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 ($V_{SWR} = 1$), 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 140 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

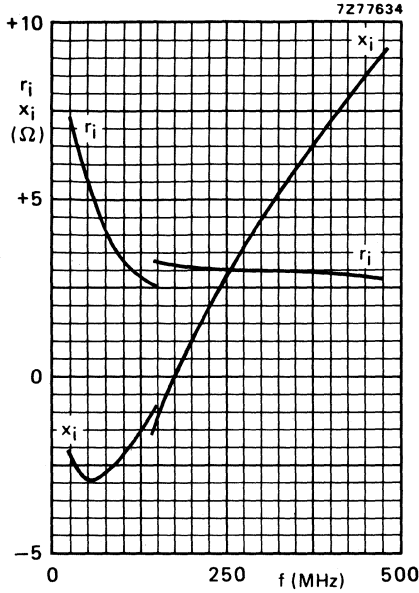


Fig. 12.

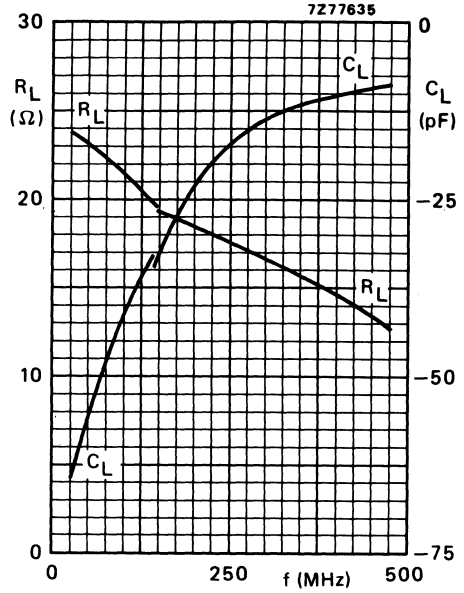
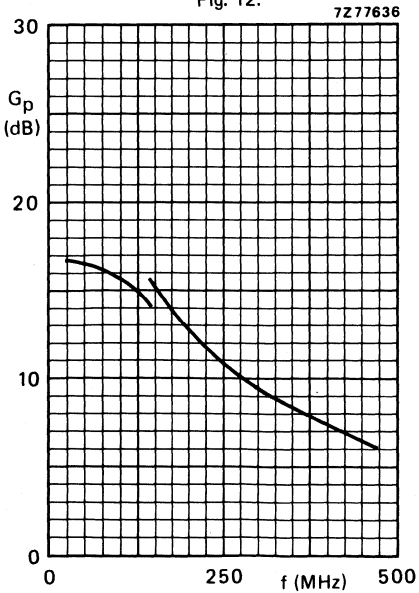


Fig. 13.



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

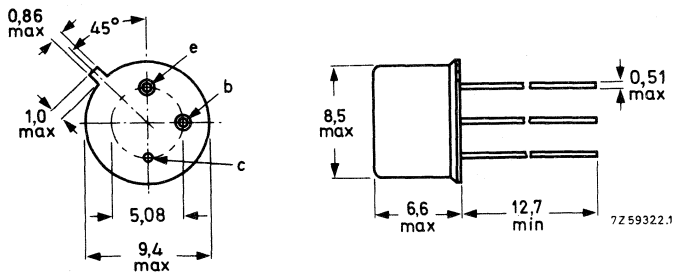
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

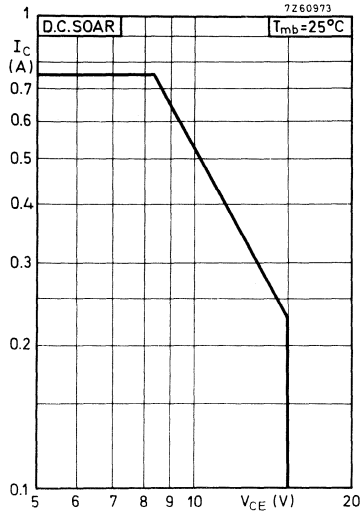
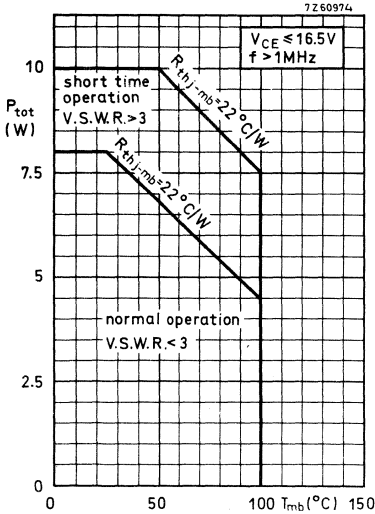


Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

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

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
Collector current (average)	$I_{C(AV)}$	max.	0.75	A
Collector current (peak value) $f > 1\text{ MHz}$	I_{CM}	max.	2.25	A
Total power dissipation up to $T_{mb} = 25\text{ }^\circ\text{C}$ $f > 1\text{ MHz}$	P_{tot}	max.	8	W



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

$E > 0.5\text{ mS}$

$-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$

$E > 0.5\text{ mS}$

D. C. current gain

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

Transition frequency

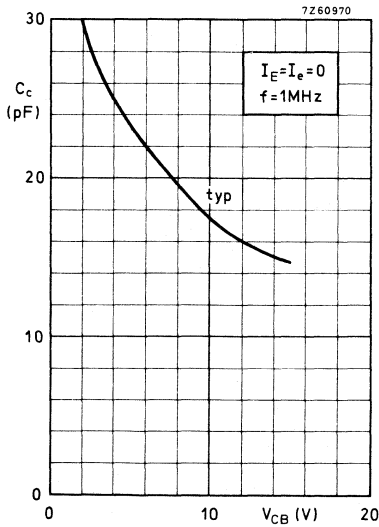
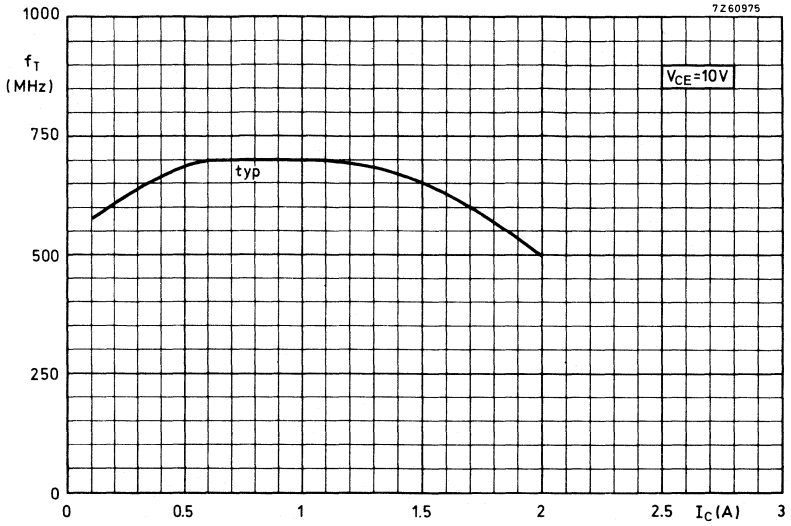
$I_C = 350\text{ mA}; V_{CE} = 10\text{ V}$ f_T typ. 700 MHz

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

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

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

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



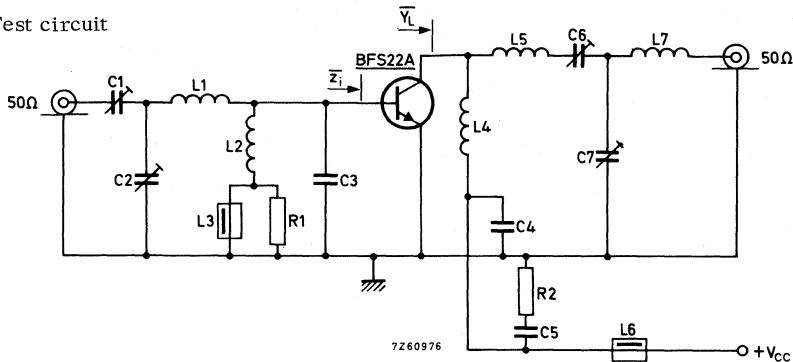
APPLICATION INFORMATION

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

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

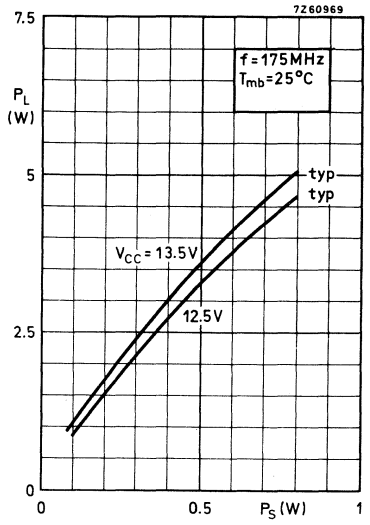
$V_{CC}(\text{V})$	$P_S(\text{W})$	$P_L(\text{W})$	$I_C(\text{A})$	$G_p(\text{dB})$	$\eta(\%)$	$\bar{Z}_i(\Omega)$	$\bar{Y}_L(\text{mS})$
13.5	< 0.63	4	< 0.49	> 8	> 60	$3.9 + j2.2$	$37 - j22$
12.5	typ. 0.63	4	typ. 0.53	typ. 8	typ. 60	-	-

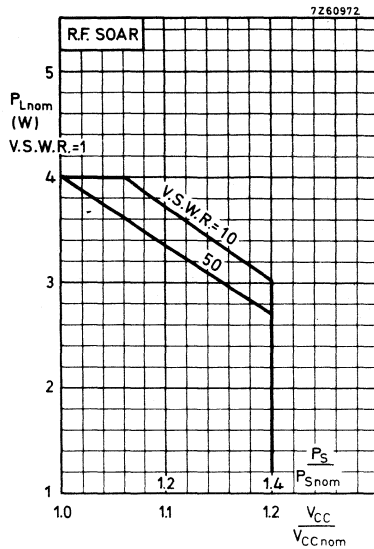
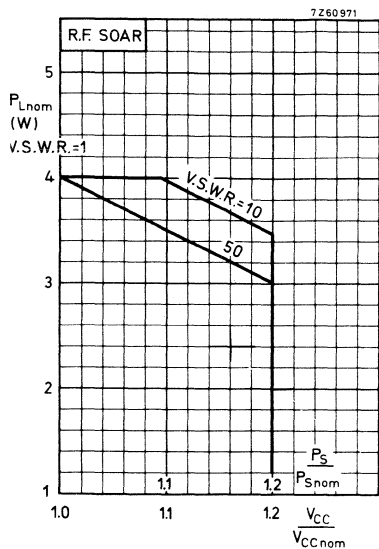
Test circuit



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

- $L1 = 1$ turn enamelled Cu wire (1.0 mm); int. diam. 10 mm; leads $2 \times 10 \text{ mm}$
 $L2 = 6$ turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads $2 \times 10 \text{ mm}$
 $L3 = L6 =$ ferrocube choke (code number 4312 020 36640)
 $L4 = 8$ turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads $2 \times 10 \text{ mm}$
 $L5 = 5$ turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 8 mm; leads $2 \times 10 \text{ mm}$
 $L7 = 7$ turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 6 mm; leads $2 \times 5 \text{ mm}$
 $R1 = R2 = 10 \Omega$ carbon





Conditions for R.F. SOAR:

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

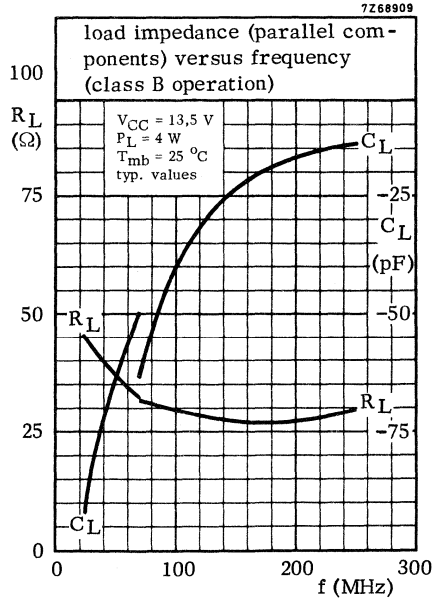
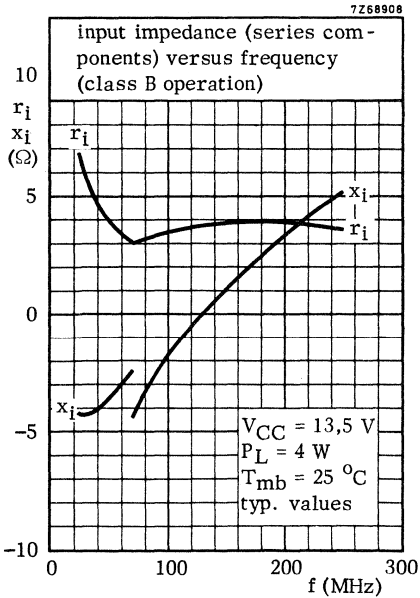
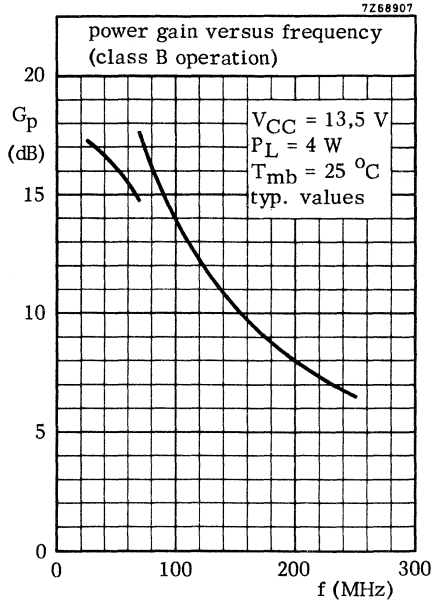
The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs above for safe operation at supply voltages other than the nominal. The graphs show 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 $10\ \Omega$ 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 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

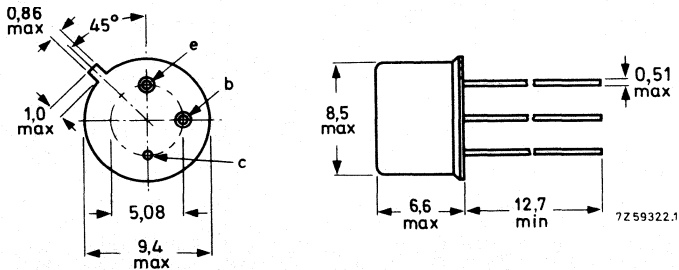
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

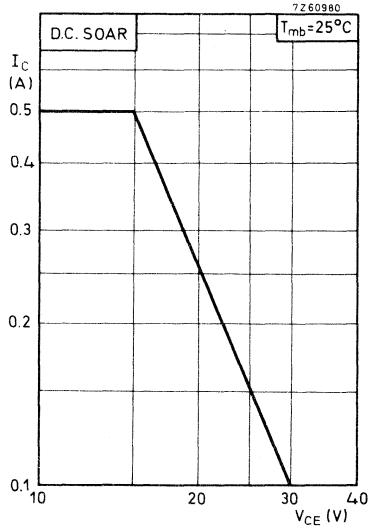
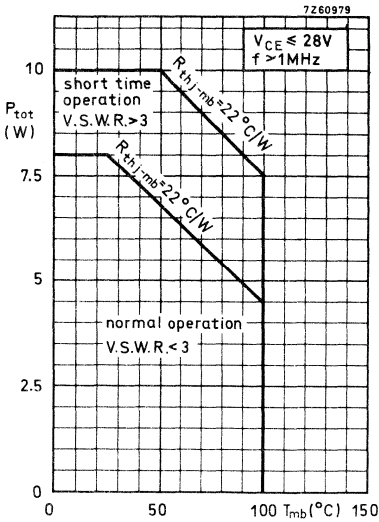


Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

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

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
Collector current (average)	$I_{C(AV)}$ max.	0.5	A
Collector current (peak value) $f > 1$ MHz	I_{CM} max.	1.5	A
Total power dissipation up to $T_{mb} = 25$ °C $f > 1$ MHz	P_{tot} max.	8	W



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

CHARACTERISTICS

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

Collector cut-off current

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

Breakdown voltages

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

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

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

Transient energy

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

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

D.C. current gain

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

Transition frequency

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

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

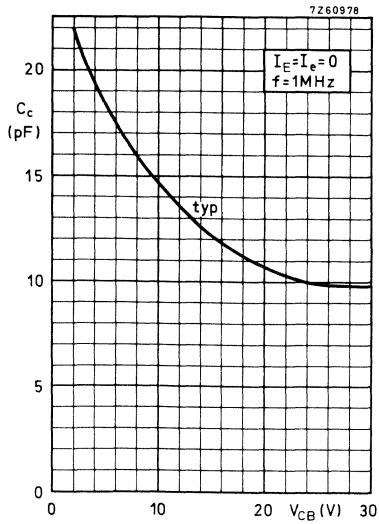
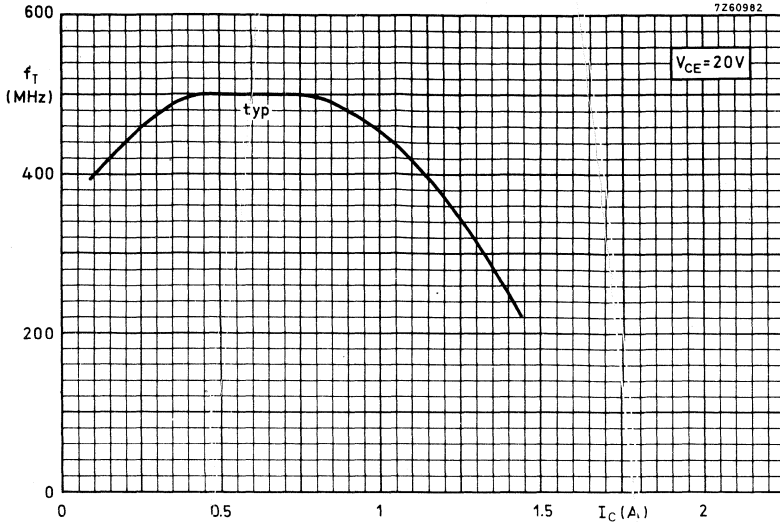
$$I_E = I_C = 0; V_{CB} = 30 \text{ V} \quad C_c \text{ typ. } 10 \text{ pF}$$

$$< 15 \text{ pF}$$

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

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

BFS23A



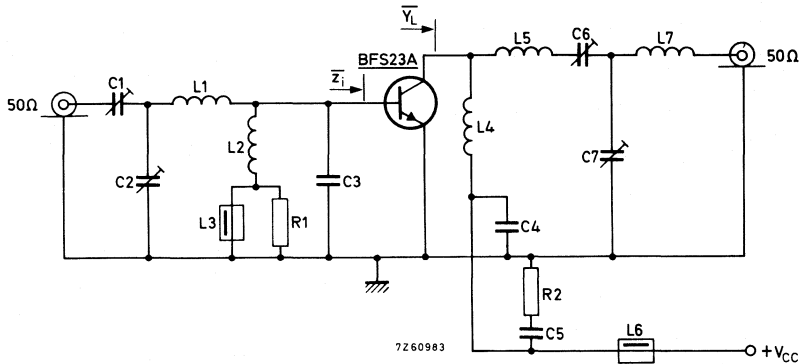
APPLICATION INFORMATION

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

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

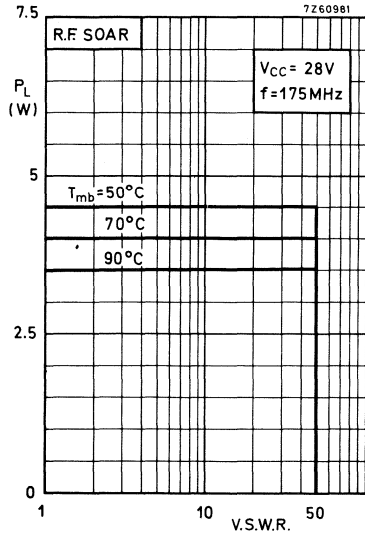
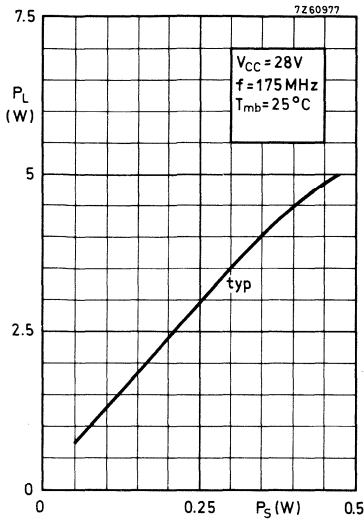
f(MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mS)
175	< 0.40	4	< 0.22	> 10	> 65	$2.3 + j1.6$	$8.9 - j18.1$

Test circuit



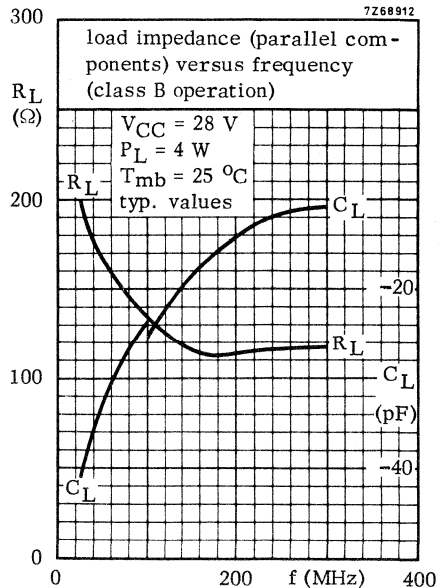
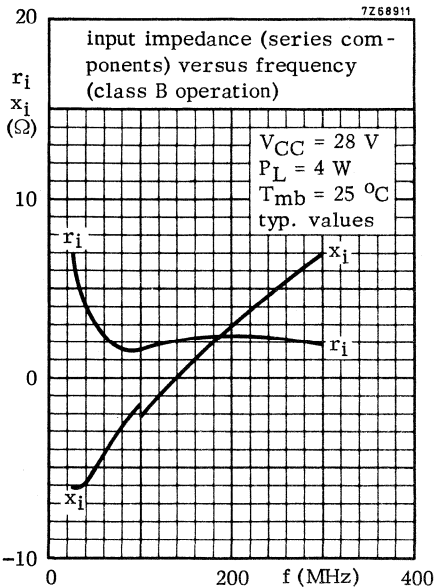
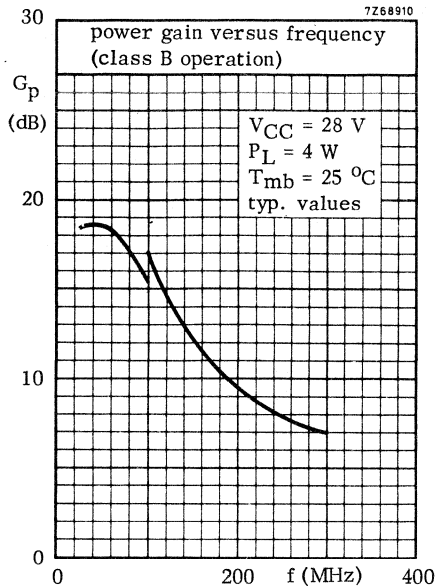
- $C1 = C6 = 4$ to 29 pF air trimmer with insulated rotor
 $C2 = C7 = 4$ to 29 pF air trimmer with non-insulated rotor
 $C3 = 39 \text{ pF}$ ceramic
 $C4 = 100 \text{ pF}$ ceramic
 $C5 = 15 \text{ nF}$ polyester

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

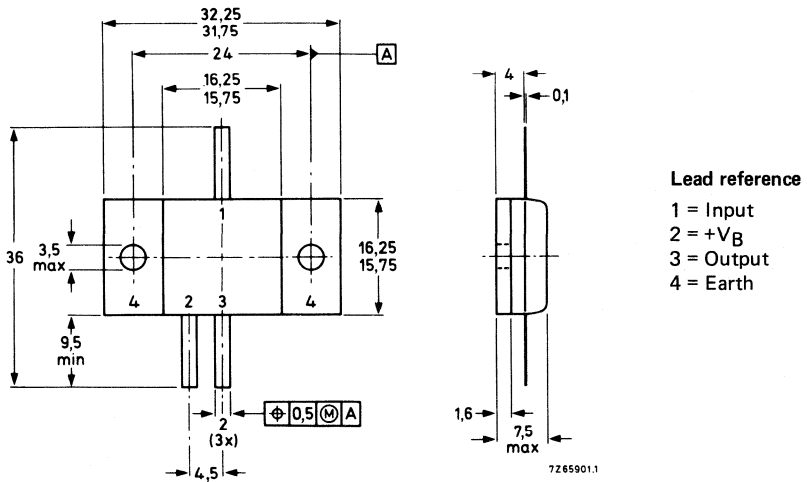
QUICK REFERENCE DATA

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 typ. 2,9	> 40 typ. 50	50
BGY22A	c.w.	420 to 480	12,5	50	> 2,5	> 40	50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-75A.



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 °C for 10 seconds at least 1 mm from the plastic.

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

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
------------------------	-----------	------	-----	----

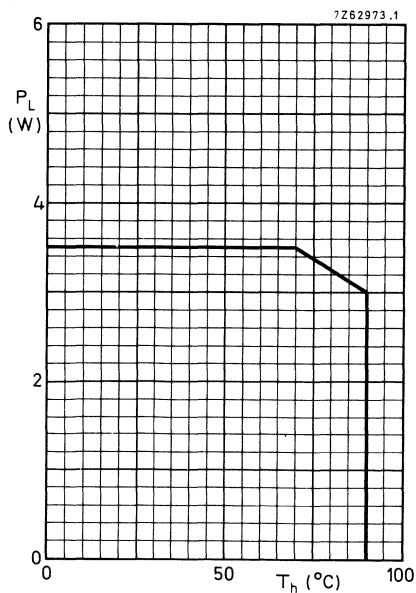
Drive power

$V_B = 13,5 \text{ V}; Z_L = 50 \Omega$	P_D	max.	150	mW
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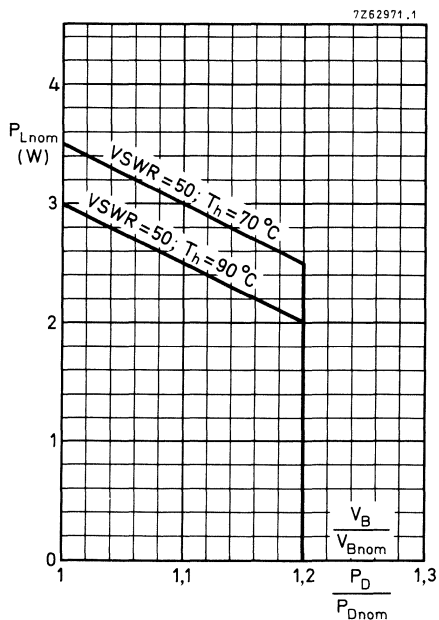
Temperatures

Storage temperature	T_{stg}	-40 to +100	$^{\circ}\text{C}$
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 $V_B = 13,5 \text{ V}; Z_L = 50 \Omega$ (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

$P_D = 50\text{ mW}$ $\eta > 40\%$

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 $50\ \Omega$

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

Temperature coefficient of P_L

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

Stability

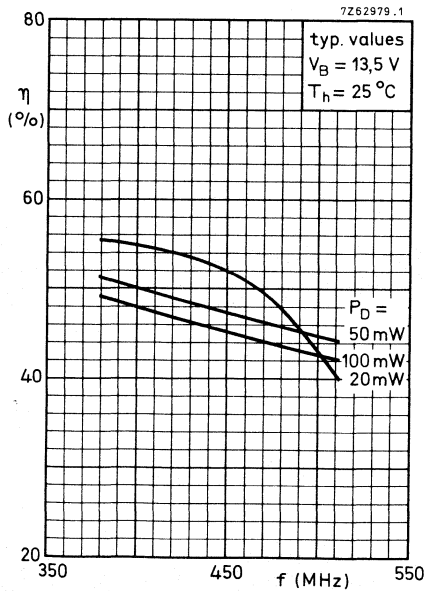
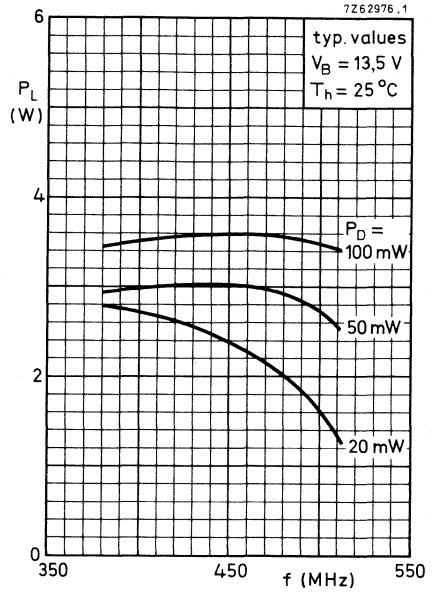
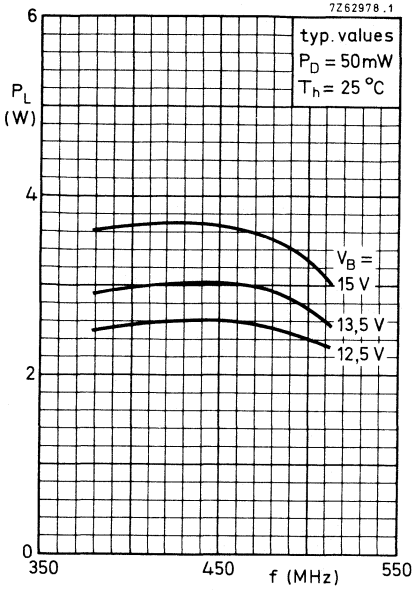
$V_B = 10,5\text{ to }15\text{ V}$; $P_D = 10\text{ mW to }100\text{ mW}$

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

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 $Z_S = Z_L = 50\ \Omega$

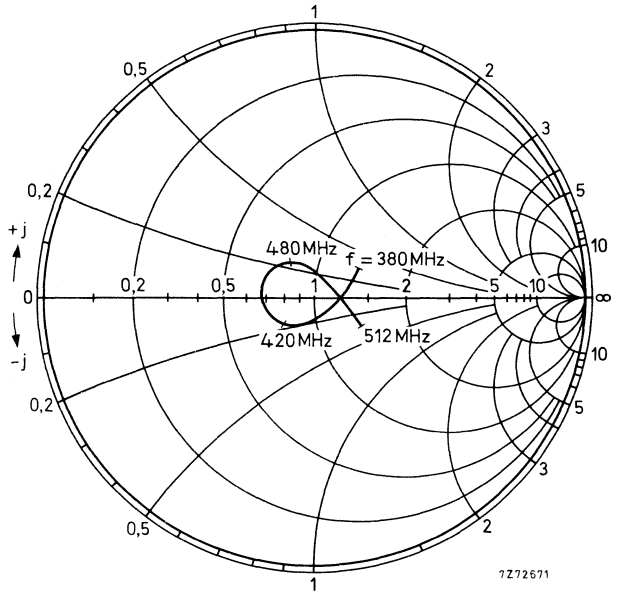
type number	f MHz	V_B V	P_D mW	P_L W	η %
BGY22	380 to 512	15,0	50	typ. 3,5	typ. 47
		13,5		> 2,5	> 40
		13,5		typ. 2,9	typ. 47
		12,5		typ. 2,5	typ. 47
BGY22A	420 to 480	12,5	50	> 2,5	> 40

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)

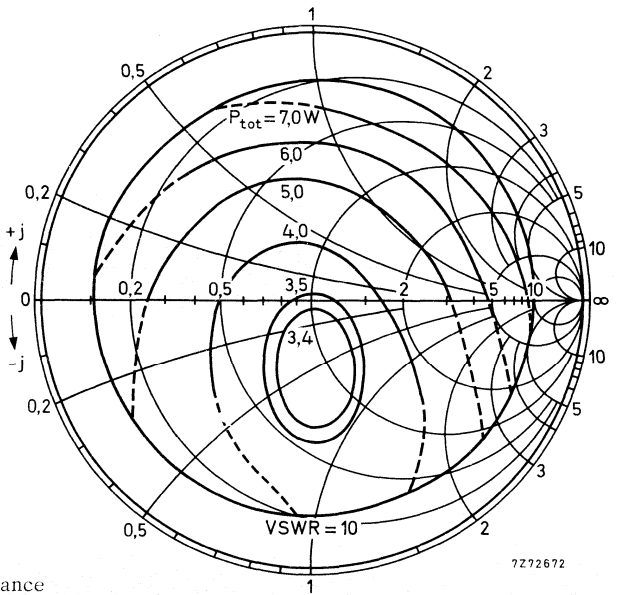
VSWR = 50 at any phase

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



Typical variation of input impedance with frequency

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

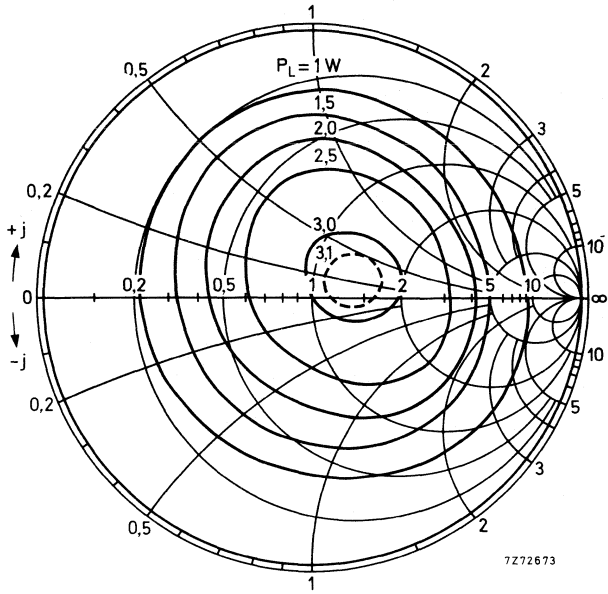


Typical variation of power dissipation with load impedance

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

$P_D = 50 \text{ mW}$

$f = 470 \text{ MHz}$

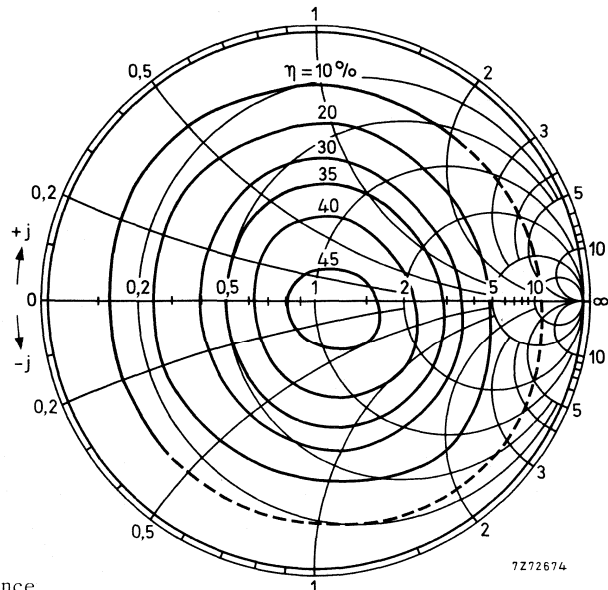


Typical variation of load power with load impedance

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

$P_D = 50 \text{ mW}$

$f = 470 \text{ MHz}$



Typical variation of efficiency with load impedance

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.

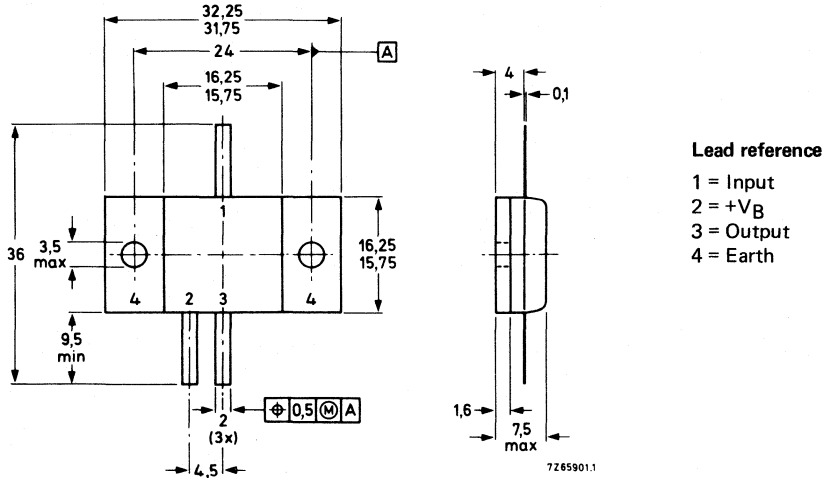
QUICK REFERENCE DATA

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 to 480	13,5	2,5	> 7,0	> 60	50
		380 to 480			typ. 8,3	typ. 71	
		480 to 512			typ. 7,5	typ. 69	
BGY23A	c.w.	420 to 480	12,5	2,5	> 7,0	> 60	50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-75A.



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 °C for 10 seconds at least 1 mm from the plastic.

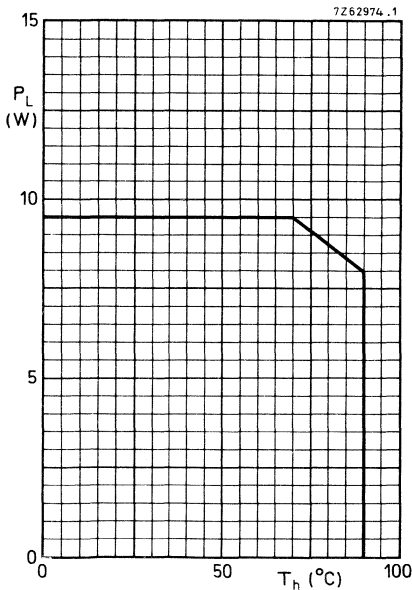
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

BGY23 BGY23A

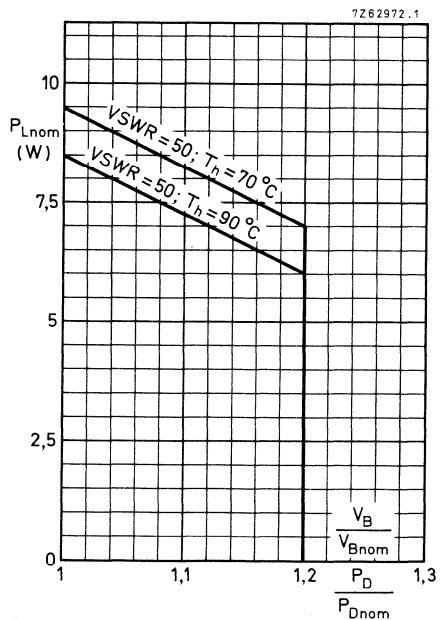
RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)
(with respect to flange)

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
Supply current (d. c.)	I_{tot}	max.	1,7	A
$V_B = 13,5$ V; $Z_L = 50$ Ω	P_D	max.	3,5	W
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

$T_h = 25^\circ\text{C}$ 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 to 9,5 W

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

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

Efficiency

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

Supply current

$P_D = 2,5\text{ W}$ I_{tot} typ. 900 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 $50\ \Omega$

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

Temperature coefficient of P_L

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

Stability

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

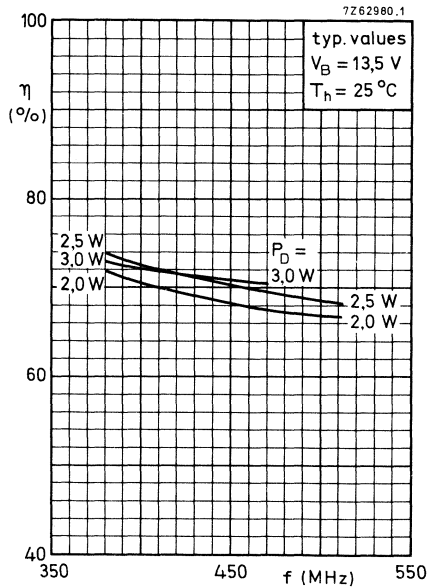
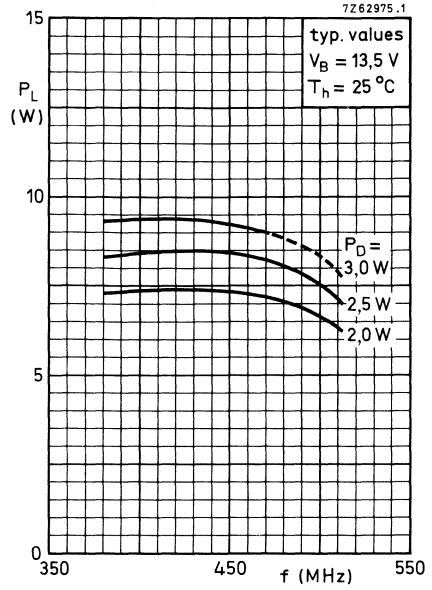
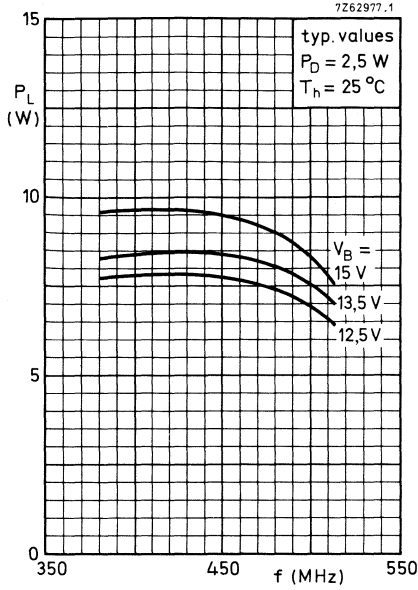
$T_h = -40^\circ\text{C to }+90^\circ\text{C}$

Output load VSWR ≤ 3 , all phases

Output load VSWR ≤ 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:

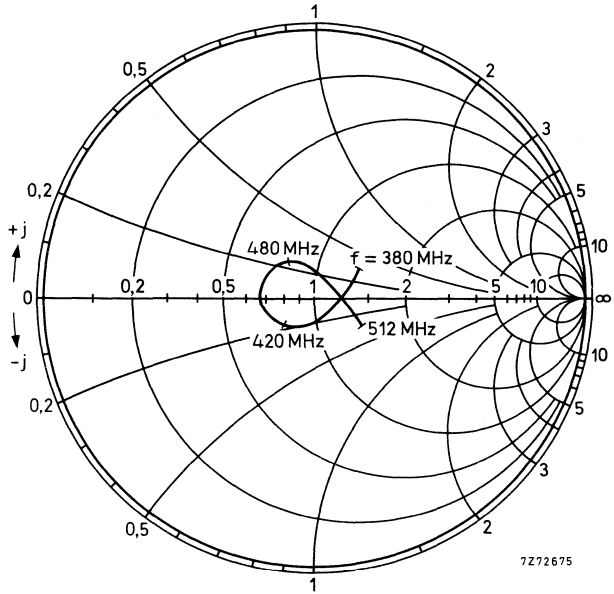
$$P_D = P_{Dnom} + 20\%; T_h = 70\text{ }^\circ\text{C}$$

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

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

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

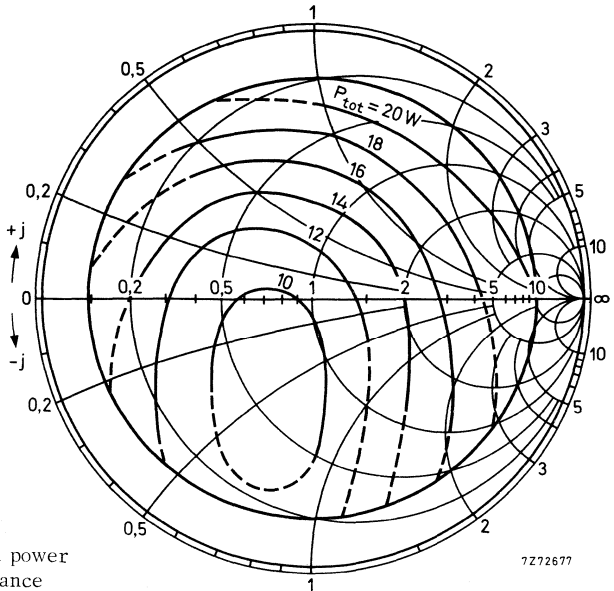
where $P_{Dnom} = P_D$ for 7,0 W module output under nominal conditions.



Typical variation of input impedance with frequency

7272675

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



BGY22/23 or
BGY22A/23A
cascaded amplifier

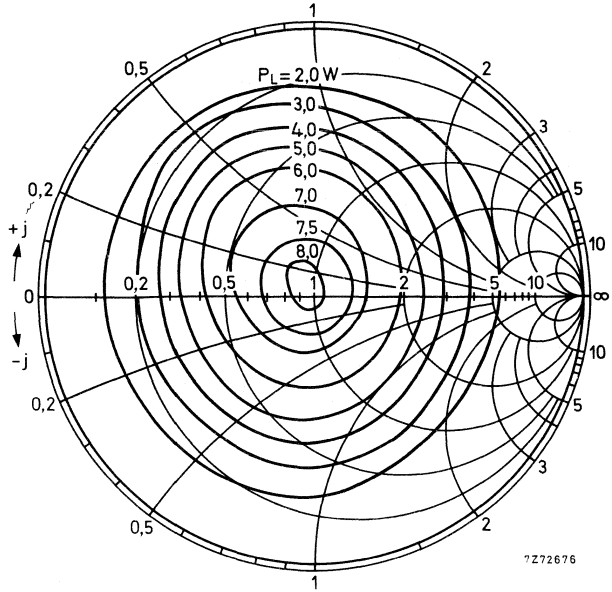
Typical variation of overall power dissipation with load impedance

7272677

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

$f = 470 \text{ MHz}$

BGY22/23 or
BGY22A/23A
cascaded amplifier

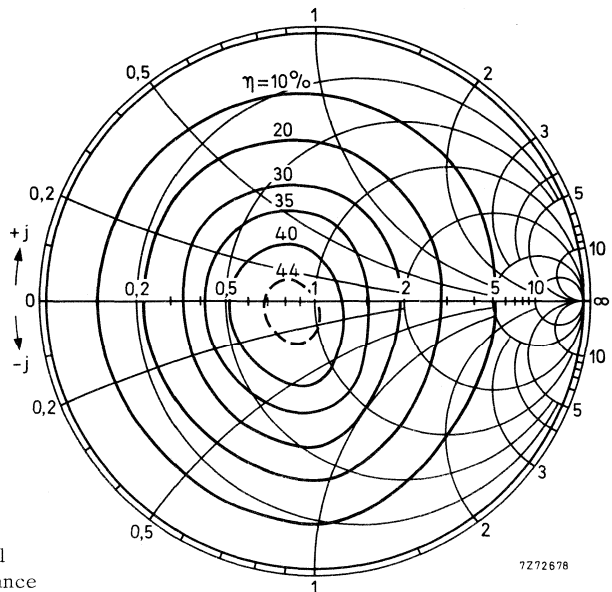


Typical variation of load power with load impedance

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

$f = 470 \text{ MHz}$

BGY22/23 or
BGY22A/23A
cascaded amplifier



Typical variation of overall efficiency with load impedance

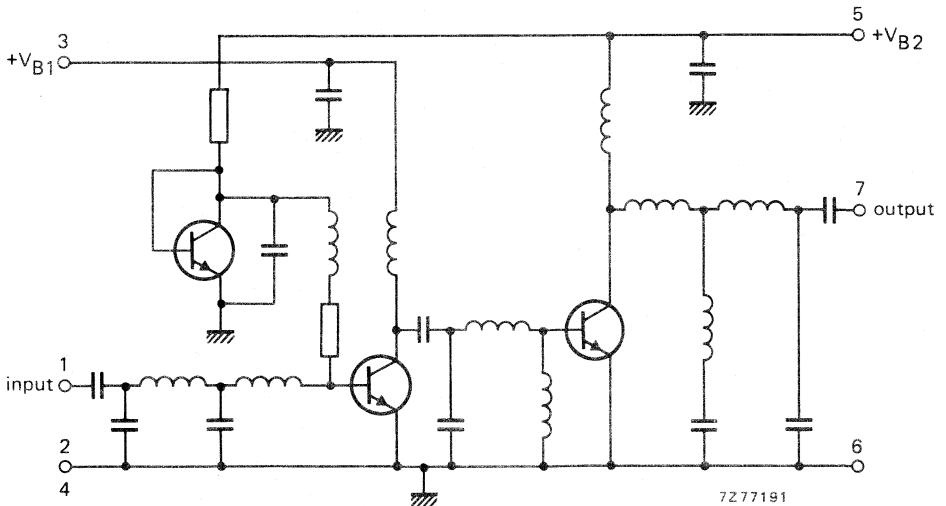
V.H.F. POWER AMPLIFIER MODULES

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_1 (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

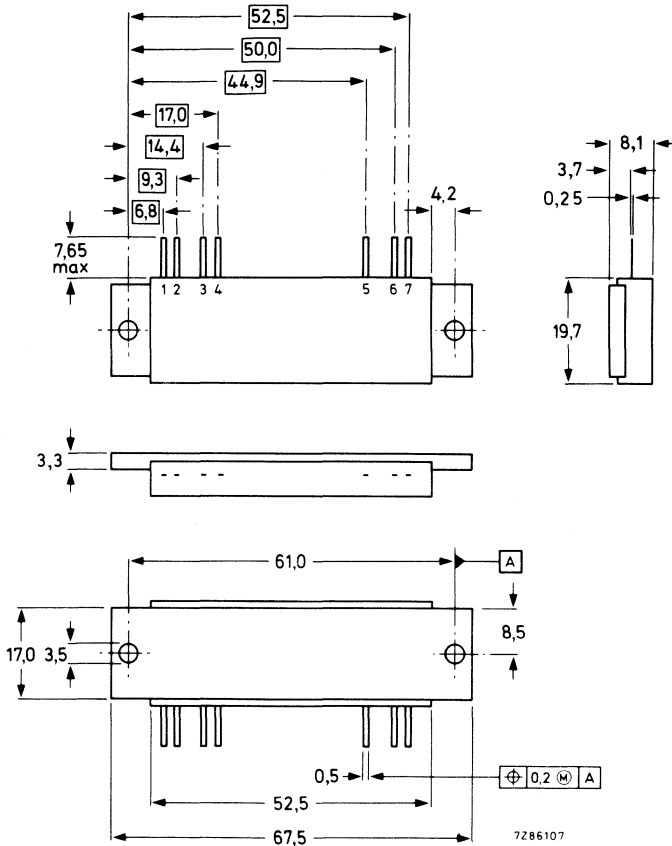


PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 SOT-132B.

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.

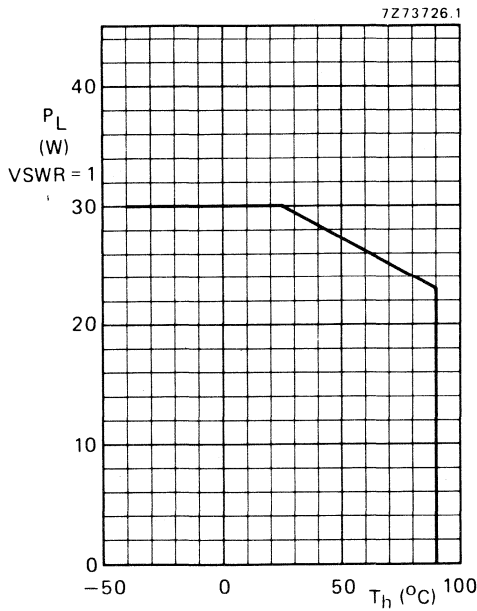
Devices may be soldered directly into a circuit with a soldering iron at maximum iron temperature of 245 °C for 10 seconds at least 1 mm from the plastic.

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
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



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

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

$R_S = R_L = 50\text{ }\Omega$

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

Frequency range

Load power

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

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

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

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

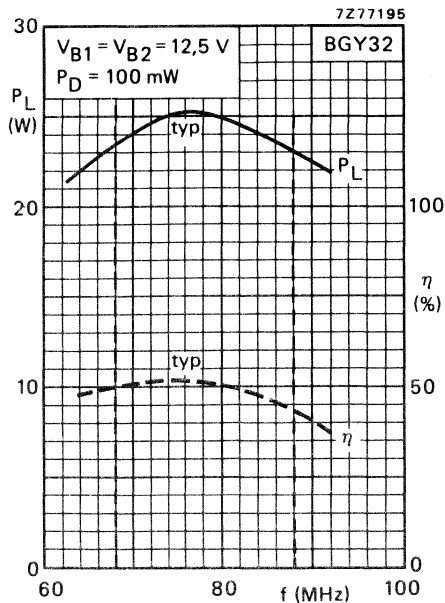
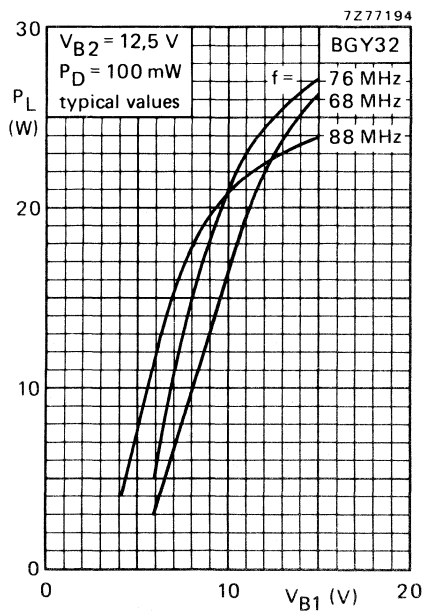
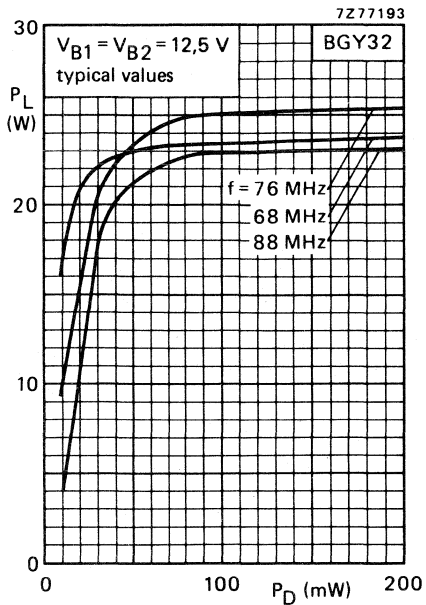
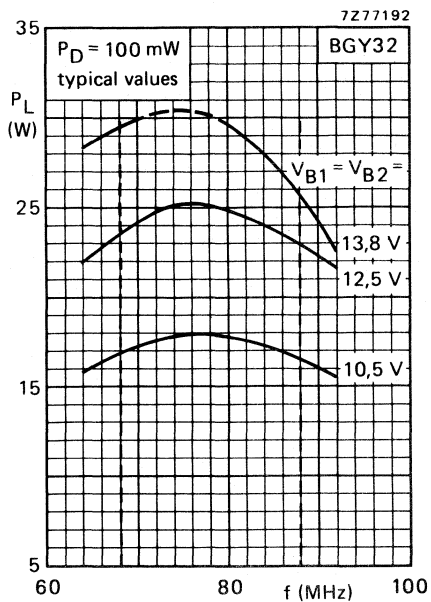
An electrolytic capacitor of 10 μF (25 V), in parallel with a polyester capacitor of 100 nF to earth, is recommended as decoupling arrangement for each power supply pin.

Power rating

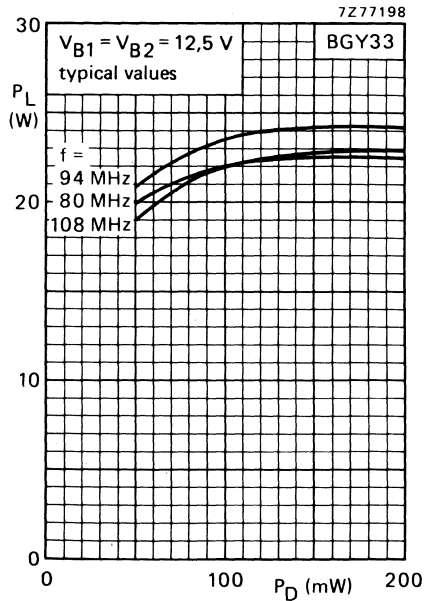
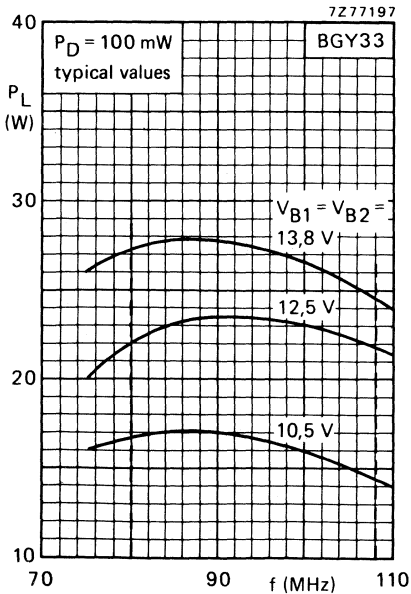
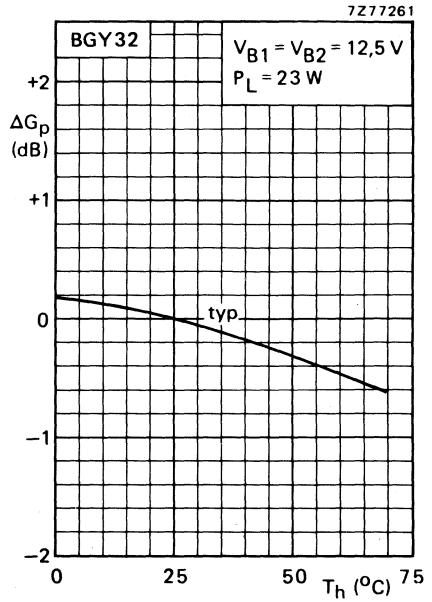
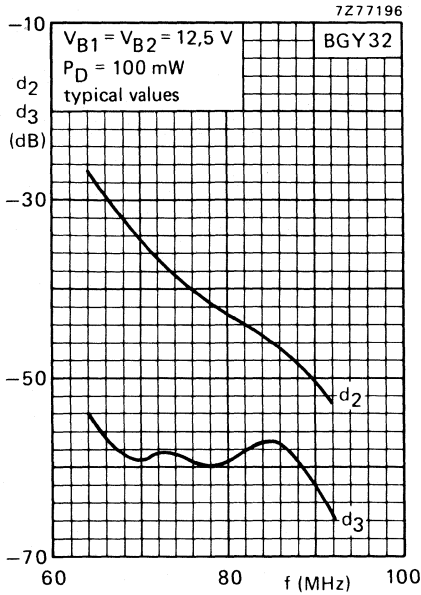
In general it is recommended that the output power from the module under nominal design conditions should not exceed 23 W in order to provide adequate safety margin under fault conditions.

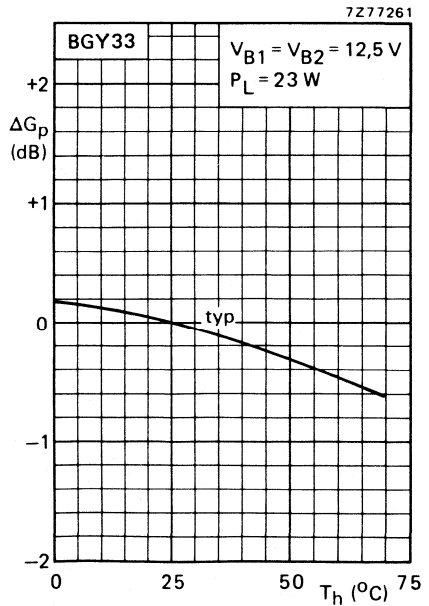
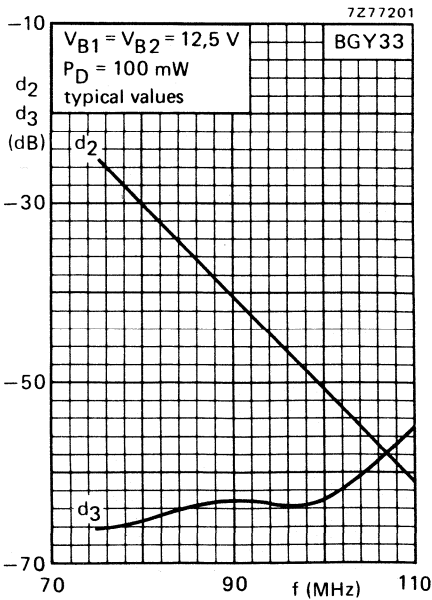
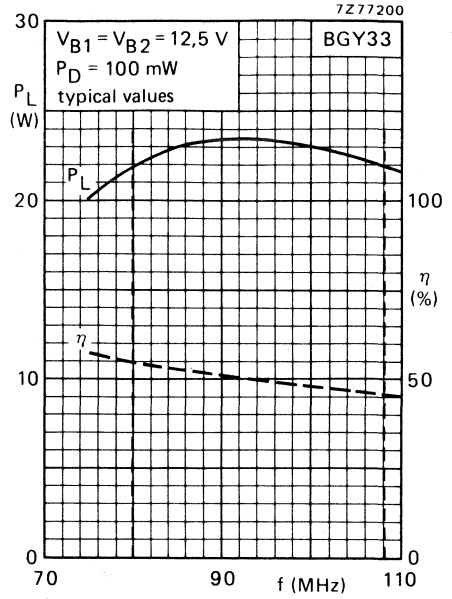
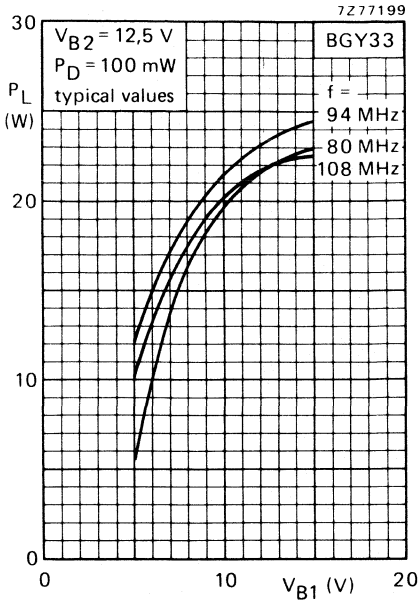
Gain control

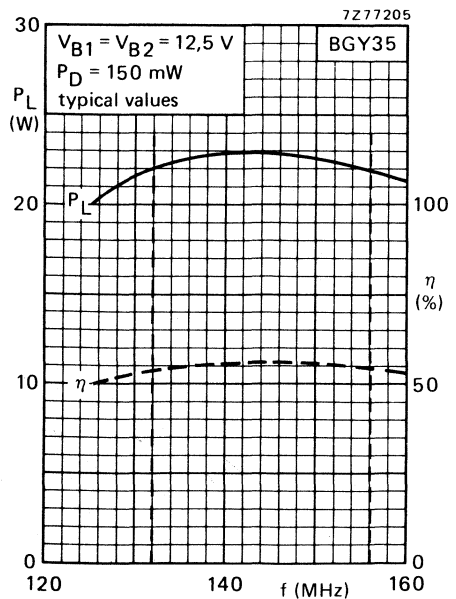
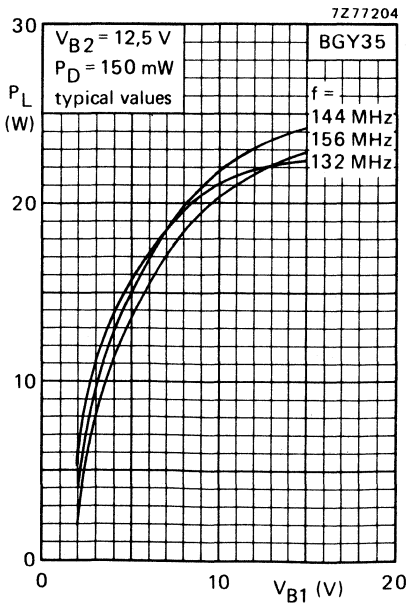
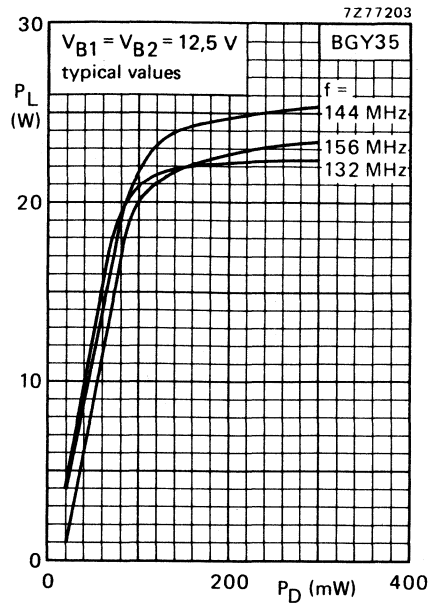
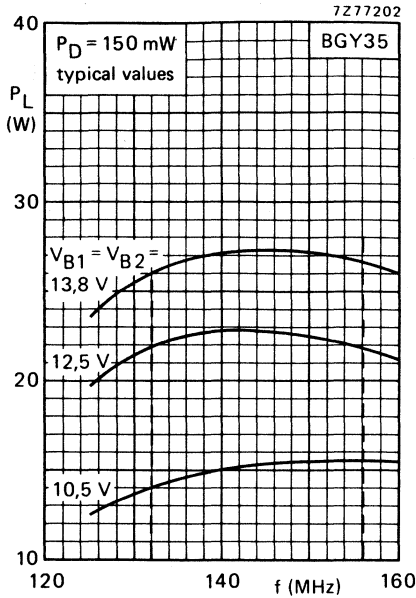
Power output can be controlled by variation of the driver stage supply voltage V_{B1} . The supply required is a voltage regulator with a current rating of 0,75 A, and an output voltage range of 3 V to 12 V.

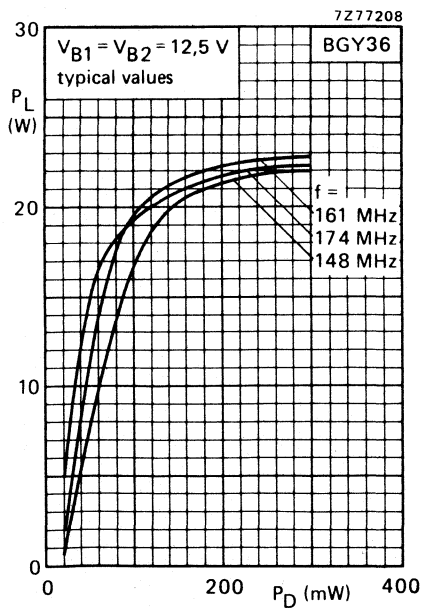
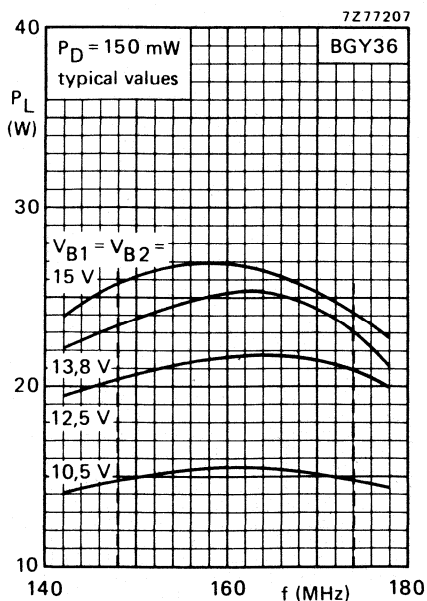
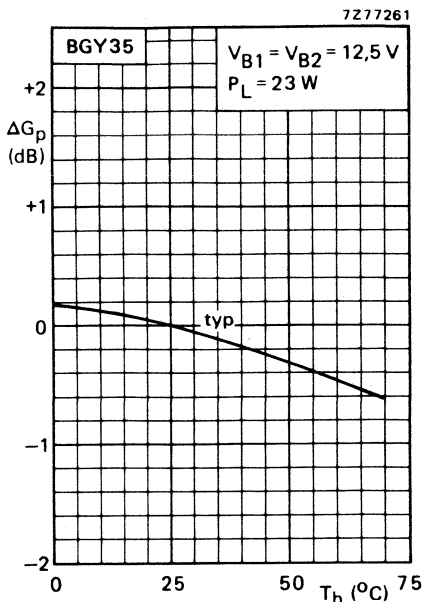
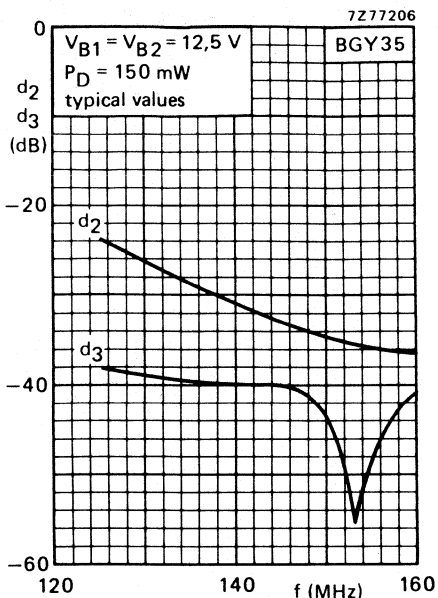


BGY32 BGY33
BGY35 BGY36

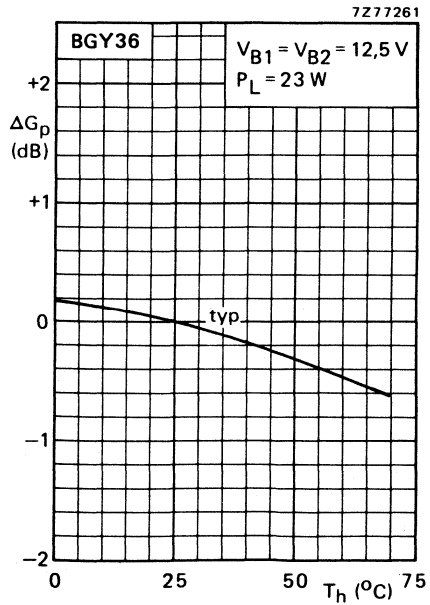
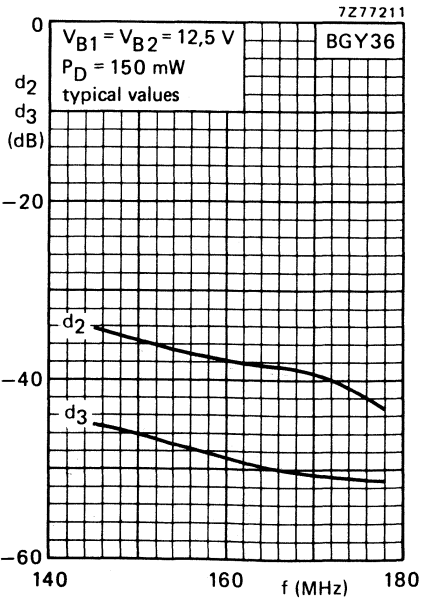
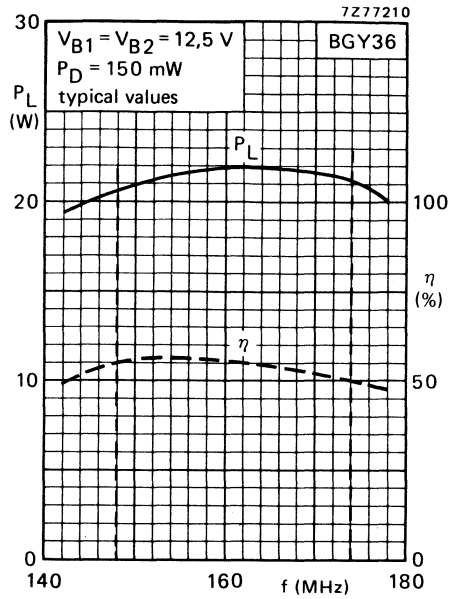
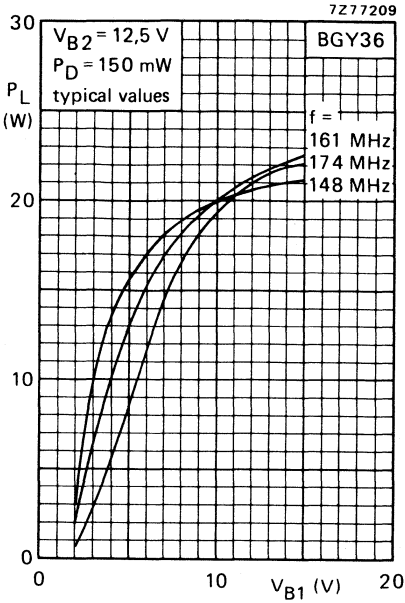








BGY32 BGY33
BGY35 BGY36



U.H.F. POWER AMPLIFIER MODULES

A range of broadband u.h.f. modules, primarily designed for mobile communication equipment, operating directly from 12 V electrical systems.

The BGY40,41 series produce minimum output powers of 7.5 W and 13 W respectively in the u.h.f. communications bands, the 'A' types covering 400 to 440 MHz and the 'B' types covering 440 to 470 MHz.

The modules consist of a three-stage r.f. amplifier using n-p-n transistor chips with lumped element matching components in a plastic stripline encapsulation.

The negative supply is internally connected to the flange.

QUICK REFERENCE DATA

Mode of operation			c.w.	
Supply voltages	V_{S1}, V_{S2}	nom.	12.5	V
Input impedance	Z_i	nom.	50	Ω
Output load impedance	Z_L	nom.	50	Ω

R.f. performance

		BGY40A	BGY41A	BGY40B	BGY41B	
Frequency of operation	f	400 to 440		440 to 470		MHz
Typical drive power	P_D	75	150	100	150	mW
Typical load power	P_L	11.5	15.6	10	15	W
Typical efficiency	η	40	40	40	40	%

MECHANICAL DATA (see Fig. 15)

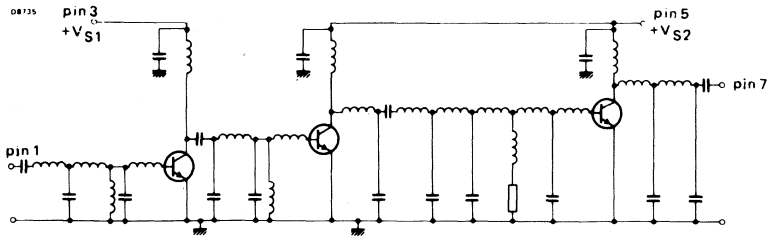


Fig. 1 Circuit of the u.h.f. modules.

PRODUCT SAFETY 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 (with respect to flange)

D.C. supply terminals		V_{S1} and V_{S2}	max.	16.5	V
R.F. input terminal		$\pm V_{in}$	max.	25	V
R.F. output terminal		$\pm V_{out}$	max.	25	V
Load power (see Fig.2)	BGY40A, 40B	P_L	max.	12	W
	BGY41A, 41B	P_L	max.	16.5	W
Input drive power	BGY40A, 40B	P_D	max.	150	mW
	BGY41A, 41B	P_D	max.	200	mW
Storage temperature range		T_{stg}		-40 to +100	°C
Operating heatsink temperature		T_h	max.	90	°C

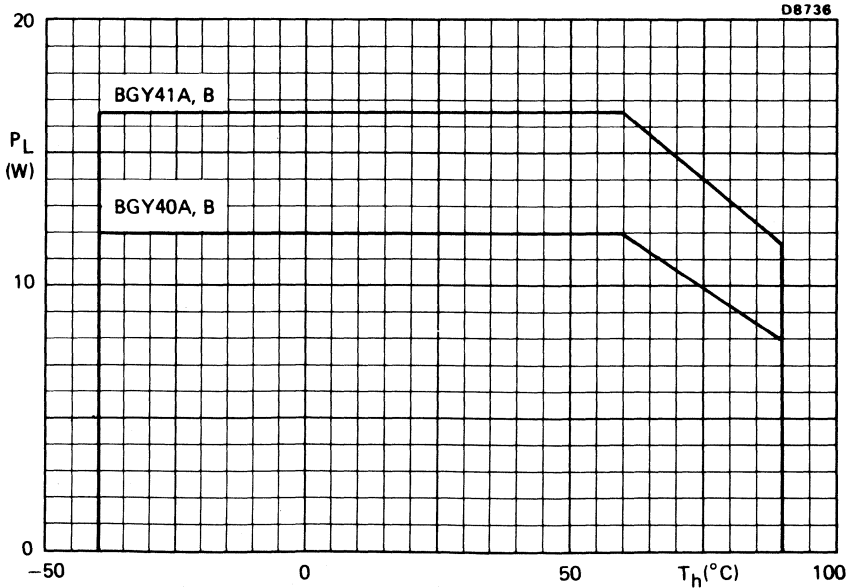


Fig.2 Load power derating; VSWR = 1

CHARACTERISTICS $T_h = 25\text{ }^\circ\text{C}$ unless otherwise specified; $V_{S1} = V_{S2} = 12.5\text{ V}$; $R_S = 50\ \Omega$; $R_L = 50\ \Omega$

		BGY40A	BGY41A	BGY40B	BGY41B	
Frequency of operation	f	400 to 440		440 to 470		MHz
Minimum load power	P_L	7.5	13	7.5	13	W
Nominal drive power	P_D	100	150	100	150	mW
Minimum efficiency	η	35	35	35	35	%
Typical load power	P_L	11.5	15.6	10	15	W
Typical drive power	P_D	75	150	100	150	mW
Typical efficiency	η	40	40	40	40	%

Harmonic output Any single harmonic will be at least 40 dB down from the carrier.**Input VSWR** (with respect to 50 Ω) typ. 1.5**Stability**

The modules are stable with load VSWR up to 3 (all phases) when operated within the following limits:

BGY40A, BGY40B	BGY41A, BGY41B
$P_D = 30$ to 150 mW	$P_D = 30$ to 200 mW
$V_{S1} = V_{S2} = 8$ to 16.5 V	$V_{S1} = V_{S2} = 8$ to 16.5 V
$P_L = 5$ to 12 W	$P_L = 5$ to 16.5 W

RuggednessThe modules will withstand load VSWR of 50 (all phases) for short period overload conditions with P_D , V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched r. f. output power rating being exceeded.**Mounting**

To ensure good thermal transfer, the module should be mounted onto a heatsink with a flat surface, with heat conducting compound between module and heatsink. If an isolation washer is used, heatsink compound should be applied to both sides of the washer. Burrs and thickening of the holes in the heatsink should be removed and 3 mm bolts tightened to a torque of 0.5 Nm.

Devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 $^\circ\text{C}$ for not more than 10 seconds at a distance of at least 1 mm from the plastic.

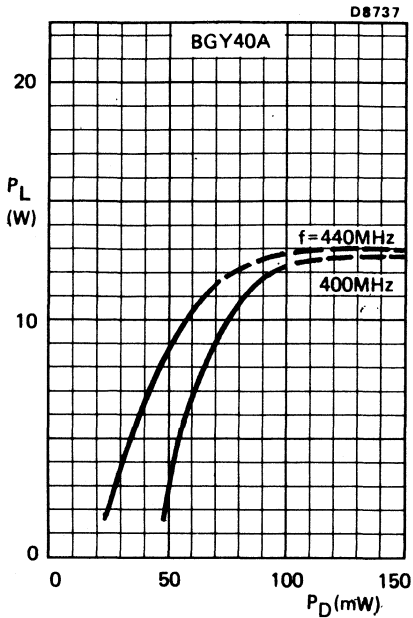


Fig.3 Typical values; $V_{S1} = V_{S2} = 12.5$ V

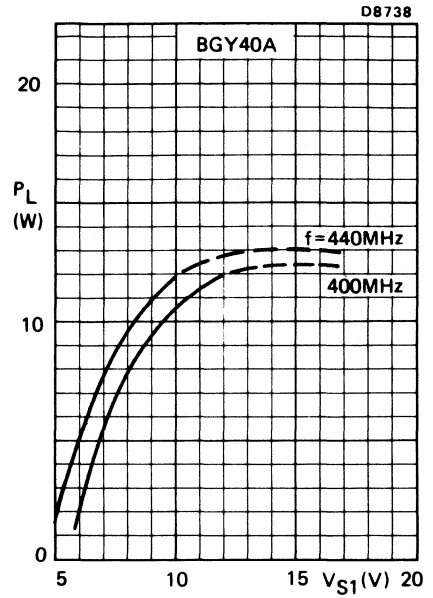


Fig.4 Typical values; $V_{S2} = 12.5$ V; $P_D = 100$ mW

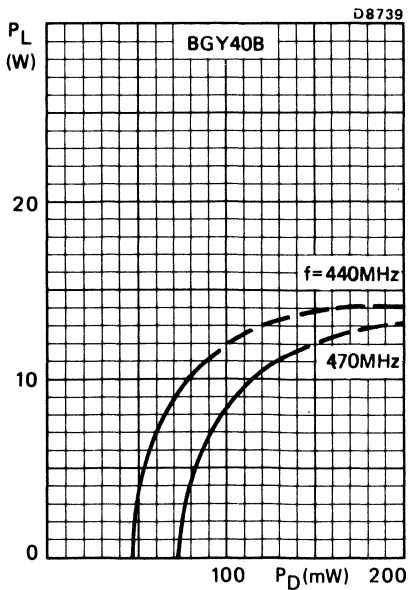


Fig.5 Typical values; $V_{S1} = V_{S2} = 12.5$ V

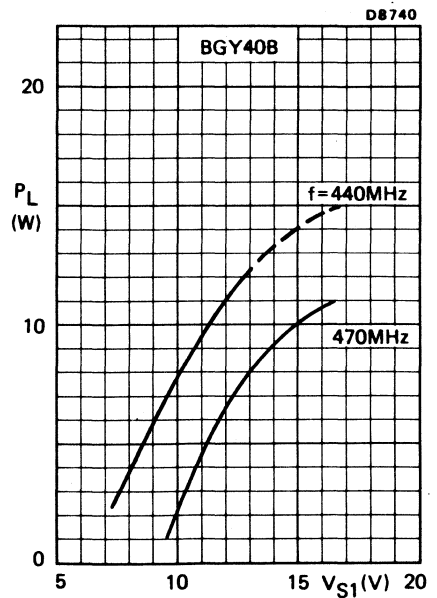


Fig.6 Typical values; $V_{S2} = 12.5$ V; $P_D = 100$ mW

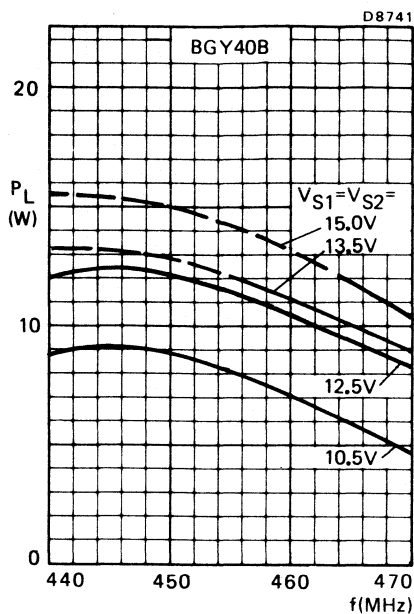


Fig.7 Typical values; $P_D = 100$ mW

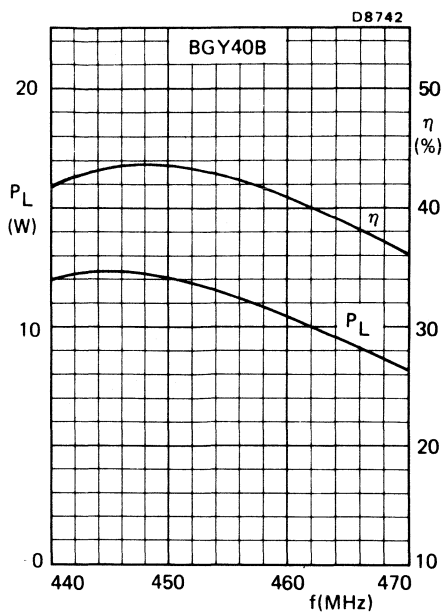


Fig.8 Typical values; $V_{S1} = V_{S2} = 12.5$ V;
 $P_D = 100$ mW

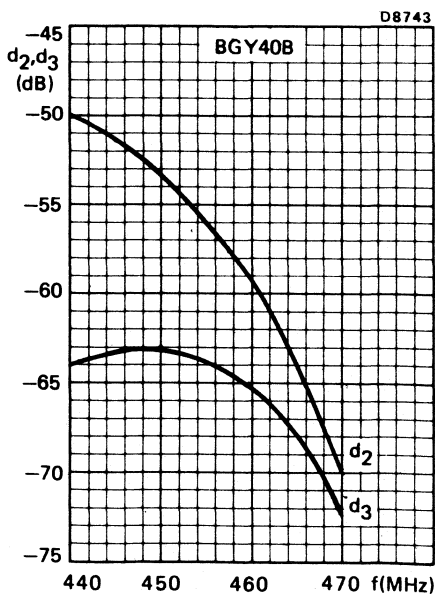


Fig.9 Typical values; $V_{S1} = V_{S2} = 12.5$ V;
 $P_D = 100$ mW

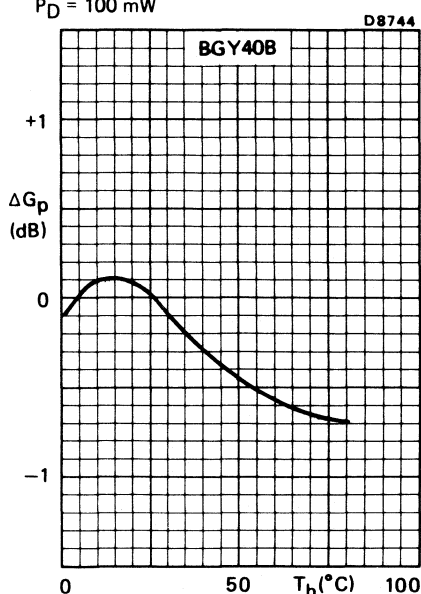
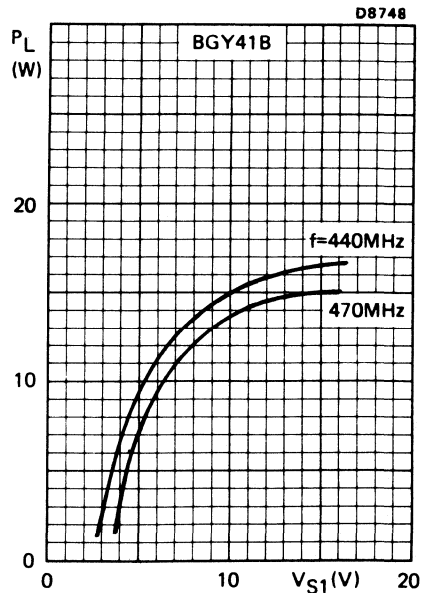
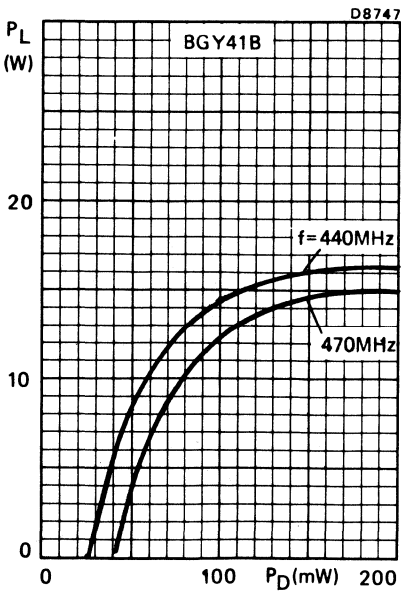
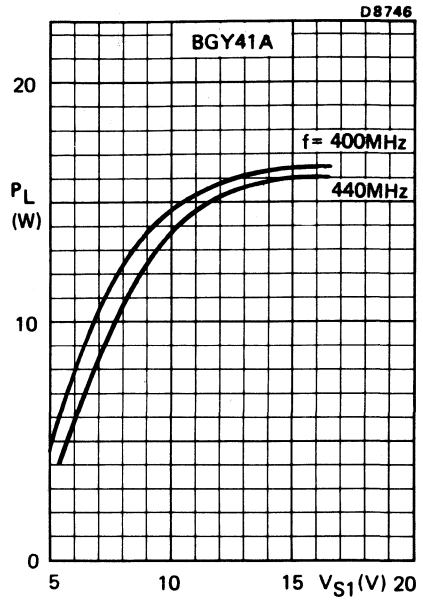
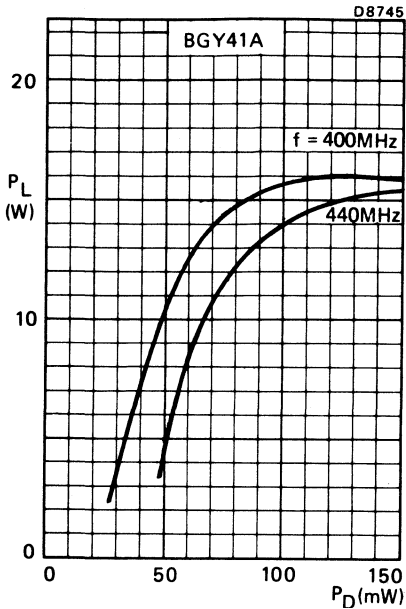


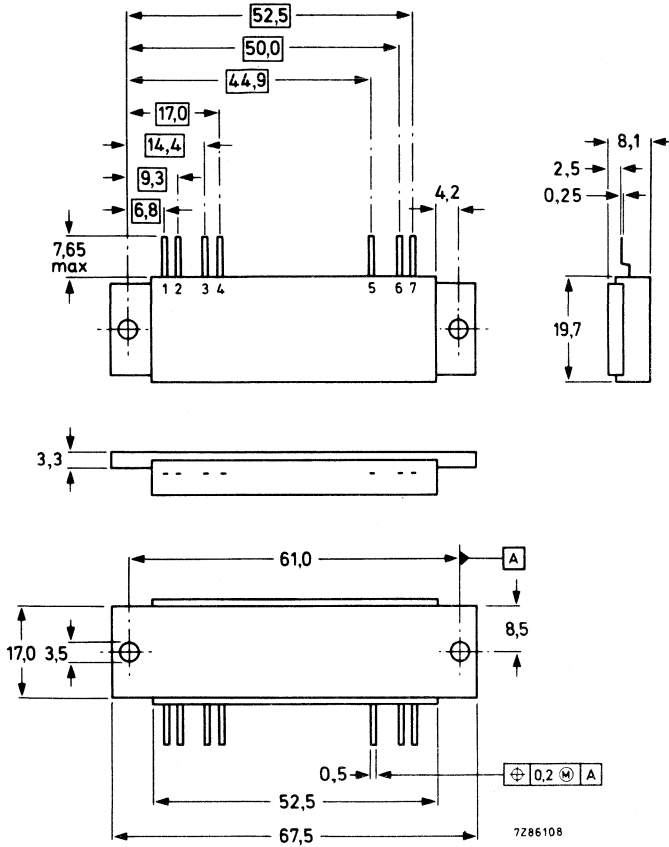
Fig.10 Typical values; $V_{S1} = V_{S2} = 12.5$ V;
 $P_D = 100$ mW



MECHANICAL DATA

Dimensions in mm

Fig. 15 SOT-132C.



Lead reference

- 1 = Input
- 2 = Earth
- 3 = VS1
- 4 = Earth
- 5 = VS2
- 6 = Earth
- 7 = Output

7286108

V.H.F. POWER AMPLIFIER MODULE

A broadband v.h.f. amplifier module primarily designed for mobile communications equipment, operating directly from 12 V electrical systems. The module will produce a minimum output of 13 W into a 50 Ω load over the frequency range 148 to 174 MHz.

The module consists of a two stage r.f. amplifier using n-p-n transistor chips with lumped-element matching components in a plastic stripline encapsulation. The negative supply is internally connected to the flange.

QUICK REFERENCE DATA

Mode of operation	c.w.			
Frequency range	f		148 to 174	MHz
Drive power	P_D	max.	150	mW
	P_D	typ.	80	mW
Load power	P_L	>	13	W
Supply voltages	V_{S1} and V_{S2}	nom.	12.5	V
Input impedance	z_i	nom.	50	Ω
Output load impedance	Z_L	nom.	50	Ω

MECHANICAL DATA (see Fig. 10)

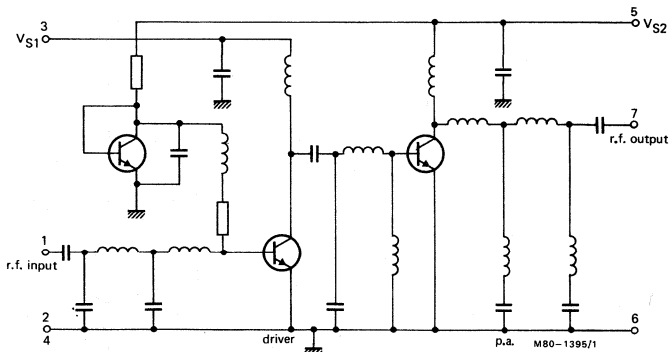


Fig. 1 Circuit of the v.h.f. module.

PRODUCT SAFETY 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 (with respect to flange)

D.C. supply terminals	V_{S1} and V_{S2}	max.	16.5	V
R.F. input terminal	$\pm V_i$	max.	25	V
R.F. output terminal	$\pm V_o$	max.	25	V
Load power (see below)	P_L	max.	18	W
Input drive power	P_D	max.	300	mW
Storage temperature range	T_{stg}		-40 to +100	$^{\circ}C$
Operating heatsink temperature	T_h	max.	90	$^{\circ}C$

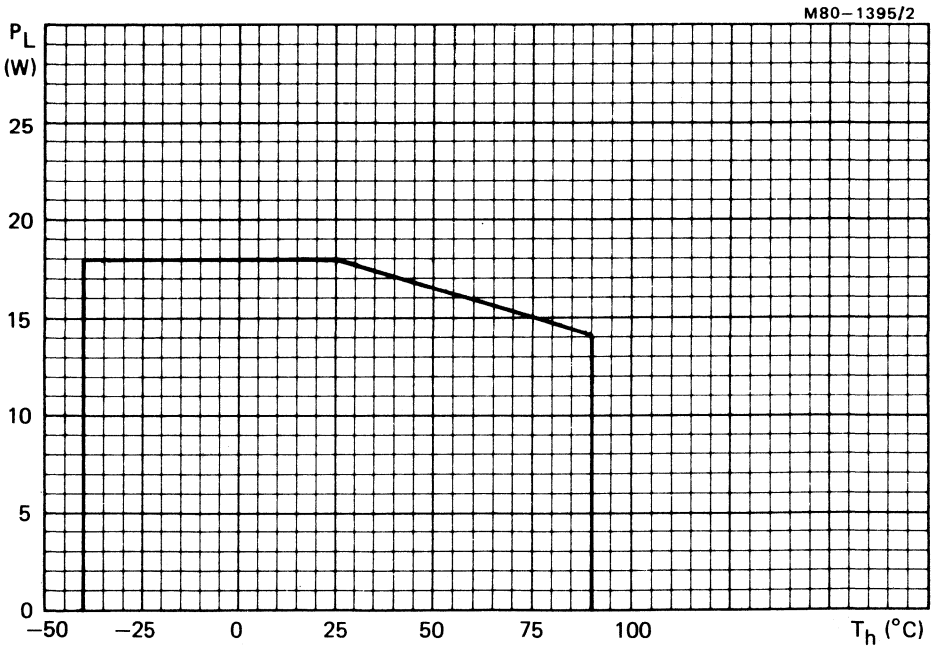


Fig.2 Load power derating; VSWR = 1

CHARACTERISTICS

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

$V_{S1} = V_{S2} = 12.5\text{ V}$; $R_S = 50\ \Omega$; frequency range 148 to 174 MHz; $R_L = 50\ \Omega$

Quiescent currents

$P_D = 0$	I_{Q1}	typ.	5	mA
	I_{Q2}	typ.	15	mA

R.F. drive power

$P_L = 13\text{ W}$	P_D	<	150	mW
	P_D	typ.	80	mW

Efficiency

$P_L = 13\text{ W}$	η	>	40	%
	η	typ.	48	%

Harmonic output

Any single harmonic will be at least 25 dB down from the carrier, with typical rejection of 34 dB.

Input VSWR (with respect to $50\ \Omega$) typ. 1.5

Stability

The module is stable with load VSWR up to 3 (all phases) when operated with:

$V_{S1} = V_{S2} = 10$ to 16.5 V ; $f = 148$ to 174 MHz ; $P_D = 30$ to 300 mW ; $P_L \leq 18\text{ W}$ (matched)

Ruggedness

The modules will withstand load VSWR of 50 for short period overload conditions, with P_D , V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched r.f. output power rating being exceeded.

Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface, with heat conducting compound between module and heatsink. If an isolation washer is used, heatsink compound should be applied to both sides of the washer. Burrs and thickening of the holes in the heatsink should be removed and 3 mm bolts tightened to a torque of 0.5 Nm.

Devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of $245\text{ }^\circ\text{C}$ for not more than 10 seconds at a distance of at least 1 mm from the plastic.

APPLICATION INFORMATION

A technical publication (M80-0056) entitled 'Transmitter design using v.h.f. broadband amplifier modules' is available on request.

Power rating

In general it is recommended that the output power from the module under nominal conditions should not exceed 16 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_{S1} . 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.

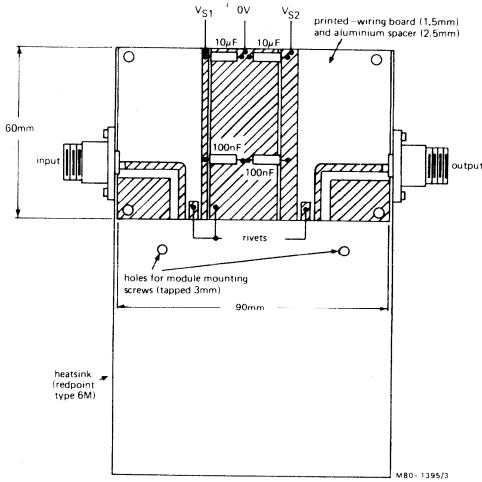


Fig.3 Test jig for v.h.f. modules

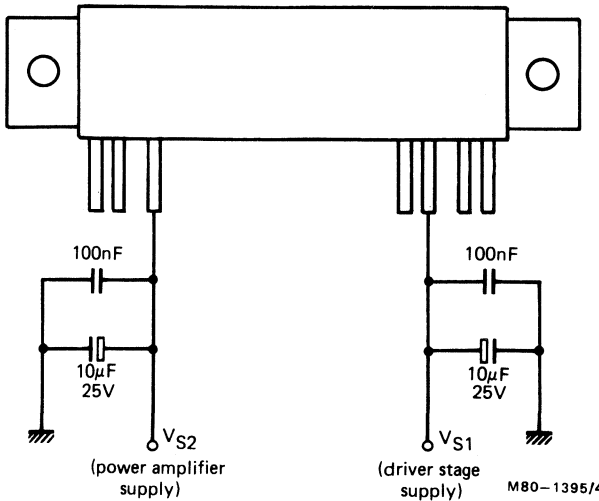


Fig.4 Recommended decoupling arrangement

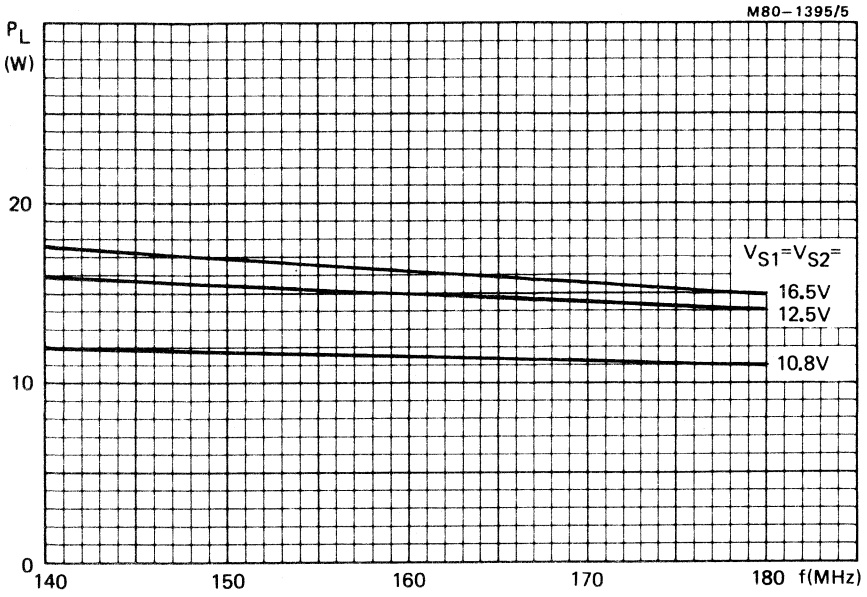


Fig.5 Typical values; $P_D = 150 \text{ mW}$

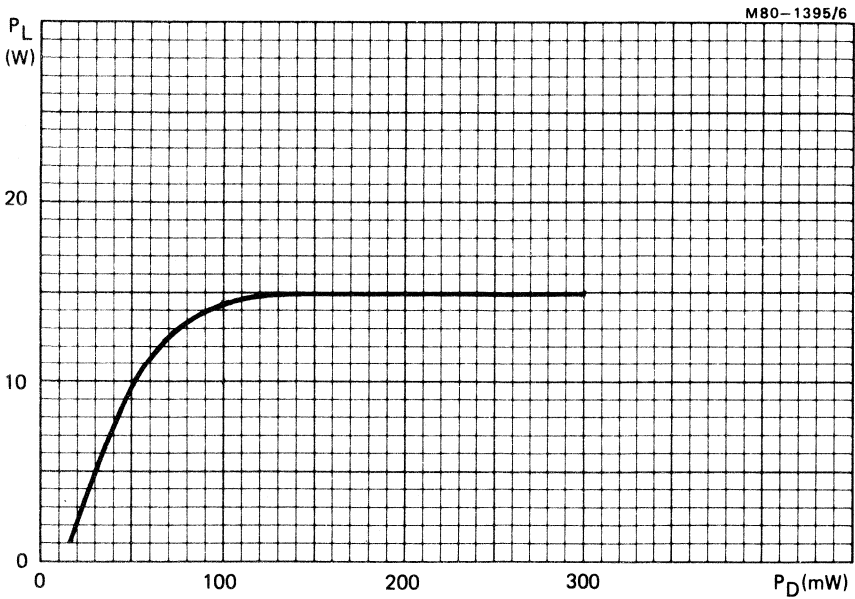


Fig.6 Typical values; $V_{S1} = V_{S2} = 12.5 \text{ V}$; $f = 160 \text{ MHz}$

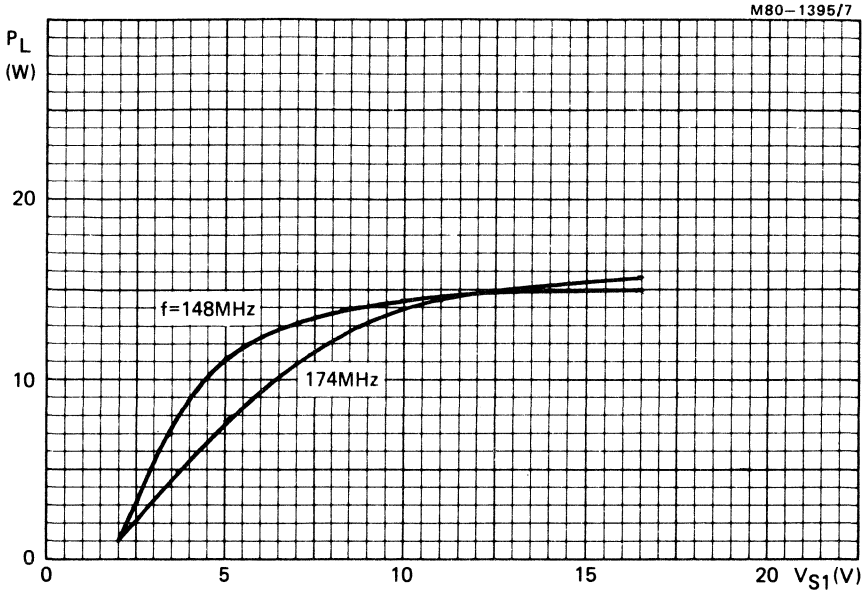


Fig.7 Typical values; $V_{S2} = 12.5$ V; $P_D = 150$ mW

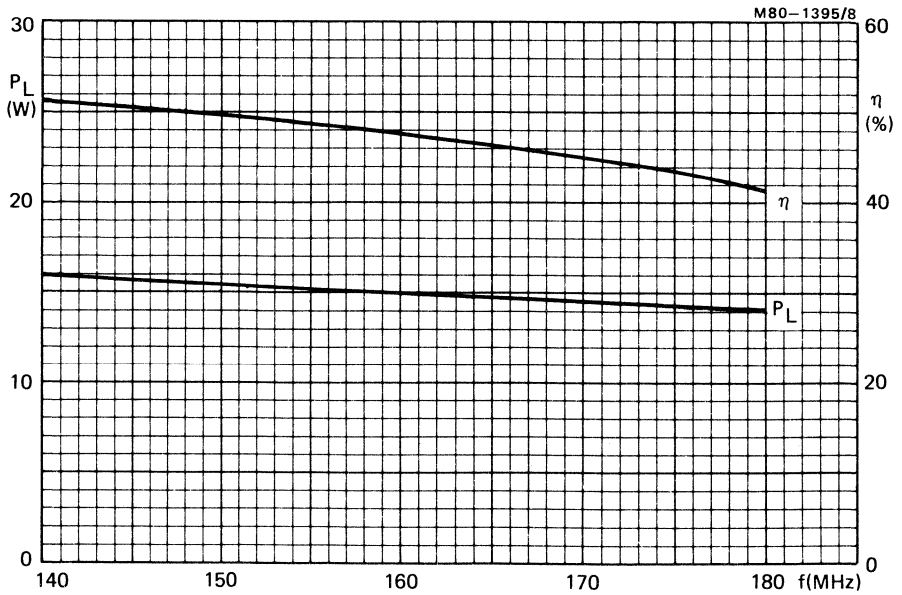


Fig.8 Typical values; $V_{S1} = V_{S2} = 12.5$ V; $P_D = 150$ mW

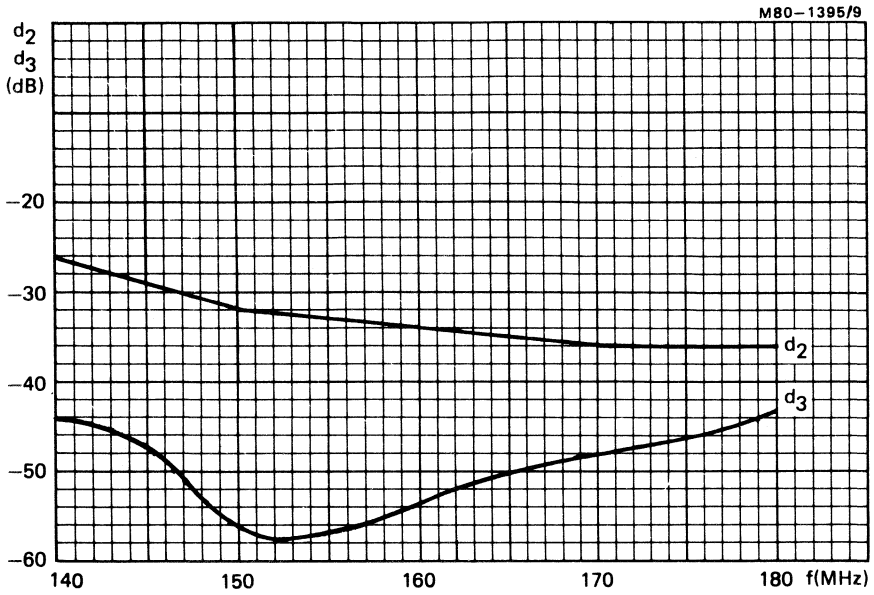
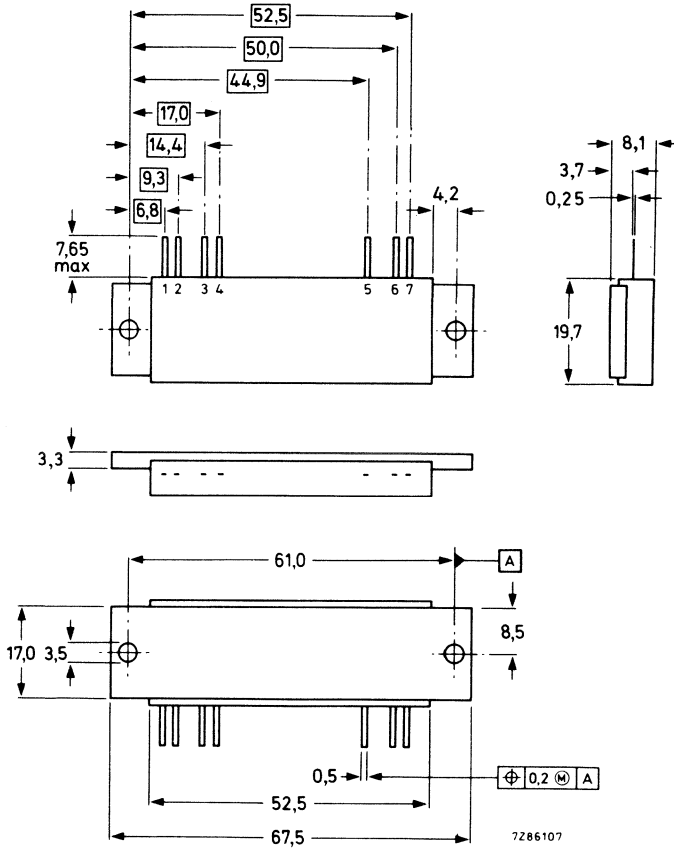


Fig.9 Typical values; $V_{S1} = V_{S2} = 12.5$ V; $P_D = 150$ mW

MECHANICAL DATA

Fig. 10 SOT-132B.

Dimensions in mm



Lead reference

- 1 = Input
- 2 = Earth
- 3 = V_{S1}
- 4 = Earth
- 5 = V_{S2}
- 6 = Earth
- 7 = Output

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY45A

V.H.F. BROADBAND POWER MODULE

V.H.F. broadband power amplifier module primarily designed for mobile communications equipment, operating directly from 12,5 V systems. The module will produce a minimum output of 30 W into a 50 Ω load over the frequency range 68 to 88 MHz.

The module consists of a two-stage amplifier using n-p-n transistor chips with lumped-element matching components in a plastic stripline encapsulation. The negative supply is internally connected to the flange.

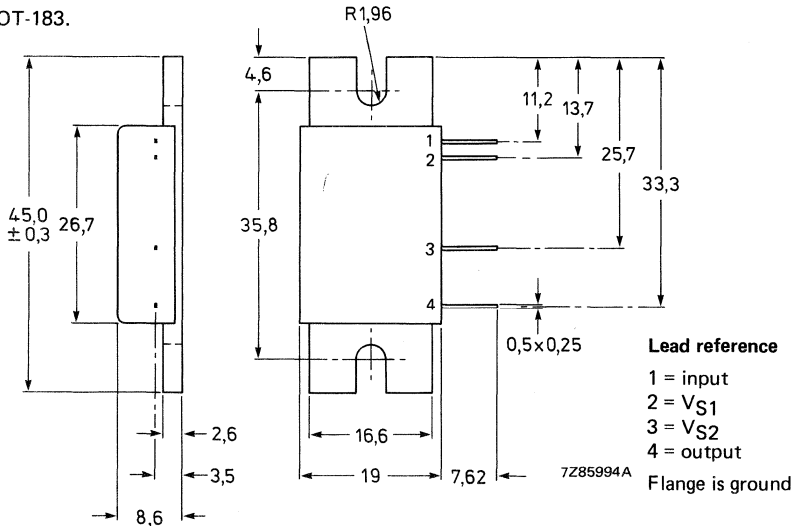
QUICK REFERENCE DATA

Mode of operation		c.w.
Frequency range		68 to 88 MHz
D.C. supply voltage (terminal 2)	V _{S1}	12,5 V
D.C. supply voltage (terminal 3)	V _{S2}	12,5 V
Drive power	P _{DR}	typ. 50 mW max. 150 mW
Load power	P _L	30 W
Efficiency	η	typ. 40 %
Operating heatsink temperature	T _h	max. 90 °C

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-183.



PRODUCT SAFETY 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)

D.C. supply terminal voltages*	$V_{S1}; V_{S2}$	max.	16,5 V*
Input terminal voltage*	$\pm V_i$	max.	25 V*
Output terminal voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	40 W**
Drive power	P_{DR}	max.	300 mW
Storage temperature	T_{stg}		-40 to 100 °C
Operating temperature	T_h	max.	90 °C

CHARACTERISTICS

→ $V_{S1} = V_{S2} = 12,5 \text{ V}; Z_S = Z_L = 50 \Omega; T_h = 25 \text{ °C}$

Quiescent currents

$$P_{DR} = 0$$

I_{Q1}	typ.	10 mA
I_{Q2}	typ.	25 mA
	max.	35 mA

Frequency range

f	68 to 88 MHz
---	--------------

Efficiency

$$P_L = 30 \text{ W}$$

η	min.	37 %
	typ.	40 %

R.F. drive power

$$P_L = 30 \text{ W}$$

P_{DR}	typ.	50 mW
	max.	150 mW

Second-harmonic rejection

$$P_L = 30 \text{ W}$$

	typ.	45 dB
	min.	30 dB

Input VSWR

with respect to 50 Ω

	typ.	1,5 : 1
	max.	2,0 : 1

Stability

The module is stable with load VSWR up to 3 : 1 (all phases) when operated within the following conditions:

$$V_{S1} = 6 \text{ to } 16,5 \text{ V}; V_{S2} = 10 \text{ to } 16,5 \text{ V}; f = 68 \text{ to } 88 \text{ MHz}; P_D = 30 \text{ to } 300 \text{ mW}$$

provided the maximum ratings of the module are not exceeded.

Ruggedness

The modules will withstand load VSWR of 20 : 1 for short overload conditions, with P_{DR} , V_{S1} and V_{S2} at maximum values, providing the combination does not cause the matched r.f. output power rating to be exceeded.

Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface with heat-conducting compound sparingly applied between module and heatsink. Any burrs on the heatsink should be removed. The connectors may be soldered directly onto a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

* With respect to the flange. ** See Fig. 2.

Power rating

In general, it is recommended that the output power from the module under nominal condition should not exceed 35 W in order to provide adequate safety margins under fault conditions.

Gain control

Power output can be controlled by variation of the driver stage supply voltage V_{S1} . The supply needed is a voltage regulator with a current rating of 1,2 A and an output voltage range of 4 V to 12,5 V.

DEVELOPMENT DATA

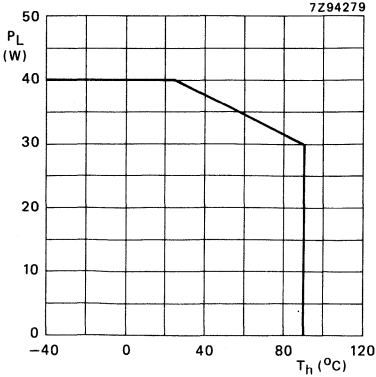


Fig. 2 Load power derating; VSWR = 1 : 1.

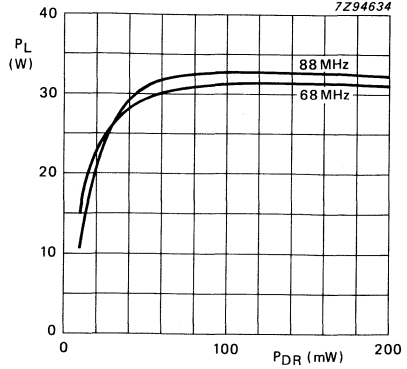


Fig. 3 $V_{S1} = V_{S2} = 12,5$ V;
 $T_h = 25$ $^{\circ}C$; typ. values.

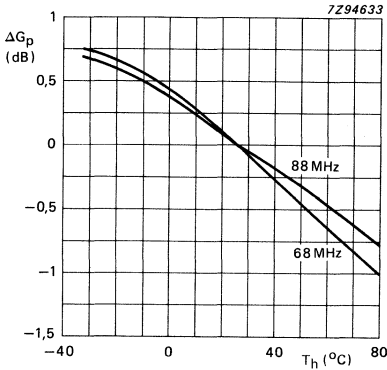


Fig. 4 $P_{DR} = 150$ mW;
 $V_{S1} = V_{S2} = 12,5$ V; typ. values.

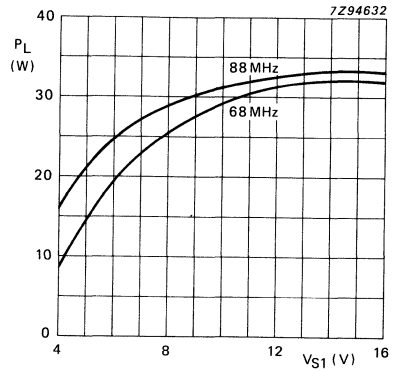


Fig. 5 $P_{DR} = 150$ mW;
 $V_{S2} = 12,5$ V; typ. values.

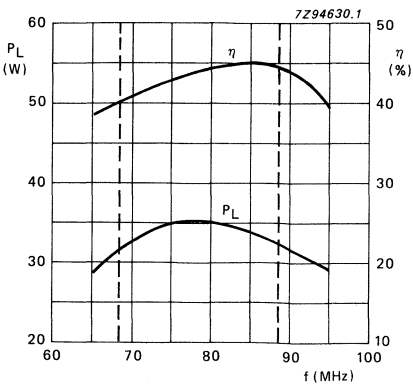


Fig. 6 $V_{S1} = V_{S2} = 12,5$ V;
 $P_{DR} = 150$ mW; typ. values.

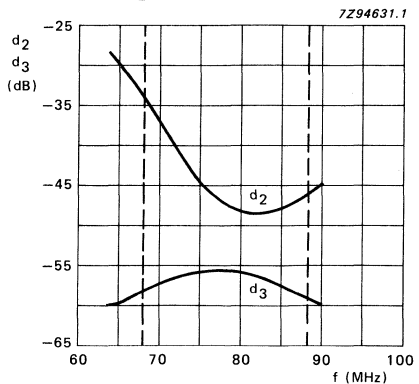


Fig. 7 $V_{S1} = V_{S2} = 12,5$ V;
 $P_L = 30$ W; typ. values.

V.H.F. BROADBAND POWER MODULE

V.H.F. broadband power amplifier module primarily designed for mobile communications equipment, operating directly from 12,5 V systems. The module will produce a minimum output of 30 W into a 50 Ω load over the frequency range 148 to 174 MHz.

The module consists of a two-stage amplifier using n-p-n transistor chips with lumped-element matching components in a plastic stripline encapsulation. The negative supply is internally connected to the flange.

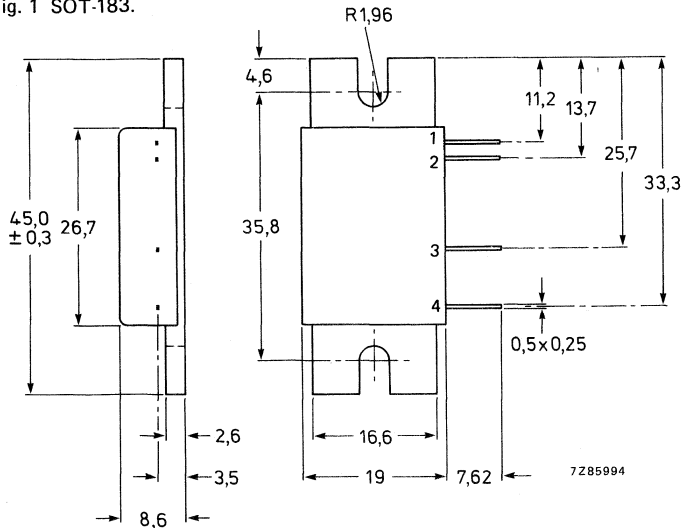
QUICK REFERENCE DATA

Mode of operation		c.w.
Frequency range		148 to 174 MHz
D.C. supply voltage (terminal 2)	V _{S1}	12,5 V
D.C. supply voltage (terminal 3)	V _{S2}	12,5 V
Drive power	P _{DR}	typ. 150 mW max. 300 mW
Load power	P _L	30 W
Efficiency	η	typ. 45 %
Operating heatsink temperature	T _h	max. 90 °C

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-183.



Lead reference

- 1 = input
 - 2 = V_{S1}
 - 3 = V_{S2}
 - 4 = Output
- Flange is ground

PRODUCT SAFETY 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)

D.C. supply terminal voltages*	$V_{S1}; V_{S2}$	max.	16,5 V*
Input terminal voltage*	$\pm V_i$	max.	25 V*
Output terminal voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	40 W**
Drive power	P_{DR}	max.	400 mW
Storage temperature	T_{stg}		-40 to 100 °C
Operating temperature	T_h	max.	90 °C

CHARACTERISTICS

→ $V_{S1} = V_{S2} = 12,5 \text{ V}$; $Z_S = Z_L = 50 \Omega$; $T_h = 25^\circ\text{C}$

Quiescent currents

$P_{DR} = 0$

I_{Q1}	typ.	10 mA
I_{Q2}	typ.	25 mA
	max.	35 mA

Frequency range

f 148 - 174 MHz

Efficiency

$P_L = 30 \text{ W}$

η	min.	40 %
	typ.	45 %

R.F. drive power

$P_L = 30 \text{ W}$

P_{DR}	max.	300 mW
	typ.	150 mW

Second-harmonic rejection

$P_L = 30 \text{ W}$

	typ.	35 dB
	min.	30 dB

Input VSWR

with respect to 50 Ω

	typ.	1,5 : 1
	max.	2,0 : 1

Stability

The module is stable with load VSWR up to 3 : 1 (all phases) when operated within the following conditions:

$V_{S1} = 6$ to 16,5 V; $V_{S2} = 10$ to 16,5 V; $f = 148$ to 174 MHz; $P_D = 150$ to 400 mW provided the maximum ratings of the module are not exceeded.

Ruggedness

The modules will withstand load VSWR of 20 : 1 for short overload conditions, with P_{DR} , V_{S1} and V_{S2} at maximum values, providing the combination does not cause the matched r.f. output power rating to be exceeded.

Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface with heat-conducting compound sparingly applied between module and heatsink. Any burrs on the heatsink should be removed. The connectors may be soldered directly onto a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

* With respect to the flange. ** See Fig. 2.

Power rating

In general, it is recommended that the output power from the module under nominal condition should not exceed 35 W in order to provide adequate safety margins under fault conditions.

Gain control

Power output can be controlled by variation of the driver stage supply voltage V_{S1} . The supply needed is a voltage regulator with a current rating of 1,2 A and an output voltage range of 3 V to 12 V.

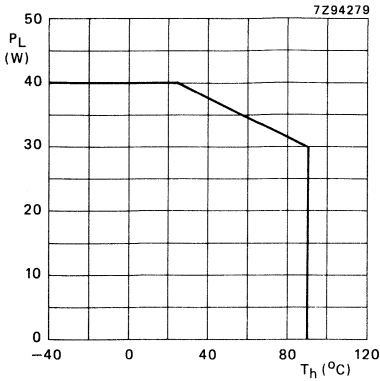


Fig. 2 Load power derating.

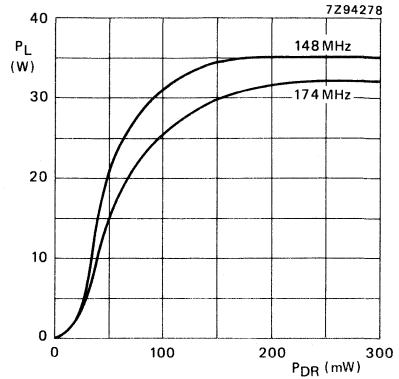


Fig. 3 $V_{S1} = V_{S2} = 12,5$ V;
 $T_h = 25$ °C; typ. values.

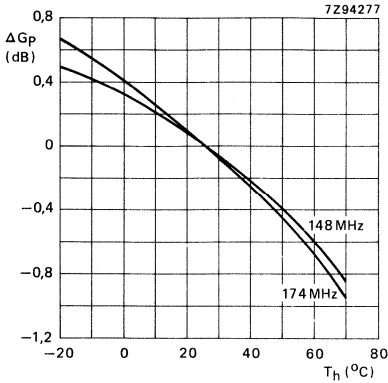


Fig. 4 $P_{DR} = 300$ mW;
 $V_{S1} = V_{S2} = 12,5$ V; typ. values.

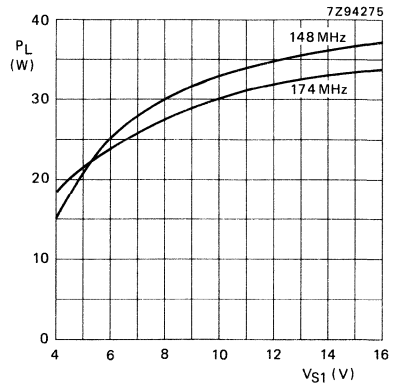


Fig. 5 $P_{DR} = 300$ mW;
 $V_{S2} = 12,5$ V; typ. values.

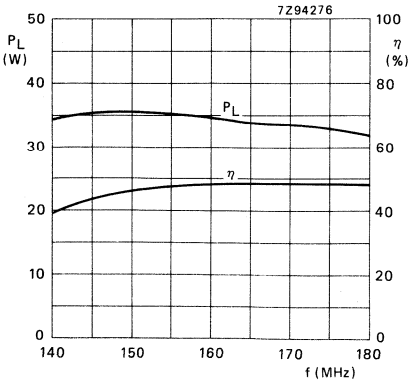


Fig. 6 $V_{S1} = V_{S2} = 12,5$ V;
 $P_{DR} = 300$ mW; typ. values.

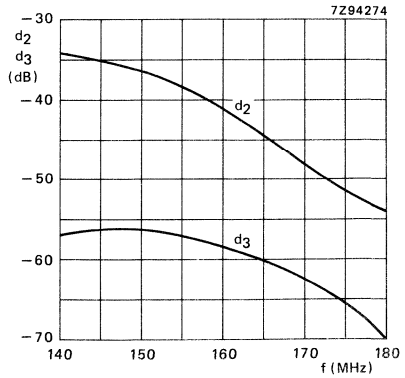


Fig. 7 $V_{S1} = V_{S2} = 12,5$ V;
 $P_{DR} = 300$ mW; typ. values.

U.H.F. AMPLIFIER MODULES

U.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V supply. The modules are two-stage amplifiers using n-p-n transistors mounted on thin-film metallized alumina substrates with stripline matching circuits.

The BGY46A and BGY46B will produce a minimum of 1,4 W into a 50 Ω load over the 400 to 440 MHz and 430 to 470 MHz frequency ranges respectively.

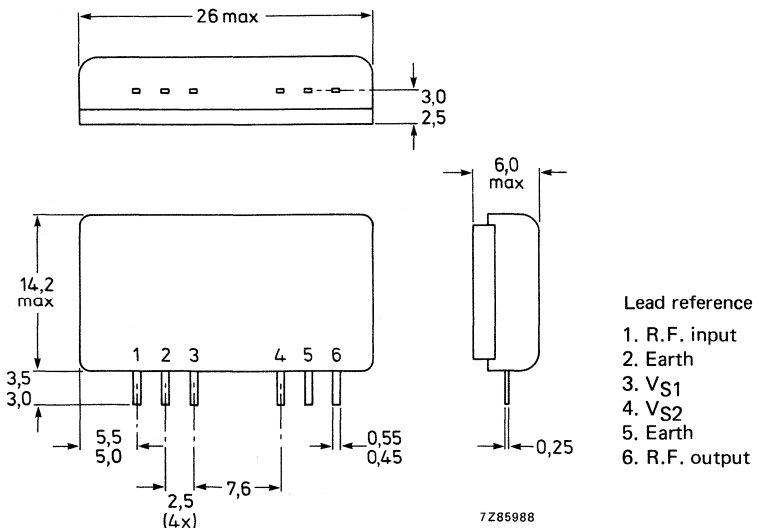
QUICK REFERENCE DATA

Mode of operation		continuous wave
Frequency range	BGY46A BGY46B	400 to 440 MHz 430 to 470 MHz
R.F. load power $V_{S1} = 7,5 \text{ V}; V_{S2} = 9,6 \text{ V}; P_{DR} = 45 \text{ mW}$	>	1,4 W
R.F. drive power $V_{S1} = 7,5 \text{ V}; V_{S2} = 9,6 \text{ V}; P_L = 1,4 \text{ W}$	<	45 mW
Input and output impedances	nom.	50 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-181.



RATINGS

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

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	12 V*
R.F. input voltage*	$\pm V_i$	max.	25 V*
R.F. output voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	2,5 W
Drive power	P_{DR}	max.	90 mW
Storage temperature	T_{stg}		-40 to 100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

Quiescent currents

$V_{S1} = 7,5 \text{ V}; V_{S2} = 9,6 \text{ V};$

$P_{DR} = 0; T_h = 25 \text{ °C}$

I_{Q1}	<	7 mA
I_{Q2}	<	0,1 mA

Efficiency

$V_{S1} = 7,5 \text{ V}; V_{S2} = 9,6 \text{ V};$

$P_{DR} = 45 \text{ mW}; R_S = R_L = 50 \text{ } \Omega$

η	>	40 %
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Harmonic output

$V_{S1} = 7,5 \text{ V}; V_{S2} = 9,6 \text{ V};$

$P_{DR} = 45 \text{ mW}; R_S = R_L = 50 \text{ } \Omega$

any harmonic	<	-30 dB
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Input VSWR

$V_{S1} = 7,5 \text{ V}; V_{S2} = 9,6 \text{ V};$

$P_{DR} = 45 \text{ mW}; R_S = R_L = 50 \text{ } \Omega$

VSWR	max.	2
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Stability

The modules will produce no spurious signals with a load mismatch of up to 5 VSWR (all phases) when operated within the following conditions:

$V_{S1} = 4 \text{ to } 12 \text{ V}; V_{S2} = 6 \text{ to } 12 \text{ V}; P_{DR} = 17 \text{ to } 70 \text{ mW}.$

Ruggedness

The modules will withstand a load mismatch VSWR of 50 (all phases) when operated within the following conditions:

$V_{S1} < 12 \text{ V}; V_{S2} < 12 \text{ V}; P_{DR} < 70 \text{ mW}; T_h < 90 \text{ °C}.$

* With respect to flange.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY47 SERIES

U.H.F. AMPLIFIER MODULES

A range of U.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V supply. The modules are two-stage amplifiers using n-p-n transistors mounted on thin-film metallized alumina substrates with stripline matching circuits.

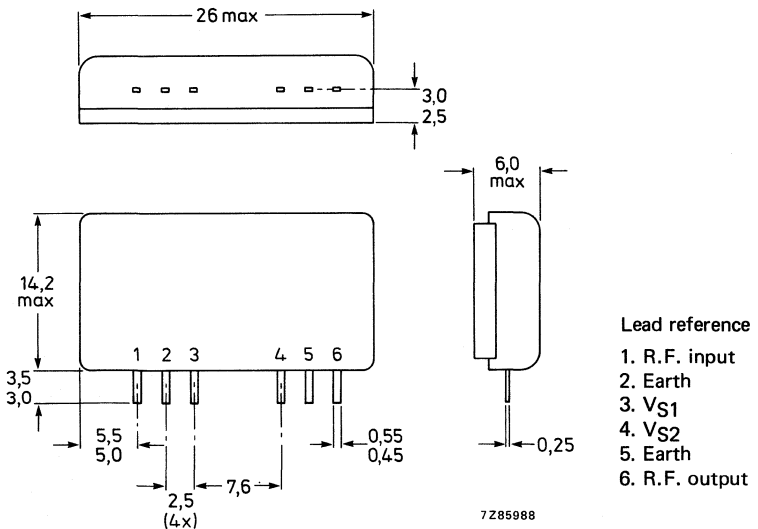
QUICK REFERENCE DATA

Mode of operation	frequency modulation				
R.F. performance	f MHz	V _{S1} V	V _{S2} V	P _{DR} mW	P _L W
BGY47A	400 to 470	7,5	7,5	< 50	> 2,0
BGY47F	460 to 512	7,5	9,6	< 50	> 3,2

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-181.



RATINGS

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

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	12 V*
R.F. input voltage*	$\pm V_i$	max.	25 V*
R.F. output voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	5 W
Drive power	P_{DR}	max.	90 mW
Storage temperature	T_{stg}		-40 to 100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

Quiescent currents

$$V_{S1} = 7,5 \text{ V}; V_{S2} = 9,6 \text{ V};$$

$$P_{DR} = 0; T_h = 25 \text{ °C}$$

I_{Q1}	<	7 mA
I_{Q2}	<	0,1 mA

Efficiency

When operated under nominal conditions

BGY47A

η	>	40 %
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→ BGY47F

η	>	36 %
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Harmonic output

$$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 50 \text{ mW}$$

BGY47A

any harmonic	<	-30 dB
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→ $V_{S1} = 7,5 \text{ V}; V_{S2} = 9,6 \text{ V}; P_{DR} = 50 \text{ mW}$

BGY47F

any harmonic	<	-30 dB
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Stability

The modules will produce no spurious signals with a load mismatch of up to 5 VSWR (all phases) when operated within the following conditions:

$$V_{S1} = 6 \text{ to } 12 \text{ V}; V_{S2} = 8 \text{ to } 12 \text{ V}; P_{DR} = 25 \text{ to } 100 \text{ mW.}$$

Ruggedness

The modules will withstand a load mismatch VSWR of 50 (all phases) when operated within the following conditions:

$$V_{S1} < 12 \text{ V}; V_{S2} < 12 \text{ V}; P_{DR} < 100 \text{ mW}; T_h < 90 \text{ °C.}$$

* With respect to flange.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY48A
BGY48B
BGY48C

U.H.F. AMPLIFIER MODULES

A range of U.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V electrical supply. The modules are three-stage amplifiers consisting of bipolar silicon n-p-n transistors and lumped element matching circuits.

The BGY48A, BGY48B and BGY48C will produce a minimum of 5 W into a 50 Ω load over the 400 to 440 MHz, 430 to 470 MHz and 460 to 512 MHz frequency ranges respectively.

QUICK REFERENCE DATA

Mode of operation		continuous wave
Frequency range	BGY48A	400 to 440 MHz
	BGY48B	430 to 470 MHz
	BGY48C	460 to 512 MHz
R.F. load power		> 5,0 W
$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 50 \text{ mW}$		
R.F. drive power		< 35 mW
$V_{S1} = V_{S2} = 9,6 \text{ V}; P_L = 5,0 \text{ W}$		
Input and output impedances		nom. 50 Ω

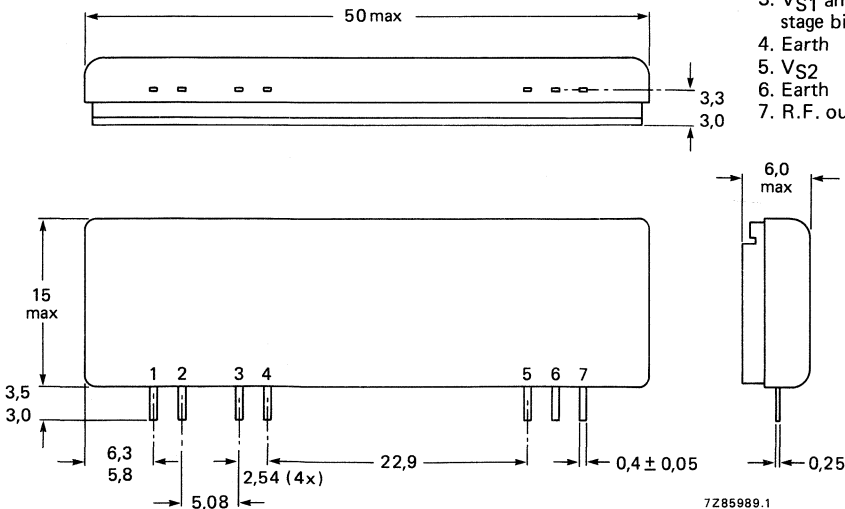
MECHANICAL DATA

Fig. 1 SOT-182.

Dimensions in mm

Lead reference

1. R.F. input
2. Earth
3. V_{S1} and second stage bias
4. Earth
5. V_{S2}
6. Earth
7. R.F. output



7285989.1

RATINGS

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

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	13,5 V*
R.F. input voltage*	$\pm V_i$	max.	25 V*
R.F. output voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	9 W
Drive power	P_{DR}	max.	70 mW
Storage temperature	T_{stg}		-40 to 100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

Quiescent currents

second stage current with first stage open circuit $V_{S2} = 9,6 \text{ V}; P_{DR} = 0; R_S = R_L = 50 \Omega; I_{S1} = 0$	I_{Q2}	<	0,5 mA
	I_{Q2}	typ.	0,1 mA

first stage current $V_{S1} = 7,1 \text{ V}; V_{S2} = 9,6 \text{ V}; P_{DR} = 0; R_S = R_L = 50 \Omega$	I_{Q1}	typ.	2 mA
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Efficiency

$V_{S1} = V_{S2} = 9,6 \text{ V}; P_L = 5,0 \text{ W}; R_S = R_L = 50 \Omega$	η	>	40 %
		typ.	42 %

Harmonic output

$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 35 \text{ mW}; R_S = R_L = 50 \Omega$	any harmonic (relative to carrier)	<	-40 dB
		typ.	-50 dB

Input VSWR

$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 35 \text{ mW}; R_S = R_L = 50 \Omega$	VSWR	max.	2
--	------	------	---

Stability

The modules will produce no signals at frequencies other than that of the carrier and harmonics of the carrier frequency when operated with a load mismatch of 5 VSWR (all phases) and when operated within the following conditions:

$$V_{S1} \leq V_{S2} = 4 \text{ to } 11,2 \text{ V}; P_{DR} = 17 \text{ to } 70 \text{ mW}; P_L < 9,0 \text{ W}.$$

Ruggedness

The modules will withstand a load VSWR of 50 for short period overload conditions, with P_D , V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched r.f. output power derating curve being exceeded. $T_h = 90 \text{ °C}$.

* With respect to earth pins.

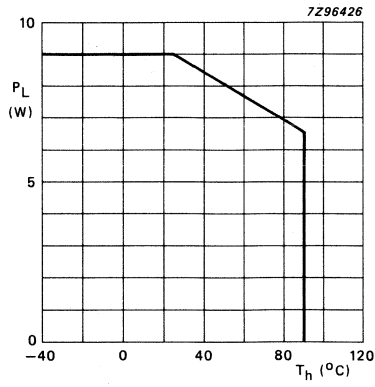


Fig. 2 Load power derating; VSWR = 1 : 1.

DEVELOPMENT DATA

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY90A

U.H.F. POWER MODULE

The BGY90A is a two stage u.h.f. power module designed for use in mobile transmitting equipment operating from a 12 V power supply.

The module consists of two n-p-n silicon planar transistors mounted on a metallized ceramic substrate together with matching and bias circuitry. The module produces an output of 7,5 W into a 50 Ω load over the frequency range of 806 to 890 MHz when operated under nominal conditions.

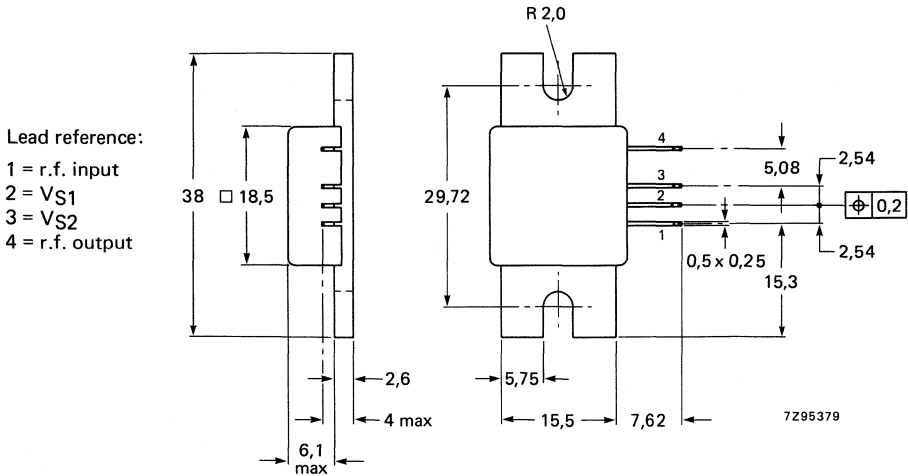
QUICK REFERENCE DATA

D.C. supply terminal voltages	$V_{S1}; V_{S2}$	nom.	12,5 V
Frequency	f		806 to 890 MHz
R.F. load power at $P_D = 200$ mW	P_L	>	7,5 W
R.F. input drive power at $P_L = 7,5$ W	P_D	<	200 mW
Input and output impedance	$Z_S; Z_L$	nom.	50 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-197.



RATINGS

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

D.C. terminal supply voltages	$V_{S1}; V_{S2}$	max.	16,5 V
D.C. voltage on r.f. input	$\pm V_i$	max.	25 V
D.C. voltage on r.f. output	$\pm V_o$	max.	25 V
Load power (r.f.)	P_L	max.	9 W
Drive power (r.f.)	P_D	max.	400 mW
Storage temperature	T_{stg}		-40 to +100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

$V_{S1} = V_{S2} = 12,5$ V; $f = 806 - 890$ MHz; $Z_S = Z_L = 50 \Omega$ unless otherwise specified

Quiescent currents			
$P_D = 0$	I_{Q1}	typ.	40 mA
	I_{Q2}	typ.	25 mA
R.F. input drive power at $P_L = 7,5$ W	P_D	<	200 mW
R.F. output power at $P_D = 200$ mW	P_L	>	7,5 W
Efficiency at $P_L = 7,5$ W		>	35 %
→ Harmonic rejection at $P_L = 7,5$ W		>	35 dB

Stability

The module will produce no spurious signals with a load mismatch of up to 3 VSWR when operated within the following conditions:

$V_{S1} = 0$ to 15 V; $V_{S2} = 6$ to 15 V; $P_D = 0$ to 400 mW; $T_h < 90$ °C; P_L (into 50Ω) ≤ 9 W.

Ruggedness

The module will withstand a load mismatch VSWR of 50 when operated within the following conditions:

$V_{S1} = 15$ V max.; $V_{S2} = 15$ V; $P_D = 400$ mW max.; $T_h < 90$ °C; providing the module is adjusted for $P_L < 9$ W (into 50Ω). This adjustment may be performed by control of either P_D or V_{S1} .

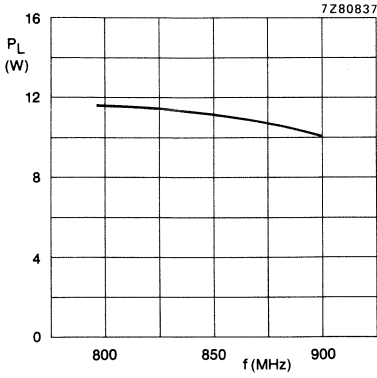


Fig. 2 Output power versus frequency; P_D = 200 mW; V_S = 12,5 V; typical values.

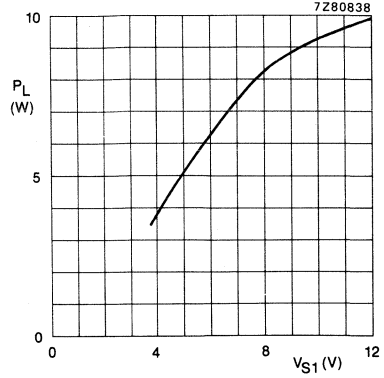


Fig. 3 Output power versus 1st stage supply voltage; f = 850 MHz; P_D = 200 mW; V_{S2} = 12,5 V; typical values.

DEVELOPMENT DATA

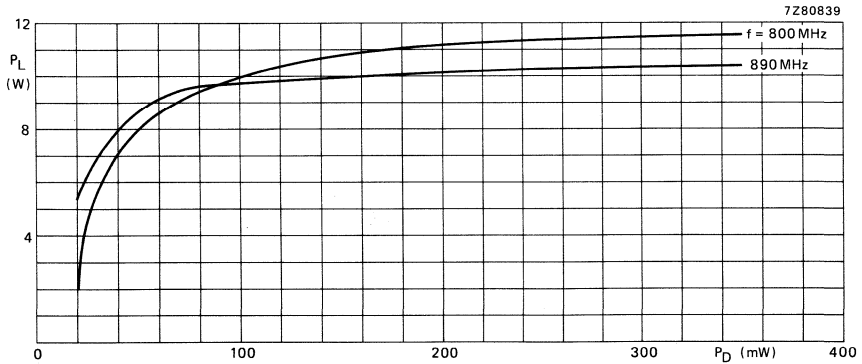


Fig. 4 Output power versus input drive power; V_S = 12,5 V; typical values.

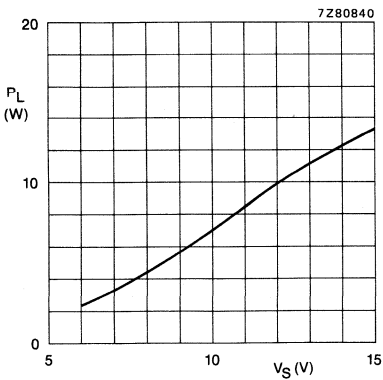


Fig. 5 Output power versus supply voltage; P_D = 200 mW; typical values.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY90B

U.H.F. POWER MODULE

The BGY90B is a two stage u.h.f. power module designed for use in mobile transmitting equipment operating from a 12 V power supply.

The module consists of two n-p-n silicon planar transistors mounted on a metallized ceramic substrate together with matching and bias circuitry. The module produces an output power of 7,5 W into a 50 Ω load over the frequency range of 870 to 950 MHz when operated under nominal conditions.

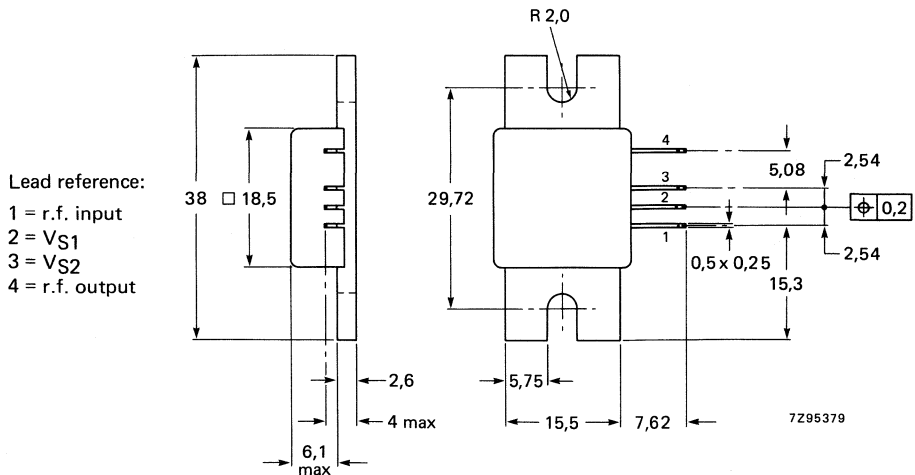
QUICK REFERENCE DATA

D.C. supply terminal voltages	$V_{S1}; V_{S2}$	nom.	12,5 V
Frequency	f		870 to 950 MHz
R.F. load power at $P_D = 200$ mW	P_L	>	7,5 W
R.F. input drive power at $P_L = 7,5$ W	P_D	<	200 mW
Input and output impedances	$Z_S; Z_L$	nom.	50 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-197.



RATINGS

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

D.C. terminal supply voltages	$V_{S1}; V_{S2}$	max.	16,5 V
D.C. voltage on r.f. input	$\pm V_i$	max.	25 V
D.C. voltage on r.f. output	$\pm V_o$	max.	25 V
Load power (r.f.)	P_L	max.	9 W
Drive power (r.f.)	P_D	max.	400 mW
Storage temperature	T_{stg}		-40 to +100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

$V_{S1} = V_{S2} = 12,5 \text{ V}$; $f = 870 - 950 \text{ MHz}$; $Z_S = Z_L = 50 \Omega$ unless otherwise specified

Quiescent currents			
$P_D = 0$	I_{Q1}	typ.	15 mA
	I_{Q2}	typ.	25 mA
R.F. input drive power at $P_L = 7,5 \text{ W}$	P_D	<	200 mW
R.F. output power at $P_D = 200 \text{ mW}$	P_L	>	7,5 W
Efficiency at $P_L = 7,5 \text{ W}$	η	>	35 %
Harmonic rejection at $P_L = 7,5 \text{ W}$		>	35 dB

Stability

The module will produce no spurious signals with a load mismatch of up to 3 VSWR when operated within the following conditions:

$V_{S1} < V_{S2} = 0$ to 15 V; $P_D = 0$ to 400 mW; $T_h < 90 \text{ °C}$; providing maximum ratings are not exceeded.

Ruggedness

The module will withstand a load mismatch VSWR of 50 when operated within the following conditions:

$V_{S1} = 15 \text{ V max.}$; $V_{S2} = 15 \text{ V}$; $P_D = 400 \text{ mW max.}$; $T_h < 90 \text{ °C}$; providing the module is adjusted for $P_L < 9 \text{ W}$ (into 50Ω). This adjustment may be performed by control of either P_D or V_{S1} .

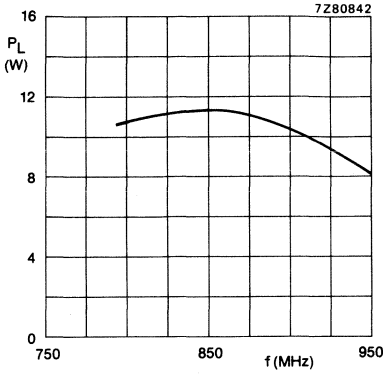


Fig. 2 Output power versus frequency;
 $P_D = 200 \text{ mW}$; $V_{S1} = V_{S2} = 12,5 \text{ V}$;
 typical values.

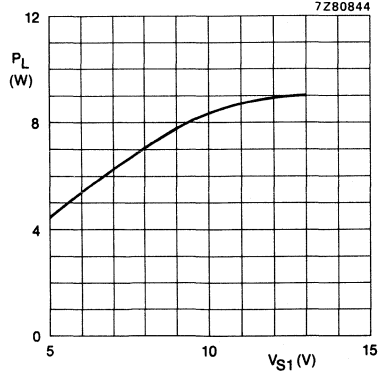


Fig. 3 Output power versus 1st stage supply voltage; $V_{S2} = 12,5 \text{ V}$; $f = 890 \text{ MHz}$,
 $P_L = 9 \text{ W}$ (at 890 MHz); typical values.

DEVELOPMENT DATA

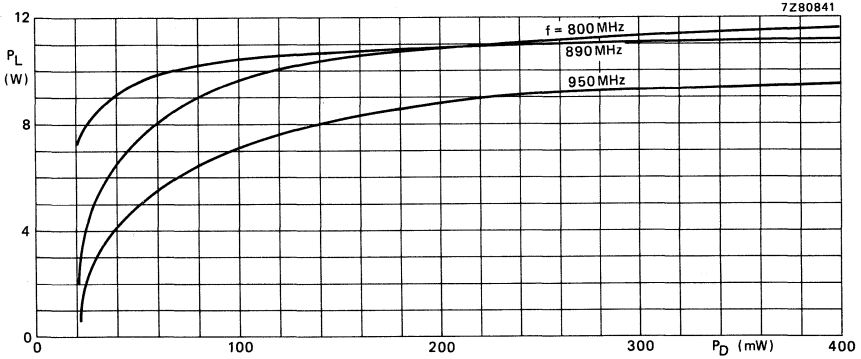


Fig. 4 Output power versus input drive power; $V_{S1} = V_{S2} = 12,5 \text{ V}$; typ. values.

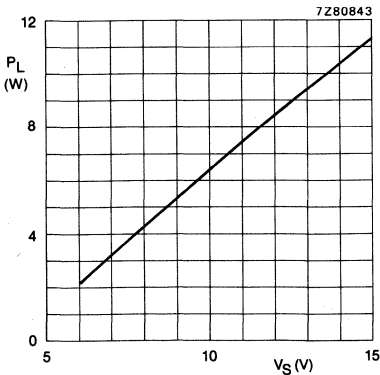


Fig. 5 Output power versus supply voltage;
 $V_S = V_{S1} = V_{S2}$; $f = 890 \text{ MHz}$;
 $P_L = 9 \text{ W}$ (at 890 MHz); typ. values.

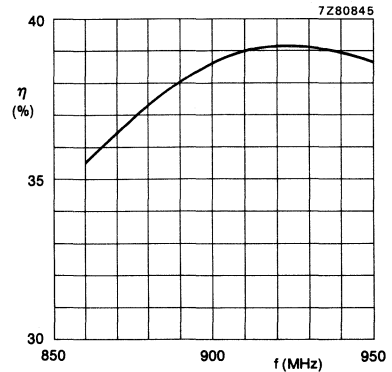


Fig. 6 Efficiency versus frequency;
 $V_{S1} = V_{S2} = 12,5 \text{ V}$; $P_L = 7,5 \text{ W}$;
 typical values.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY93A
BGY93B
BGY93C

V.H.F. AMPLIFIER MODULES

A range of V.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V supply. The modules are two-stage amplifiers consisting of n-channel FET crystals and lumped element matching circuits.

The BGY93A, BGY93B and BGY93C will produce a minimum of 2 W into a 50 Ω load over the 68 to 88 MHz, 136 to 156 MHz and 148 to 174 MHz frequency ranges respectively.

QUICK REFERENCE DATA

Mode of operation		continuous wave
Frequency range	BGY93A	68 to 88 MHz
	BGY93B	136 to 156 MHz
	BGY93C	148 to 174 MHz
R.F. load power		
$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 35 \text{ mW}$	>	2,0 W
R.F. drive power		
$V_{S1} = V_{S2} = 9,6 \text{ V}; P_L = 2,0 \text{ W}$	<	35 mW
Input and output impedances	nom.	50 Ω

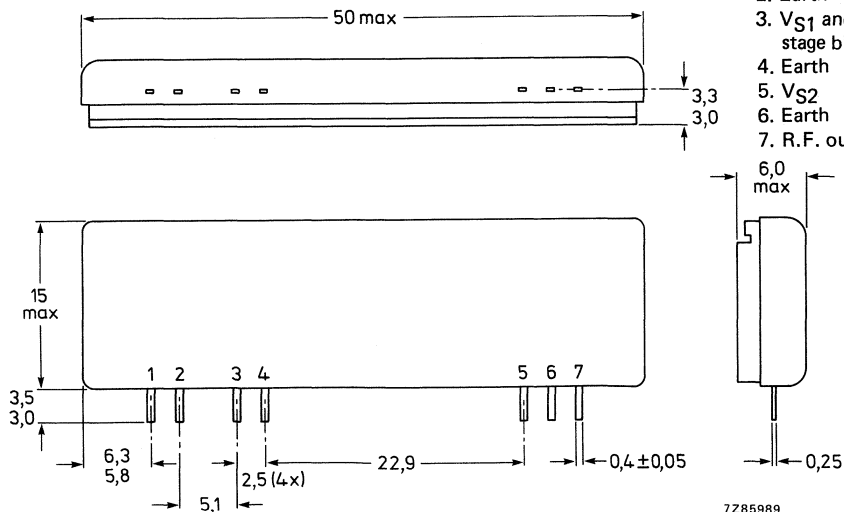
MECHANICAL DATA

Fig. 1 SOT-182.

Dimensions in mm

Lead reference

1. R.F. input
2. Earth
3. V_{S1} and second stage bias
4. Earth
5. V_{S2}
6. Earth
7. R.F. output



7285989

RATINGS

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

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	13,5 V*
R.F. input voltage*	$\pm V_i$	max.	25 V*
R.F. output voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	4 W
Drive power	P_{DR}	max.	70 mW
Storage temperature	T_{stg}		-40 to 100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

Quiescent currents

Second stage current with first stage open circuit

$V_{S2} = 9,6 \text{ V}; P_{DR} = 0;$
 $R_S = R_L = 50 \Omega; I_{S1} = 0$

I_{Q2}	typ.	0,1 mA
	<	0,5 mA

Second stage current with first stage connected

$V_{S1} = 9,3 \text{ V}; V_{S2} = 9,6 \text{ V};$
 $P_{DR} = 0; R_S = R_L = 50 \Omega$

I_{Q2}	typ.	270 mA
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First stage current

$V_{S1} = 9,3 \text{ V}; V_{S2} = 9,6 \text{ V};$
 $P_{DR} = 0; R_S = R_L = 50 \Omega$

I_{Q1}	typ.	70 mA
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Efficiency

$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 35 \text{ mW};$
 $R_S = R_L = 50 \Omega$

>	40 %
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Harmonic output

$V_{S1} = V_{S2} = 9,6 \text{ V}$ (relative to carrier);
 $P_{DR} = 35 \text{ mW}; R_S = R_L = 50 \Omega$

any harmonic	<	-30 dB
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Input VSWR

$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 35 \text{ mW};$
 $R_S = R_L = 50 \Omega$

VSWR	max.	2
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Stability

The modules will produce no signals at frequencies other than that of the carrier frequency when operated with a load mismatch of 8 VSWR (all phases) and when operated within the following conditions:

$V_{S1} \leq V_{S2} = 4$ to 11,2 V; $P_{DR} = 17$ to 70 mW.

Ruggedness

The modules will withstand a load mismatch VSWR of 50 (all phases) when operated within the following conditions:

$V_{S1} \leq V_{S2} \leq 11,2 \text{ V}; P_{DR} < 70 \text{ mW}; T_h \leq 90 \text{ °C}.$

* With respect to flange.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY94A
BGY94B
BGY94C

V.H.F. AMPLIFIER MODULES

A range of V.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V supply. The modules are two-stage amplifiers consisting of n-channel FET crystals and lumped element matching circuits.

The BGY94A, BGY94B and BGY94C will produce a minimum of 5 W into a 50 Ω load over the 68 to 88 MHz, 132 to 156 MHz and 148 to 174 MHz frequency ranges respectively.

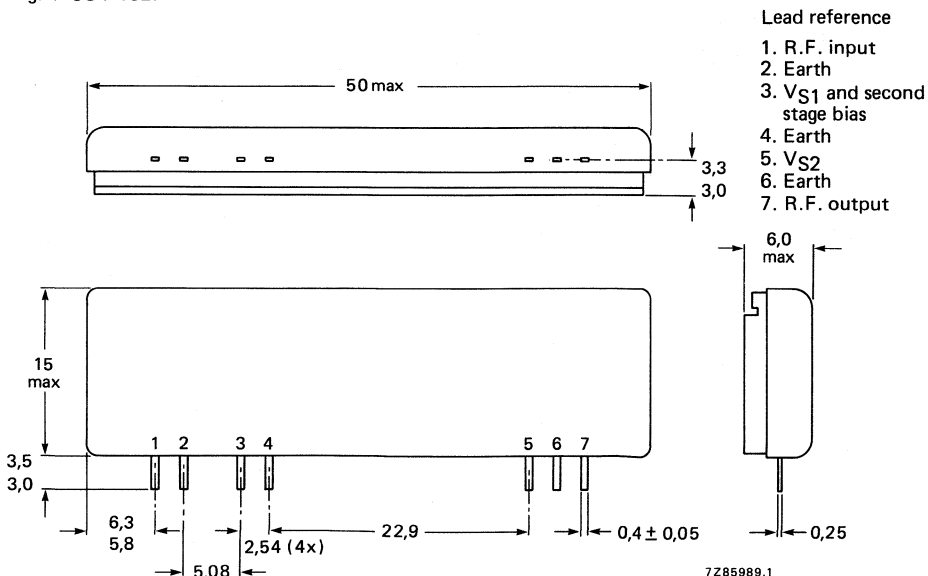
QUICK REFERENCE DATA

Mode of operation		continuous wave
Frequency range	BGY94A	68 to 88 MHz
	BGY94B	132 to 156 MHz
	BGY94C	148 to 174 MHz
R.F. load power		
$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 50 \text{ mW}$		> 5,0 W
R.F. drive power		
$V_{S1} = V_{S2} = 9,6 \text{ V}; P_L = 5,0 \text{ W}$		< 35 mW
Input and output impedances		nom. 50 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-182.



RATINGS

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

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	13,5 V*
R.F. input voltage*	$\pm V_i$	max.	25 V*
R.F. output voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	9 W
Drive power	P_{DR}	max.	70 mW
Storage temperature	T_{stg}		-40 to 100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

Quiescent currents

second stage current with first stage open circuit

$V_{S2} = 9,6 \text{ V}; P_{DR} = 0; R_S = R_L = 50 \Omega; I_{S1} = 0$ $I_{Q2} < 0,5 \text{ mA}$

first stage current

$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 0; R_S = R_L = 50 \Omega$ $I_{Q1} \text{ typ. } 125 \text{ mA}$

Efficiency

$V_{S1} = V_{S2} = 9,6 \text{ V}; P_L = 5 \text{ W}; R_S = R_L = 50 \Omega$ $\eta > 40 \%$

Harmonic output

$V_{S1} = V_{S2} = 9,6 \text{ V}$
 $P_{DR} = 35 \text{ mW}; R_S = R_L = 50 \Omega$ any harmonic
 (relative to carrier) $< -35 \text{ dB}$

Input VSWR

$V_{S1} = V_{S2} = 9,6 \text{ V}; P_{DR} = 35 \text{ mW}; R_S = R_L = 50 \Omega$ $V_{SWR} \text{ max. } 2$

Stability

The modules will produce no signals at frequencies other than that of the carrier frequency when operated with a load mismatch of 8 VSWR (all phases) and when operated within the following conditions:

$V_{S1} \leq V_{S2} = 4 \text{ to } 11,2 \text{ V}; P_{DR} = 17 \text{ to } 70 \text{ mW}; P_L = 9,0 \text{ W (matched)}$

Ruggedness

The modules will withstand a load VSWR of 50 for short period overload conditions, with P_D , V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched r.f. output power derating curve being exceeded. $T_h = 90 \text{ °C}$.

Gain control

Power output can be controlled by variation of the driver stage supply voltage V_{S1} . The supply required is a voltage regulator with a current rating of 0,25 A and an output voltage range of 4,0 V to 9,6 V. V_{S1} must not exceed V_{S2} .

* With respect to earth pins.

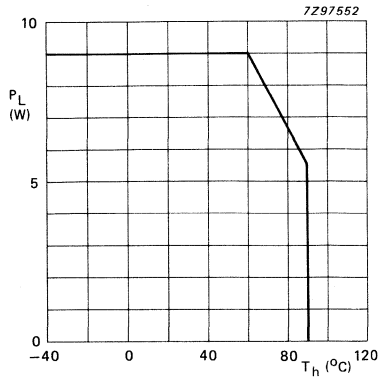


Fig. 2 Load power derating; VSWR = 1 : 1.

DEVELOPMENT DATA

U.H.F. AMPLIFIER MODULE

The BGY95 is a three-stage u.h.f. amplifier module designed primarily for mobile transmitting equipment operating from a nominal 7,5 V power supply.

The module consists of three N-P-N silicon planar transistors mounted on a metallized ceramic substrate, together with matching and bias circuitry. The BGY95A and BGY95B produce an output power of 2,5 W into a 50 Ω load over the frequency band 825-845 MHz and 890-915 MHz respectively. The output power can be controlled by means of a DC voltage (V_{S1}).

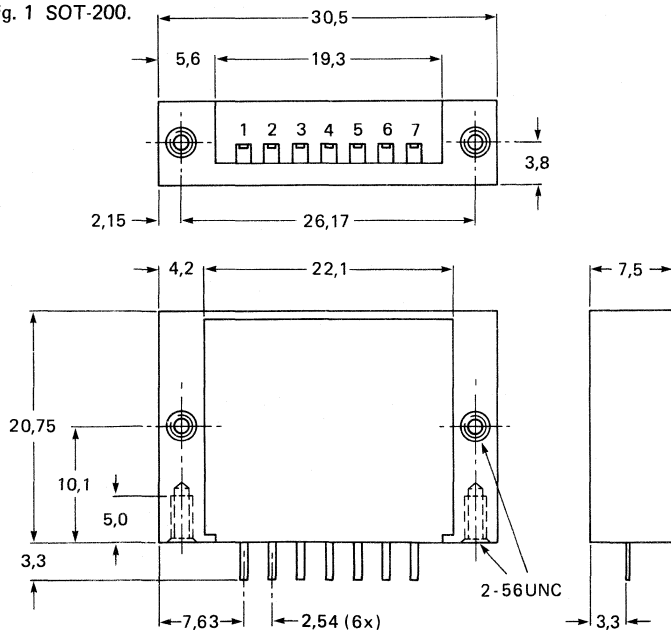
QUICK REFERENCE DATA

Mode of operation				c.w.
Frequency range	BGY95A	f		825-845 MHz
	BGY95B	f		890-915 MHz
R.F. power output				
$V_{S1} = V_{S2} = V_{S3} = 7,5 \text{ V}; P_D = 20 \text{ mW}$		P_L	min.	2,5 W
R.F. input drive power				
$V_{S1} = V_{S2} = V_{S3} = 7,5 \text{ V}; P_L = 2,5 \text{ W}$		P_D	≤	20 mW
Output load impedance		Z_L	nom.	50 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-200.



Lead reference

Pin 1 = r.f. input

2 = V_{S1}

3 = not connected

4 = V_{S2}

5 = V_{S3}

6 = not connected

7 = r.f. Earth

case = Earth

7295470.3

BGY95A BGY95B

RATINGS

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

Voltages with respect to case

r.f. input pin	V_{in}	max.	± 25 V
r.f. output pin	V_{out}	max.	± 25 V
Supply pins	V_{S1}	max.	8 V
	V_{S2}	max.	11 V
	V_{S3}	max.	11 V
R.F. output power	P_L	max.	3,55 W
R.F. input drive power	P_D	max.	40 mW
Storage temperature	T_{stg}		-40 to + 100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

Performance:

BGY95A: $f = 825\text{-}845$ MHz; $R_S = R_L = 50 \Omega$; $V_{S1} = V_{S2} = V_{S3} = 7,5$ V

BGY95B: $f = 890\text{-}915$ MHz; $R_S = R_L = 50 \Omega$; $V_{S1} = V_{S2} = V_{S3} = 7,5$ V

R.F. output power

$P_D = 20$ mW	P_L	min.	2,5 W
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R.F. input drive power

$P_L = 2,5$ W	P_D	\leq	20 mW
---------------	-------	--------	-------

Efficiency

$P_L = 2,5$ W	η	min.	35 %
---------------	--------	------	------

Harmonic rejection

$P_L = 2,5$ W		min.	30 dB
---------------	--	------	-------

Input VSWR

with respect to 50Ω ;
 $P_D = 20$ mW

VSWR	typ.	1,5
	max.	2,0

Gain control: $P_D = 20$ mW;

at $V_{S1} = 0,5$ V

at $V_{S1} = 6,0$ V

P_L	max.	6 mW
P_L	min.	2,5 W

Stability:

The module will produce no spurious signals with a load mismatch $VSWR < 3 : 1$ when operated with $V_{S1} = 0,5$ to $7,5$ V, $V_{S2} = V_{S3} = 6$ to 10 V, $P_D = 10$ to 40 mW and $T_h \leq 90$ °C, provided maximum ratings are not exceeded.

Ruggedness:

The module will withstand a load mismatch of $50 : 1$ when operated with $V_{S1} = 0$ to 8 V, $V_{S2} = V_{S3} = 0$ to 11 V, $P_D = 0$ to 40 mW and $T_h = 90$ °C, provided maximum ratings are not exceeded.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY96A
BGY96B

U.H.F. AMPLIFIER MODULE

The BGY96 is a three-stage u.h.f. amplifier module designed primarily for mobile transmitting equipment operating from a nominal 9,6 V power supply.

The module consists of three N-P-N silicon planar transistors mounted on a metallized ceramic substrate, together with matching and bias circuitry. The BGY96A and BGY96B produce an output power of 2,5 W into a 50 Ω load over the frequency band 825-845 MHz and 890-915 MHz respectively. The output power can be controlled by means of a DC voltage (V_{S1}).

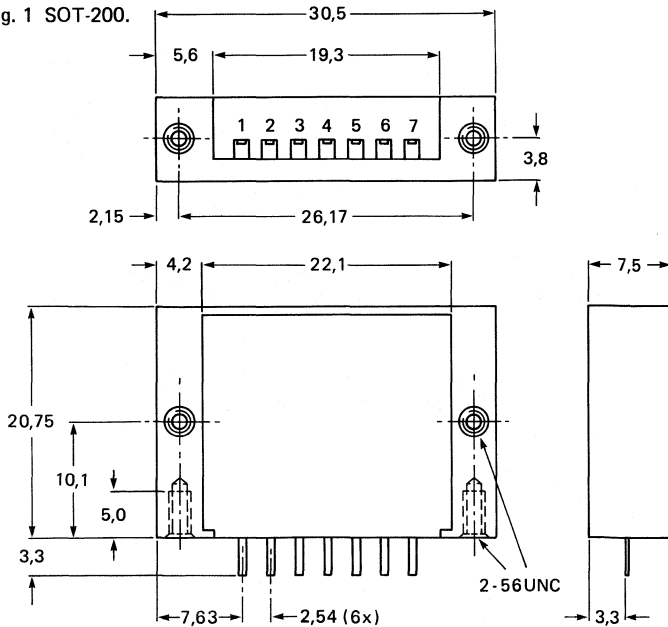
QUICK REFERENCE DATA

Mode of operation			c.w.
Frequency range	BGY96A	f	825-845 MHz
	BGY96B	f	890-915 MHz
R.F. power output		P_L	min. 2,5 W
$V_{S1} = 6\text{ V}; V_{S2} = V_{S3} = 9,6\text{ V}; P_D = 20\text{ mW}$			
R.F. input drive power		P_D	≤ 20 mW
$V_{S1} = 6\text{ V}; V_{S2} = V_{S3} = 9,6\text{ V}; P_L = 2,5\text{ W}$			
Output load impedance		Z_L	nom. 50 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-200.



Lead reference

Pin 1 = r.f. input

2 = V_{S1}

3 = not connected

4 = V_{S2}

5 = V_{S3}

6 = not connected

7 = r.f. output

case = Earth

7295470.3

BGY96A BGY96B

RATINGS

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

Voltages with respect to case

r.f. input pin

V_{in} max. ± 25 V

r.f. output pin

V_{out} max. ± 25 V

Supply pins

V_{S1} max. 8 V

V_{S2} max. 13 V

V_{S3} max. 13 V

R.F. output power

P_L max. 3,55 W

R.F. input drive power

P_D max. 50 mW

Storage temperature

T_{stg} -40 to $+100$ °C

Operating heatsink temperature

T_h max. 90 °C

CHARACTERISTICS

Performance:

BGY96A: $f = 825-845$ MHz; $R_S = R_L = 50$ Ω ; $V_{S1} = 6$ V; $V_{S2} = V_{S3} = 9,6$ V

BGY96B: $f = 890-915$ MHz. $R_S = R_L = 50$ Ω ; $V_{S1} = 6$ V; $V_{S2} = V_{S3} = 9,6$ V

R.F. output power

$P_D = 20$ mW

P_L min. 2,5 W

R.F. input drive power

$P_L = 2,5$ W

$P_D \leq 20$ mW

Efficiency

$P_L = 2,5$ W

η min. 35 %

Harmonic rejection

$P_L = 2,5$ W

min. 30 dB

Input VSWR

with respect to 50 Ω ;

$P_D = 20$ mW

VSWR typ. 1,5
max. 2,0

Gain control: $P_D = 20$ mW;

at $V_{S1} = 0,5$ V

at $V_{S1} = 6,0$ V

P_L max. 6 mW
 P_L min. 2,5 W

Stability:

The module will produce no spurious signals with a load mismatch $VSWR < 3 : 1$ when operated with $V_{S1} = 0,5$ to 6 V, $V_{S2} = V_{S3} = 7,9$ to 12 V, $P_D = 10$ to 40 mW and $T_h \leq 90$ °C, provided maximum ratings are not exceeded.

Ruggedness:

The module will withstand a load mismatch of 50 : 1 when operated with $V_{S1} = 0$ to 8 V, $V_{S2} = V_{S3} = 0$ to 13 V, $P_D = 0$ to 50 mW and $T_h = 90$ °C, provided maximum ratings are not exceeded.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BLF146

R.F. POWER MOSFET

N-channel enhancement mode vertical D-MOS transistor intended for use in professional transmitters in the HF range.

The transistor has a 4-lead flange envelope with a ceramic cap (SOT-121). All leads are isolated from the flange.

QUICK REFERENCE DATA

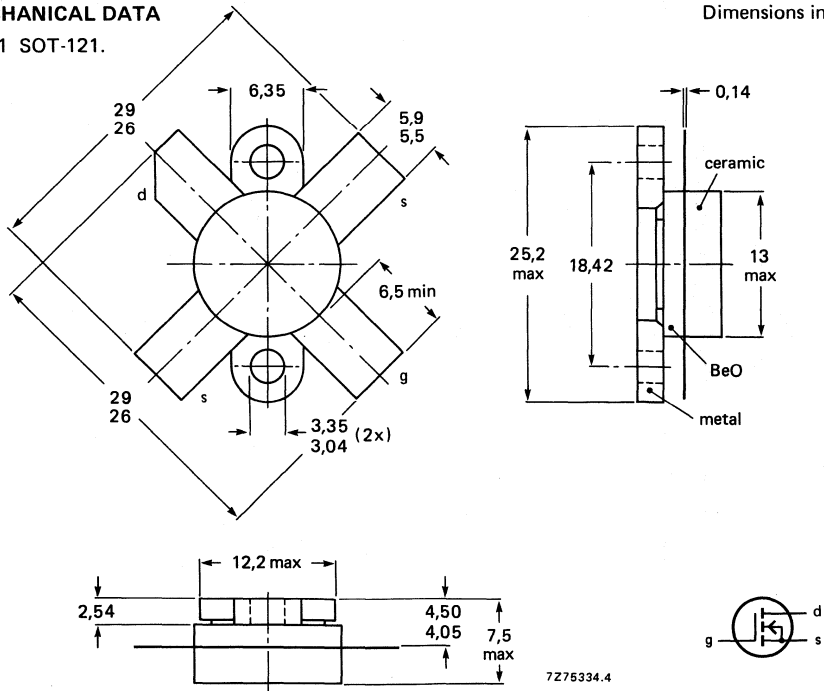
R.F. performance at $T_h = 25^\circ\text{C}$ in common-source class-AB circuit.

mode of operation	f MHz	V_{DS} V	P_L (PEP) W	G_p db	η (2-tone) %	d3 dB
S.S.B.	28	28	80	> 18	> 35	< -30

MECHANICAL DATA

Fig. 1 SOT-121.

Dimensions in mm



7276334.4

Note: Protect the gate-source input against static charge during transport or handling.

PRODUCT SAFETY 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).

Drain-source voltage	V_{DS}	max.	65 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (D.C.)	I_D	max.	7 A
Total power dissipation $T_{mb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	130 W
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	max.	1,35 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,2 K/W

CHARACTERISTICS

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

Drain-source breakdown voltage $I_D = 50\text{ mA}; V_{GS} = 0$	$V_{(BR)DS}$	min.	65 V
Drain-source leakage current $V_{DS} = 28\text{ V}; V_{GS} = 0$	I_{DSS}	max.	2,5 mA
Gate-source leakage current $\pm V_{GS} = 20\text{ V}, V_{DS} = 0$	I_{GSS}	max.	1 μA
Gate threshold voltage $I_D = 50\text{ mA}; V_{DS} = 10\text{ V}$	$V_{GS(th)}$		2 to 4,5 V
Forward tranconductance $I_D = 5\text{ A}; V_{DS} = 10\text{ V}$	G_{fs}	min. typ.	3 S 3,8 S
Drain-source ON resistance $I_D = 5\text{ A}; V_{GS} = 10\text{ V}$	$R_{DS(on)}$	typ.	0,2 Ω
On-state drain current $V_{DS} = 10\text{ V}; V_{GS} = 10\text{ V}$	I_{DSX}	typ.	22 A
Input capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0$	C_{iss}	typ.	260 pF
Output capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0\text{ V}$	C_{oss}	typ.	180 pF
Feedback capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0$	C_{rss}	typ.	25 pF

APPLICATION INFORMATION

R.F. performance in SSB operation (common-source class-AB circuit)

 $f_1 = 28.000 \text{ MHz}$; $f_2 = 28.001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $I_{DQ} = 0,6 \text{ A}$; $R_{GS} = 18 \text{ } \Omega$

mode of operation	f MHz	V _{DS} V	P _L (PEP) W	G _p db	η (2-tone) %	d ₃ dB
S.S.B.	28	28	80	> 18	> 35	< -30

Optimum load impedance: $3,3 + j 0,5 \text{ } \Omega$

The intermodulation products are measured with respect to the level of one tone.

LOAD MISMATCHThe device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power and supply voltage ($T_h = 25 \text{ }^\circ\text{C}$).

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BLF242

R.F. POWER MOSFET

N-channel enhancement mode vertical D-MOS transistor intended for use in professional transmitters in the VHF range.

The transistor has a 4-lead flange envelope with a ceramic cap (SOT-123). All leads are isolated from the flange.

QUICK REFERENCE DATA

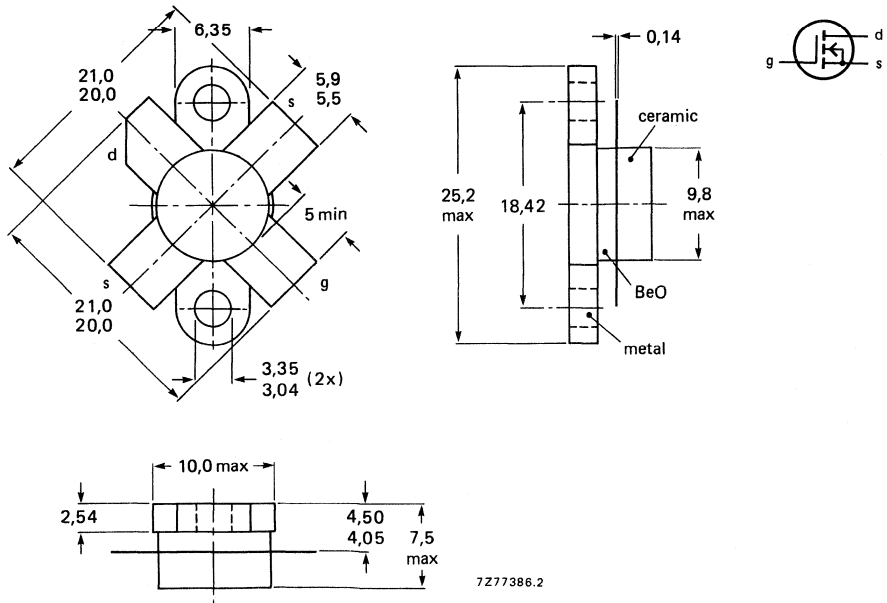
R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in common-source class-B circuit.

Mode of operation	V_{DS} V	f MHz	P_L W	G_p dB	η %
narrow band; c.w.	28	175	5	> 13	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



Note: Protect gate-source input against static charge during transport or handling.

PRODUCT SAFETY 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).

Drain-source voltage	V_{DS}	max.	65 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (D.C.)	I_D	max.	0,5 A
Total power dissipation $T_{mb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	16 W
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	max.	11 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,3 K/W

CHARACTERISTICS

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

Drain-source breakdown voltage $I_D = 0,1\text{ mA}; V_{GS} = 0$	$V_{(BR)DS}$	min.	65 V
Drain-source leakage current $V_{DS} = 28\text{ V}; V_{GS} = 0$	I_{DSS}	max.	0,01 mA
Gate-source leakage current $\pm V_{GS} = 20\text{ V}; V_{DS} = 0$	I_{GSS}	max.	1 μA
Gate threshold voltage $I_D = 3\text{ mA}; V_{DS} = 10\text{ V}$	$V_{GS(th)}$		2 to 4,5 V
Forward tranconductance $I_D = 0,3\text{ A}; V_{DS} = 10\text{ V}$	G_{fs}	min. typ.	0,16 S 0,24 S
Drain-source ON resistance $I_D = 0,3\text{ A}; V_{GS} = 10\text{ V}$	$R_{DS(on)}$	typ.	3,3 Ω
On-state drain current $V_{DS} = 10\text{ V}; V_{GS} = 10\text{ V}$	I_{DSX}	typ.	1,4 A
Input capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0$	C_{iss}	typ.	14 pF
Output capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0\text{ V}$	C_{oss}	typ.	9,4 pF
Feedback capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0$	C_{rss}	typ.	1,7 pF

APPLICATION INFORMATION

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

$f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $I_{DQ} = 10 \text{ mA}$; $R_{GS} = 46 \text{ } \Omega$

mode of operation	V_{DS} V	P_L W	P_S W	G_p dB	I_D A	η %
narrow band; c.w.	28	5	< 0,25	> 13	< 0,36	> 50
	28	5	typ. 0,12	typ. 16	typ. 0,3	typ. 60

Optimum load impedance : $19 + j 38 \text{ } \Omega$

Input impedance : $9,4 - j 22 \text{ } \Omega$

LOAD MISMATCH

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power and supply voltage ($T_h = 25 \text{ }^\circ\text{C}$).

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BLF244

R.F. POWER MOSFET

N-channel enhancement mode vertical D-MOS transistor intended for use in professional transmitters in the VHF range.

The transistor has a 4-lead flange envelope with a ceramic cap (SOT-123). All leads are isolated from the flange.

QUICK REFERENCE DATA

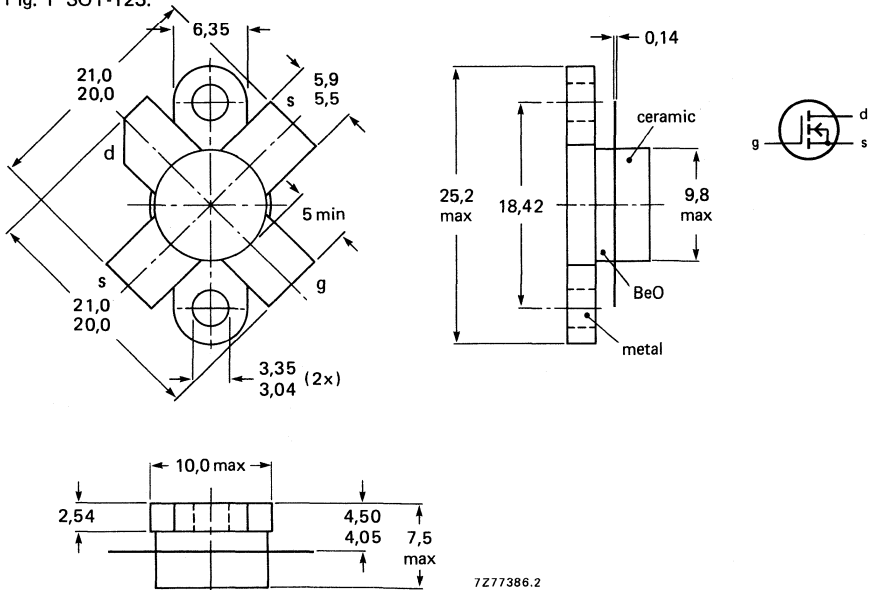
R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in common-source class-C circuit.

mode of operation	V_{DS} V	f MHz	P_L W	G_p dB	η_d %
narrow band; c.w.	28	175	15	> 13	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



Note: Protect the gate-source input against static charge during transport or handling.

PRODUCT SAFETY 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)

Drain-source voltage	V_{DS}	max.	65 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.)	I_D	max.	1,5 A
Total power dissipation up to $T_{mb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	30 W
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	max.	5,8 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,3 K/W

CHARACTERISTICS

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

Drain-source breakdown voltage $I_D = 5\text{ mA}; V_{GS} = 0$	$V_{(BR)DS}$	min.	65 V
Drain-source leakage current $V_{DS} = 28\text{ V}; V_{GS} = 0$	I_{DSS}	max.	1 mA
Gate-source leakage current $\pm V_{GS} = 20\text{ V}; V_{DS} = 0$	I_{GSS}	max.	1 μA
Gate threshold voltage $I_D = 5\text{ mA}; V_{DS} = V_{GS}$	$V_{GS(th)}$		2 to 4,5 V
Forward transconductance $V_{DS} = 10\text{ V}; I_D = 0,6\text{ A}$	G_{fs}	min. typ.	0,5 S 0,8 S
On-state drain current $V_{DS} = 10\text{ V}; V_{GS} = 10\text{ V}$	I_{DSX}	typ.	4,5 A
Input capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0$	C_{iss}	typ.	60 pF
Output capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0\text{ V}$	C_{oss}	typ.	40 pF
Feedback capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0\text{ V}$	C_{rss}	typ.	4 pF
Drain-flange capacitance	C_{df}	typ.	2 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-source class-C circuit) $f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$;
 $V_{GS} = 1,8 \text{ V}$

mode of operation	V_{DS} V	P_L W	P_S W	G_p dB	I_D A	η_d %
narrow band; c.w.	28 28	15 15	< 0,75 typ. 0,3	> 13 typ. 17	< 1,07 typ. 0,9	> 50 typ. 60

Optimum load impedance : $6,4 + j9,7 \text{ } \Omega$
 Input impedance : $2,4 - j11 \text{ } \Omega$

LOAD MISMATCH

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power and supply voltage ($T_h = 25 \text{ }^\circ\text{C}$).

DEVELOPMENT DATA

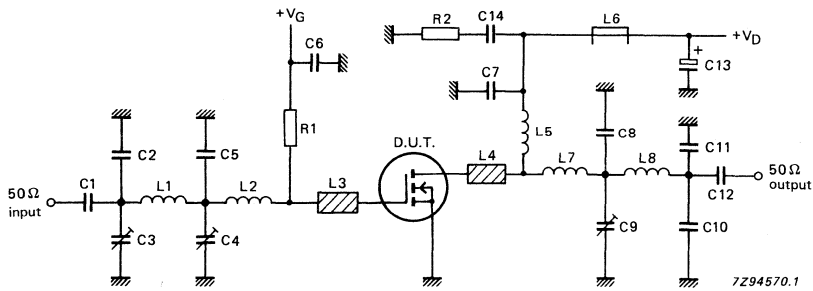


Fig. 2 Class-C test circuit at $f = 175 \text{ MHz}$.

List of components:

- R1 = 23 Ω , metal film (46,4 Ω // 46,4 Ω , 2 x 1/4 W)
- R2 = 10 Ω , metal film
- C1 = 680 pF, ATC chip
- C2 = 20 pF, ATC chip
- C3, C4 = 5-60 pF, PTFE trimmer, cat. no. 2222 809 08003
- C5 = 75 pF, ATC chip
- C6 = 10 nF, chip capacitor, cat. no. 2222 852 47103
- C7 = 100 pF ATC chip
- C8 = 47 pF, ATC chip
- C9 = 5-60 pF, PTFE trimmers, cat. no 2222 809 08003
- C10, C11 = 11 pF, ATC chip
- C12 = 680 pF, ATC chip
- C13 = 2,2 μ F, tantalum electrolytic capacitor
- C14 = 100 nF, chip capacitor, cat. no. 2222 852 47104
- L1 = 32 nH, 4 turns of enamelled Cu-wire (1 mm) int. diam. 3 mm, leads: 2 x 5 mm, length: 6,3 mm
- L2 = 12,2 nH, 1 turn of enamelled Cu-wire (1 mm) int. diam. 5,6 mm, leads: 2 x 5 mm
- L3, L4 = 30 Ω striplines, width 6,0 mm, length 15 mm
- L5 = 118,8 nH, 6 turns of enamelled Cu-wire (1 mm) int. diam. 6 mm, leads: 2 x 5 mm, length: 10,4 mm
- L6 = RF choke, grade 3B, cat. no. 4312 020 36640
- L7 = 19 nH, 2 turns of enamelled Cu-wire (1 mm) int. diam. 3 mm, leads: 2 x 5 mm, length: 2,4 mm
- L8 = 28,5 nH, 4 turns of enamelled Cu-wire (1 mm) int. diam. 3 mm, leads: 2 x 5 mm, length: 8,5 mm

P.C.B. material: epoxy fibre glass, thickness 1/16 inch, $\epsilon_r = 4,5$

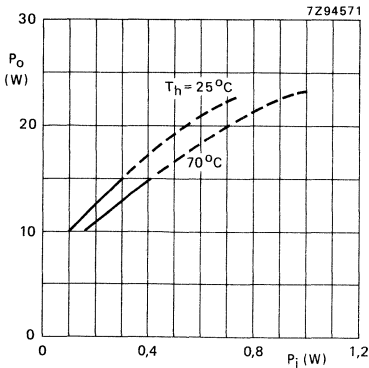


Fig. 3 Output power versus input power.
 $f = 175$ MHz; $V_{DS} = 28$ V.

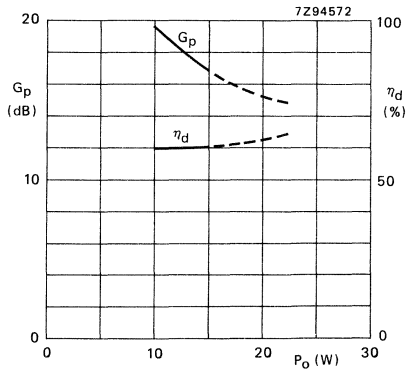


Fig. 4 Power gain and drain efficiency versus output power.
 $f = 175$ MHz; $V_{DS} = 28$ V; $T_h = 25$ $^\circ\text{C}$.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BLF245

R.F. POWER MOSFET

N-channel enhancement mode vertical D-MOS transistor intended for use in professional transmitters in the VHF range.

The transistor has a 4-lead flange envelope with a ceramic cap (SOT-123). All leads are isolated from the flange.

QUICK REFERENCE DATA

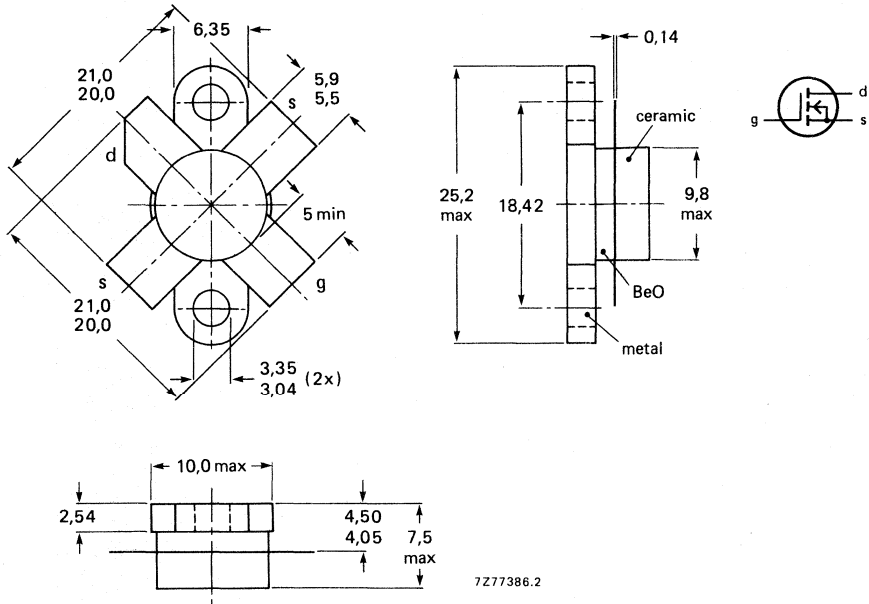
R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in common-source class-B circuit.

mode of operation	V_{DS} V	f MHz	P_L W	G_p dB	η_D %
narrow band; c.w.	28	175	30	> 13	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



PRODUCT SAFETY 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)

Drain-source voltage	V_{DS}	max.	65 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.)	I_D	max.	3 A
Total power dissipation up to $T_{mb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	55 W
Storage temperature	T_{stg}	-65 to + 150	$^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	max.	3,2 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,3 K/W

CHARACTERISTICS

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

Drain-source breakdown voltage $I_D = 10\text{ mA}; V_{GS} = 0$	$V_{(BR)DS}$	min.	65 V
Drain-source leakage current $V_{DS} = 28\text{ V}; V_{GS} = 0$	I_{DSS}	max.	2,5 mA
Gate-source leakage current $\pm V_{GS} = 20\text{ V}; V_{DS} = 0$	I_{GSS}	max.	1 μA
Gate threshold voltage $I_D = 10\text{ mA}; V_{DS} = V_{GS}$	$V_{GS(th)}$	2 to 4,5 V	
Forward transconductance $V_{DS} = 10\text{ V}; I_D = 1,5\text{ A}$	G_{fs}	min. typ.	1,1 S 1,6 S
On-state drain current $V_{DS} = 10\text{ V}; V_{GS} = 10\text{ V}$	I_{DSX}	typ.	8,5 A
Input capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0$	C_{iss}	typ.	110 pF
Output capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0\text{ V}$	C_{oss}	typ.	70 pF
Feedback capacitance at $f = 1\text{ MHz}$ $V_{DS} = 28\text{ V}; V_{GS} = 0$	C_{rss}	typ.	6 pF
Drain-flange capacitance	C_{df}	typ.	2 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-source class-B circuit) $f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$;
 $I_{DQ} = 50 \text{ mA}$

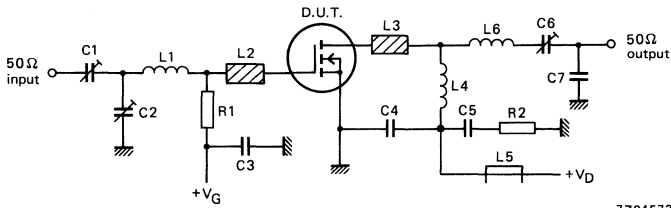
mode of operation	V_{DS} V	P_L W	P_S W	G_p dB	I_D A	η_D %
narrow band; c.w.	28 28	30 30	< 1,5 typ. 0,7	> 13 typ. 16	< 2,14 typ. 1,6	> 50 typ. 65

Optimum load impedance : $5,1 + j5,0 \Omega$
 Input impedance : $2,0 - j6,5 \Omega$

LOAD MISMATCH

The device is capable of withstanding a full load mismatch (VSWR of 50, varied through all phases) at rated load power and supply voltage ($T_h = 25 \text{ }^\circ\text{C}$).

DEVELOPMENT DATA



7294573.1

Fig. 2 Class-B test circuit at $f = 175 \text{ MHz}$.

List of components:

- R1 = 1 k Ω , metal film
- R2 = 10 Ω , metal film
- C1 = 4-40 pF, PTFE trimmer
- C2 = 5-60 pF, PTFE trimmer
- C3 = 100 pF chip + 100 nF chip
- C4 = 100 pF ceramic plate cap.
- C5 = 100 nF polyester
- C6 = 5-60 pF, PTFE trimmer + 18 pF chip
- C7 = 27 pF chip + 24 pF chip
- L1 = 18 nH; 3 turns of 0,5 mm copper wire, int. diam. 2 mm, length 3,3 mm leads: 2 x 5 mm
- L2 = 30 Ω stripline; W = 6 mm, L = 10 mm
- L3 = 30 Ω stripline; W = 6 mm, L = 10 mm
- L4 = 100 nH; 6 turns of 1,5 mm enamelled copper wire, int. diam. 5 mm, length 12,6 mm, leads: 2 x 5 mm
- L5 = Ferroxcube RF choke, grade 3B, cat. no. 4312 020 36640
- L6 = 27 nH; 2 turns of 1,5 mm enamelled copper wire int. diam. 5 mm, length 4,1 mm, leads: 2 x 5 mm

P.C.B. material: epoxy fibre glass, thickness 1/16 inch, $\epsilon_r = 4,5$

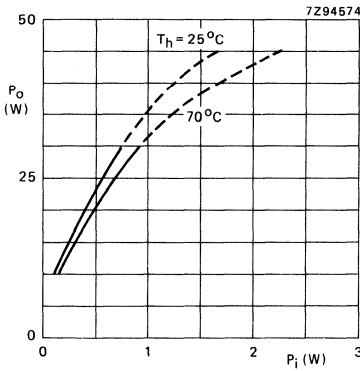


Fig. 3 Output power versus input power.
 $f = 175$ MHz; $V_{DS} = 28$ V.

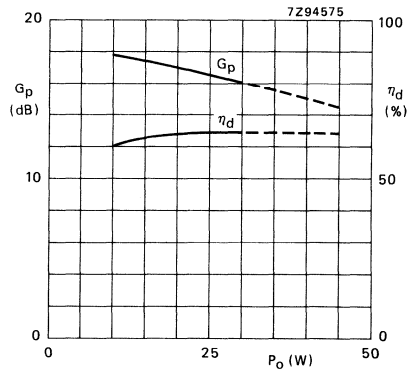


Fig. 4 Power gain and drain efficiency versus output power.
 $f = 175$ MHz; $V_{DS} = 28$ V; $T_h = 25$ $^\circ\text{C}$.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in handheld radio stations in the 900 MHz communications band.

This device has been designed specifically for class-B operation.

Features:

- the device can be applied at rated load power without an external heatsink when it is mounted on a printed circuit board (see Fig. 4).
- gold metallization ensures excellent reliability.

The transistor has a 4-lead studless envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

R.F. performance at $T_a = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit.*

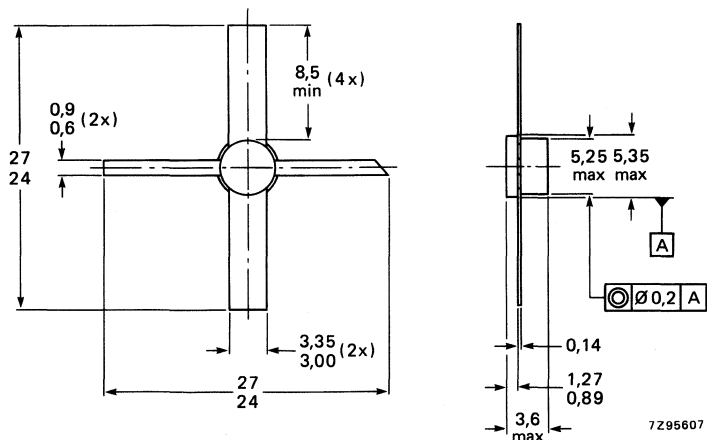
mode of operation	V_{CE} V	f MHz	P _O W	G _p dB	η C %
c.w. (class-B)	7,5	900	0,75	> 7,0	> 50

* Device mounted on a printed circuit board (see Fig. 4).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172D.



PRODUCT SAFETY 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)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
average	$I_C; I_{C(AV)}$	max.	250 mA
(peak value); $f > 1$ MHz	I_{CM}	max.	750 mA
Total power dissipation			
at $T_{amb} = 50$ °C; $f > 1$ MHz*	$P_{tot(rf)}$	max.	2,3 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

Dissipation = 2,5 W; $T_{mb} = 25$ °C

From junction to ambient* ($f > 1$ MHz)	$R_{th\ j-a(rf)}$	max.	65 K/W
From junction to mounting base ($f > 1$ MHz)	$R_{th\ j-mb(rf)}$	max.	25 K/W

* Device mounted on a printed circuit board (see Fig. 4).

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 2,5\text{ mA}$

$V_{(BR)CBO} > 20\text{ V}$

Collector-emitter breakdown voltage
open base; $I_C = 5\text{ mA}$

$V_{(BR)CEO} > 10\text{ V}$

Emitter-base breakdown voltage
open collector; $I_E = 0,5\text{ mA}$

$V_{(BR)EBO} > 3\text{ V}$

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 10\text{ V}$

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

Second breakdown energy
 $L = 25\text{ mH}; f = 50\text{ Hz}; R_{BE} = 10\text{ }\Omega$

$E_{SBR} > 0,3\text{ mJ}$

D.C. current gain
 $I_C = 0,15\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE} > 25$

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = i_e = 0; V_{CB} = 7,5\text{ V}$

C_C typ. $2,8\text{ pF}$

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 0; V_{CE} = 7,5\text{ V}$

C_{re} typ. $1,6\text{ pF}$

Collector-mounting base capacitance

C_{c-mb} typ. $0,5\text{ pF}$

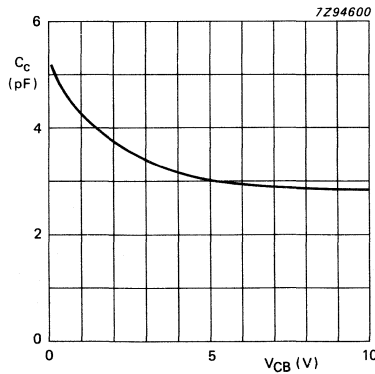
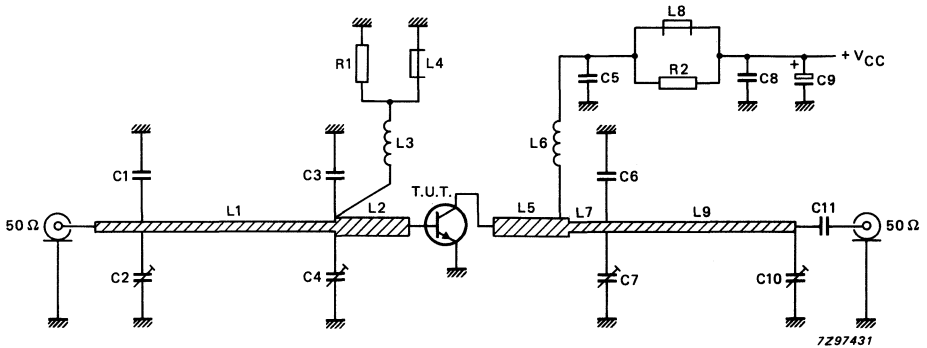


Fig. 2 $I_E = i_e = 0; f = 1\text{ MHz}$; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900 \text{ MHz}$; $T_a = 25 \text{ }^\circ\text{C}$

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	7,5	0,75	>7,0 typ. 8,5	>50 typ. 63

Fig. 3 Class-B test circuit at $f = 900 \text{ MHz}$.

List of components:

- C1 = 3 pF multilayer ceramic chip capacitor*
- C2 = C4 = C7 = C10 = 1,4 to 5,5 pF film dielectric trimmer (cat.no. 2222 809 09001)
- C3 = C6 = 3,9 pF multilayer ceramic chip capacitor*
- C5 = C8 = C11 = 180 pF multilayer ceramic chip capacitor
- C9 = 1 μF (35 V) tantalum capacitor
- L1 = 50 Ω stripline (38 mm x 2,4 mm)
- L2 = L5 = 35 Ω stripline (14 mm x 4 mm)
- L3 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
- L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat.no. 4312 020 36642)
- L6 = 50 nH; 5 turns closely wound enamelled Cu wire (0,6 mm); int. dia. 3 mm; leads 2 x 5 mm
- L7 = 50 Ω stripline (12,2 mm x 2,4 mm)
- L9 = 50 Ω stripline (30,5 mm x 2,4 mm)
- R1 = R2 = 10 \pm 5%; 0,25 W metal film resistor

The striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch; thickness of copper-sheet 2 x 35 μm .

* American Technical Ceramics capacitor type 100A or capacitor of same quality.

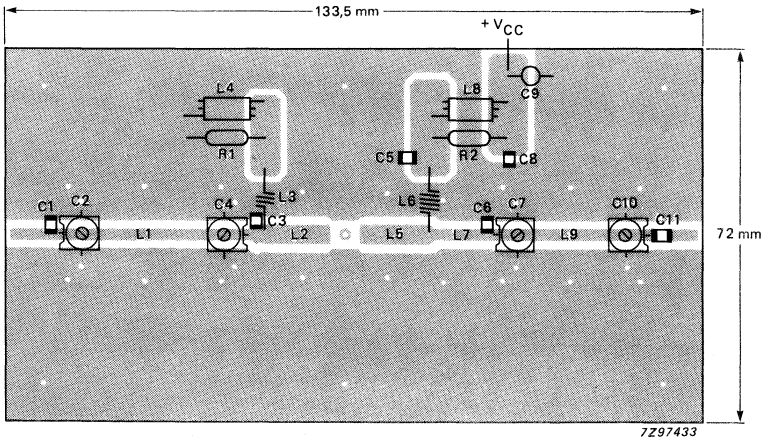
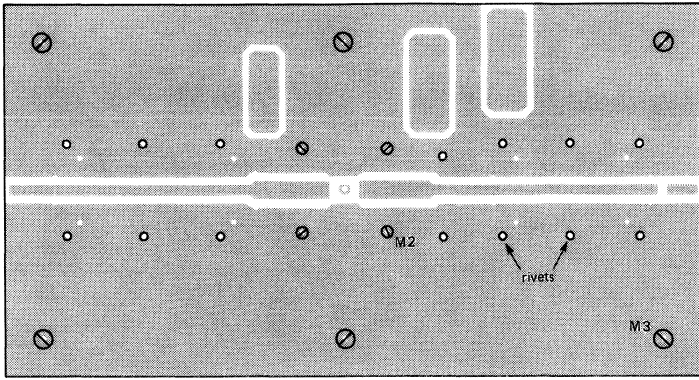


Fig. 4 Printed circuit board and component lay out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

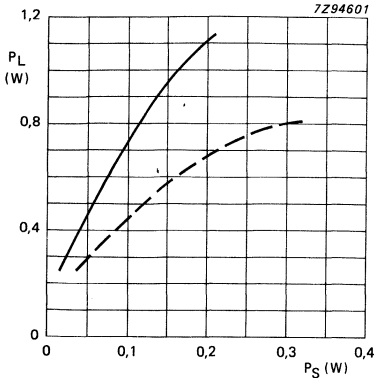


Fig. 5 Load power vs. source power.

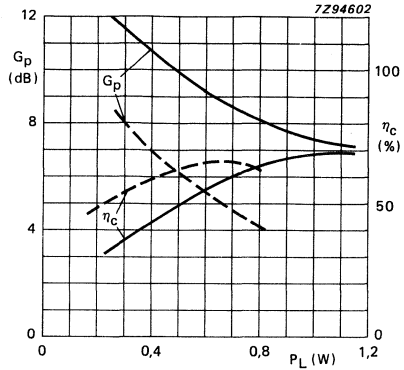


Fig. 6 Power gain and efficiency vs. load power.

Conditions for Figs 5 and 6:

$f = 900 \text{ MHz}$; $T_a = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

$V_{CE} = 7,5 \text{ V}$ (—); $V_{CE} = 5,0 \text{ V}$ (-----)

(transistor mounted on printed circuit board, shown in Fig. 4, without applying an external heatsink).

RUGGEDNESS

The device is capable of withstanding a full load mismatch ($VSWR = 50$; all phases) at rated load power up to a supply voltage of $9,0 \text{ V}$ at $T_a = 25 \text{ }^\circ\text{C}$. Device mounted on a printed circuit board (see Fig. 4).

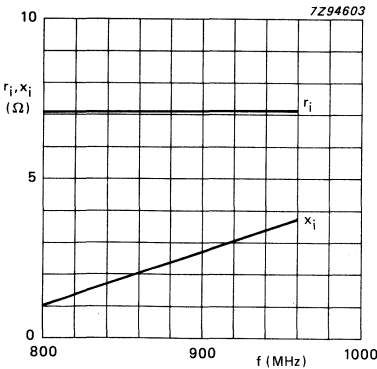


Fig. 7 Input impedance (series components).

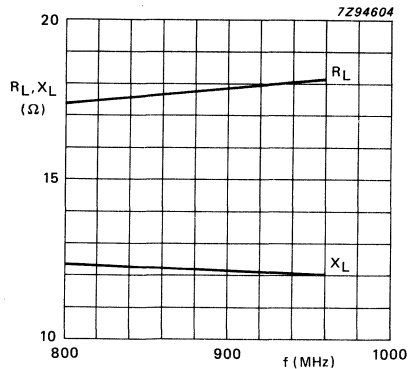


Fig. 8 Load impedance (series components).

Conditions for Figs 7, 8 and 9:

$V_{CE} = 7,5 \text{ V}$; $P_L = 0,75 \text{ W}$; $f = 800 - 960 \text{ MHz}$; $T_a = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

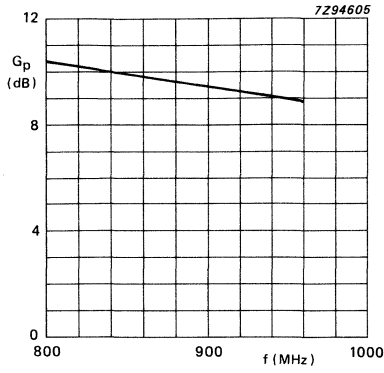


Fig. 9 Power gain vs. frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in handheld radio stations in the 900 MHz communications band.

This device has been designed specifically for class-B operation.

Features:

- the device can be applied at rated load power without an external heatsink when it is mounted on a printed wiring board.
- gold metallization ensures excellent reliability.

The transistor has a 4-lead studless envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

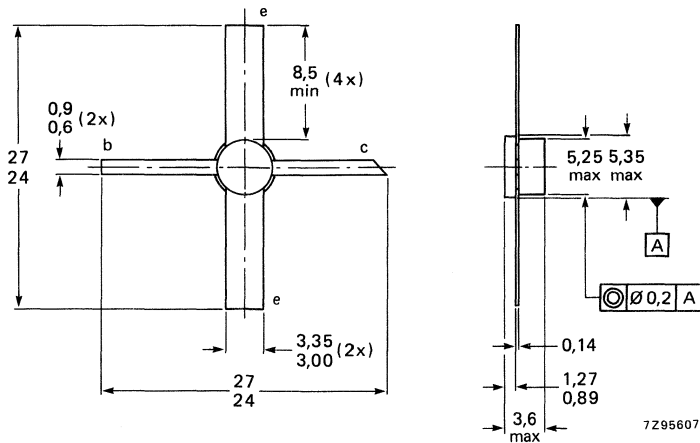
R.F. performance at $T_a = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w. (class-B)	7,5	900	1,5	> 6,0	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172D.



PRODUCT SAFETY 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)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
average	$I_C; I_C(AV)$	max.	500 mA
(peak value); $f > 1$ MHz	I_{CM}	max.	1500 mA
Total power dissipation at $T_{amb} = 50$ °C; $f > 1$ MHz*	$P_{tot}(rf)$	max.	3,0 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCEDissipation = 4,5 W; $T_{mb} = 25$ °C

From junction to ambient* ($f > 1$ MHz)	$R_{th\ j-a}(rf)$	max.	50 K/W
From junction to mounting base ($f > 1$ MHz)	$R_{th\ j-mb}(rf)$	max.	20 K/W

* Device mounted on a printed wiring board (see Fig. 4).

CHARACTERISTICS

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

Collector-base breakdown voltage open emitter; $I_C = 5\text{ mA}$	$V_{(BR)CBO}$	>	20 V
Collector-emitter breakdown voltage open base; $I_C = 10\text{ mA}$	$V_{(BR)CEO}$	>	10 V
Emitter-base breakdown voltage open collector; $I_E = 1\text{ mA}$	$V_{(BR)EBO}$	>	3 V
Collector cut-off current $V_{BE} = 0; V_{CE} = 10\text{ V}$	I_{CES}	<	2,5 mA
Second breakdown energy $L = 25\text{ mH}; f = 50\text{ Hz}; R_{BE} = 10\text{ }\Omega$	E_{SBR}	>	0,55 mJ
D.C. current gain $I_C = 300\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	>	25
Collector capacitance at $f = 1\text{ MHz}$ $I_E = i_e = 0; V_{CB} = 7,5\text{ V}$	C_c	typ.	4,5 pF
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 7,5\text{ V}$	C_{re}	typ.	3 pF
Collector-mounting base capacitance	C_{c-mb}	typ.	0,5 pF

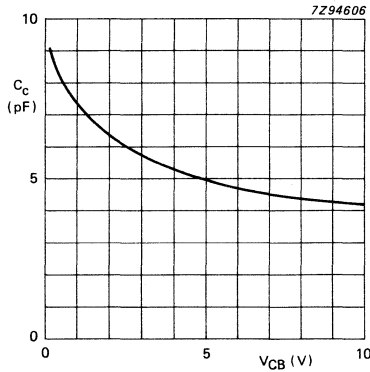


Fig. 2 $I_E = i_e = 0; f = 1\text{ MHz}$; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900 \text{ MHz}$; $T_a = 25 \text{ }^\circ\text{C}$

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	7,5	1,5	$> 6,0$ typ. 7,0	> 50 typ. 65

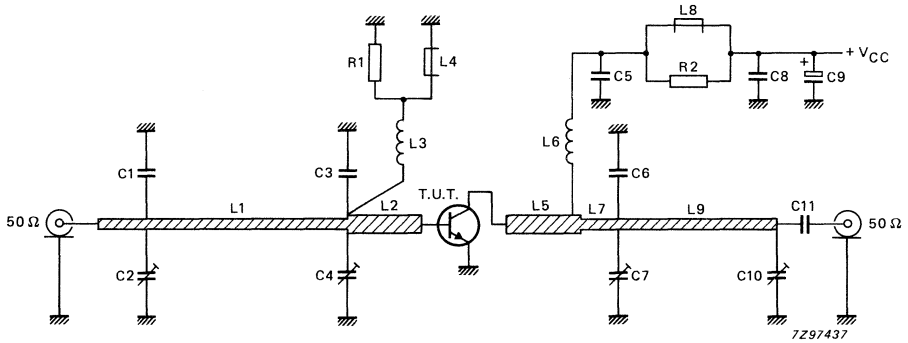


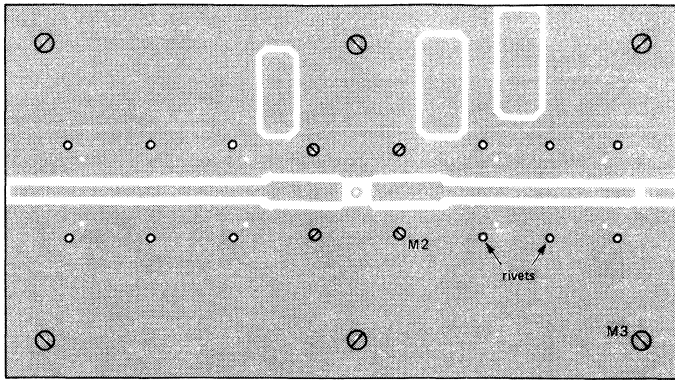
Fig. 3 Class-B test circuit at $f = 900 \text{ MHz}$.

List of components:

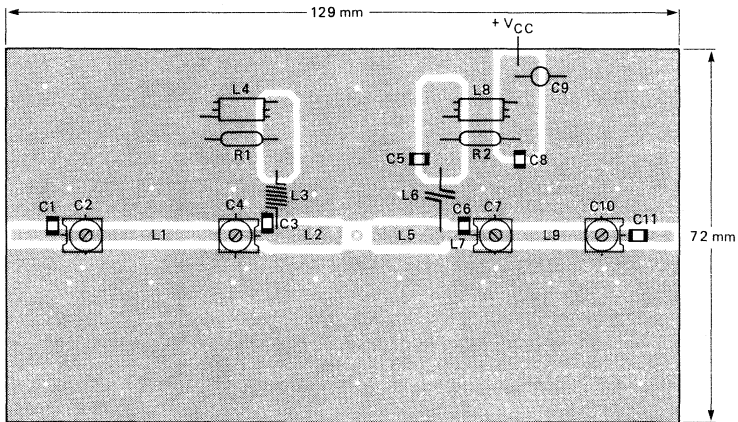
- C1 = C6 = 2 pF multilayer ceramic chip capacitor*
- C2 = C4 = C7 = C10 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C3 = 4,7 pF multilayer ceramic chip capacitor*
- C5 = C8 = C11 = 180 pF multilayer ceramic chip capacitor
- C9 = 1 μF (35 V) tantalum capacitor
- L1 = 50 Ω stripline (40 mm x 2,4 mm)
- L2 = L5 = 35 Ω stripline (14 mm x 4,0 mm)
- L3 = 100 nH; 8 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
- L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat.no. 4312 020 36642)
- L6 = 30 nH; 2 turns Cu wire (1,0 mm); int. dia. 5,5 mm; length 4,5 mm; leads 2 x 5 mm.
- L7 = 50 Ω stripline (6,0 mm x 2,4 mm)
- L9 = 50 Ω stripline (30,3 mm x 2,4 mm)
- R1 = R2 = 10 $\Omega \pm 5\%$; 0,25 W metal film resistor

The striplines on a double Cu-clad printed wiring board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch; thickness of copper-sheet 2 x 35 μm .

* American Technical Ceramics capacitor type 100A or capacitor of same quality.



7297438



7297439

Fig. 4 Printed wiring board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as a groundplane. Earth connections are made by hollow rivets and also by fixing screws and copper straps under the emitters to provide a direct contact between the copper on the component side and the groundplane.

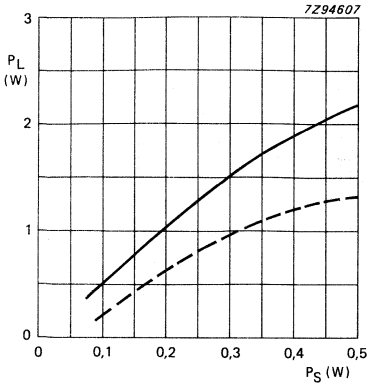


Fig. 5 Load power vs. source power.

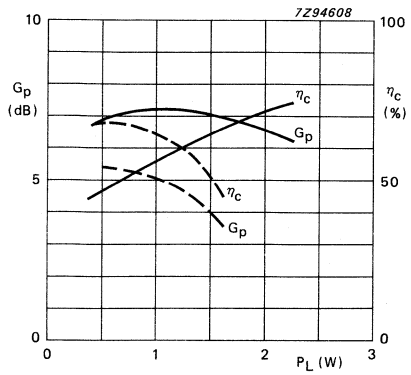


Fig. 6 Power gain and efficiency vs. load power.

Conditions for Figs 5 and 6:

$f = 900 \text{ MHz}$; $T_a = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

$V_{CE} = 7,5 \text{ V}$ (—); $V_{CE} = 5,0 \text{ V}$ (-----)

(transistor mounted on printed wiring board, shown in Fig. 4, without applying an external heatsink).

RUGGEDNESS

The device is capable of withstanding a full load mismatch ($VSWR = 50$; all phases) at rated load power up to a supply voltage of $9,0 \text{ V}$ at $T_a = 25 \text{ }^\circ\text{C}$.

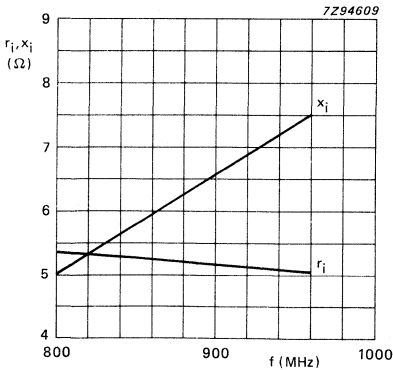


Fig. 7 Input impedance (series components).

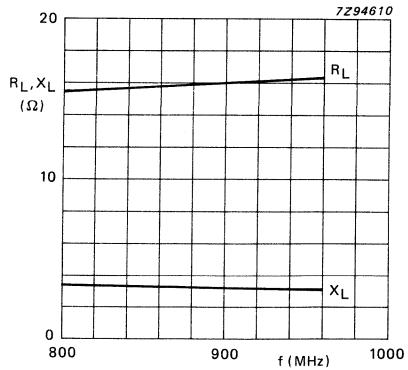


Fig. 8 Load impedance (series components).

Conditions for Figs 7, 8 and 9:

$V_{CE} = 7,5 \text{ V}$; $P_L = 1,5 \text{ W}$; $f = 800 - 960 \text{ MHz}$; $T_a = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

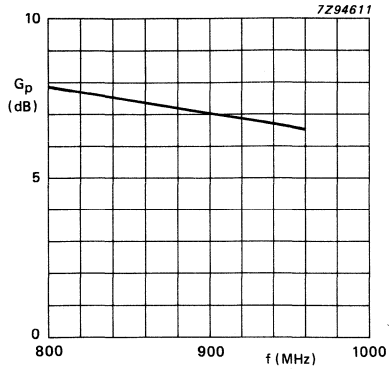


Fig. 9 Power gain vs. frequency.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BLT92/SL

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in handheld radio stations in the 900 MHz communications band.

This device has been designed specifically for class-B operation.

The transistor has a 4-lead studless envelope with a ceramic cap (SOT-122D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

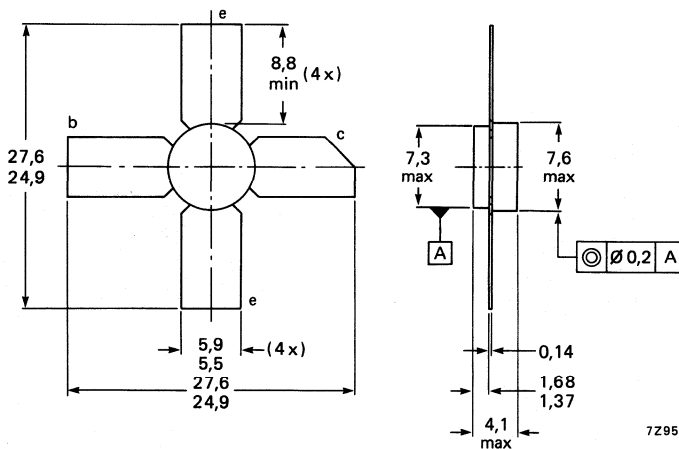
R.F. performance at $T_{mb} = 25\text{ }^{\circ}\text{C}$ in a common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w. (class-B)	7,5	900	3	> 7,0	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122D.



7Z95608

PRODUCT SAFETY 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)	V_{CB0}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	1,8 A
Total power dissipation at $T_{mb} = 65$ °C; $f > 1$ MHz	$P_{tot}(rf)$	max.	10 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base ($f > 1$ MHz)	$R_{th\ j-mb}$	max.	6 K/W
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CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

D.C. current gain

$I_C = 0,6$ A; $V_{CE} = 5$ V	h_{FE}	min.	25
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Ruggedness

The device is capable of withstanding a full load mismatch (VSWR = 50 through all phases) at 3 W load power up to a supply voltage of 9,0 V and $T_{mb} = 25$ °C.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability.
- internal matching to achieve an optimum wideband capability and high power gain.

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

QUICK REFERENCE DATA

Envelope	SOT-119	
Mode of operation	class-B; c.w.	
Collector-emitter voltage (d.c.)	V_{CE}	12,5 V
Frequency	f	470 MHz
Load power	P_L	20 W
Power gain	G_P	> 6,5 dB
Collector efficiency	η_c	> 55 %
Heatsink temperature	T_h	25 °C

MECHANICAL DATA

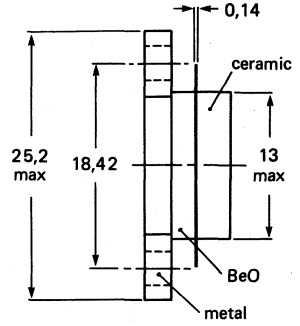
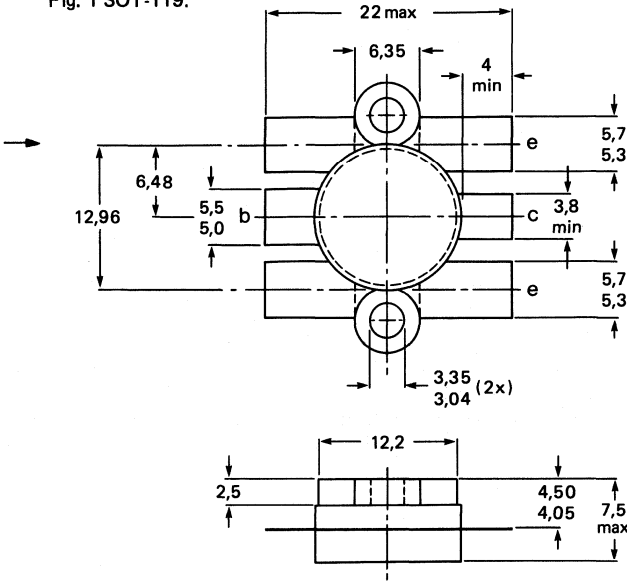
SOT-119 (see Fig. 1).

PRODUCT SAFETY 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



7277385.8

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V	
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5 V	
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V	
Collector current d.c. or average	I_C	max.	4 A	
(peak value); $f > 1$ MHz	I_{CM}	max.	12 A	
Total power dissipation at $T_{mb} = 25$ °C	P_{tot} (d.c.)	max.	38 W	←
$f > 1$ MHz; $T_{mb} = 25$ °C	P_{tot} (r.f.)	max.	44 W	
Storage temperature	T_{stg}		-65 to +150 °C	
Operating junction temperature	T_j	max.	200 °C	

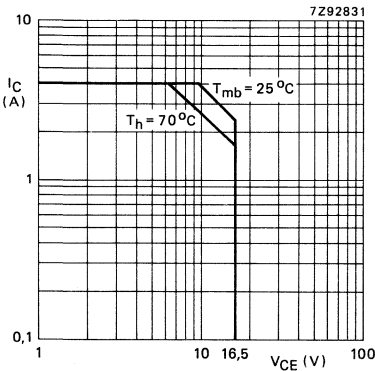


Fig. 2 D.C.SOAR.
 $R_{th\ mb-h} = 0,2$ K/W

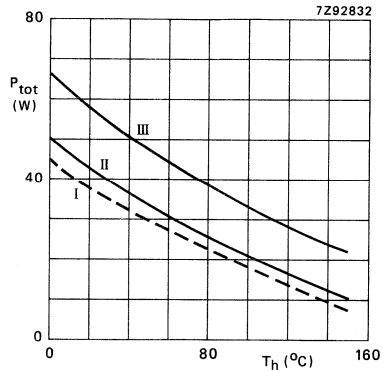


Fig. 3 Power/temperature derating curves
I Continuous operation
II Continuous operation ($f > 1$ MHz)
III Short-time operation during mismatch;
($f > 1$ MHz)

THERMAL RESISTANCE (dissipation = 37 W; $T_{mb} = 25$ °C, i.e. $T_h = 18$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j-mb(d.c.)}$	max	4,6 K/W	←
(r.f. dissipation)	$R_{th\ j-mb(r.f.)}$	max	4,1 K/W	
From mounting base to heatsink	$R_{th\ mb-h}$	max	0,2 K/W	

CHARACTERISTICS

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

Collector-base breakdown voltage

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

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

Collector-emitter breakdown voltage

$I_C = 50\text{ mA}$; open base

$$V_{(BR)CEO} > 16,5\text{ V}$$

Emitter-base breakdown voltage

$I_E = 5\text{ mA}$; open collector

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

Collector cut-off current

$V_{BE} = 0$; $V_{CE} = 20\text{ V}$

$$I_{CES} < 12,5\text{ mA}$$

Second breakdown energy

$L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

$$E_{SBR} > 5,3\text{ mJ}$$

D.C. current gain

$I_C = 2,7\text{ A}$; $V_{CE} = 10\text{ V}$

$$h_{FE} > \begin{matrix} 15 \\ \text{typ.} \\ 60 \end{matrix}$$

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

$I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$

$$C_c \text{ typ. } 53\text{ pF}$$

Feed-back capacitance at $f = 1\text{ MHz}$

$I_C = 0$; $V_{CE} = 12,5\text{ V}$

$$C_{re} \text{ typ. } 33\text{ pF}$$

Collector-flange capacitance

$$C_{cf} \text{ typ. } 3\text{ pF}$$

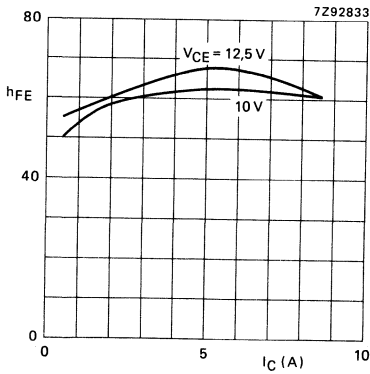


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; typ. values.

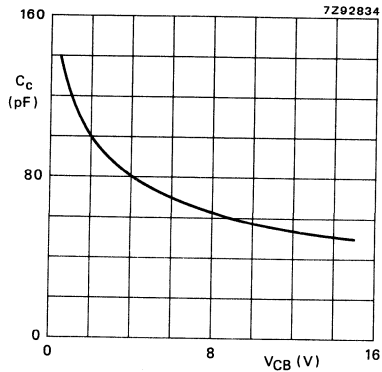


Fig. 5 $I_E = i_e = 0$; $f = 1\text{ MHz}$; typ. values.

APPLICATION INFORMATION

Mode of operation

Collector-emitter voltage (d.c.)

Frequency

Load power

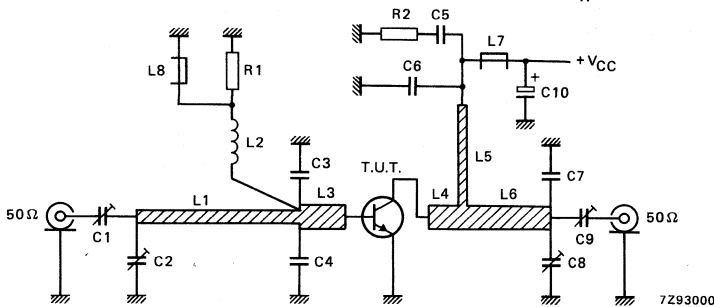
Power gain

Collector efficiency

Heatsink temperature

in narrow band test circuit;
class-B; c.w. V_{CE} 12,5 V

f 470 MHz

 P_L 20 W G_p > 6,5 dB
typ. 7,8 dB η_c > 55 %
typ. 64 % T_h 25 °CFig. 6 Class-B test circuit at $f = 470$ MHz.

List of components:

C1 = C9 = 1,8 to 10 pF film dielectric trimmer (cat.no. 2222 809 05002)

C2 = 2 to 9 pF film dielectric trimmer (cat.no. 2222 809 09002)

C3 = C4 = 8,2 pF multilayer ceramic chip capacitor (100A type) *

C5 = 100 nF polyester film capacitor

C6 = 120 pF multilayer ceramic chip capacitor

C7 = 8,2 pF multilayer ceramic chip capacitor (100B type) *

C8 = 2 to 18 pF film dielectric trimmer (cat.no. 2222 809 09003)

C10 = 2,2 μ F electrolytic capacitorL1 = 50 Ω stripline (43,5 mm x 4,0 mm)

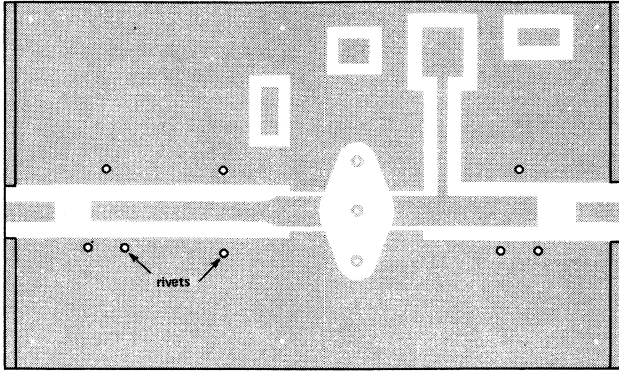
L2 = 100 nH; 5 turns closely wound enamelled Cu-wire (0,5 mm); int. diam. 4 mm; leads 2 x 5 mm

L3 = 37,6 Ω stripline (8,0 mm x 6,0 mm)L4 = 37,6 Ω stripline (9,0 mm x 6,0 mm)L5 = 74,4 Ω stripline (22,5 mm x 2,0 mm)L6 = 37,6 Ω stripline (18,0 mm x 6,0 mm)

L7 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat.no. 4312 020 36642)

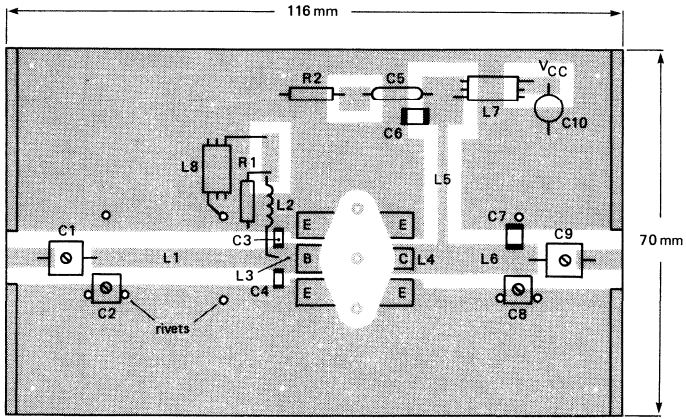
R1 = 1 $\Omega \pm 5\%$; 0,4 W metal film resistor (MR25 type)R2 = 10 $\Omega \pm 5\%$; 0,4 W metal film resistor (MR25 type)L1, L3, L4, L5 and L6 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16 inch.

* American Technical Ceramics capacitor or capacitor of same quality.



7293002

Fig. 7 P.C. board for 470 MHz, class-B test circuit.



7293001

Fig. 8 Component lay-out of 470 MHz, class-B test circuit.

Note:

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by copper straps under the emitters and around the board to provide a direct contact between the copper on the component side and the ground plane.

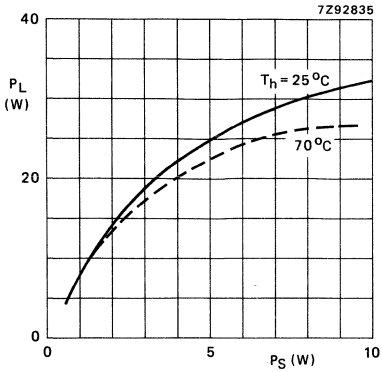


Fig. 9 Load power vs. source power.

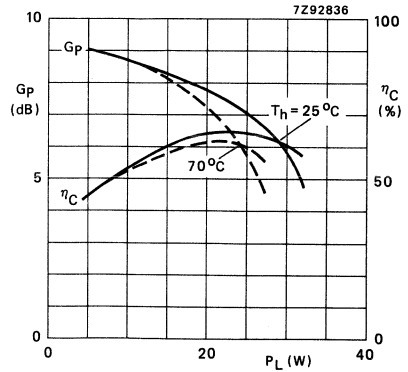


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs. 9 and 10:

$V_{CE} = 12,5 \text{ V}$; $f = 470 \text{ MHz}$; class-B operation; $T_h = 25 \text{ }^\circ\text{C}$ and $70 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch ($VSWR = 50$; all phases) up to 25 W under the following conditions:

$V_{CE} = 15,5 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$.

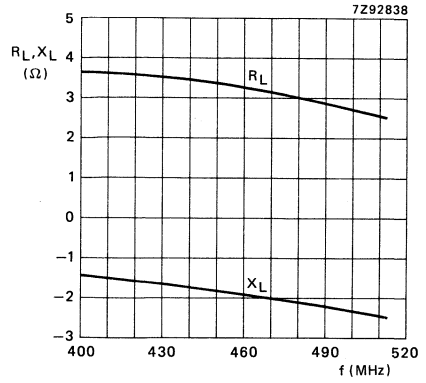
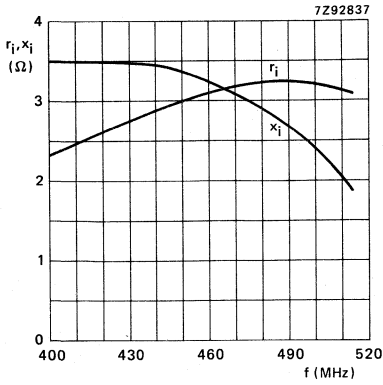


Fig. 11 Input impedance (series components).

Fig. 12 Load impedance (series components).

Conditions for Figs. 11, 12 and 13:

$V_{CE} = 12,5 \text{ V}$; $P_L = 20 \text{ W}$; $f = 400\text{--}512 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; class-B operation; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$; typical values.

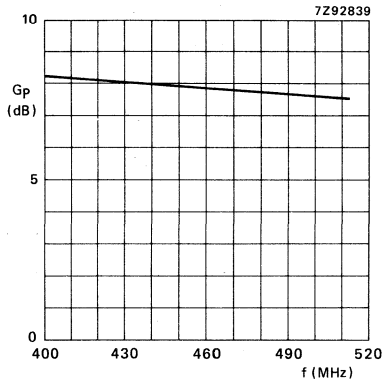


Fig. 13 Power gain versus frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability
- internal matching to achieve an optimum wideband capability and high power gain

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

QUICK REFERENCE DATA

Envelope	SOT-119
Mode of operation	class-B; c.w.
Collector-emitter voltage (d.c.)	V_{CE} 12,5 V
Frequency	f 470 MHz
Load power	P_L 30 W
Power gain	G_p > 6,0 dB
Collector efficiency	η_C > 55 %
Heatsink temperature	T_h 25 °C

MECHANICAL DATA

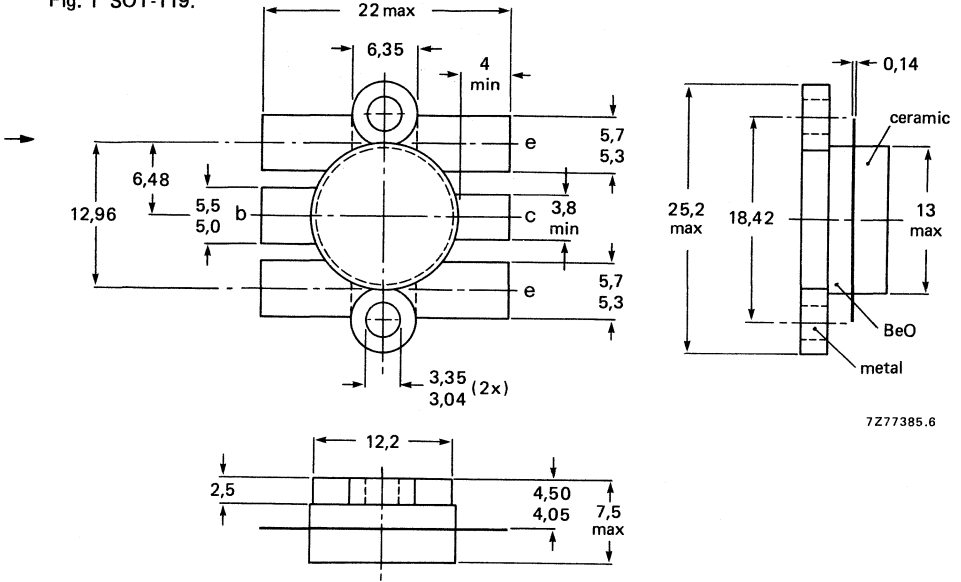
SOT-119 (see Fig. 1).

PRODUCT SAFETY 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



7277385.6

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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current d.c. or average (peak value); $f > 1$ MHz	I_C I_{CM}	max.	6 A 18 A
Total power dissipation $f > 1$ MHz; $T_{mb} = 25$ °C	P_{tot} (r.f.)	max.	65 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

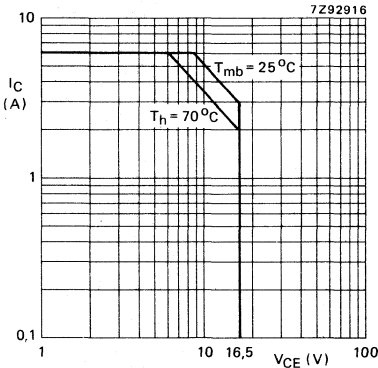


Fig. 2 D.C. SOAR.
 $R_{th\ mb-h} = 0,2$ K/W

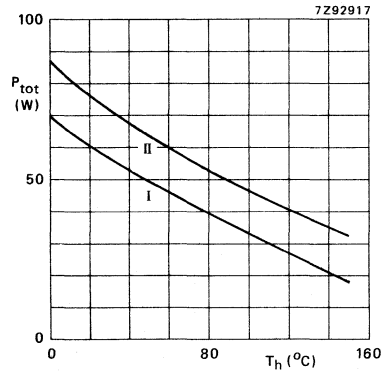


Fig. 3 Power/temperature derating curves
I Continuous operation ($f > 1$ MHz)
II Short-time operation during mismatch;
($f > 1$ MHz)

THERMAL RESISTANCE (dissipation = 45 W; $T_{mb} = 25$ °C).

From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(r.f.)}$	max.	2,45 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,2 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage

$I_C = 50\text{ mA}$; open emitter

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

Collector-emitter breakdown voltage

$I_C = 100\text{ mA}$; open base

$V_{(BR)CEO} > 16,5\text{ V}$

Emitter-base breakdown voltage

$I_E = 10\text{ mA}$; open collector

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

Collector cut-off current

$V_{BE} = 0$; $V_{CE} = 16\text{ V}$

$I_{CES} < 22\text{ mA}$

Second breakdown energy

$L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

$E_{SBR} > 8\text{ mJ}$

D.C. current gain

$I_C = 4\text{ A}$; $V_{CE} = 10\text{ V}$

$h_{FE} > 15$
typ. 60

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

$I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$

C_c typ. 85 pF

Feed-back capacitance at $f = 1\text{ MHz}$ *

$I_C = 0$; $V_{CE} = 12,5\text{ V}$

C_{re} typ. 52 pF

Collector-flange capacitance

C_{cf} typ. 3 pF

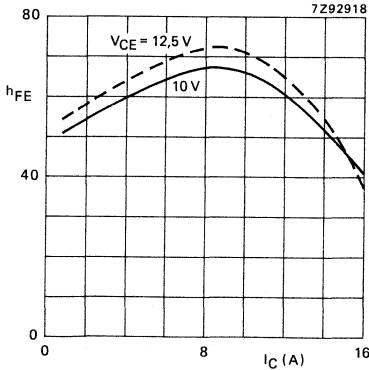


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; typ. values.

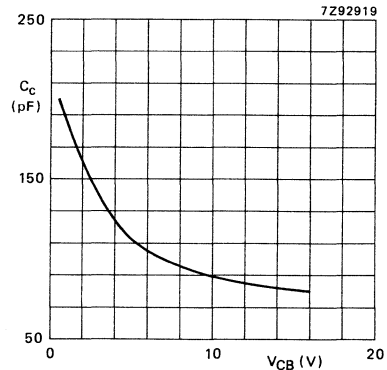
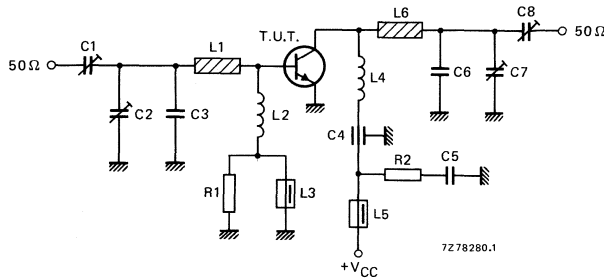


Fig. 5 $I_E = i_e = 0$; $f = 1\text{ MHz}$; typ. values.

* Device mounted in SOT-119 envelope without inputmatching.

APPLICATION INFORMATION

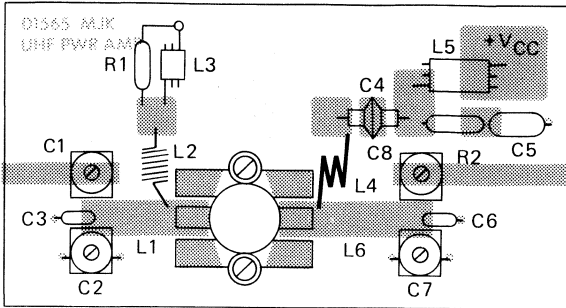
Mode of operation	In narrow-band test circuit; class-B; c.w.	
Collector-emitter voltage (d.c.)	V_{CE}	12,5 V
Frequency	f	470 MHz
Load power	P_L	30 W
Power gain	G_P	> 6,0 dB
		typ. 7,4 dB
Collector efficiency	η_C	> 55 %
		typ. 66 %
Heatsink temperature	T_h	25 °C

Fig. 6 Class-B test circuit at $f = 470$ MHz.

List of components:

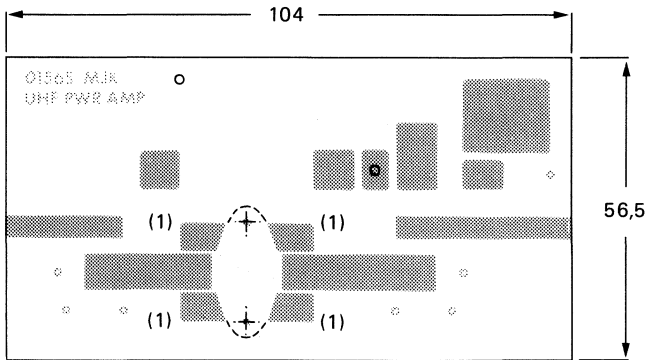
- C1 = C2 = C7 = C8 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
 C3 = C6 = 3,9 pF ceramic capacitor (500 V)
 C4 = 100 pF feed-through capacitor
 C5 = 100 nF polyester film capacitor
 L1 = stripline (24,0 mm x 6,7 mm)
 L2 = 10 turns closely wound enamelled Cu-wire (0,4 mm); int. diam. 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. diam. 4 mm; length 3 mm; leads 2 x 5 mm
 L5 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
 L6 = stripline (28,4 mm x 6,7 mm)
 R1 = R2 = 10 Ω carbon resistor
 L1 and L6 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16 inch.

Component lay-out and printed-circuit board for 470 MHz test circuit are shown in Figs 7 and 8.

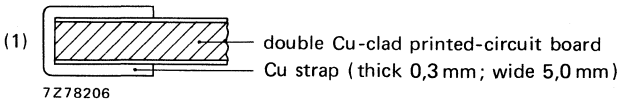


7Z78204.1

Fig. 7 Component lay-out of 470 MHz, class-B test circuit.



7Z78205.1



7Z78206

Fig. 8 P.c. board for 470 MHz, class-B test circuit.

Note:

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side fully metallized serving as groundplane. Earth connections are made by hollow rivets and also by copper straps under the emitter to provide a direct contact between the copper on the component side and the ground plane.

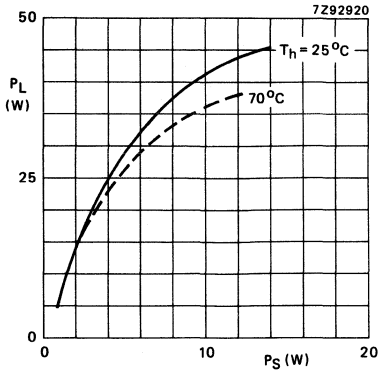


Fig. 9 Load power vs. source power.

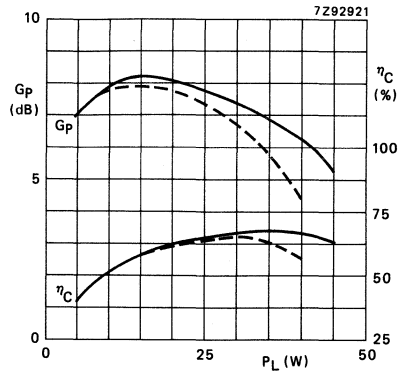


Fig. 10 Power gain and efficiency vs. load power.

— $T_h = 25^\circ\text{C}$;
 - - - $T_h = 70^\circ\text{C}$.

Conditions for Figs 9 and 10:

$V_{CE} = 12,5 \text{ V}$; $f = 470 \text{ MHz}$; class-B operation; $T_h = 25^\circ\text{C}$ and 70°C ; $R_{th\ mb-h} = 0,2 \text{ K/W}$; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch ($VSWR = 50$; all phases) up to 38 W under the following conditions:

$V_{CE} = 15,5 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 25^\circ\text{C}$; $R_{th\ mb-h} = 0,2 \text{ K/W}$.

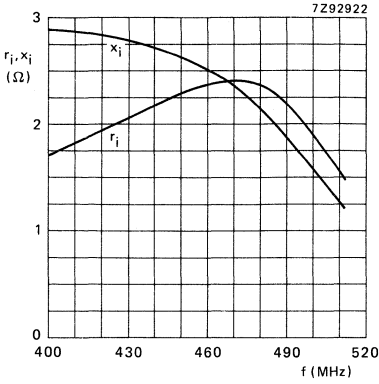


Fig. 11 Input impedance (series components).

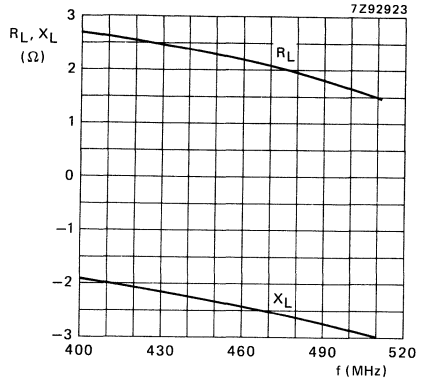


Fig. 12 Load impedance (series components).

Conditions for Figs 11, 12 and 13:

$V_{CE} = 12,5 \text{ V}$; $P_L = 30 \text{ W}$; $f = 400\text{--}512 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; class-B operation; $R_{th\text{ mb-h}} = 0,2 \text{ K/W}$; typical values.

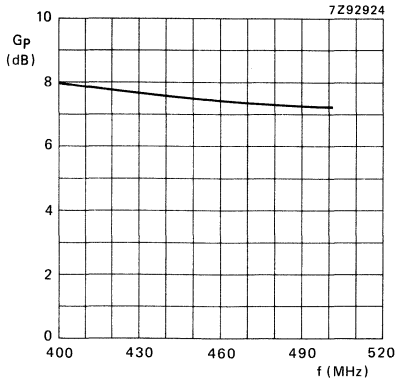


Fig. 13 Power gain versus frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-119 envelope primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

Features

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile.
- internal matching to achieve an optimum wideband capability and high power gain.
- gold metallization ensures excellent reliability.

The transistor has a 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 a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	45	> 4,8	> 55

MECHANICAL DATA

Dimensions in mm

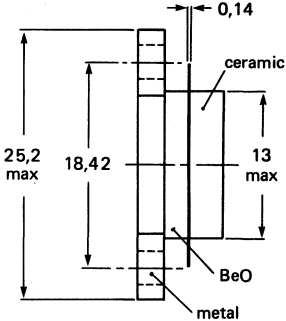
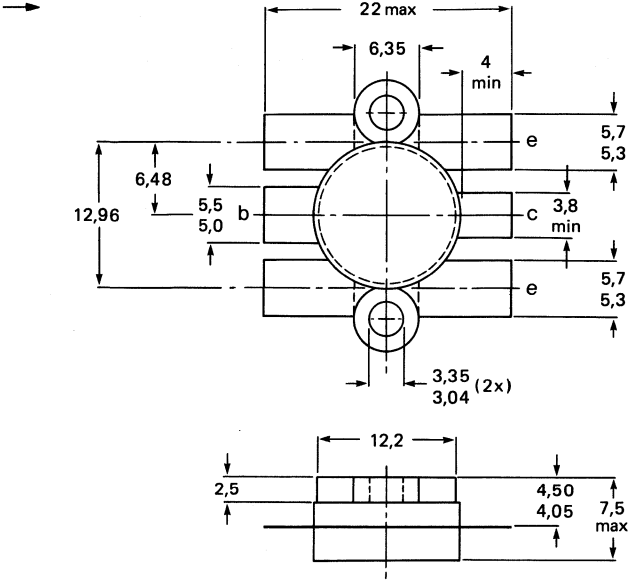
SOT-119 (see Fig. 1).

PRODUCT SAFETY 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



7277385.6

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

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

Heatsink compound must be applied and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current d.c. or average	I_C	max.	9 A
(peak value); $f > 1$ MHz	I_{CM}	max.	27 A
Total power dissipation at $T_{mb} = 25\text{ }^\circ\text{C}$; $f > 1$ MHz	P_{tot}	max.	87 W
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

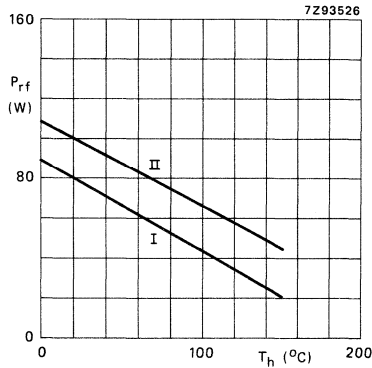


Fig. 2 Power/temperature derating curves.

- I Continuous operation ($f > 1$ MHz).
- II Short-time operation during mismatch ($f > 1$ MHz).

MAXIMUM THERMAL RESISTANCE

Dissipation = 54 W; $T_{amb} = 25\text{ }^\circ\text{C}$

From junction to mounting base (r.f. operation)	R_{thj-mb}	max.	1,7 K/W
From mounting base to heatsink	R_{thmb-h}	max.	0,2 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 100\text{ mA}$

$V_{(BR)CBO}$ min. 36 V

Collector-emitter breakdown voltage
open base; $I_C = 200\text{ mA}$

$V_{(BR)CEO}$ min. 16,5 V

Emitter-base breakdown voltage
open collector; $I_E = 20\text{ mA}$

$V_{(BR)EBO}$ min. 4 V

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 16\text{ V}$

I_{CES} max. 44 mA

Second breakdown energy
 $L = 25\text{ mH}; f = 50\text{ Hz}; R_{BE} = 10\text{ }\Omega$

E_{SBR} min. 15 mJ

D.C. current gain
 $V_{CE} = 10\text{ V}; I_C = 8\text{ A}$

h_{FE} min. 15
typ. 60

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = i_e = 0; V_{CB} = 12,5\text{ V}$

C_C typ. 170 pF

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 0; V_{CE} = 12,5$

C_{re} typ. 100 pF

Collector-flange capacitance

C_{cf} typ. 3 pF

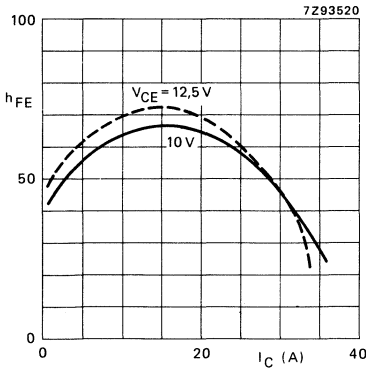


Fig. 3 D.C. current gain versus collector current; $T_j = 25\text{ }^\circ\text{C}$.

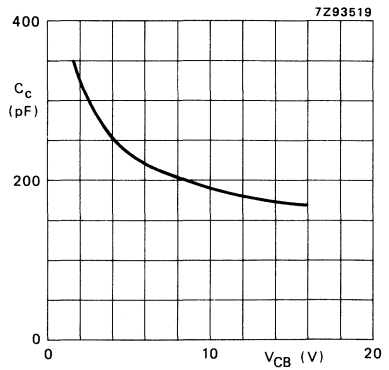
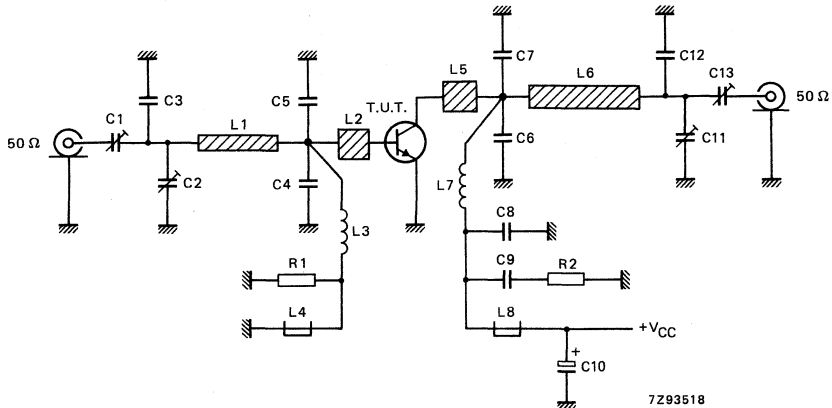


Fig. 4 Output capacitance versus $V_{CB}; I_E = i_e = 0; f = 1\text{ MHz}$.

APPLICATION INFORMATION

R.F. performance at $T_h = 25^\circ\text{C}$ in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	45	> 4,8 typ. 5,8	> 55 typ. 61

Fig. 5 Class-B test circuit at $f = 470$ MHz.

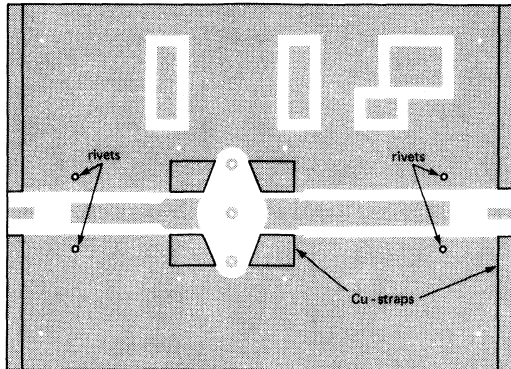
List of components:

- C1 = C13 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
 C2 = C11 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
 C3 = 12 pF multilayer ceramic chip capacitor*
 C4 = C5 = 8,2 pF multilayer ceramic chip capacitor**
 C6 = C7 = 15 pF multilayer ceramic chip capacitor*
 C8 = 110 pF multilayer ceramic chip capacitor*
 C9 = 3 x 100 nF multilayer ceramic chip capacitor in parallel
 C10 = 2,2 μ F (35 V) electrolytic capacitor
 C12 = 5,6 pF multilayer ceramic chip capacitor*
 L1 = 34,6 Ω stripline (17 mm x 4 mm)
 L2 = L5 = 25,3 Ω stripline (6 mm x 6 mm)
 L3 = 45 nH; 4 turns, closely wound enamelled Cu-wire (0,5 mm); int. dia. 2,5 mm;
 leads 2 x 5 mm
 L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
 L6 = 29,2 Ω stripline (25,5 mm x 5 mm)
 L7 = 10 nH; 1 turn Cu-wire (1,0 mm); int. dia. 5 mm; leads 2 x 5 mm
 R1 = 1 $\Omega \pm 5\%$ (0,4 W) metal film resistor
 R2 = 10 $\Omega \pm 5\%$ (1,0 W) metal film resistor

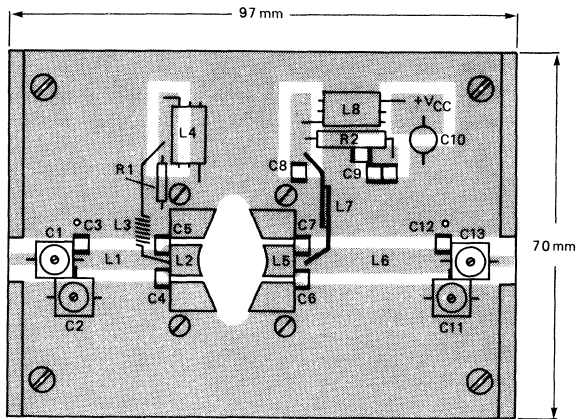
* American Technical Ceramics capacitor type B or capacitor of the same quality.

** Idem type A.

Striplines are on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($E_r = 2,2$); thickness 1/32 inch.



7Z93516



7Z93517

Fig. 6 Printed circuit board and component layout for 470 MHz class-B test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

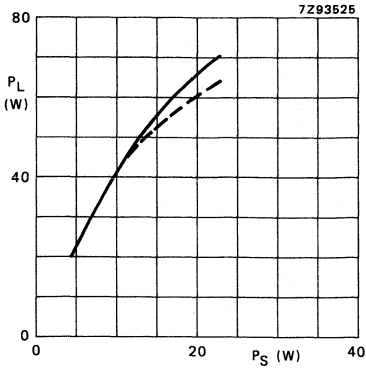


Fig. 7 Load power versus source power.

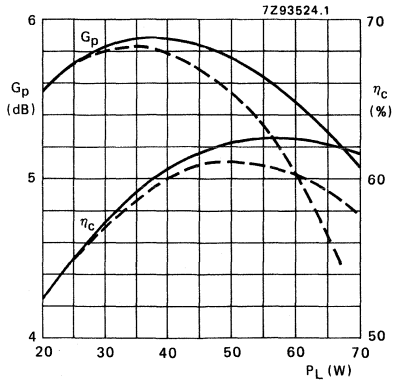


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

Typical values; $V_{CE} = 12,5 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$ (—) and $70 \text{ }^\circ\text{C}$ (- - -);
 $R_{th\ mb-h} = 0,2 \text{ K/W}$; class-B operation.

RUGGEDNESS

The BLU45/12 is capable of withstanding a full load mismatch (VSWR = 50 through all phases) up to 55 W under the following conditions: $V_{CE} = 15,5 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th\ mb-h} = 0,2 \text{ K/W}$.

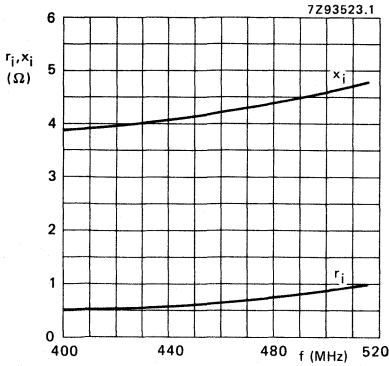


Fig. 9 Input impedance (series components).

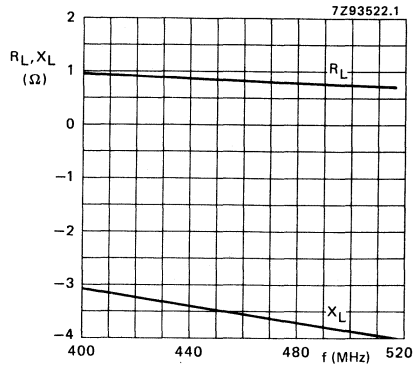


Fig. 10 Load impedance (series components).

Conditions for Figs 9, 10 and 11 (class-B operation):

Typical values; $V_{CE} = 12,5$ V; $P_L = 45$ W; $f = 400$ to 512 MHz; $T_h = 25$ °C;
 $R_{th\ mb-h} = 0,2$ K/W.

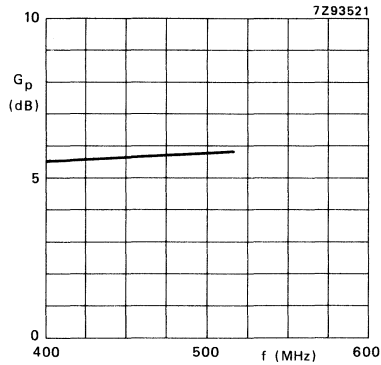


Fig. 11 Power gain versus frequency.

V.H.F./U.H.F. PUSH-PULL POWER TRANSISTOR

N-P-N silicon planar epitaxial push-pull transistor designed for use in military and professional wideband applications in the 30 to 400 MHz range.

Features:

- Diffused emitter ballasting resistors providing excellent current sharing and ruggedness;
- Gold metallization ensures excellent reliability;
- Multicell geometry giving good balance of dissipated power and low thermal resistance;
- Internal input matching to achieve an optimum wideband capability and high power gain.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

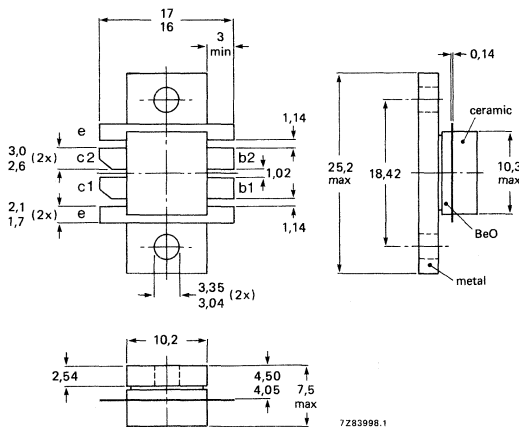
R.F. performance in a common-emitter class-B wideband (100–400 MHz) circuit at $T_h = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w.	28	400	30	> 10	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,60 Nm (6,0 kg.cm)
 max. 0,75 Nm (7,5 kg.cm)

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

Heatsink compound must be sparingly applied and evenly distributed.

PRODUCT SAFETY 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)	V_{CB0}	max.	60 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$)	V_{CER}	max.	45 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current d.c.	I_C	max.	$2 \times 1,8$ A
Total power dissipation * at $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	45 W*
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE (total device)

From junction to mounting base	R_{thj-mb}	max.	2,7 K/W
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CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 10 \text{ mA}$	$V_{(BR)CES}$	>	60 V
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Emitter-base breakdown voltage
open collector; $I_E = 10 \text{ mA}$

$V_{(BR)EBO}$	>	3,5 V
---------------	---	-------

Collector-base capacitance

$I_E = i_e = 0; V_{CB} = 28 \text{ V}$	C_{cb}	typ.	$2 \times 10 \text{ pF}$
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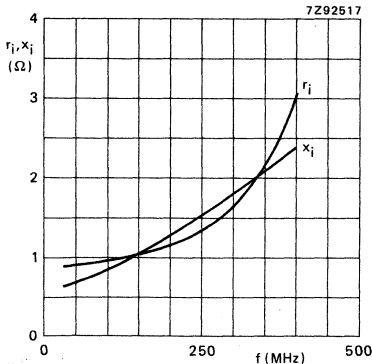


Fig. 2 Input impedance
(series components; either section).

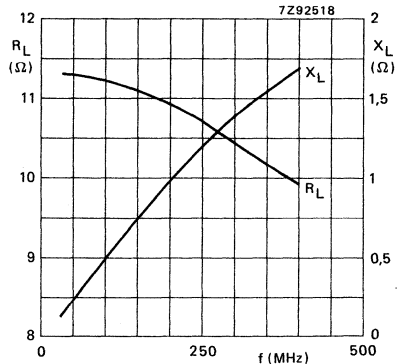


Fig. 3 Load impedance
(series components; either section).

Conditions for Figs 2 and 3:

Typical values; $V_{CE} = 28 \text{ V}; P_L = 30 \text{ W}; T_h = 25 \text{ }^\circ\text{C};$ class-B operation.

* Dissipation of either transistor section should not exceed half rated dissipation.

V.H.F./U.H.F. PUSH-PULL POWER TRANSISTOR

N-P-N silicon planar epitaxial push-pull transistor designed for use in military and professional wideband applications in the 30 to 400 MHz range.

Features:

- Diffused emitter ballasting resistors providing excellent current sharing and ruggedness;
- Gold metallization ensures excellent reliability;
- Multicell geometry giving good balance of dissipated power and low thermal resistance;
- Internal input matching to achieve an optimum wideband capability and high power gain.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

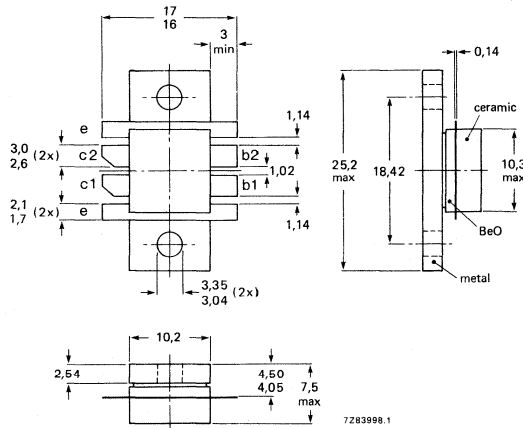
R.F. performance in a common-emitter class-B wideband (100–400 MHz) circuit at $T_h = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w.	28	400	45	> 9	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,60 Nm (6,0 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

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

Heatsink compound must be sparingly applied and evenly distributed

PRODUCT SAFETY 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)	V_{CBO}	max.	60 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$)	V_{CER}	max.	45 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current d.c.	I_C	max.	$2 \times 2,5$ A
Total power dissipation* at $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	65 W*
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE (total device)

From junction to mounting base	R_{thj-mb}	max.	2 K/W
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CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 20$ mA	$V_{(BR)CES}$	>	60 V
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Emitter-base breakdown voltage

open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	3,5 V
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Collector-base capacitance

$I_E = i_e = 0; V_{CB} = 28$ V	C_{cb}	typ.	2×15 pF
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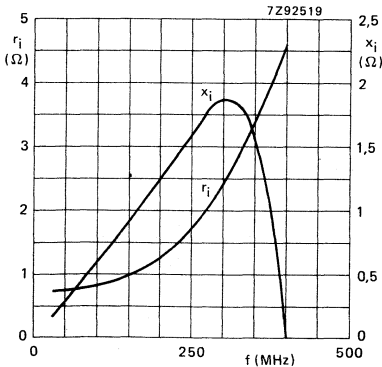


Fig. 2 Input impedance (series components; either section).

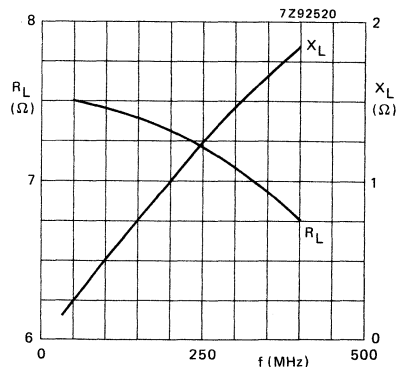


Fig. 3 Load impedance (series components; either section).

Conditions for Figs 2 and 3:

Typical values; $V_{CE} = 28$ V; $P_L = 45$ W; $T_h = 25 \text{ }^\circ\text{C}$; class-B operation.

* Dissipation of either transistor section should not exceed half rated dissipation.

V.H.F./U.H.F. PUSH-PULL POWER TRANSISTOR

N-P-N silicon planar epitaxial push-pull transistor designed for use in military and professional wideband applications in the 30 to 400 MHz range.

Features:

- Diffused emitter ballasting resistors providing excellent current sharing and ruggedness;
- Gold metallization ensures excellent reliability;
- Multicell geometry giving good balance of dissipated power and low thermal resistance;
- Internal input matching to achieve an optimum wideband capability and high power gain.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

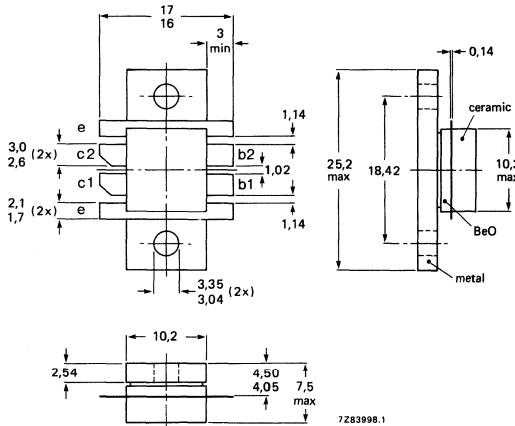
R.F. performance in a common-emitter class-B wideband (100–400 MHz) circuit at $T_h = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w.	28	400	60	> 8	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,60 Nm (6,0 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

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

Heatsink compound must be sparingly applied and evenly distributed

PRODUCT SAFETY 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)	V_{CBO}	max.	60 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$)	V_{CER}	max.	45 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current d.c.	I_C	max.	2×4 A
Total power dissipation* at $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	95 W*
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE (total device)

From junction to mounting base	R_{thj-mb}	max.	1,3 K/W
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CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 20 \text{ mA}$

$V_{(BR)CES}$	>	60 V
---------------	---	------

Emitter-base breakdown voltage

open collector; $I_E = 10 \text{ mA}$

$V_{(BR)EBO}$	>	3,5 V
---------------	---	-------

Collector-base capacitance

$I_E = i_e = 0; V_{CB} = 28 \text{ V}$

C_{cb}	typ.	2×22 pF
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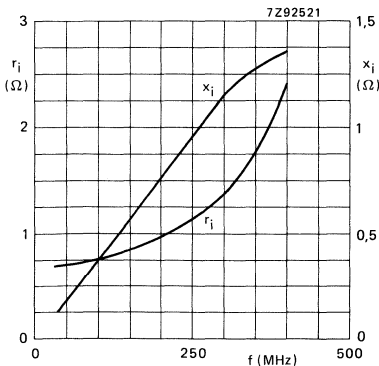


Fig. 2 Input impedance (series components; either section).

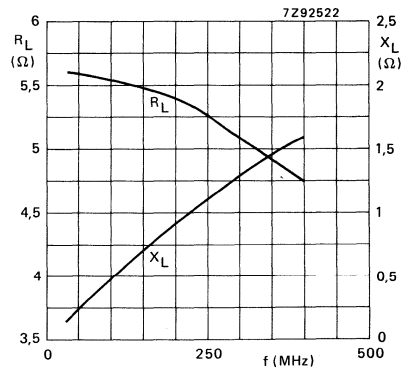


Fig. 3 Load impedance (series components; either section).

Conditions for Figs 2 and 3:

Typical values; $V_{CE} = 28 \text{ V}; P_L = 60 \text{ W}; T_h = 25 \text{ }^\circ\text{C}$; class-B operation.

* Dissipation of either transistor section should not exceed half rated dissipation.

V.H.F./U.H.F. PUSH-PULL POWER TRANSISTOR

N-P-N silicon planar epitaxial push-pull transistor designed for use in military and professional wideband applications in the 30 to 400 MHz range.

Features:

- Diffused emitter ballasting resistors providing excellent current sharing and ruggedness;
- Gold metallization ensures excellent reliability;
- Multicell geometry giving good balance of dissipated power and low thermal resistance;
- Internal input matching to achieve an optimum wideband capability and high power gain.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

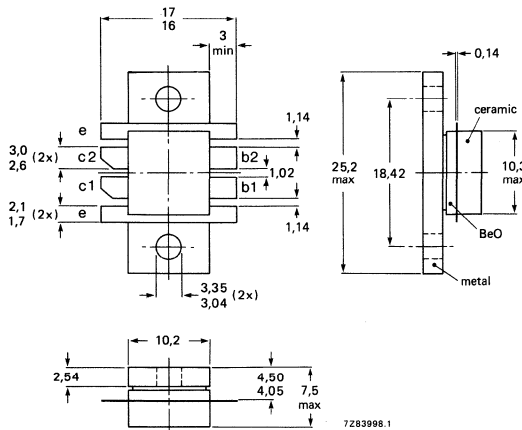
R.F. performance in a common-emitter class-C wideband circuit at $T_h = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w.	28	225–400	100	> 7	> 55
c.w.	28	100–400	100	> 6	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,60 Nm (6,0 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

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

Heatsink compound must be sparingly applied and evenly distributed

PRODUCT SAFETY 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)	V_{CBO}	max.	60 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$)	V_{CER}	max.	45 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current d.c.	I_C	max.	2 x 5 A
Total power dissipation* at $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	125 W*
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE (total device)

From junction to mounting base	R_{thj-mb}	max.	1,0 K/W
--------------------------------	--------------	------	---------

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 100 \text{ mA}$

$V_{(BR)CES}$	>	60 V
---------------	---	------

Emitter-base breakdown voltage

open collector; $I_E = 10 \text{ mA}$

$V_{(BR)EBO}$	>	3,5 V
---------------	---	-------

Collector-base capacitance

$I_E = i_e = 0; V_{CB} = 28 \text{ V}$

C_{cb}	typ.	2 x 30 pF
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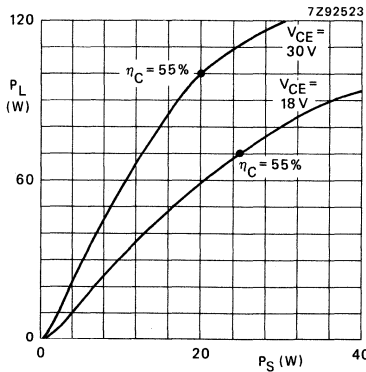


Fig. 2 Load power vs. source power.

* Dissipation of either transistor section should not exceed half rated dissipation.

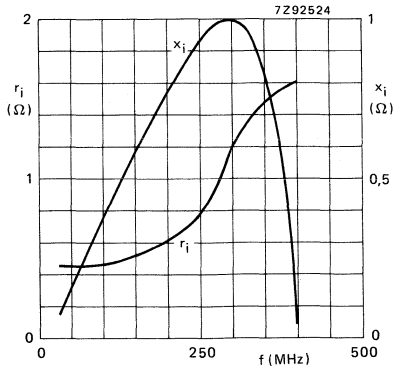


Fig. 3 Input impedance (series components; either section).

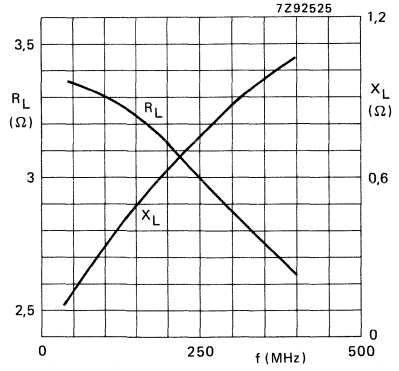


Fig. 4 Load impedance (series components; either section).

Conditions for Figs 3 and 4:

Typical values: $V_{CE} = 28$ V; $P_L = 100$ W; $T_h = 25$ °C; class-C operation.

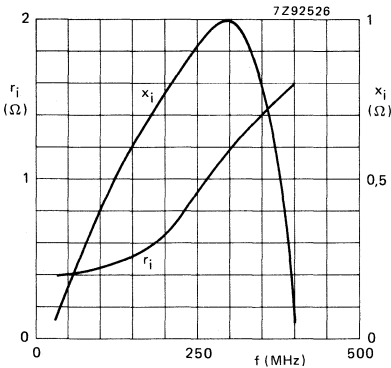


Fig. 5 Input impedance (series components; either section).

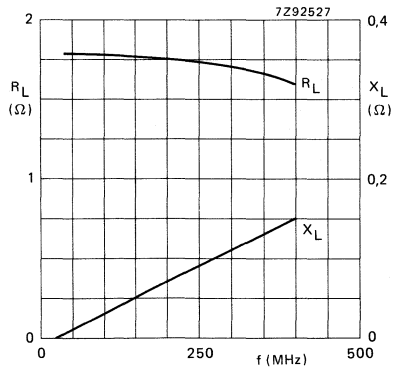


Fig. 6 Load impedance (series components; either section).

Conditions for Figs 5 and 6:

Typical values: $V_{CE} = 18$ V; $P_L = 70$ W; $T_h = 25$ °C; class-C operation.

APPLICATION INFORMATION

R.F. performance in a common-emitter class-C wideband circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w.	28	100–400	100	> 6	> 50
c.w.	28	225–400	100	> 7	> 55

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-119 envelope primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

Features

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile.
- internal matching to achieve an optimum wideband capability and high power gain.
- gold metallization ensures excellent reliability.

The transistor has a 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 a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	60	> 4,4	> 55

MECHANICAL DATA

SOT-119 (see Fig. 1).

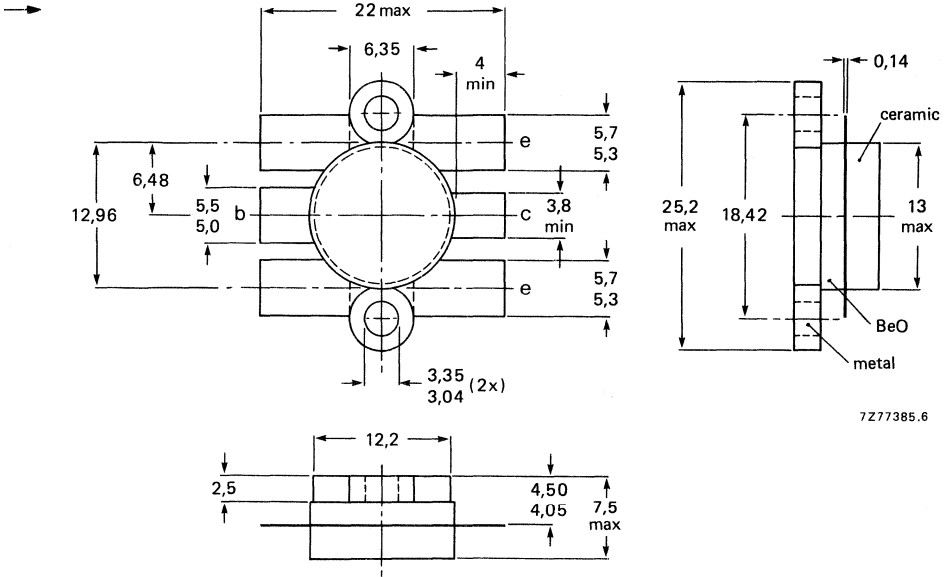
Dimensions in mm

PRODUCT SAFETY 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



7Z77385.6

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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current d.c. or average	I_C	max.	12 A
(peak value); $f > 1$ MHz	I_{CM}	max.	36 A
Total power dissipation at $T_{mb} = 25\text{ }^\circ\text{C}$; $f > 1$ MHz	P_{tot}	max.	110 W
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

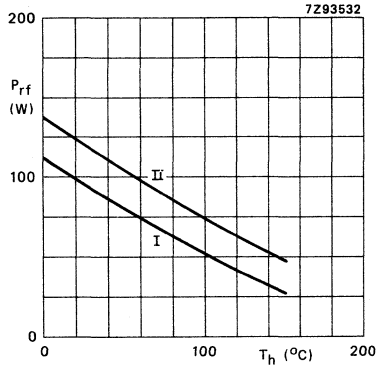


Fig. 2 Power/temperature derating curves.

- I Continuous operation ($f > 1$ MHz).
- II Short-time operation during mismatch ($f > 1$ MHz).

MAXIMUM THERMAL RESISTANCE

Dissipation = 72 W; $T_{amb} = 25\text{ }^\circ\text{C}$

From junction to mounting base (r.f. operation)	$R_{th\ j-mb}$	max.	1,4 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,2 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 100\text{ mA}$

Collector-emitter breakdown voltage
open base; $I_C = 200\text{ mA}$

Emitter-base breakdown voltage
open collector; $I_E = 20\text{ mA}$

Collector cut-off current
 $V_{BE} = 0$; $V_{CE} = 16\text{ V}$

Second breakdown energy
 $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

D.C. current gain
 $V_{CE} = 10\text{ V}$; $I_C = 8\text{ A}$

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 0$; $V_{CE} = 12,5$

Collector-flange capacitance

$V_{(BR)CBO}$ min. 36 V

$V_{(BR)CEO}$ min. 16,5 V

$V_{(BR)EBO}$ min. 4 V

I_{CES} max. 44 mA

E_{SBR} min. 15 mJ

h_{FE} min. 15
typ. 60

C_c typ. 170 pF

C_{re} typ. 100 pF

C_{cf} typ. 3 pF

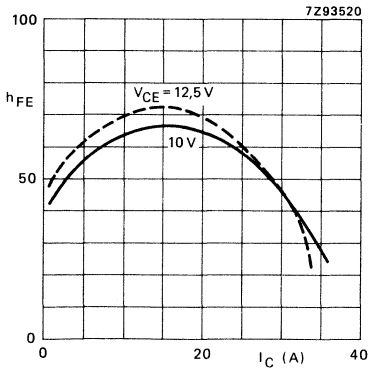


Fig. 3 D.C. current gain versus collector current; $T_j = 25\text{ }^\circ\text{C}$.

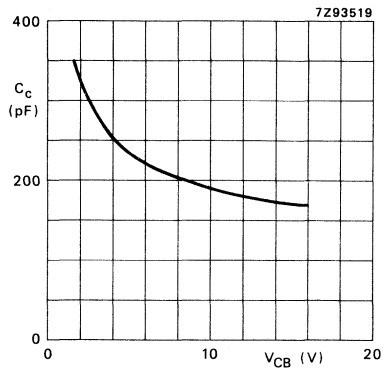
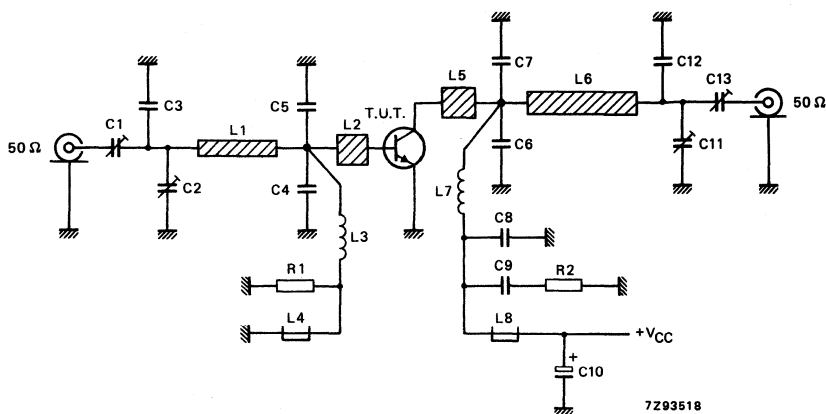


Fig. 4 Output capacitance versus V_{CB} ; $I_E = i_e = 0$; $f = 1\text{ MHz}$.

APPLICATION INFORMATION

R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	60	> 4,4 typ. 5,5	> 55 typ. 62

Fig. 5 Class-B test circuit at $f = 470\text{ MHz}$.

List of components:

C1 = C13 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)

C2 = C11 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C3 = 12 pF multilayer ceramic chip capacitor*

C4 = C5 = 8,2 pF multilayer ceramic chip capacitor**

C6 = C7 = 15 pF multilayer ceramic chip capacitor*

C8 = 110 pF multilayer ceramic chip capacitor*

C9 = 3 x 100 nF multilayer ceramic chip capacitor in parallel

C10 = 2,2 μF (35 V) electrolytic capacitor

C12 = 5,6 pF multilayer ceramic chip capacitor*

L1 = 34,6 Ω stripline (17 mm x 4 mm)L2 = L5 = 25,3 Ω stripline (6 mm x 6 mm)

L3 = 45 nH; 4 turns, closely wound enamelled Cu-wire (0,5 mm); int. dia. 2,5 mm; leads 2 x 5 mm

L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)

L6 = 29,2 Ω stripline (25,5 mm x 5 mm)

L7 = 10 nH; 1 turn Cu-wire (1,0 mm); int. dia. 5 mm; leads 2 x 5 mm

R1 = 1 $\Omega \pm 5\%$ (0,4 W) metal film resistorR2 = 10 $\Omega \pm 5\%$ (1,0 W) metal film resistor

* American Technical Ceramics capacitor type B or capacitor of the same quality.

** Idem type A.

Striplines are on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($E_r = 2,2$); thickness 1/32 inch.

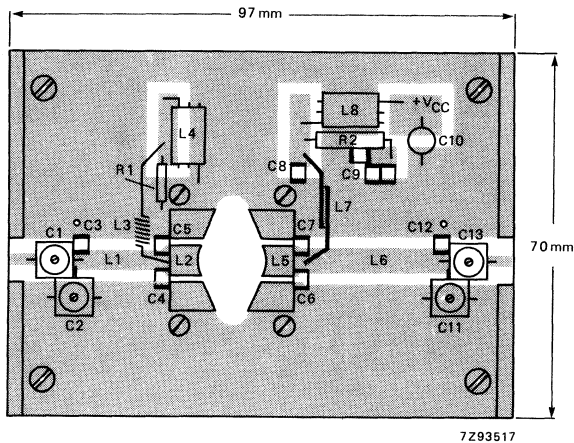
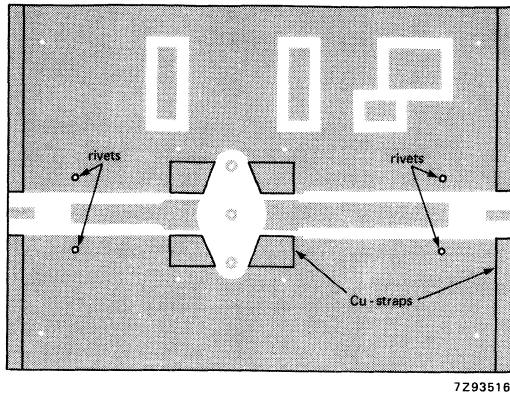


Fig. 6 Printed circuit board and component layout for 470 MHz class-B test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

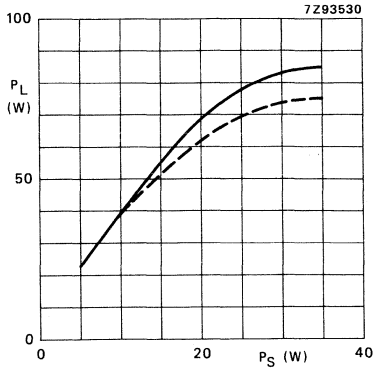


Fig. 7 Load power versus source power.

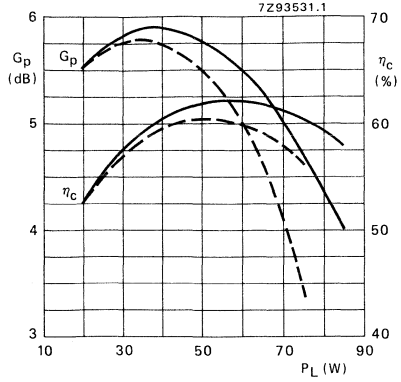


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

Typical values; $V_{CE} = 12,5 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$ (—) and $70 \text{ }^\circ\text{C}$ (---);
 $R_{th\text{ mb-h}} = 0,2 \text{ K/W}$; class-B operation.

RUGGEDNESS

The BLU60/12 is capable of withstanding a full load mismatch ($VSWR = 50$ through all phases) up to 70 W under the following conditions; $V_{CE} = 15,5 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0,2 \text{ K/W}$.

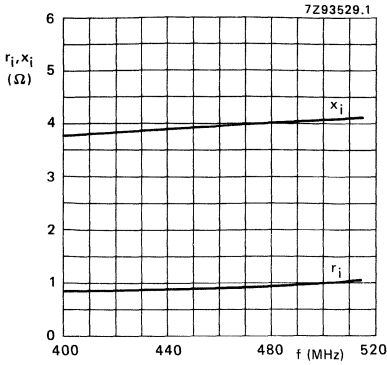


Fig. 9 Input impedance (series components).

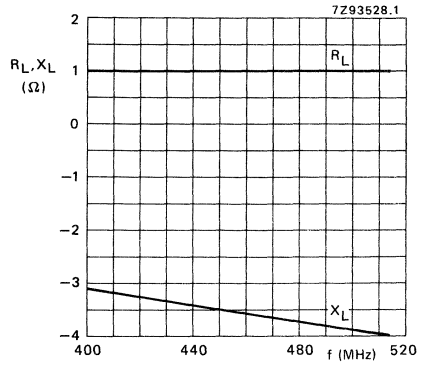


Fig. 10 Load impedance (series components).

Conditions for Figs 9, 10 and 11 (class-B operation):

Typical values; $V_{CE} = 12,5$ V; $P_L = 60$ W; $f = 400$ to 512 MHz; $T_h = 25$ °C; $R_{th\ mb-h} = 0,2$ K/W.

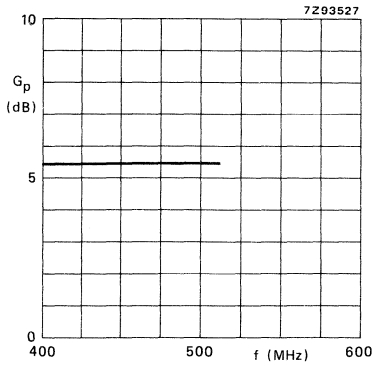


Fig. 11 Power gain versus frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 470 MHz band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-122). All leads are isolated from the stud.

QUICK REFERENCE DATA

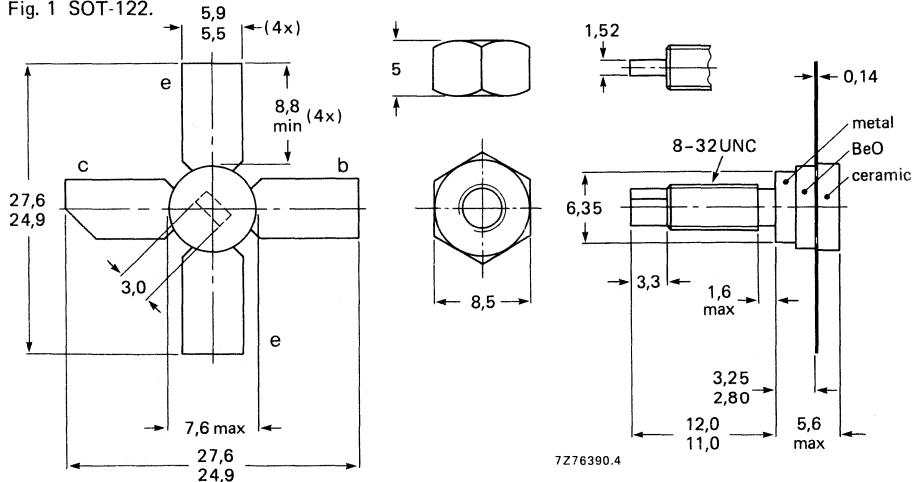
R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	7	> 8,5	> 55

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



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

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

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

PRODUCT SAFETY 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)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current d.c. or average	I_C	max.	1,2 A
(peak value); $f > 1$ MHz	I_{CM}	max.	3,6 A
Total power dissipation at $T_{mb} = 52^\circ\text{C}$	$P_{tot(d.c.)}$	max.	17 W
$f > 1$ MHz; $T_{mb} = 52^\circ\text{C}$	$P_{tot(r.f.)}$	max.	22,5 W
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

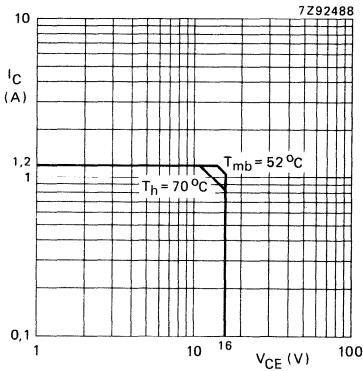


Fig. 2 D.C. SOAR.
 $R_{th\ mb-h} = 0,6\ \text{K/W}$.

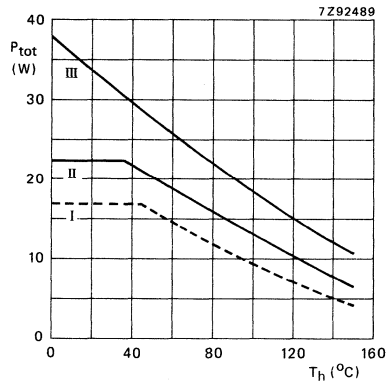


Fig. 3 Power/temperature derating curves.
I Continuous operation
II Continuous operation ($f > 1$ MHz)
III Short-time operation during mismatch; ($f > 1$ MHz).

THERMAL RESISTANCE

Dissipation = 15 W; $T_{mb} = 25^\circ\text{C}$

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

From mounting base to heatsink

$R_{th\ j-mb(dc)}$	=	7,5 K/W
$R_{th\ j-mb(rf)}$	=	5,6 K/W
$R_{th\ mb-h}$	=	0,6 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage, open emitter; $I_C = 15\text{ mA}$

Collector-emitter breakdown voltage, open base; $I_C = 30\text{ mA}$

Emitter-base breakdown voltage, open collector; $I_E = 1,5\text{ mA}$

Collector cut-off current, $V_{BE} = 0$; $V_{CE} = 16\text{ V}$

Second breakdown energy, $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

D.C. current gain, $I_C = 0,9\text{ A}$; $V_{CE} = 10\text{ V}$

Transition frequency at $f = 500\text{ MHz}^*$, $-I_E = 0,9\text{ A}$; $V_{CB} = 12,5\text{ V}$

Collector capacitance at $f = 1\text{ MHz}$, $I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$

Feed-back capacitance at $f = 1\text{ MHz}$, $I_C = 0$; $V_{CE} = 12,5\text{ V}$

Collector-stud capacitance

$V_{(BR)CBO}$	$>$	36 V
$V_{(BR)CEO}$	$>$	16 V
$V_{(BR)EBO}$	$>$	3 V
I_{CES}	$<$	7,5 mA
ESBR	$>$	2,3 mJ
h_{FE}	$>$	25
		typ. 100
f_T		typ. 4,0 GHz
C_c		typ. 10 pF
C_{re}		typ. 7 pF
C_{cs}		typ. 1,2 pF

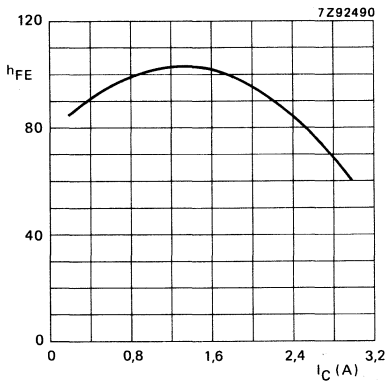


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; $V_{CE} = 10\text{ V}$; typical values.

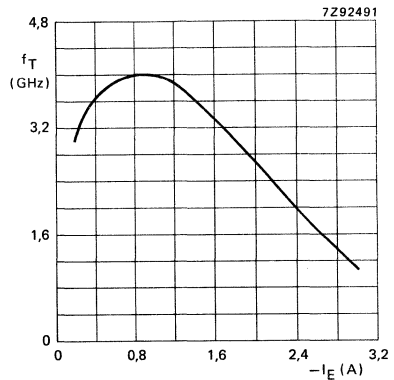


Fig. 5 $V_{CB} = 12,5\text{ V}$; $f = 500\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

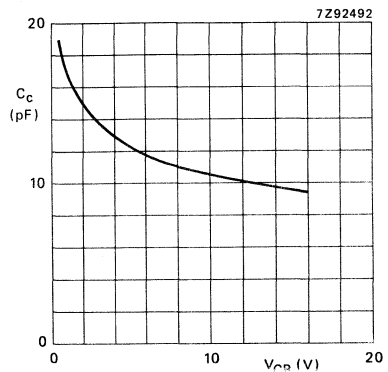


Fig. 6 $I_E = i_e = 0$; $f = 1\text{ MHz}$; typical values.

* Measured under pulse conditions: $t_p = 50\text{ }\mu\text{s}$; $\delta < 1\%$.

APPLICATION INFORMATION

R.F. performance in common-emitter circuit; class-B: $f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$

mode of operation	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η_C %
narrow band; c.w.	12,5	7	< 0,99 typ. 0,55	> 8,5 typ. 11,0	< 1,0 typ. 0,8	> 55 typ. 70

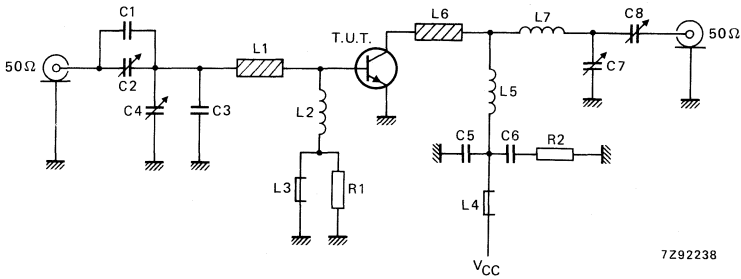
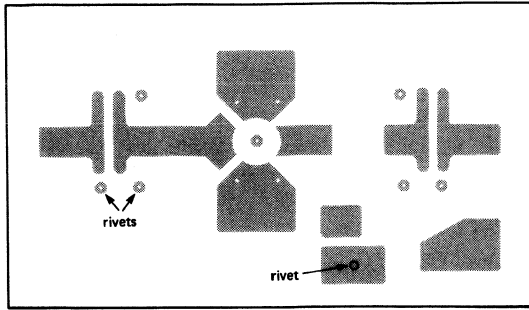


Fig. 7 Class-B test circuit at $f = 470 \text{ MHz}$.

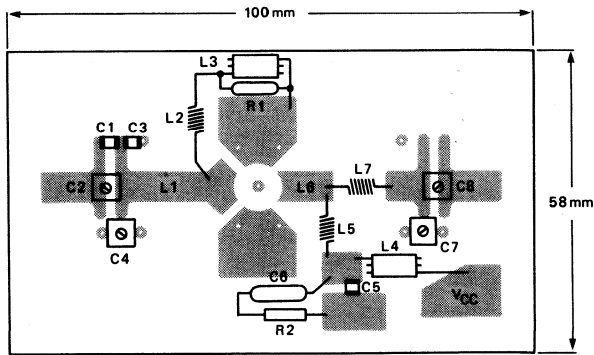
List of components:

- C1 = 2,7 pF multilayer ceramic chip capacitor*
 - C2 = C7 = C8 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
 - C3 = 7,5 pF multilayer ceramic chip capacitor*
 - C4 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
 - C5 = 100 pF multilayer ceramic chip capacitor
 - C6 = 100 nF metallized film capacitor
 - L1 = 38 Ω stripline (22,5 mm x 6,0 mm)
 - L2 = 15 nH; 1 turn Cu wire (1,0 mm); int. dia. 5 mm; leads 2 x 5 mm
 - L3 = L4 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
 - L5 = 29 nH; 2 turns enamelled Cu wire (1,0 mm); int. dia. 6 mm; length 3,5 mm; leads 2 x 5 mm
 - L6 = 38 Ω stripline (10,0 mm x 6,0 mm)
 - L7 = 7 nH; 1/2 turn Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 5 mm
 - R1 = R2 = 10 $\Omega \pm 10\%$; 0,25 W metal film resistor
- L1 and L6 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.



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Fig. 8 Printed circuit board and component lay-out for 470 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by hollow rivets and also by copper straps under the emitters.

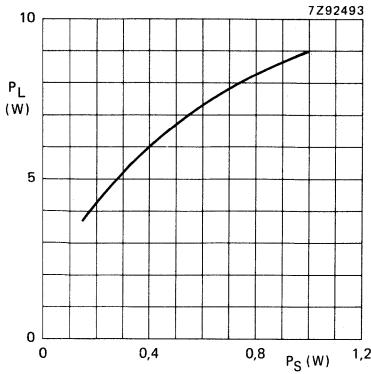


Fig. 9 Load power vs. source power.

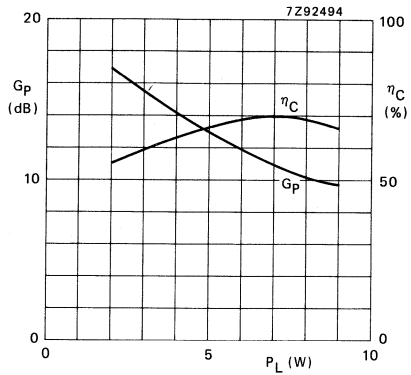


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:

$V_{CE} = 12,5$ V; $f = 470$ MHz; $T_h = 25$ °C; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V and $T_h = 25$ °C.

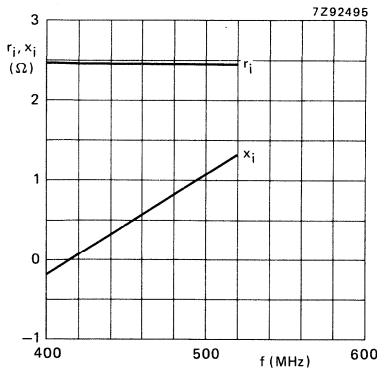


Fig. 11 Input impedance (series components).

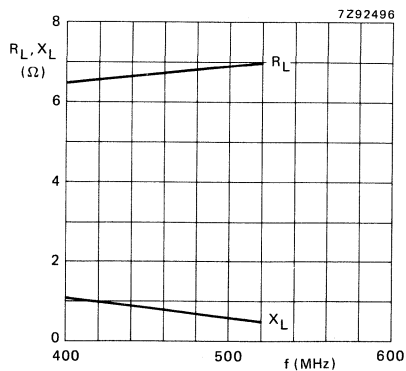


Fig. 12 Load impedance (series components).

Conditions for Figs 11 and 12:

$V_{CE} = 12,5$ V; $P_L = 7$ W; $f = 400-520$ MHz; $T_h = 25$ °C; class-B operation; typical values.

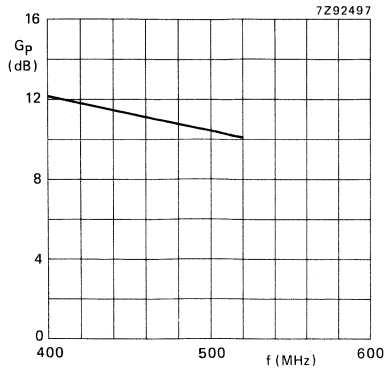


Fig. 13 Power gain vs. frequency.

$V_{CE} = 12,5 \text{ V}$; $P_L = 7 \text{ W}$; $f = 400\text{-}520 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$;
class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability.

The transistor is encapsulated in a subminiature plastic transfer-moulded cross package (SOT-103).

QUICK REFERENCE DATA

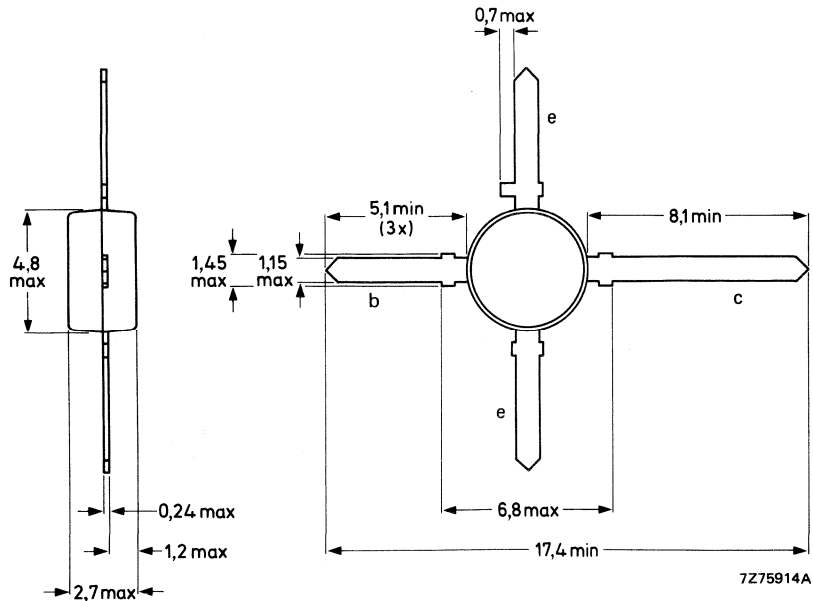
R.F. performance at $T_{amb} = 25\text{ }^{\circ}\text{C}$ in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	900	0,5	> 8,0	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	I_C	max.	150 mA
(peak value); $f > 1$ MHz	I_{CM}	max.	500 mA
Total power dissipation at $T_{coll. tap} = 75$ °C	P_{tot}	max.	1,65 W
Total power dissipation* at $T_{amb} = 25$ °C	P_{tot}	max.	1,0 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE*

From junction to collector tap (d.c.)	$R_{th j-ct(dc)}$	=	60 K/W
From junction to ambient (d.c.)	$R_{th j-a(dc)}$	=	150 K/W

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector-base breakdown voltage open emitter; $I_C = 2,5$ mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 10$ mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; $I_E = 0,5$ mA	$V_{(BR)EBO}$	>	3 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 16$ V	I_{CES}	<	1 mA
D.C. current gain $I_C = 100$ mA; $V_{CE} = 10$ V	h_{FE}	>	25
Transition frequency at $f = 500$ MHz** $-I_E = 100$ mA; $V_{CB} = 12,5$ V	f_T	typ.	4,0 GHz
Collector capacitance at $f = 1$ MHz $I_E = i_e = 0$; $V_{CB} = 12,5$ V	C_c	typ.	2,1 pF
Feed-back capacitance at $f = 1$ MHz $I_C = 0$; $V_{CE} = 12,5$ V	C_{re}	typ.	1,3 pF

* Transistor mounted on a p.c. board with a collector area of 50 mm².

** Measured under pulse conditions: $t_p = 50$ μs; $\delta < 1\%$.

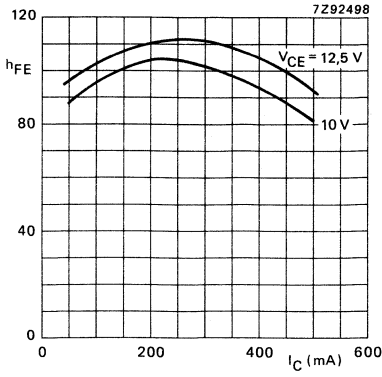


Fig. 2 $T_j = 25$ °C; typical values.

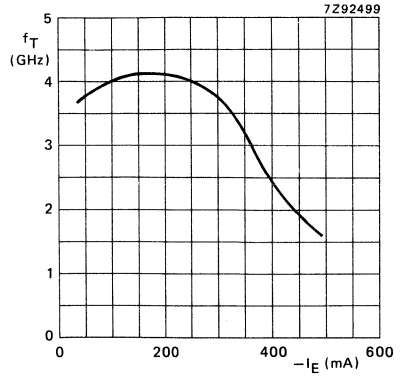


Fig. 3 $V_{CB} = 12.5$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

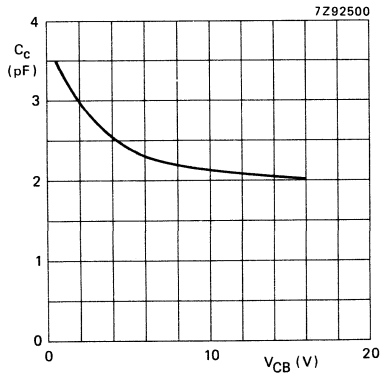


Fig. 4 $I_E = i_e = 0$; $f = 1$ MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$

mode of operation	V_{CE} V	P_{L} W	P_{S} W	G_{p} dB	I_{C} mA	η_{C} %
narrow band; c.w.	12,5	0,5	< 0,079 typ. 0,056	> 8,0 typ. 9,5	< 80 typ. 62	> 50 typ. 65

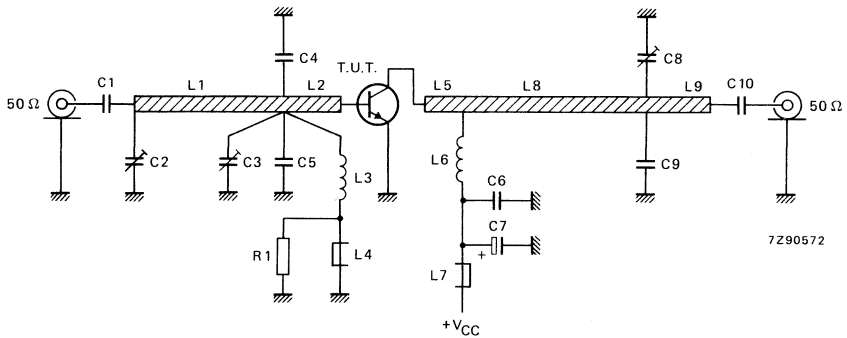


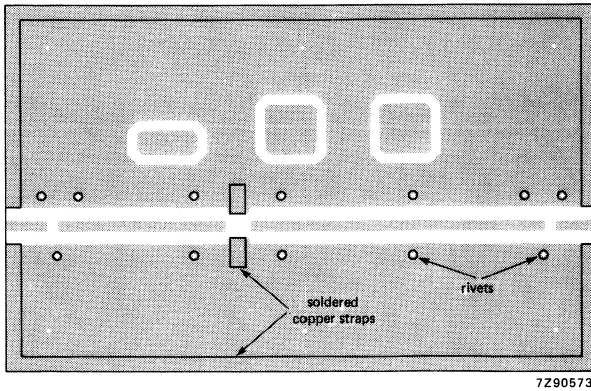
Fig. 5 Class-B test circuit at $f = 900 \text{ MHz}$.

List of components:

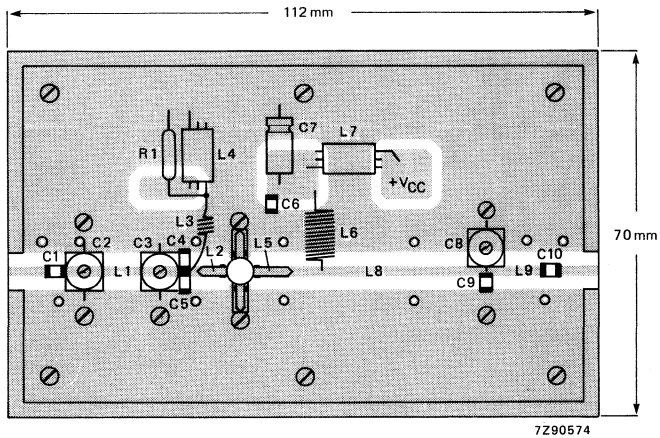
- C1 = C6 = C10 = 330 pF multilayer ceramic chip capacitor
- C2 = C3 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C4 = C5 = 6,8 pF multilayer ceramic chip capacitor*
- C7 = 6,8 μF (63 V) electrolytic capacitor
- C8 = 1,0 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
- C9 = 1,2 pF multilayer ceramic chip capacitor*
- L1 = 50 Ω stripline (24,0 mm x 2,4 mm)
- L2 = 50 Ω stripline (8,0 mm x 2,4 mm)
- L3 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
- L4 = L7 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
- L5 = 50 Ω stripline (14,0 mm x 2,4 mm)
- L6 = 245 nH; 9 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5 mm; leads 2 x 3 mm
- L8 = 50 Ω stripline (32,5 mm x 2,4 mm)
- L9 = 50 Ω stripline (10,0 mm x 2,4 mm)
- R1 = 10 Ω ± 10%; 0,25 W metal film resistor

L1, L2, L5, L8 and L9 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.



7Z90573



7Z90574

Fig. 6 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

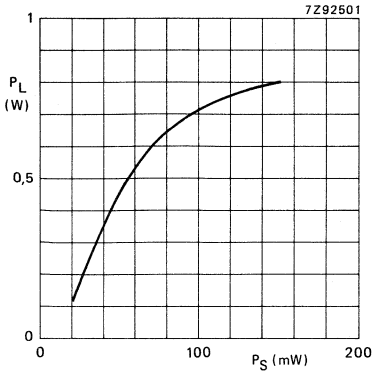


Fig. 7 Load power vs. source power.

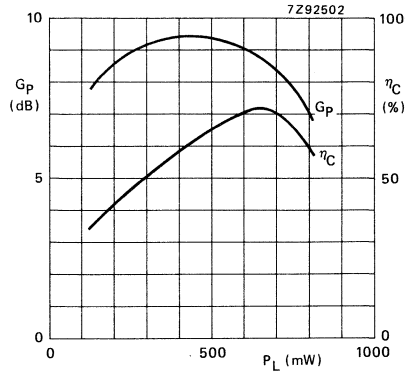


Fig. 8 Power gain and efficiency vs. load power.

Conditions for Figs 7 and 8:

$V_{CE} = 12,5$ V; $f = 900$ MHz; $T_{amb} = 25$ °C; class-B operation; test circuit tuned at $P_L = 0,5$ W; typical values.

RUGGEDNESS

The transistor is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V and $T_{amb} = 25$ °C.

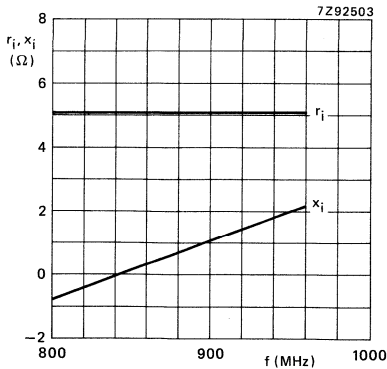


Fig. 9 Input impedance (series components).

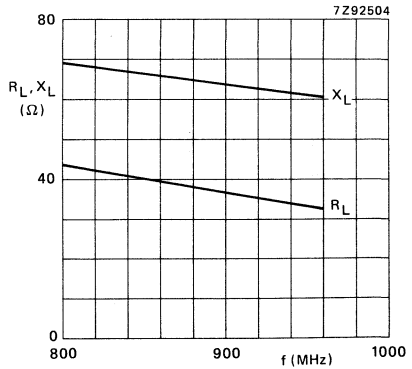


Fig. 10 Load impedance (series components).

Conditions for Figs 9 and 10:

$V_{CE} = 12,5$ V; $P_L = 0,5$ W; $f = 800-960$ MHz; $T_{amb} = 25$ °C; class-B operation; typical values.

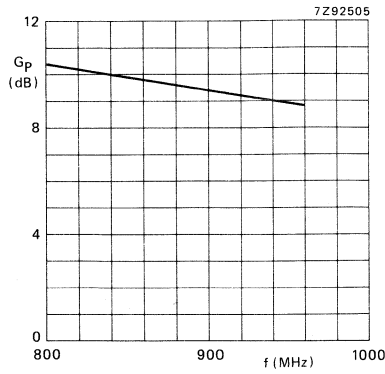


Fig. 11 Power gain vs. frequency.

$V_{CE} = 12,5 \text{ V}$; $P_L = 0,5 \text{ W}$; $f = 800\text{-}960 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the u.h.f. band. The transistor is also very suitable for application in the 900 MHz mobile radio band.

Features:

- multi-base structure and diffused emitter-ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-122). All leads are isolated from the stud.

QUICK REFERENCE DATA

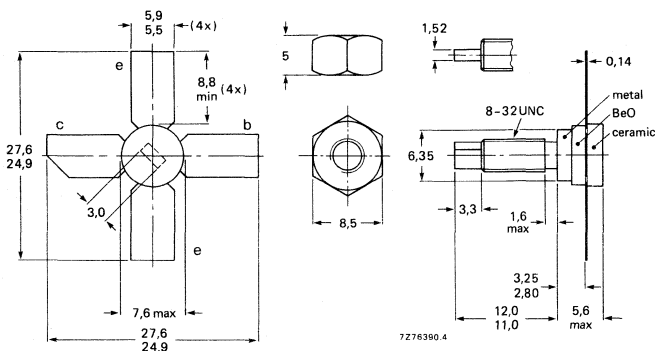
R.F. performance at $T_h = 25^\circ\text{C}$ in a common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_c %
narrow band; c.w.	12,5 12,5	470 900	5 4	> 10,5 typ. 7,0	> 60 typ. 60

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.

PRODUCT SAFETY 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)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current d.c. or average	$I_C; I_{C(AV)}$	max.	0,8 A
peak value; $f > 1$ MHz	I_{CM}	max.	2,5 A
→ D.C. power dissipation up to $T_{mb} = 50$ °C	P_{tot} (d.c.)	max.	12,5 W
R.F. power dissipation → $f > 1$ MHz; $T_{mb} = 25$ °C	P_{tot} (r.f.)	max.	19 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

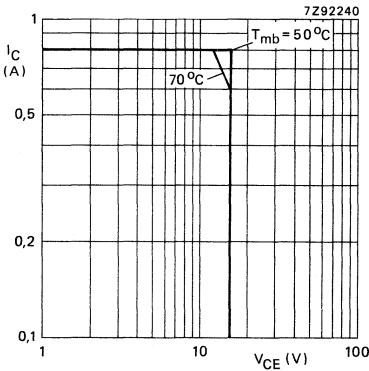


Fig. 2 D.C. SOAR.
 $R_{th\ mb-h} = 0,6$ K/W.

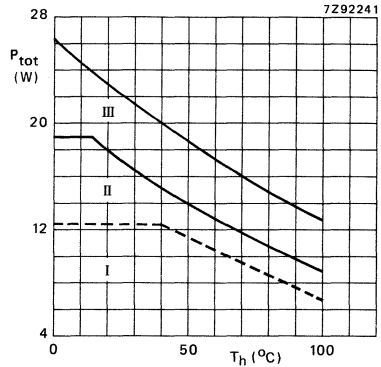


Fig. 3 Power/temperature derating curves.
I Continuous d.c. operation.
II Continuous r.f. operation ($f > 1$ MHz).
III Short-time r.f. operation during mismatch; ($f > 1$ MHz).

THERMAL RESISTANCE (dissipation = 9 W; $T_{mb} = 25$ °C)

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

$R_{th\ j-mb(dc)} = 10$ K/W

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

$R_{th\ j-mb(rf)} = 7,5$ K/W

From mounting base to heatsink

$R_{th\ mb-h} = 0,6$ K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 10\text{ mA}$

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

Collector-emitter breakdown voltage
open base; $I_C = 20\text{ mA}$

$V_{(BR)CEO} > 16\text{ V}$

Emitter-base breakdown voltage
open collector; $I_E = 1\text{ mA}$

$V_{(BR)EBO} > 3\text{ V}$

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 16\text{ V}$

$I_{CES} < 5\text{ mA}$

Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$
 $R_{BE} = 10\text{ }\Omega$

$E_{SBR} > 1\text{ mJ}$

D.C. current gain**

$I_C = 0,6\text{ A}; V_{CE} = 10\text{ V}$

$h_{FE} > 25$
typ. 100

Transition frequency at $f = 500\text{ MHz}^*$

$I_C = 0,6\text{ A}; V_{CE} = 12,5\text{ V}$

f_T typ. 4,0 GHz

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

$I_E = I_e = 0; V_{CB} = 12,5\text{ V}$

C_c typ. 7,5 pF

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

$I_C = 0; V_{CE} = 12,5\text{ V}$

C_{re} typ. 5 pF

Collector-stud capacitance

C_{cs} typ. 1,2 pF ←

* Measured under pulse conditions: $t_p = 50\text{ }\mu\text{s}; \delta < 0,01$.

** Measured under pulse conditions: $t_p = 300\text{ }\mu\text{s}; \delta < 0,01$.

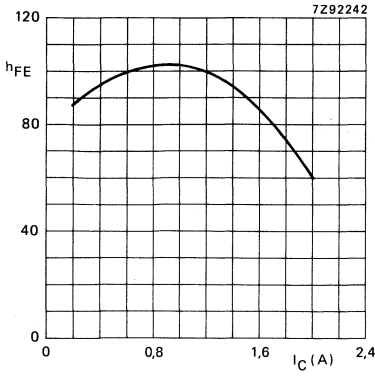


Fig. 4 $V_{CE} = 10$ V; $T_j = 25$ °C; typ. values.

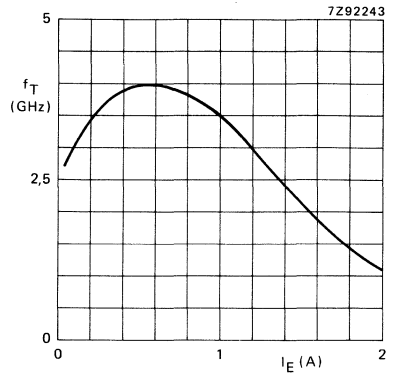


Fig. 5 $V_{CB} = 12,5$ V; $f = 500$ MHz; $T_j = 25$ °C; typ. values.

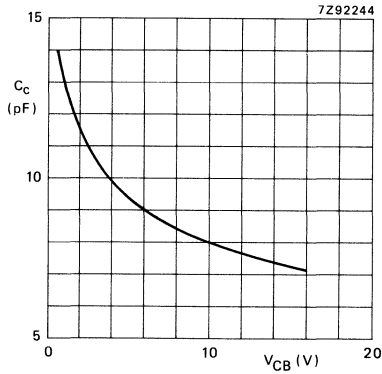
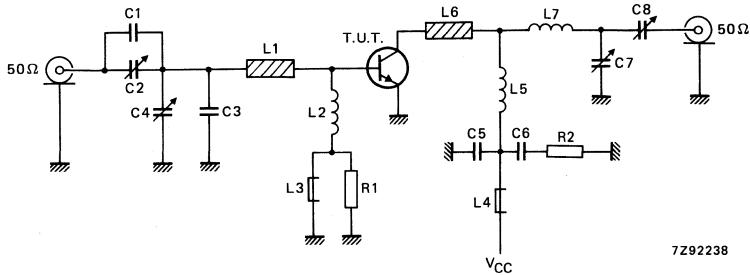


Fig. 6 $I_E = i_e = 0$; $f = 1$ MHz; typ. values.

APPLICATION INFORMATION (part I)

R.F. performance in c.w. operation (common-emitter class-B circuit) at $f = 470$ MHz; $T_h = 25$ °C.

mode of operation	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η_C %
narrow band; c.w.	12,5	5	< 0,45 typ. 0,32	> 10,5 typ. 12	< 0,665 typ. 0,60	> 60 typ. 66

Fig. 7 Class-B test circuit at $f = 470$ MHz.

List of components:

C1 = 2,7 pF multilayer ceramic chip capacitor*

C2 = C7 = C8 = 1,4-5,5 pF film dielectric trimmer (cat.no. 2222 809 09001)

C3 = 7,5 pF multilayer ceramic chip capacitor*

C4 = 2-9 pF film dielectric trimmer (cat.no. 2222 809 09002)

C5 = 100 pF multilayer ceramic chip capacitor (cat. no. 2222 852 13101)

C6 = 100 nF metallized film capacitor (cat. no. 2222 352 45104)

L1 = stripline, 22,5 mm x 6,0 mm

L2 = 1 turn Cu-wire (1,0 mm), int. dia. 5,5 mm, leads 2 x 5 mm

L3 = L4 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)

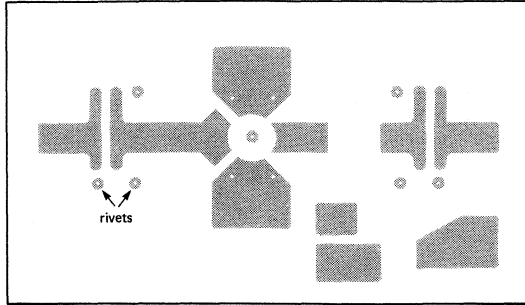
L5 = 4 turns enamelled Cu-wire (1,0 mm), int. dia. 6 mm, length 7,5 mm, leads 2 x 5 mm

L6 = stripline, 10,0 mm x 6,0 mm

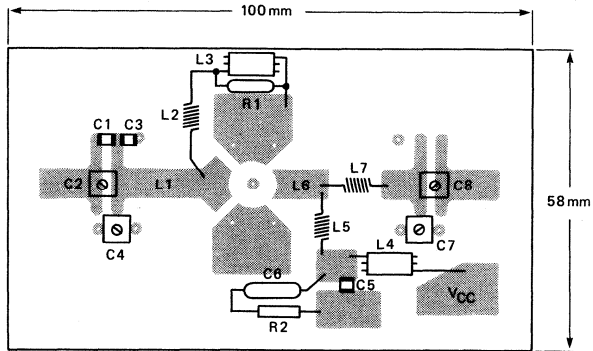
L7 = 1 turn Cu-wire (1,0 mm), int. dia. 5 mm, leads 2 x 5 mm

R1 = R2 = 10 Ω metal film resistor, 0,25 WL1 and L6 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,74$) and a thickness of 1/16 inch.

* American Technical Ceramics capacitor type 100 A or capacitor of same quality.



7290362



7290361

Fig. 8 Printed circuit board and component layout for 470 MHz.

The circuits and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper to serve as ground plane. Earth connections are made by hollow rivets.

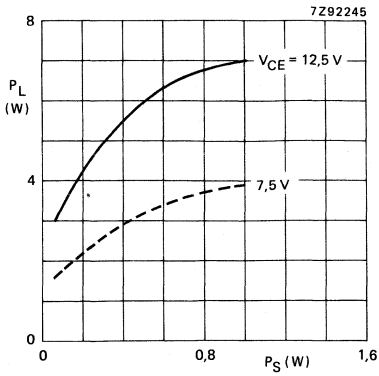


Fig. 9 Output power.

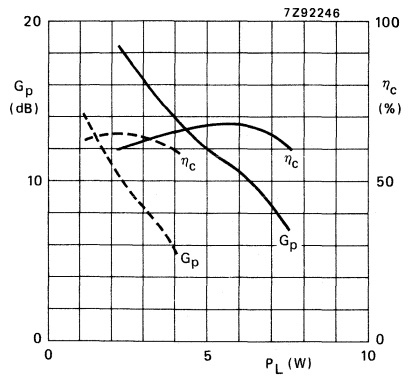


Fig. 10 Power gain and efficiency;
 — : $V_{CE} = 12,5$ V
 - - - : $V_{CE} = 7,5$ V.

Conditions for Figs 9 and 10:

$f = 470$ MHz; class-B operation; $T_h = 25$ °C; typ. values.

RUGGEDNESS:

The device is capable of withstanding a load mismatch with VSWR = 50 (all phases) up to a supply voltage of 15,5 V at rated load power.

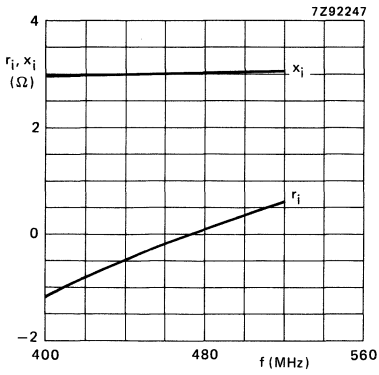


Fig. 11 Input impedance (series components).

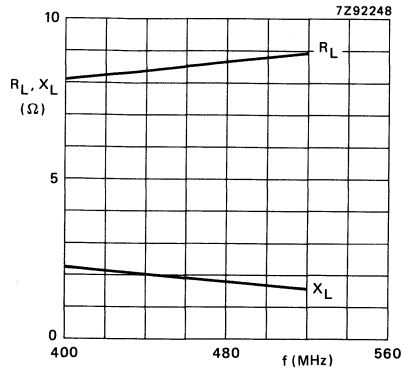


Fig. 12 Load impedance (series components).

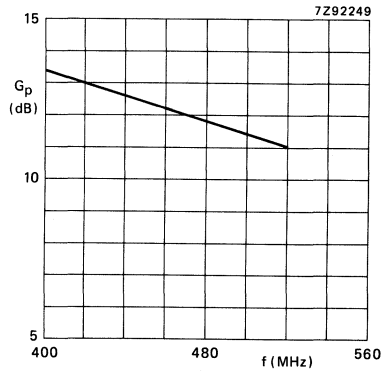


Fig. 13 Power gain.

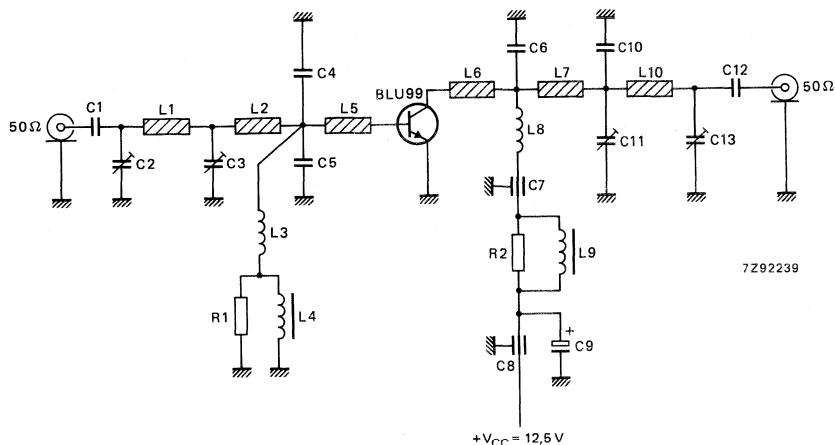
Conditions for Figs 11, 12 and 13:

$V_{CE} = 12,5 \text{ V}$; $P_L = 5 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $f = 400\text{-}520 \text{ MHz}$; typical values.

APPLICATION INFORMATION (part II)

R.F. performance in c.w. operation (common-emitter class-B circuit) at $f = 900$ MHz; $T_h = 25$ °C

mode of operation	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η_C %
narrow band; c.w.	12,5	4	typ. 0,8	typ. 7,0	typ. 0,54	typ. 60

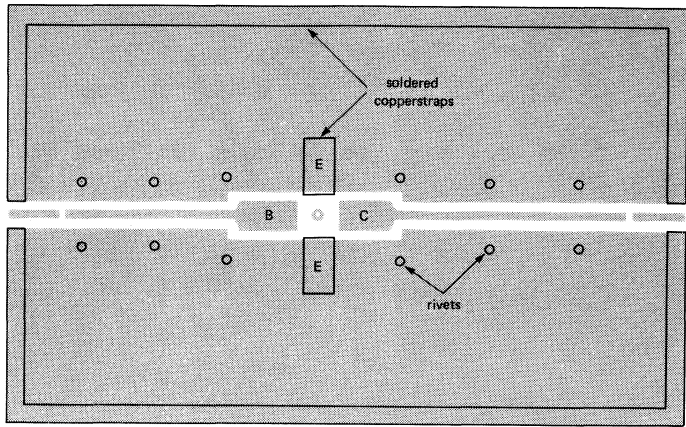
Fig. 14 Class-B test circuit at $f = 900$ MHz.

List of components:

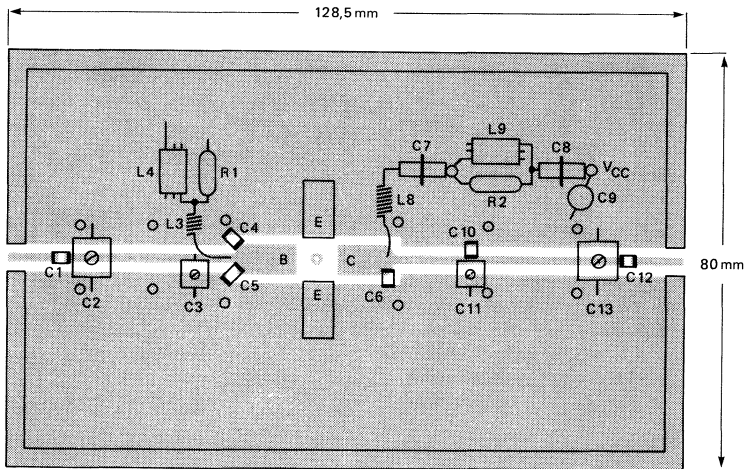
- C1 = C12 = 33 pF multilayer ceramic chip capacitor*
- C2 = C13 = 1,4-5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C3 = C11 = 1,2-3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
- C4 = C5 = C10 = 6,2 pF multilayer ceramic chip capacitor*
- C6 = 1 pF multilayer ceramic chip capacitor*
- C7 = 10 pF ceramic feed-through capacitor
- C8 = 330 pF ceramic feed-through capacitor
- C9 = 2,2 μ F tantalum electrolytic capacitor
- L1 = stripline, 21,0 mm x 1,85 mm
- L2 = stripline, 5,0 mm x 1,85 mm
- L3 = 60 nH, 4 turns enamelled Cu-wire (0,4 mm), close wound, int. dia. 3 mm
- L4 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat. no 4312 020 36642)
- L5 = stripline, 11,3 mm x 6,0 mm
- L6 = stripline, 10,0 mm x 6,0 mm
- L7 = stripline, 15,9 mm x 1,85 mm
- L8 = 280 nH, 15 turns enamelled Cu-wire (0,4 mm), close wound, int. dia. 3 mm
- L10 = stripline, 28,0 mm x 1,85 mm
- R1 = R2 = 10 Ω metal film resistor, 0,25 W

L1, L2, L5, L6, L7 and L10 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,74$) and thickness of 1/32 in.

* American Technical Ceramics capacitor type 100 A or capacitor of same quality.



7Z90363



7Z90364

Fig. 15 Printed circuit board and component layout for a 900 MHz test circuit.

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper to serve as a ground plane. Earth connections are made by hollow rivets and also by fixing screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

RUGGEDNESS

The device is capable of withstanding a load mismatch with VSWR = 50 (all phases) up to a supply voltage of 15,5 V at rated load power.

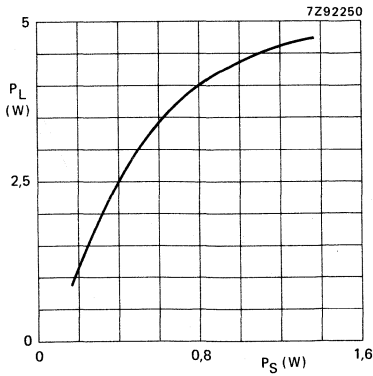


Fig. 16 Output power.

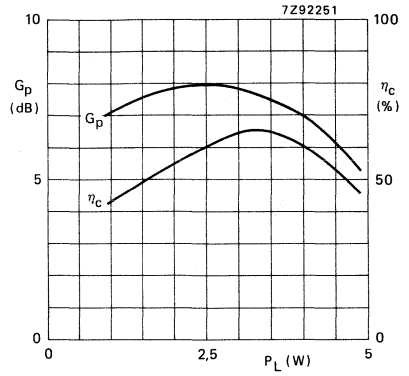


Fig. 17 Power gain and efficiency.

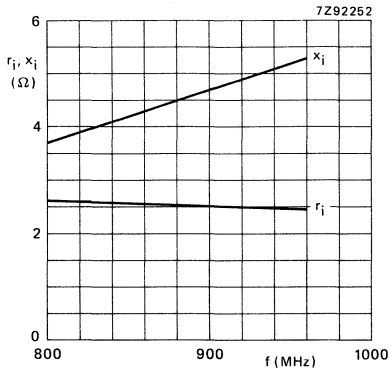


Fig. 18 Input impedance (series components).

Conditions for Figs 16 and 17:

$f = 900$ MHz; $V_{CE} = 12,5$ V; class-B operation;
 $T_h = 25$ °C; typ. values.

Conditions for Figs 18 and 19:

$f = 800-960$ MHz; $V_{CE} = 12,5$ V; $P_L = 4$ W;
 $T_h = 25$ °C; typ. values.

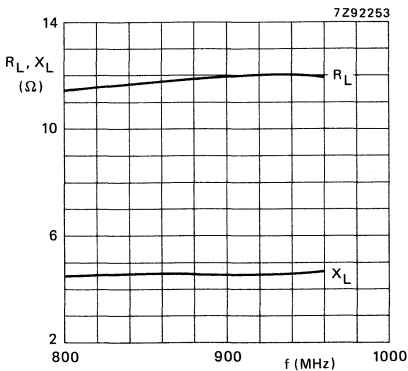


Fig. 19 Load impedance (series components).

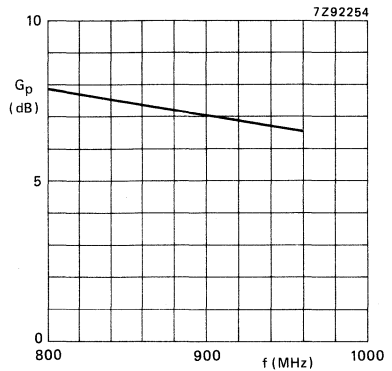


Fig. 20 Power gain.

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

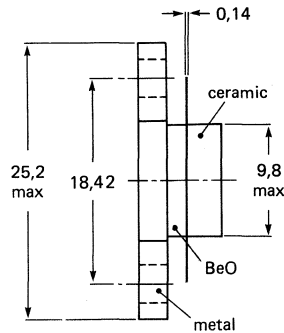
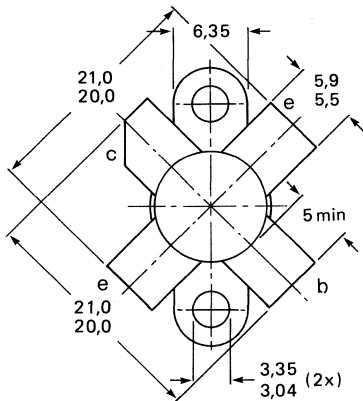
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

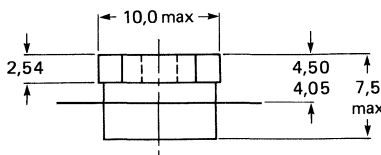


7277386.2

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

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

Heatsink compound must be applied sparingly
and evenly distributed.



PRODUCT SAFETY 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

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

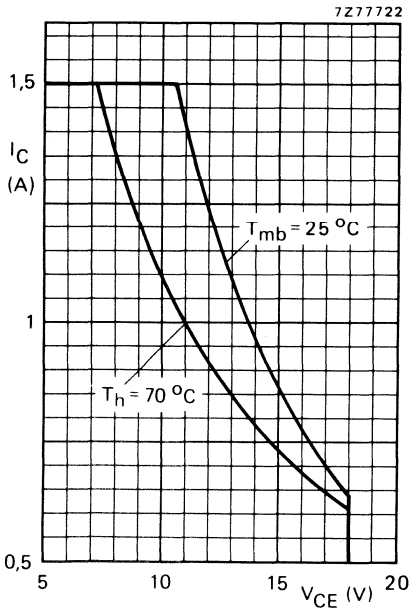


Fig. 2 D.C. SOAR.

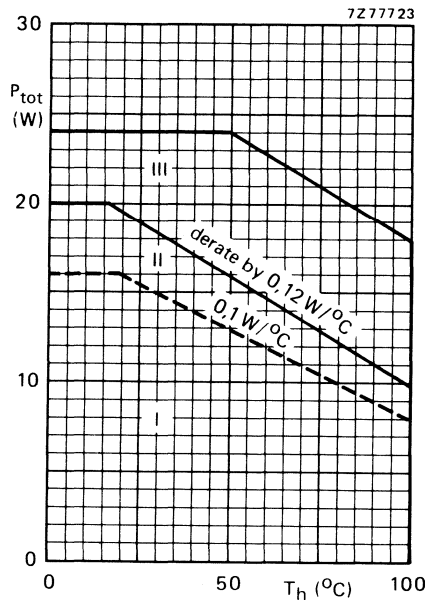


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- 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 K/W

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

$R_{th j-mb(rf)}$ = 8,6 K/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,3 K/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* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

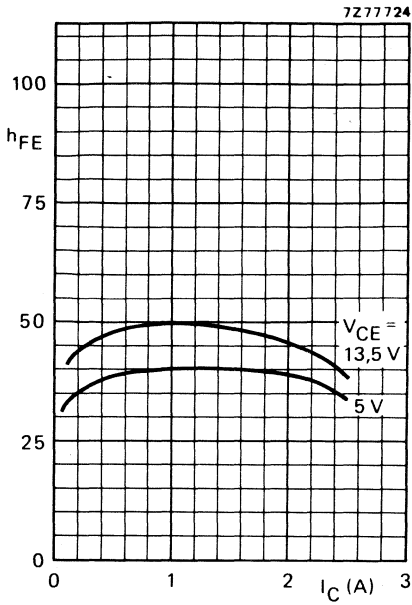


Fig. 4 Typical values; $T_j = 25^\circ C$.

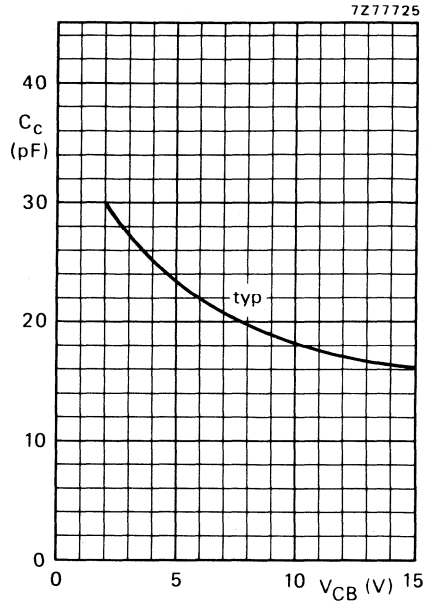


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ C$.

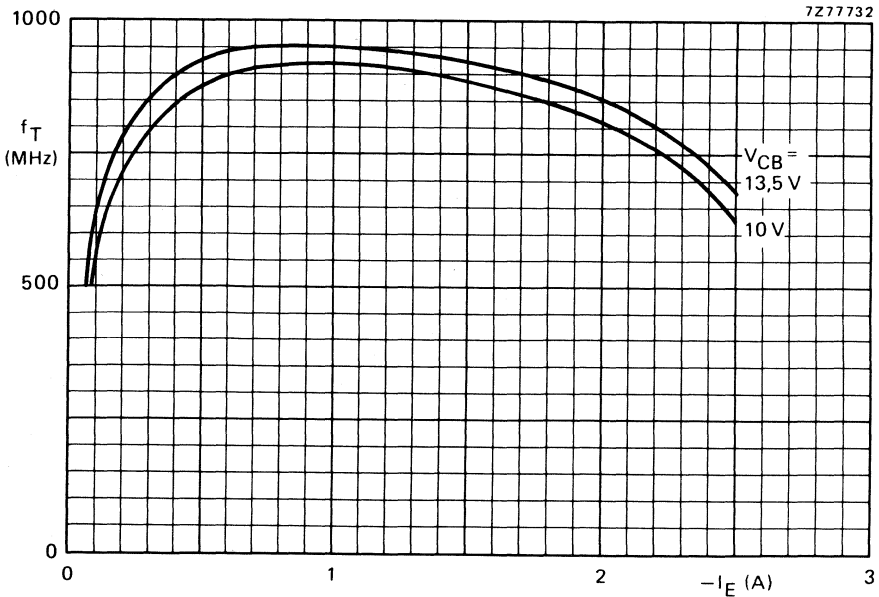


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25^\circ C$.

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 (mS)
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	—	—

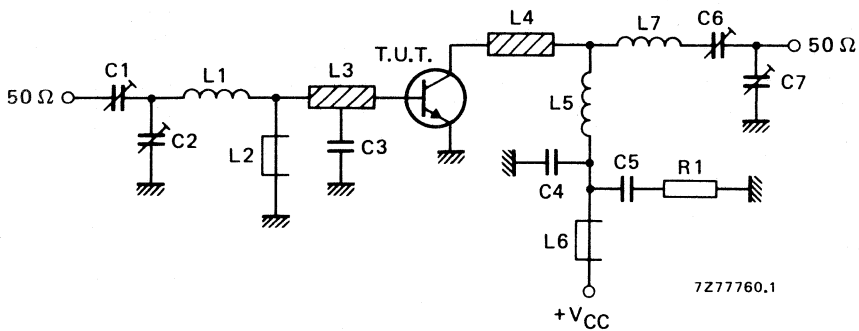


Fig. 7 Test circuit; c.w. class-B.

List of components:

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

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

C3 = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

C7 = 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 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = L4 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor

L5 = 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

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistor

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

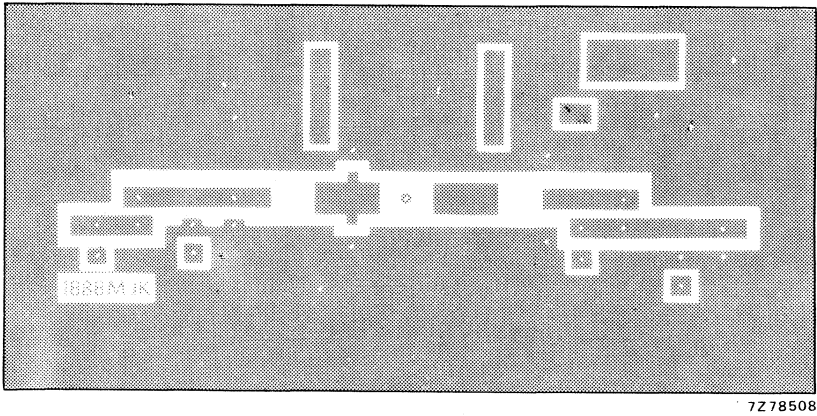
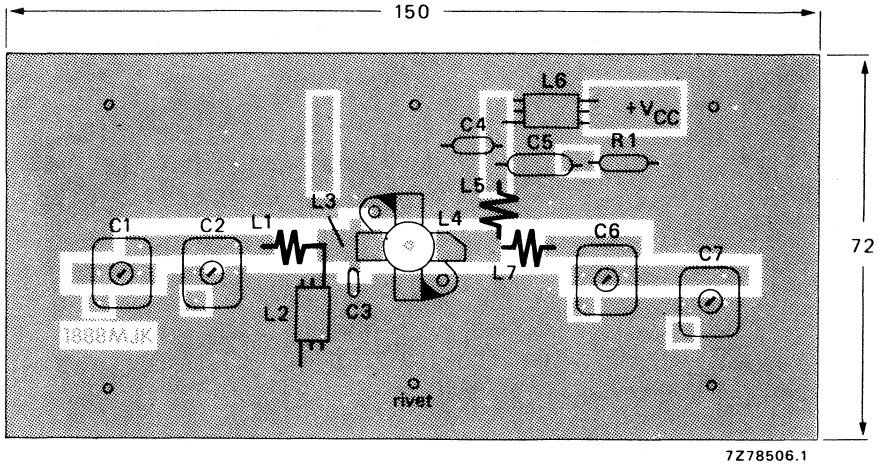


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

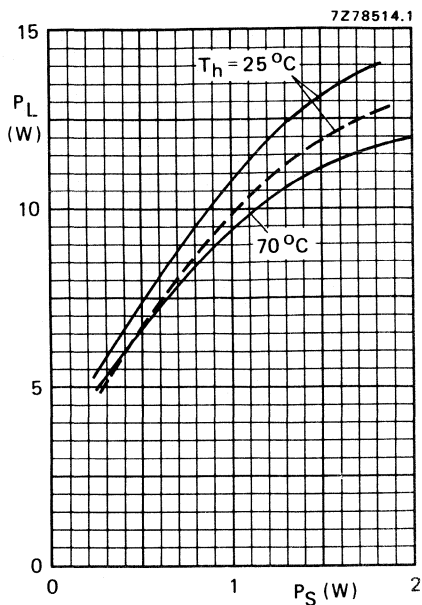


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; --- $V_{CE} = 12,5 \text{ V}$.

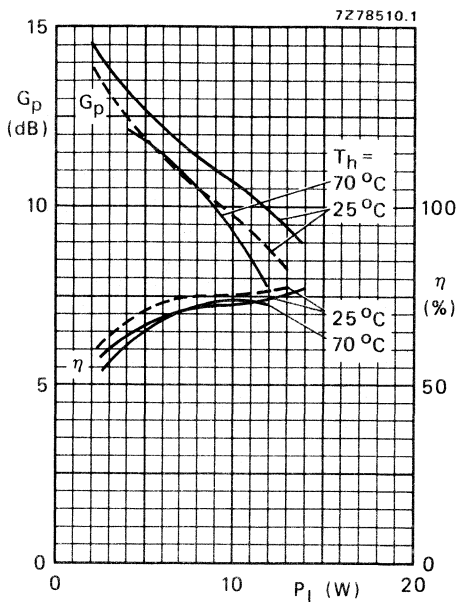


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; --- $V_{CE} = 12,5 \text{ V}$.

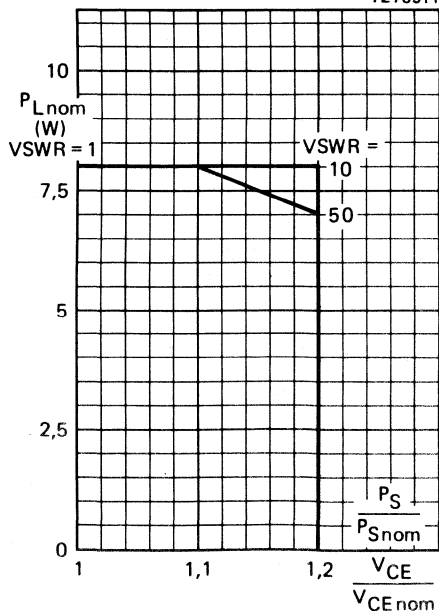


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70^\circ\text{C}$;
 $R_{th\text{ mb-h}} = 0,3 \text{ K/W}$; $V_{CE\text{ nom}} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{S\text{ nom}}$ at $V_{CE\text{ nom}}$ and $V_{\text{SWR}} = 1$.

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 ($V_{\text{SWR}} = 1$), 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.

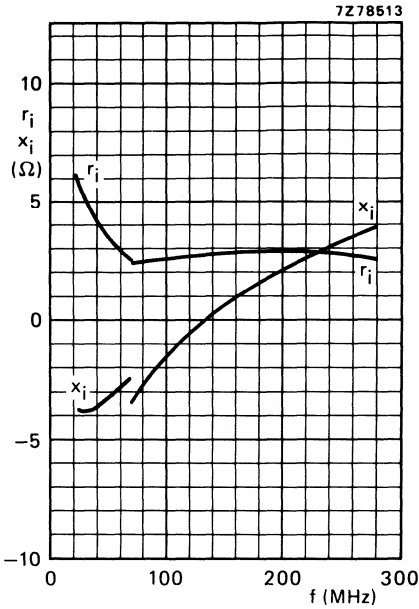


Fig. 12 Input impedance (series components).

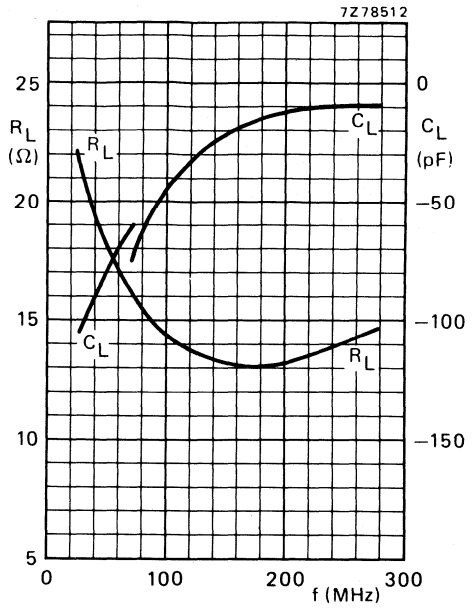


Fig. 13 Load impedance (parallel components).

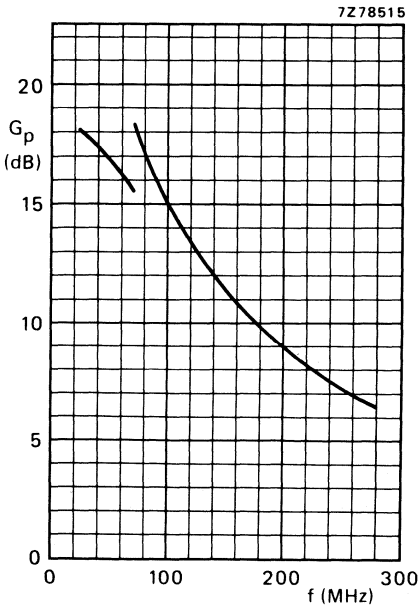


Fig. 14.

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.

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

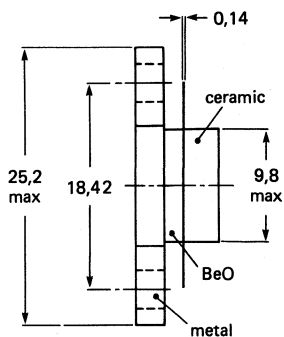
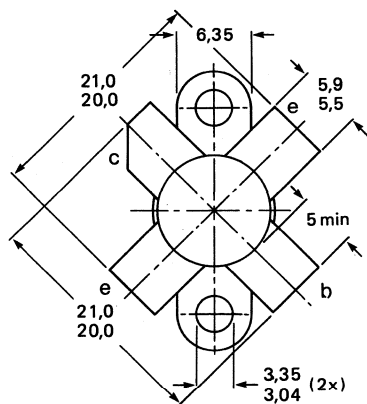
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

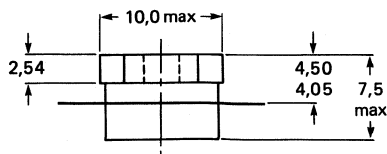


7Z77386.2

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

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

Heatsink compound must be applied sparingly
and evenly distributed.



PRODUCT SAFETY 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

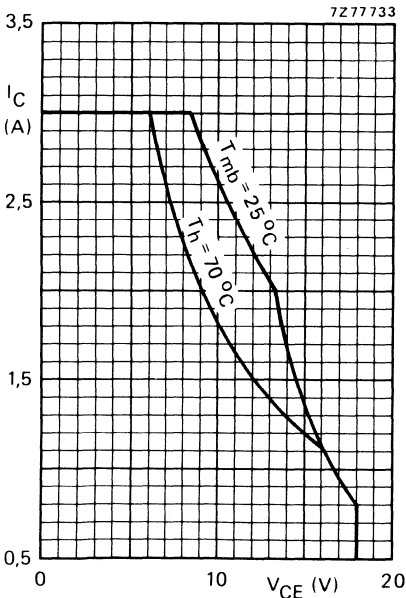


Fig. 2 D.C. SOAR.

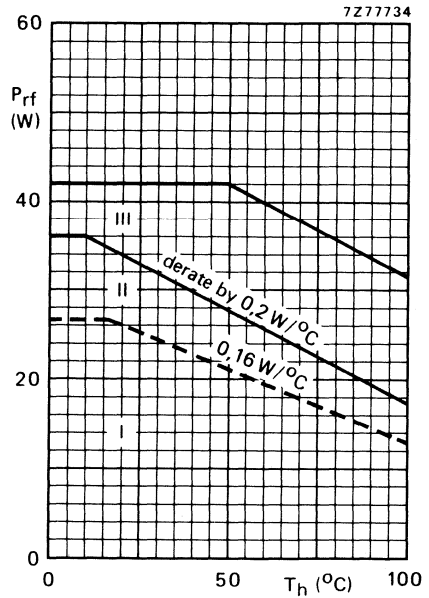


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th j-mb(rf)}$	=	4,95 K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,3 K/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* Measured under pulse conditions: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

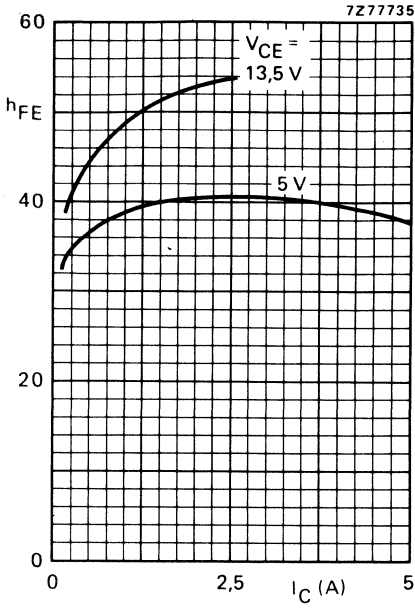


Fig. 4 Typical values; $T_j = 25$ °C.

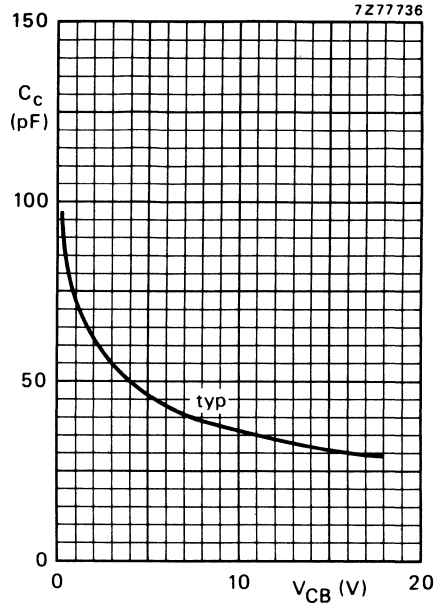


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

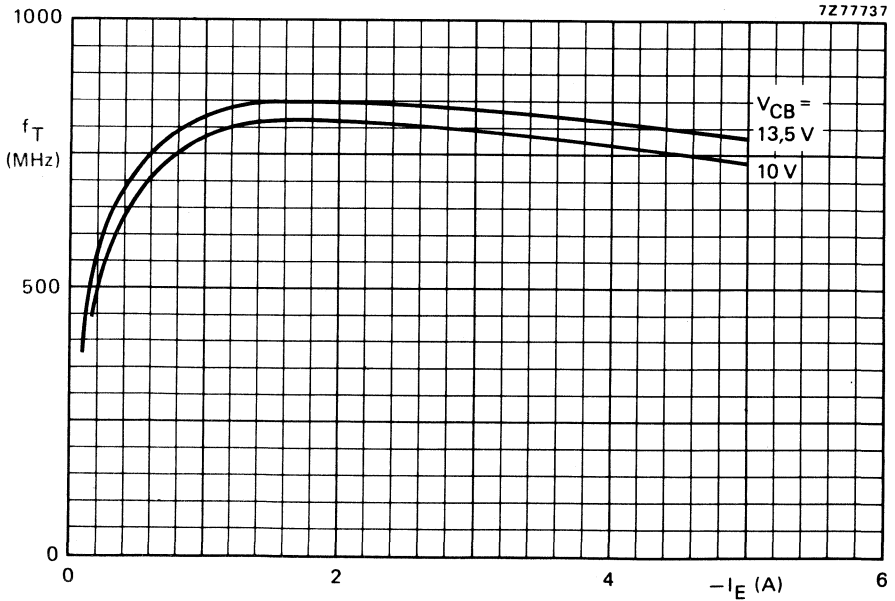


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25$ °C .

APPLICATION INFORMATION

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

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

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 (mS)
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	—	—

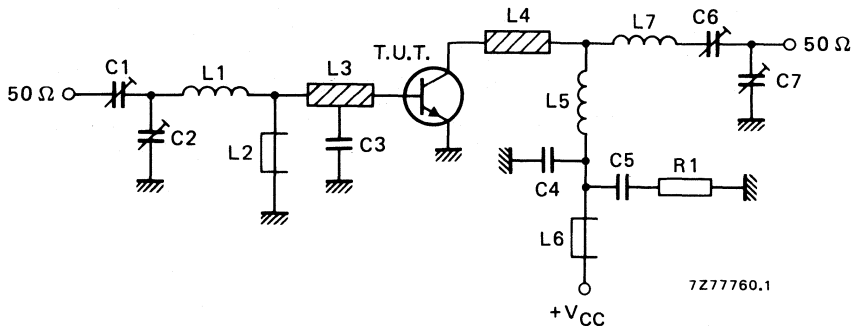


Fig. 7 Test circuit; c.w. class-B.

List of components:

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

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

C3 = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

C7 = 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 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = L4 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor

L5 = 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

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistor

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

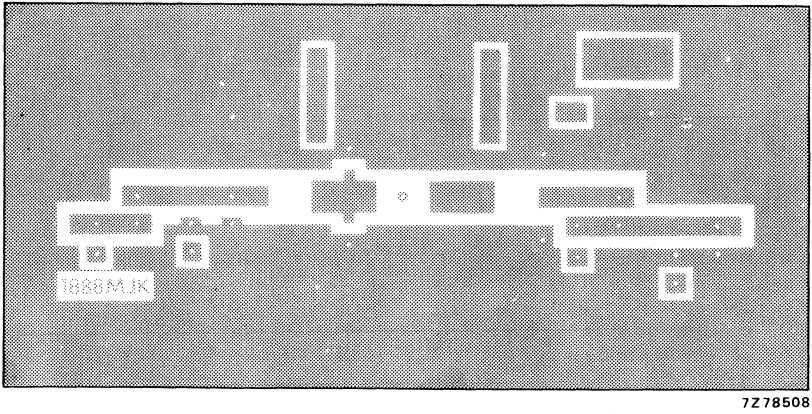
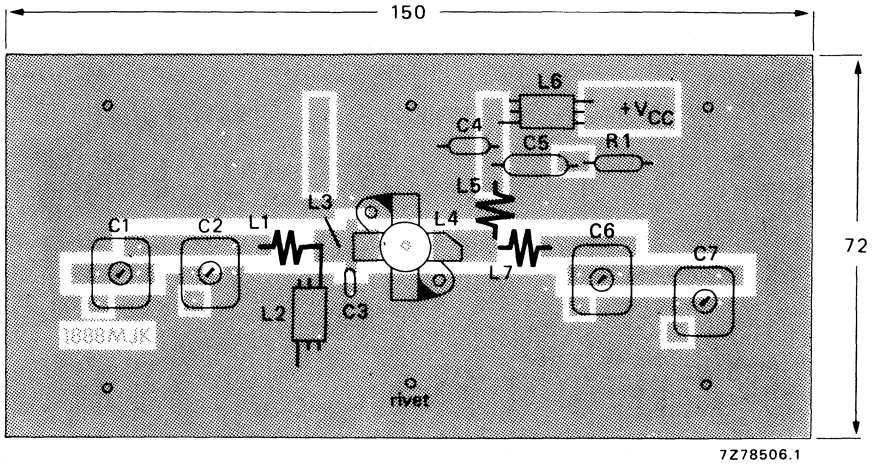


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

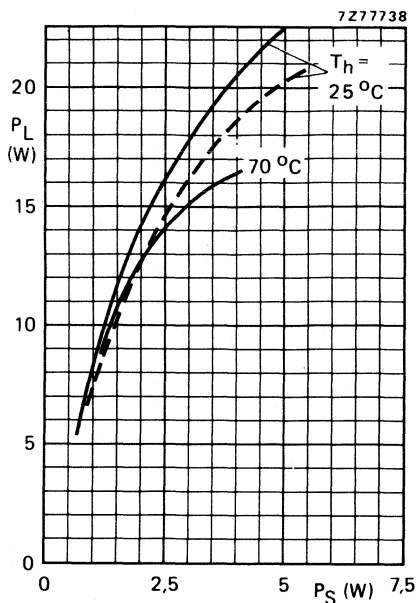


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

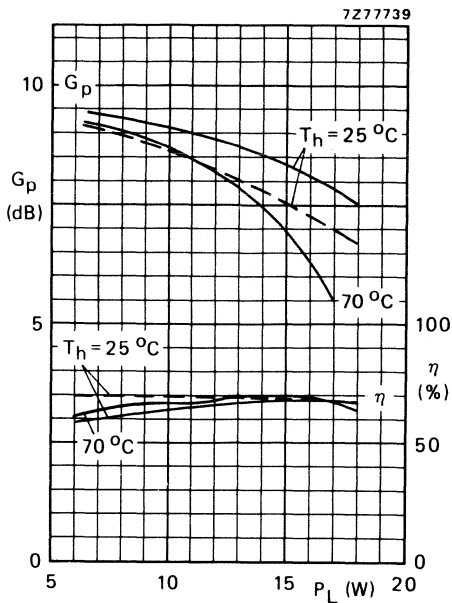


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

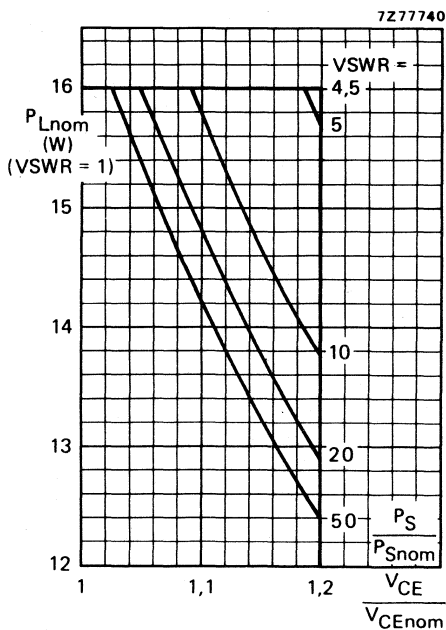


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,3 \text{ K/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

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.

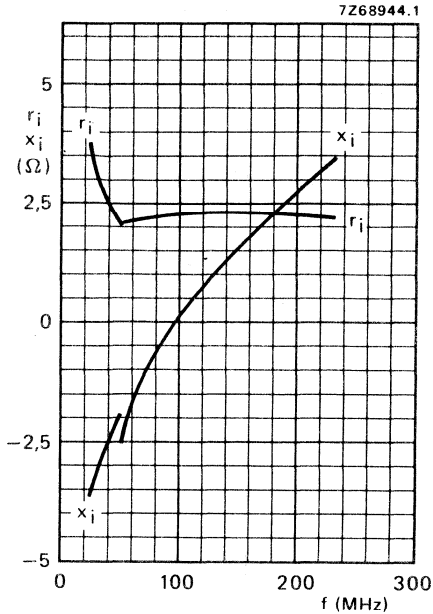


Fig. 12 Input impedance (series components).

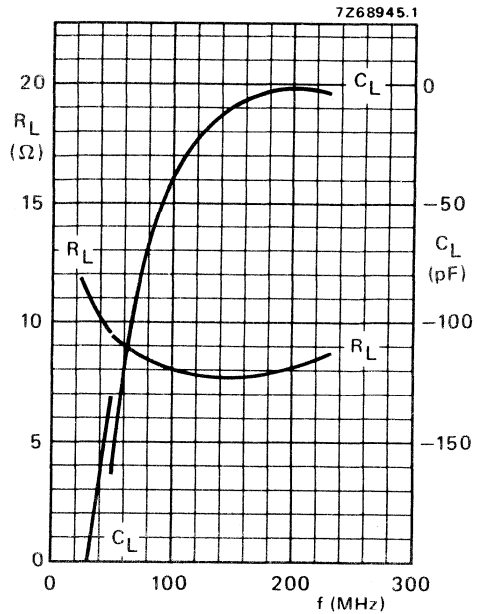
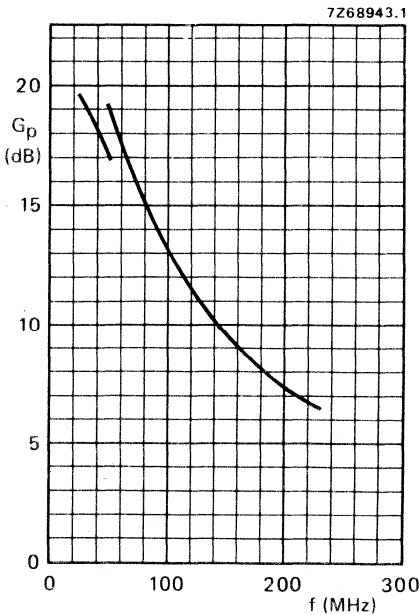


Fig. 13 Load impedance (parallel components).



Conditions for Figs 12, 13 and 14:
 Typical values: $V_{CE} = 13,5 \text{ V}$; $P_L = 15 \text{ W}$;
 $T_{h1} = 25 \text{ }^\circ\text{C}$.

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. 14.

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

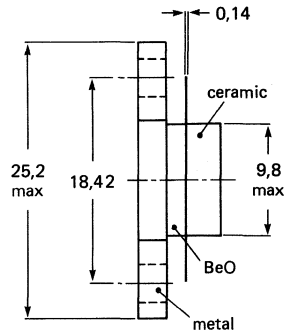
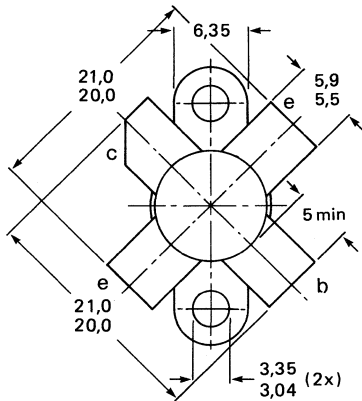
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

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

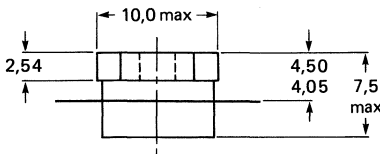
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



7277386.2



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

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

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY 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

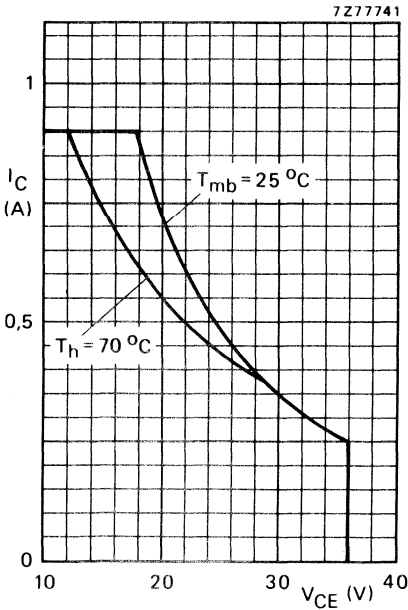


Fig. 2 D.C. SOAR.

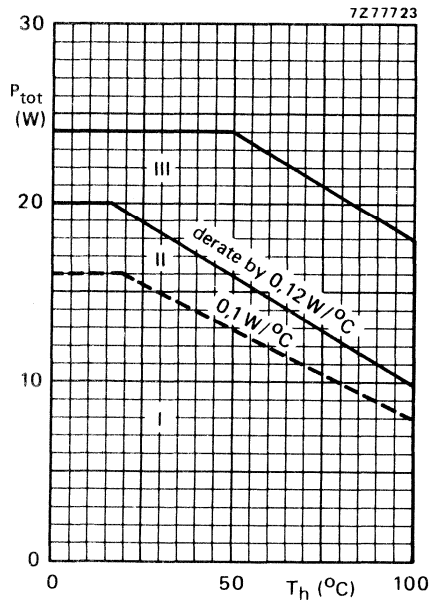


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	8,6 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,3 K/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

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

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

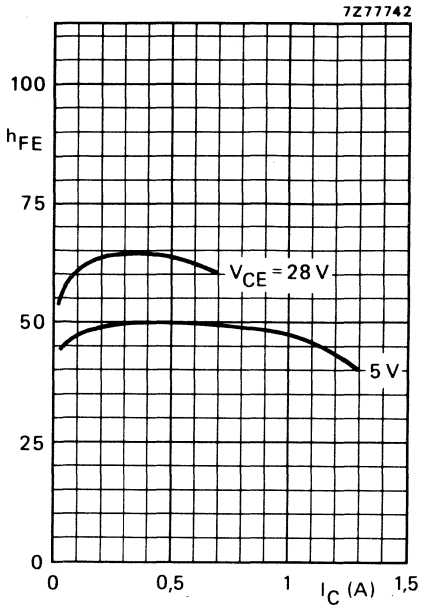


Fig. 4 Typical values; $T_j = 25^\circ\text{C}$.

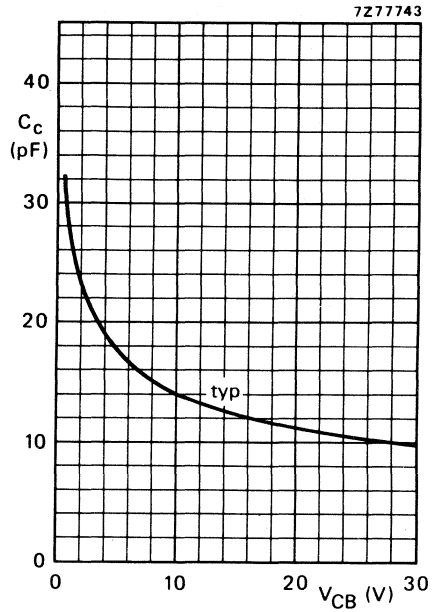


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

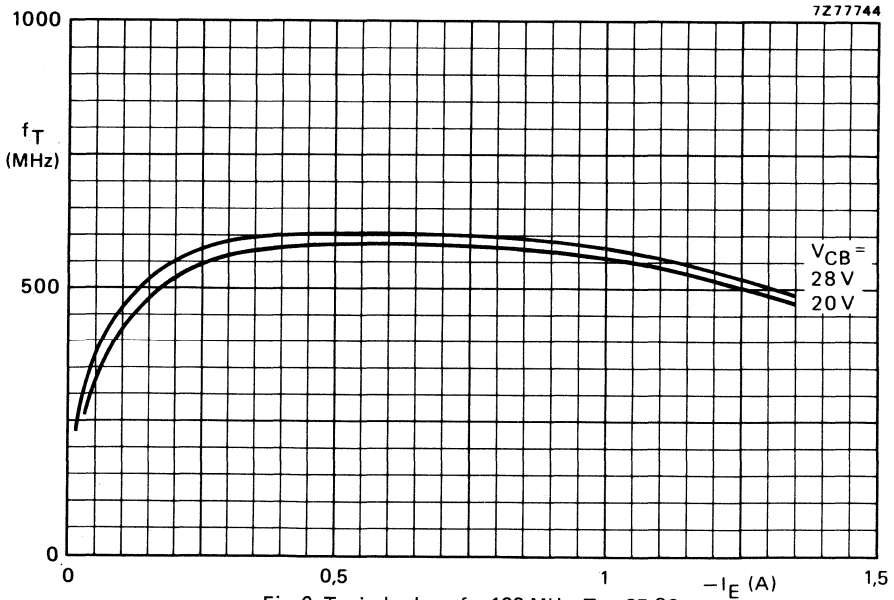


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25^\circ\text{C}$.

APPLICATION INFORMATION

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

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

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 (mS)
175	28	8	< 0,5	> 12	< 0,44	> 65	$1,8 + j0,7$	$18 - j20$

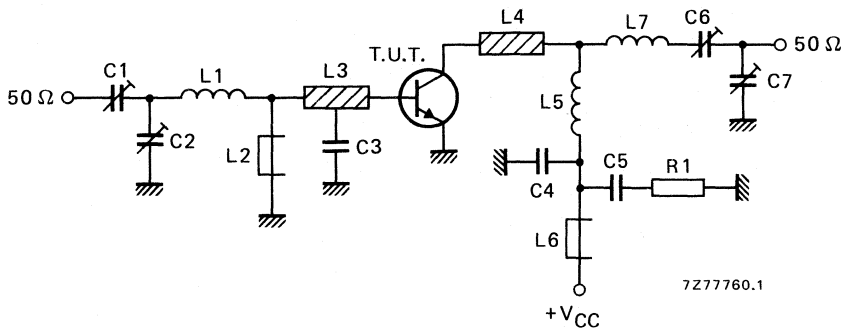


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 27 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 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 = 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 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L7 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 8,2 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. 8.

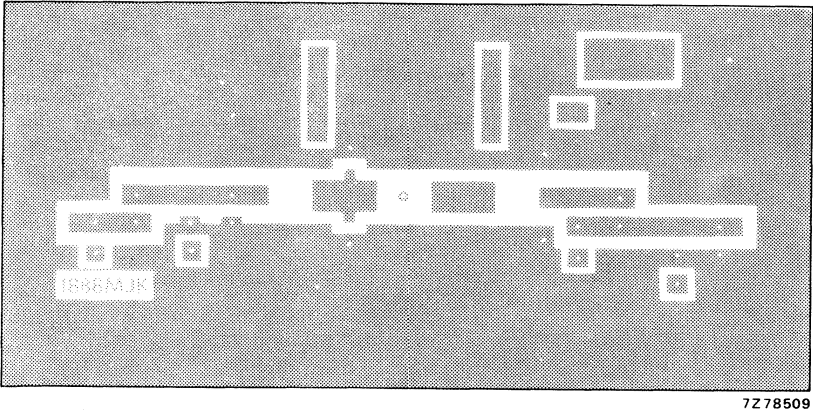
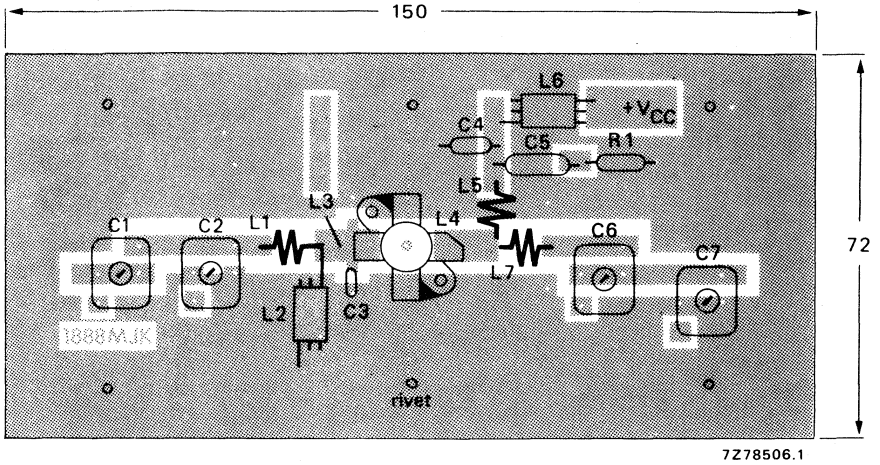


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

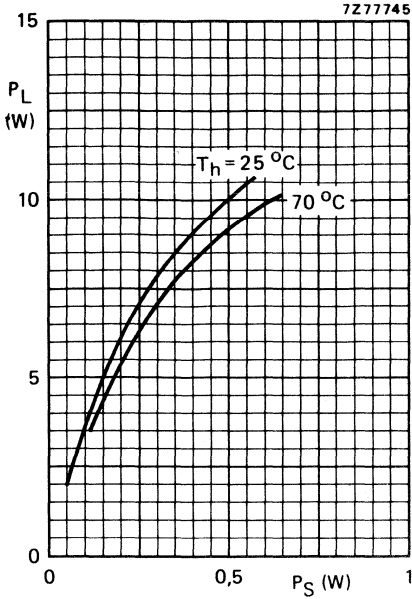


Fig. 9 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

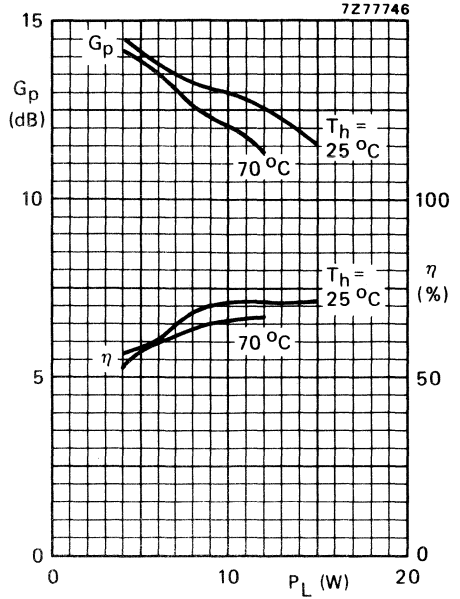


Fig. 10 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

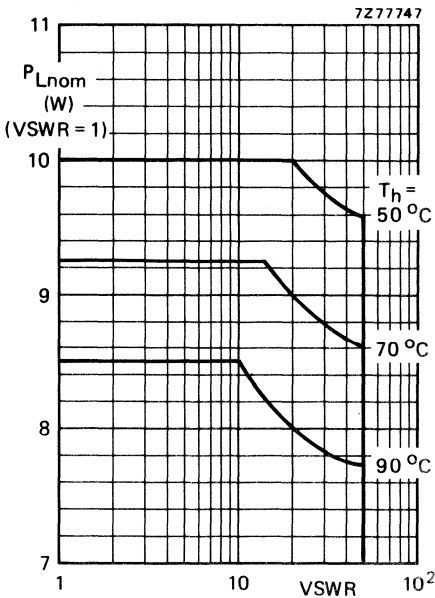


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175\text{ MHz}$; $V_{CE} = 28\text{ V}$; $R_{th\text{ mb-h}} = 0,3\text{ K/W}$. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures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

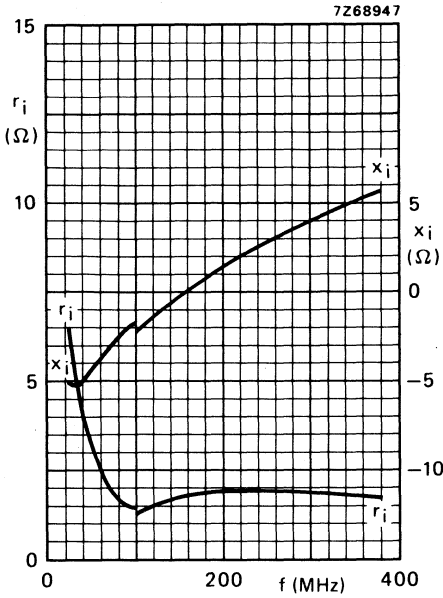


Fig. 12 Input impedance (series components).

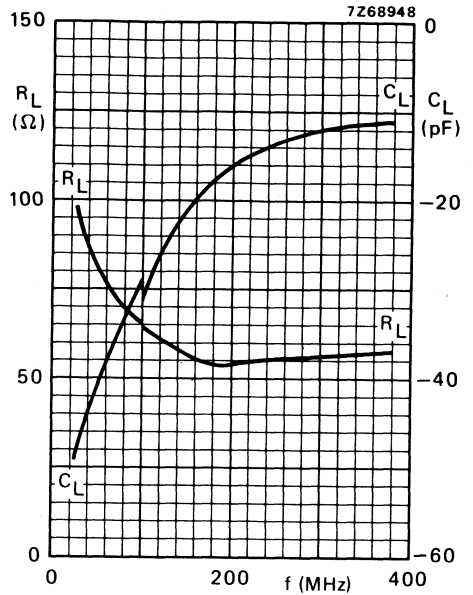


Fig. 13 Load impedance (parallel components).

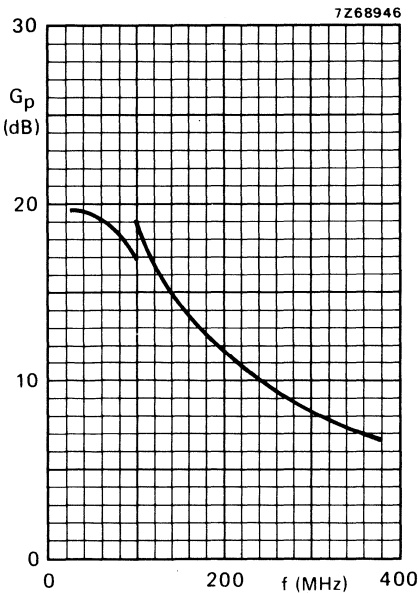


Fig. 14.

Conditions for Figs 12, 13 and 14.
 Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 8 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

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 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

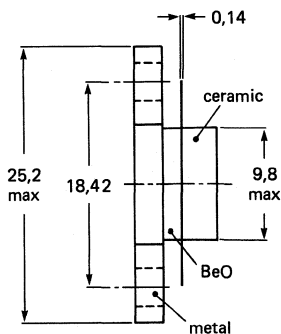
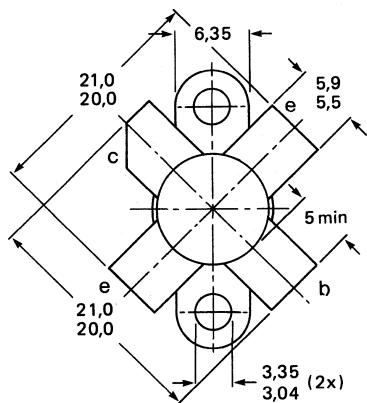
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

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

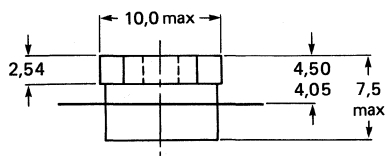
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



7Z77386.2



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

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

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY 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

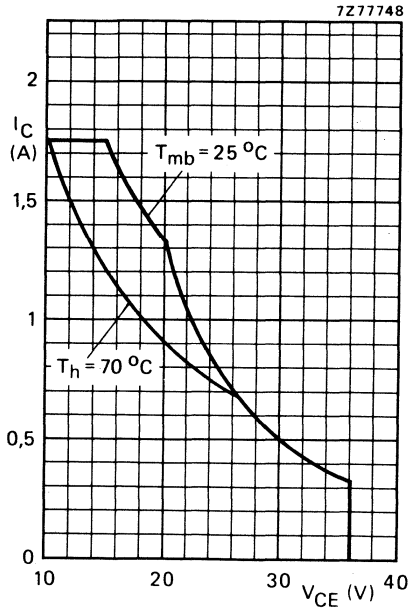


Fig. 2 D.C. SOAR.

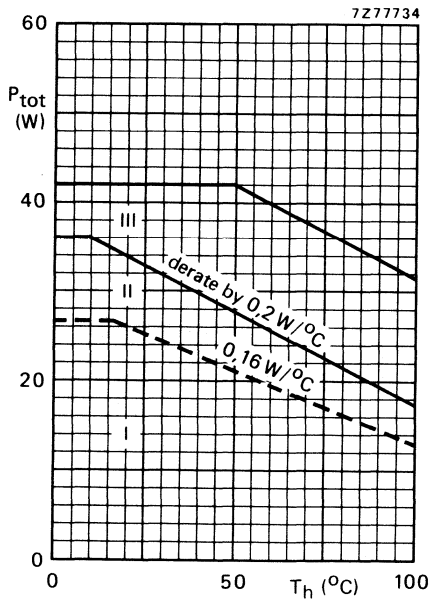


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	4,95 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,3 K/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

 $ESBO > 2,5\text{ mJ}$ $R_{BE} = 10\text{ }\Omega$ $ESBR > 2,5\text{ mJ}$

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 $f = 100\text{ MHz}$ * $-I_E = 0,7\text{ A}; V_{CB} = 28\text{ V}$ 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* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

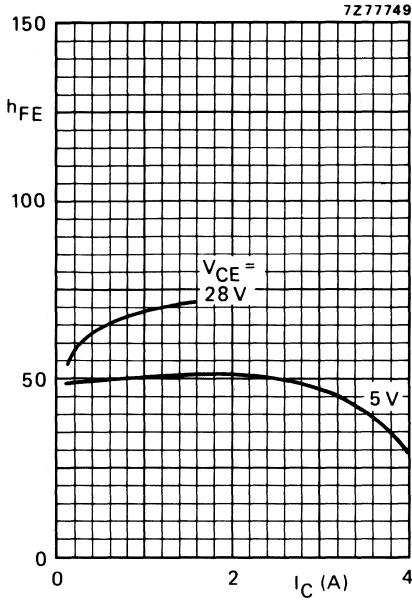


Fig. 4 Typical values; $T_j = 25^\circ C$.

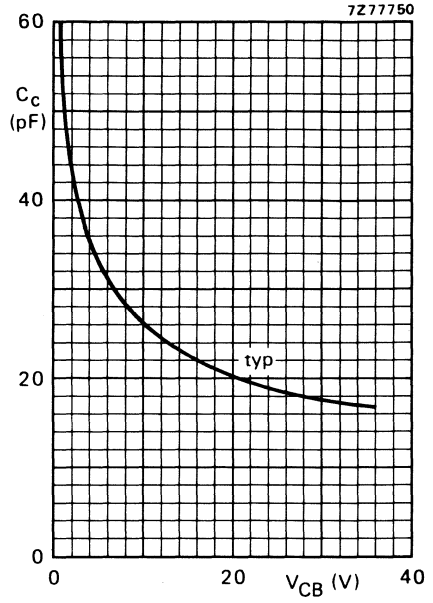


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

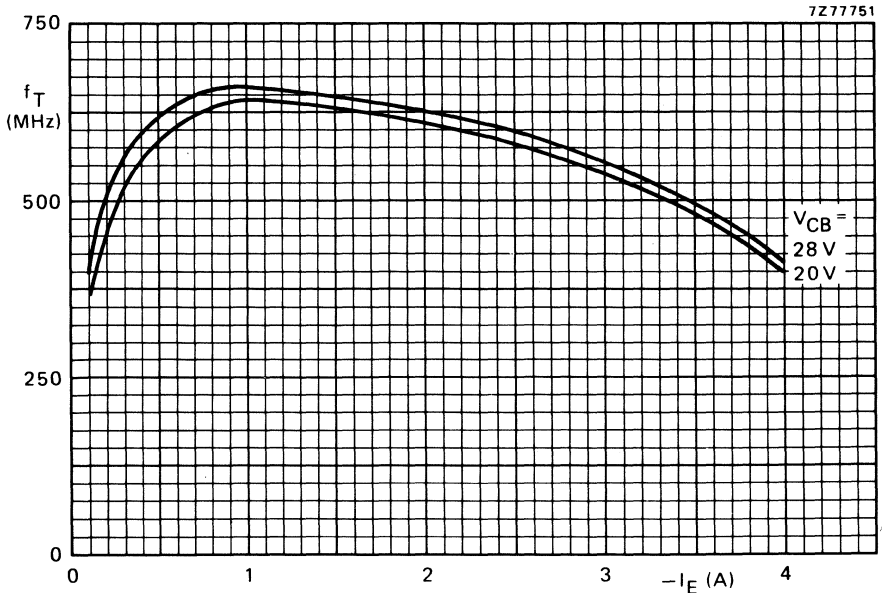


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ C$.

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{V}_L (mS)
175	28	15	< 1,5	> 10	< 0,83	> 65	$1,4 + j1,85$	$33 - j27,5$

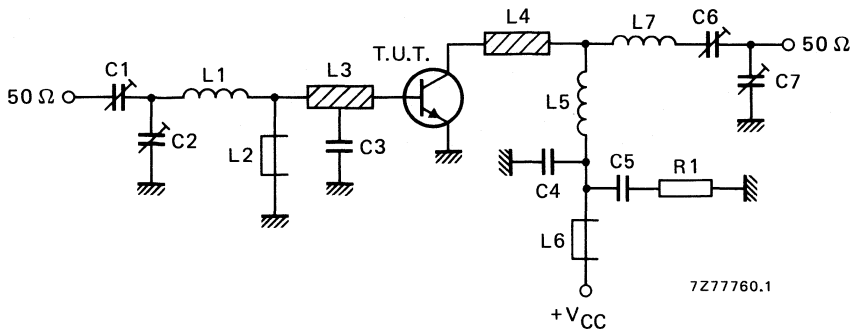


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 27 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

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

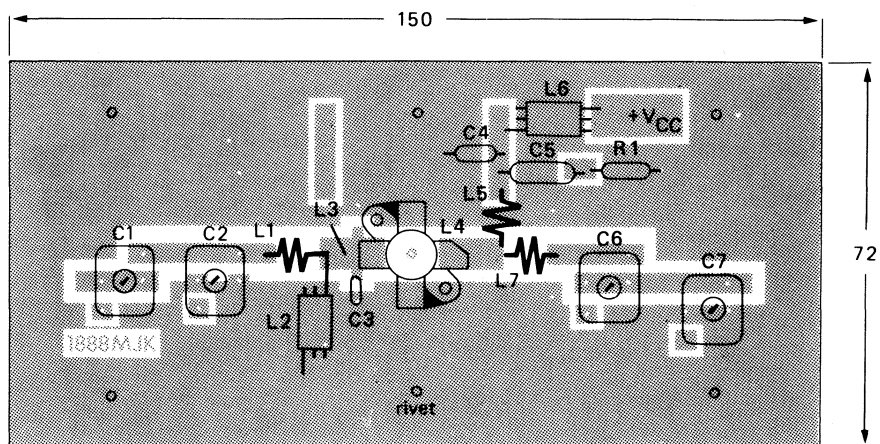
L6 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L7 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; leads 2 x 5 mm

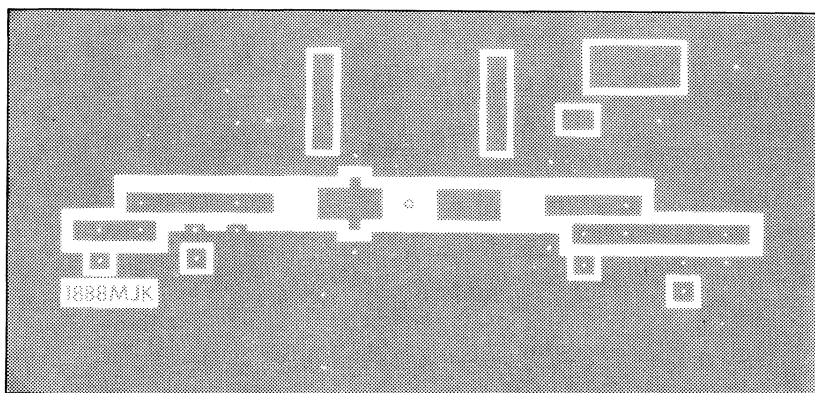
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor

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



7278506.1



7278509

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.

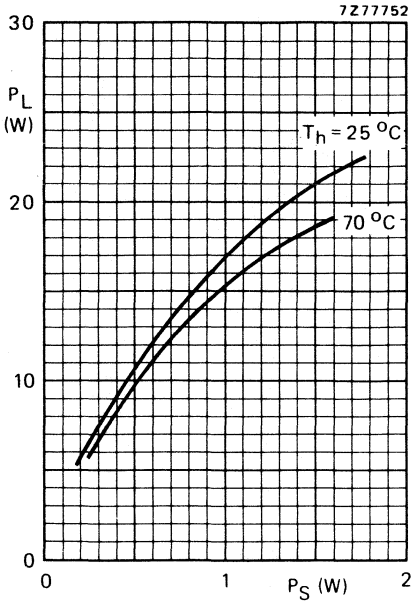


Fig. 9 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

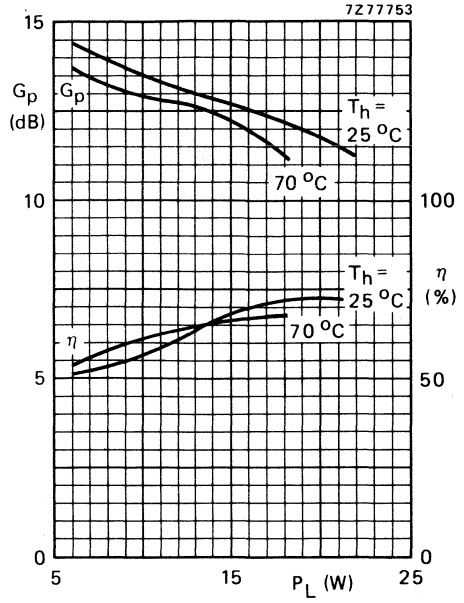


Fig. 10 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

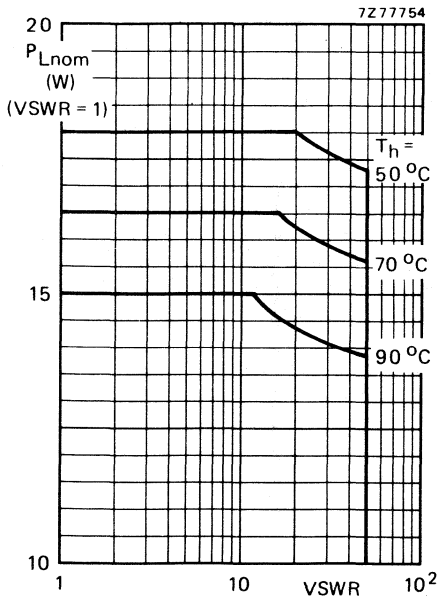


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175\text{ MHz}$; $V_{CE} = 28\text{ V}$; $R_{th\text{ mb-h}} = 0,3\text{ K/W}$. The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures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

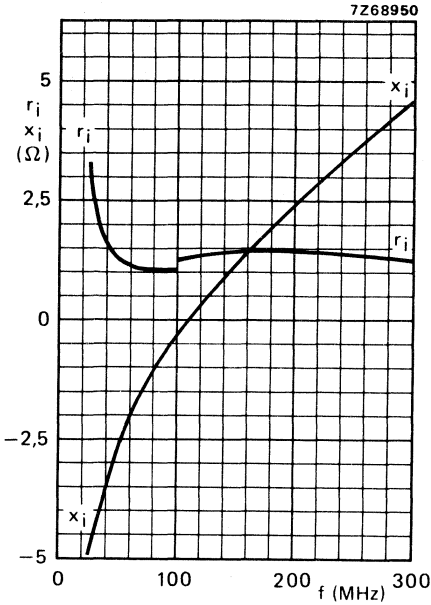


Fig. 12 Input impedance (series components).

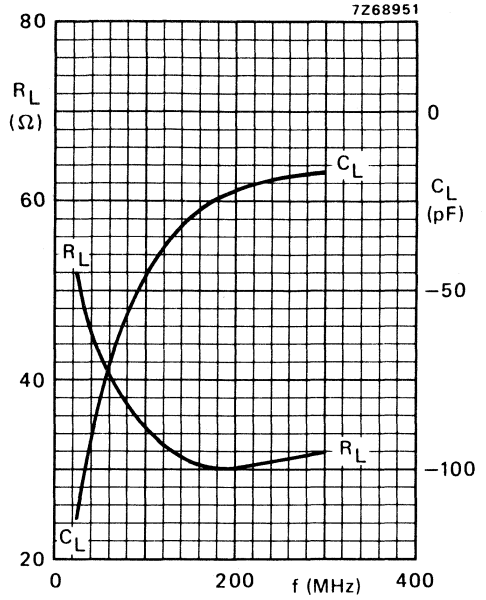


Fig. 13 Load impedance (parallel components).

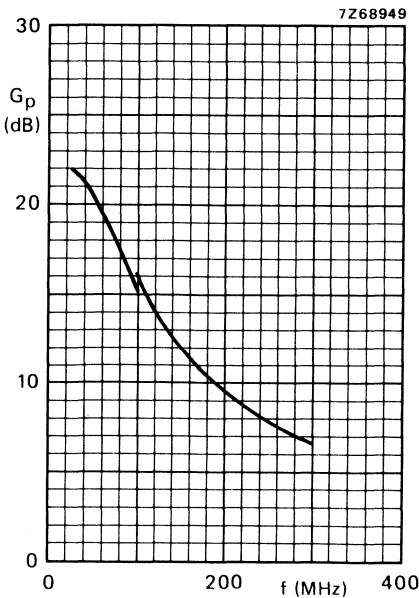


Fig. 14.

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 primarily for use in v.h.f.-f.m. broadcast transmitters.

Features:

- internally matched input for wideband operation and high power gain;
- multi-base structure and diffused emitter ballasting resistors for an optimum temperature profile;
- gold-metallization ensures excellent reliability.

The transistor has a 1/2in 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 operation	V_{CE} V	f MHz	P_L W	P_S W	G_p dB	η %
narrow band; c.w.	28	108	175	< 17,5	> 10,0	> 65

MECHANICAL DATA

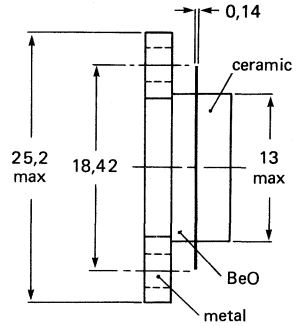
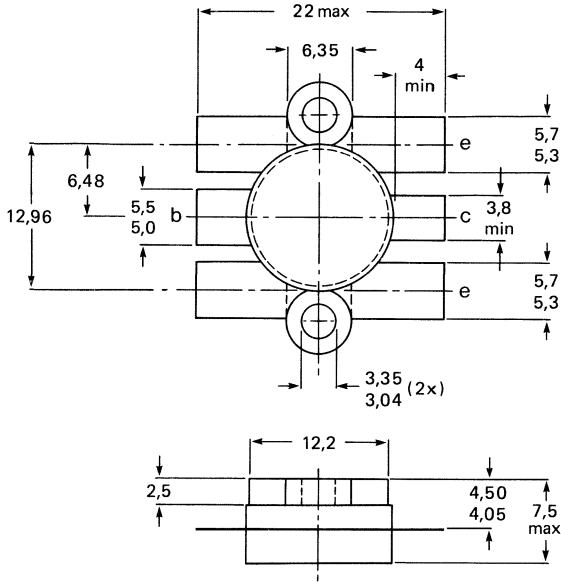
SOT-119 (see Fig. 1).

PRODUCT SAFETY 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



7Z77385.6

Torque on screw: min. 0,6 Nm (6 kg cm)

max. 0,75 Nm (7,5 kg cm)

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

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

V_{CESM} max. 65 V

V_{CEO} max. 33 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current
d.c. or average
(peak value); $f > 1$ MHz

I_C ; $I_{C(AV)}$ max. 17,5 A

I_{CM} max. 35 A

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

P_{tot} (d.c.) max. 220 W

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

P_{tot} (r.f.) max. 270 W

R.F. power dissipation ($f > 1$ MHz); $T_h = 70$ °C

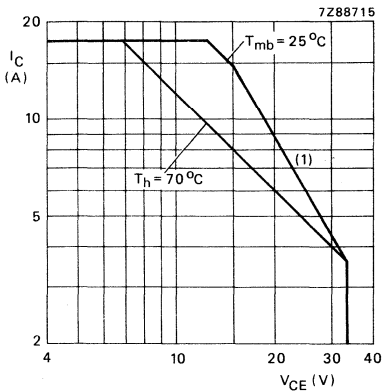
P_{tot} (r.f.) max. 146 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C



(1) Second breakdown limit.

Fig. 2 D.C. SOAR.

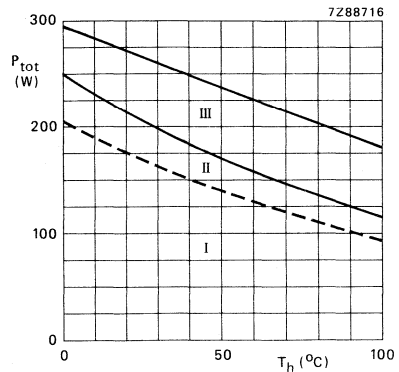


Fig. 3 Power derating curves vs. temperature.

- I Continuous d.c. operation
- II Continuous r.f. operation ($f > 1$ MHz)
- III Short-time operation during mismatch; ($f > 1$ MHz).

THERMAL RESISTANCE (dissipation = 150 W; $T_{mb} = 72$ °C, i.e. $T_h = 42$ °C)

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

$R_{th j-mb(dc)}$ max 0,85 K/W

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

$R_{th j-mb(rf)}$ max 0,60 K/W

From mounting base to heatsink

$R_{th mb-h}$ max 0,2 K/W

CHARACTERISTICS

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

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 50\text{ mA}$ open base; $I_C = 200\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$ $V_{(BR)CEO} > 33\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 20\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 33\text{ V}$ $I_{CES} < 25\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 20\text{ mJ}$ $R_{BE} = 10\ \Omega$ $E_{SBR} > 20\text{ mJ}$

D.C. current gain*

 $I_C = 8,5\text{ A}; V_{CE} = 25\text{ V}$ h_{FE} typ. 50
15 to 100

Collector-emitter saturation voltage*

 $I_C = 20\text{ A}; I_B = 4,0\text{ A}$ V_{CEsat} typ. 1,6 VTransition frequency at $f = 100\text{ MHz}^{**}$ $-I_E = 8,5\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 600 MHz $-I_E = 20\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 600 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 25\text{ V}$ C_c typ. 275 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 25\text{ V}$ C_{re} typ. 155 pF

Collector-flange capacitance

 C_{cf} typ. 3 pF* Measured under pulse conditions: $t_p \leq 300\ \mu\text{s}; \delta \leq 0,02$.** Measured under pulse conditions: $t_p \leq 50\ \mu\text{s}; \delta \leq 0,01$.

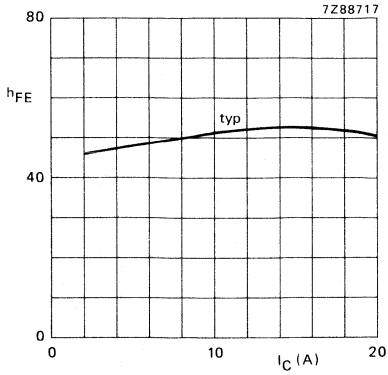


Fig. 4 $V_{CE} = 25$ V; $T_j = 25$ °C.

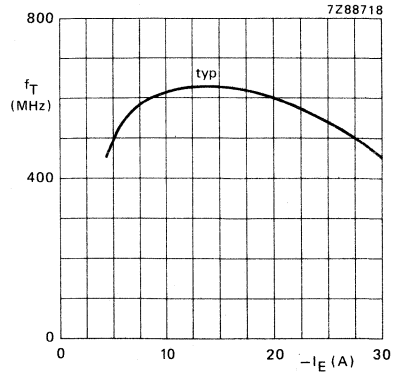


Fig. 5 $V_{CB} = 25$ V; $f = 100$ MHz; $T_j = 25$ °C.

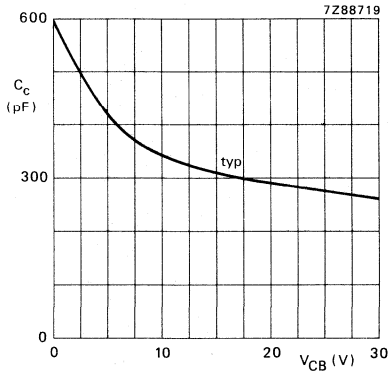
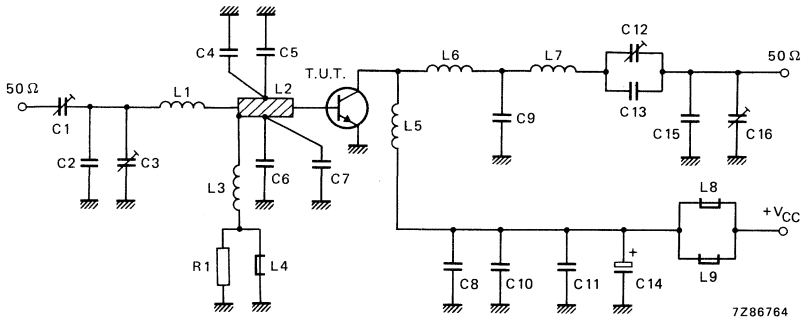


Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

APPLICATION INFORMATION

R.F. performance in narrow band c.w. operation (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	n %
108	28	175	< 17,5 typ. 13,9	> 10,0 typ. 11,0	< 9,6 typ. 8,9	> 65 typ. 70

Fig. 7 Class-B test circuit at $f = 108\text{ MHz}$.

List of components

C1 = C3 = 7 to 100 pF film dielectric trimmer (cat. no. 2222 809 07015)

C2 = C4 = C5 = C6 = C7 = 100 pF (500 V) multilayer ceramic chip capacitor (ATC[▲]); except for C2 these capacitors are placed 7 mm from transistor edge

C8 = C10 = 470 pF multilayer ceramic chip capacitor (cat. no. 2222 856 13471)

C9 = C15 = 40 pF, parallel connection of 4 x 10 pF lead feed-through capacitors (cat. no. 2222 702 05109)

C11 = 100 nF multilayer ceramic chip capacitor (cat. no. 2222 852 59104)

C12 = C16 = 7 to 47 pF precision tuning capacitor (cat. no. 2222 805 00174)

C13 = 19 pF, parallel connection of 4 x 4,7 pF lead feed-through capacitors (cat. no. 2222 702 04478)

C14 = 6,8 μF /63 V electrolytic capacitor

L1 = Cu strip (10 mm x 4 mm x 0,5 mm)

L2 = strip on printed-circuit board

L3 = 7 turns closely wound enamelled Cu wire (0,3 mm); int. dia. 3,0 mm; leads 2 x 6 mm

L4 = L8 = L9 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L5 = 3 turns enamelled Cu wire (1,6 mm); int. dia. 8 mm; length 9 mm; leads 2 x 5 mm

L6 = Cu strip (27 mm x 9 mm x 0,5 mm)

L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 8 mm; length 9 mm; leads 2 x 10 mm

L2 is strip on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16 in.

R1 = 10 Ω carbon resistor[▲] ATC means American Technical Ceramics.

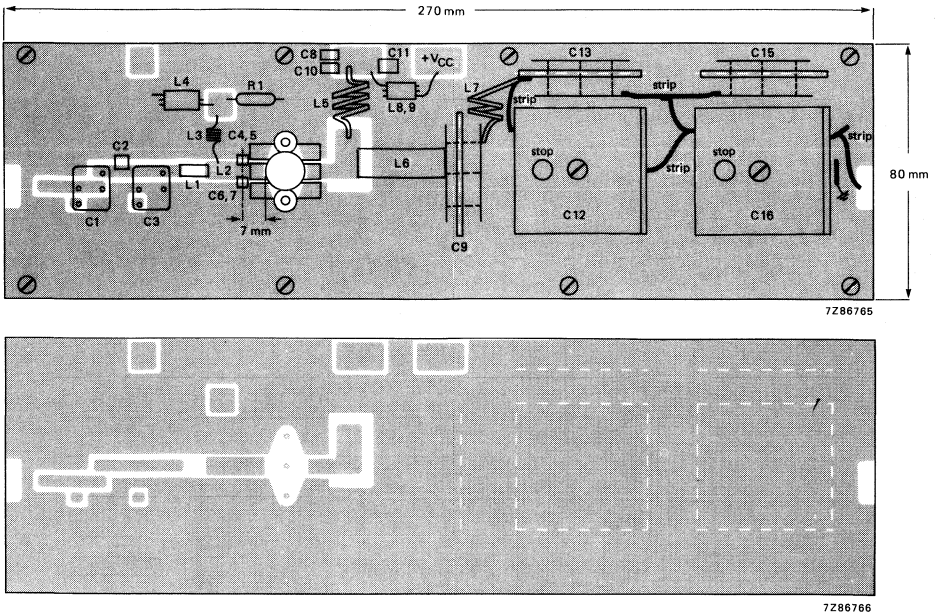


Fig. 8 Component layout and printed-circuit board for 108 MHz class-B test circuit. (Dimensions in mm.)

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by means of fixing screws. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

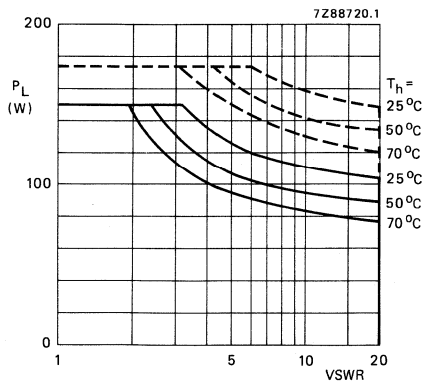


Fig. 9 R.F. SOAR. — $f > 1$ MHz (continuous);
 - - - short time operation during mismatch ($f > 1$ MHz).

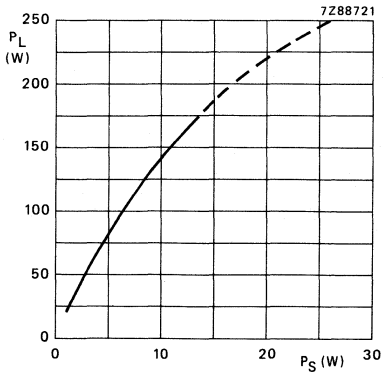


Fig. 10 Load power as a function of source power.

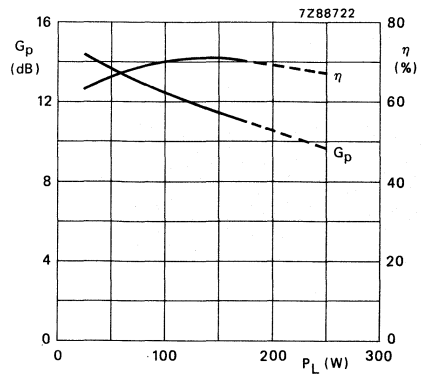


Fig. 11 Power gain and efficiency as a function of source power.

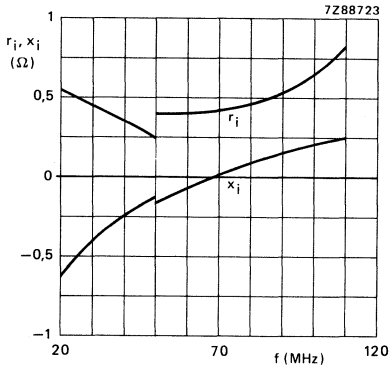


Fig. 12 Input impedance (series components).

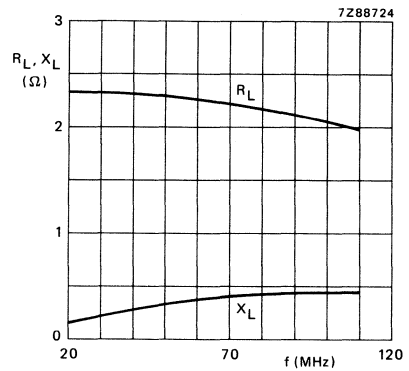


Fig. 13 Load impedance (series components).

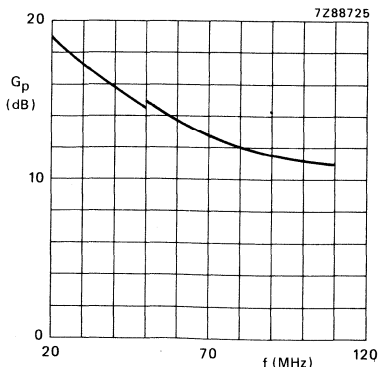


Fig. 14 Power gain as a function of frequency.

Conditions for Figs 10 and 11:

Test circuit tuned for each power level;
 typical values; $V_{CE} = 28 \text{ V}$; $f = 108 \text{ MHz}$;
 $T_h = 25 \text{ }^\circ\text{C}$; class-B operation.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 175 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$; class-B operation.

OPERATING NOTE for Figs 12, 13 and 14:

Below 50 MHz a base-emitter resistor of $4,7 \text{ } \Omega$ is recommended to avoid oscillation.

This resistor must be effective for r.f. only.

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers for television transmitters and transposers. Diffused emitter ballasting resistors and the application of **gold sandwich metallization** ensure an optimum temperature profile and excellent reliability properties.

The transistor has a 1/4" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

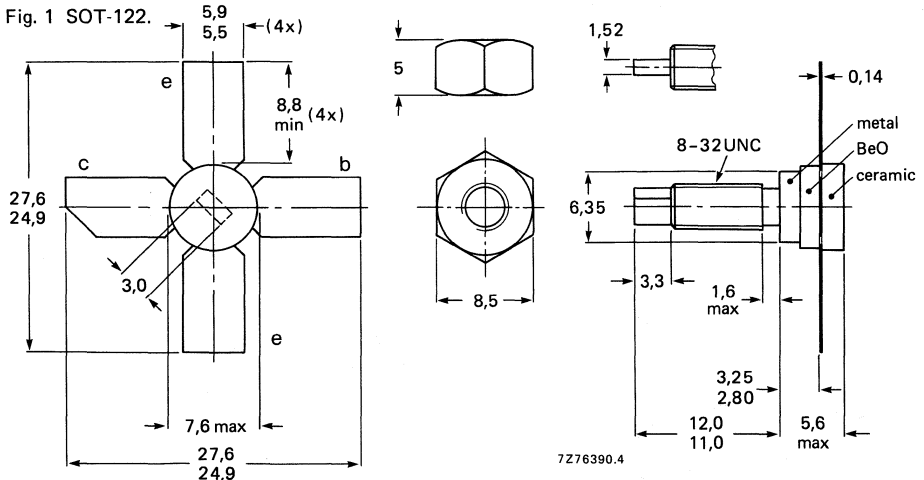
R.F. performance mode of operation	f_{vision} MHz	V_{CE} V	I_{C} A	T_{h} °C	d_{im}^* dB	$P_{\text{O sync}}^*$ W	G_{p} dB
class-A; linear amplifier	224,25	25	0,46	70	-60	> 1,5	> 18
	224,25	25	0,46	25	-60	typ. 1,7	typ. 20

* 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.

PRODUCT SAFETY 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

V_{CESM} max. 60 V

V_{CEO} max. 30 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

(peak value); $f > 1$ MHz

I_C ; $I_C(AV)$ max. 1,5 A

I_{CM} max. 3,5 A

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

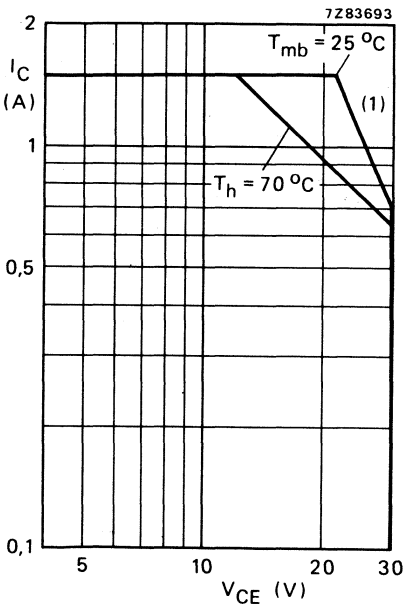
P_{tot} max. 32,5 W

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.

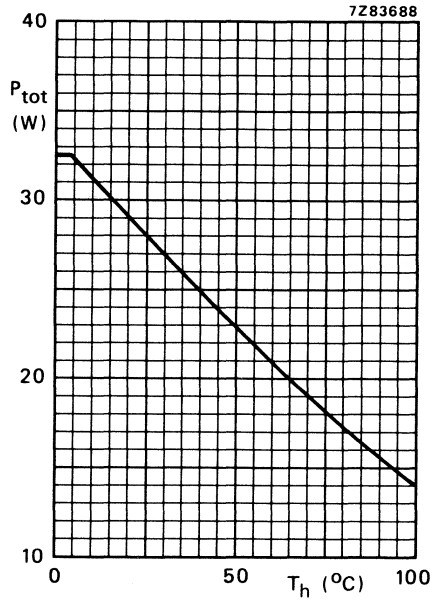


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base

(dissipation = 12 W; $T_{mb} = 77$ °C; i.e. $T_h = 70$ °C)

$R_{th j-mb} = 5,6$ K/W

From mounting base to heatsink

$R_{th mb-h} = 0,6$ K/W

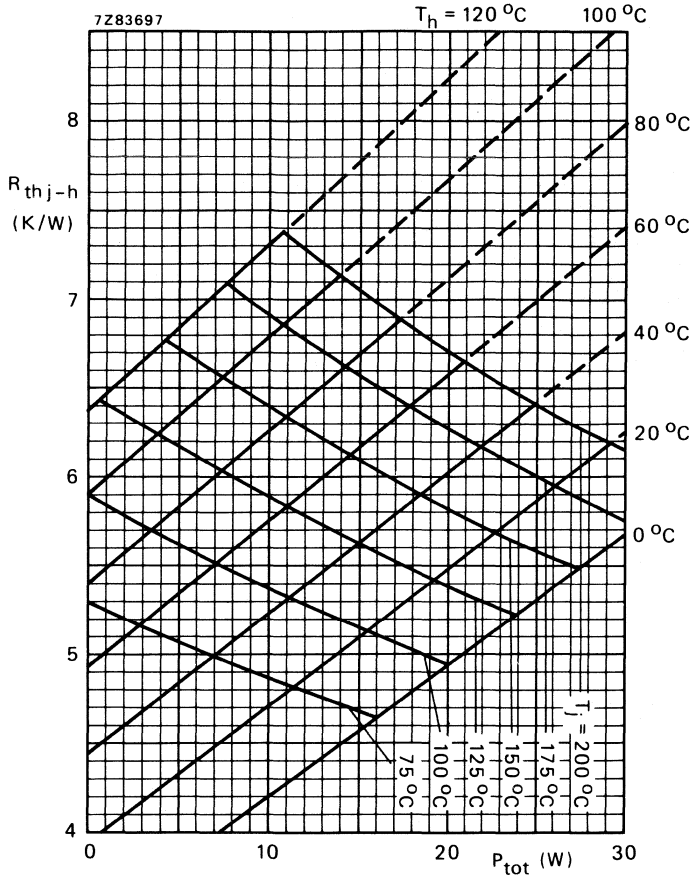


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,6\text{ K/W}$).

Example

Nominal class-A operation; $V_{CE} = 25\text{ V}$; $I_C = 0,46\text{ A}$; $T_h = 70\text{ }^\circ\text{C}$.

Fig. 4 shows: $R_{th\ j-h}$ max. $6,13\text{ K/W}$
 T_j max. $140,5\text{ }^\circ\text{C}$

Typical device: $R_{th\ j-h}$ typ. $5,45\text{ K/W}$
 T_j typ. $133\text{ }^\circ\text{C}$

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 10\text{ mA}$

open base; $I_C = 50\text{ mA}$

$V_{(BR)CES} > 60\text{ V}$

$V_{(BR)CEO} > 30\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 4\text{ mA}$

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

Collector cut-off current

$V_{BE} = 0; V_{CE} = 30\text{ V}$

$I_{CES} < 4\text{ mA}$

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

open base

$E_{SBO} > 2\text{ mJ}$

$R_{BE} = 10\ \Omega$

$E_{SBR} > 2\text{ mJ}$

D.C. current gain *

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

h_{FE} typ. 65
15 to 120

Collector-emitter saturation voltage *

$I_C = 1,0\text{ A}; I_B = 0,1\text{ A}$

V_{CEsat} typ. 0,8 V

Transition frequency at $f = 500\text{ MHz}$ **

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

f_T typ. 1,20 GHz

$-I_E = 1,0\text{ A}; V_{CB} = 25\text{ V}$

f_T typ. 1,15 GHz

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

$I_E = I_e = 0; V_{CB} = 25\text{ V}$

C_C typ. 18 pF

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

$I_C = 20\text{ mA}; V_{CE} = 25\text{ V}$

C_{re} typ. 9,2 pF

→ Collector-stud capacitance

C_{cs} typ. 1,2 pF

* Measured under pulse conditions: $t_p \leq 300\ \mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\ \mu\text{s}; \delta \leq 0,01$.

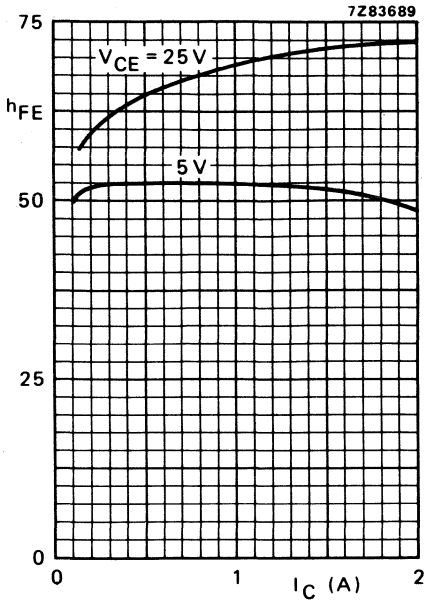


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

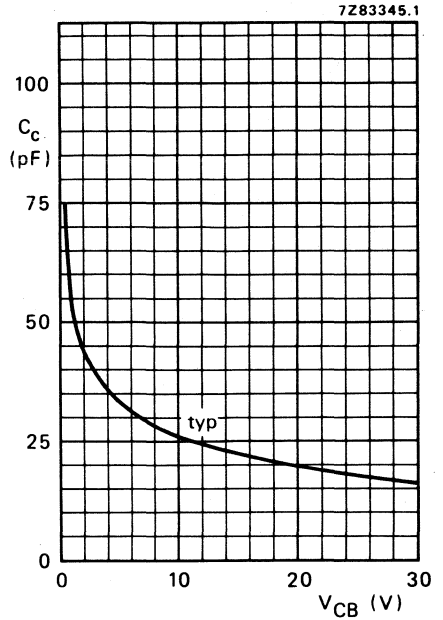


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

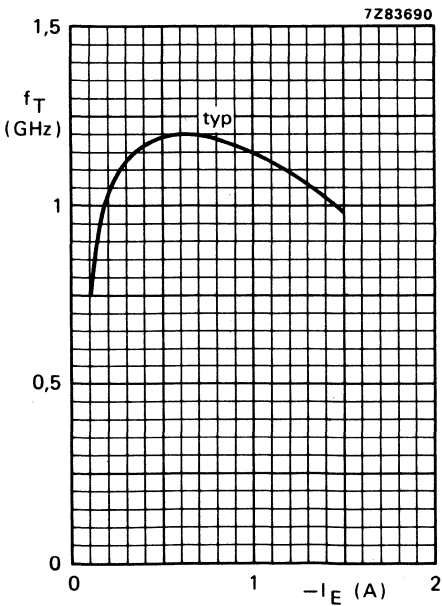


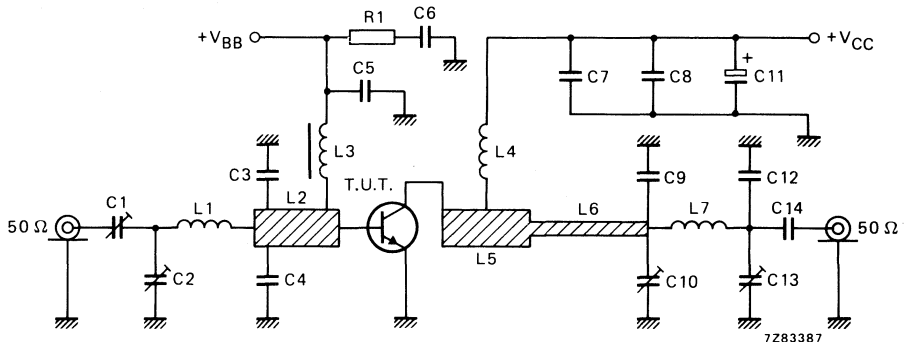
Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_{C} (A)	T_{h} ($^{\circ}\text{C}$)	d_{im} (dB)*	$P_{\text{o sync}}$ (W)*	G_{p} (dB)
224,25	25	0,46	70	-60	> 1,5	> 18
224,25	25	0,46	70	-60	typ. 1,7	typ. 19,5
224,25	25	0,46	25	-60	typ. 1,8	typ. 20

* 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 $f_{\text{vision}} = 224,25$ MHz.

List of components:

C1 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)

C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = C4 = 82 pF multilayer ceramic chip capacitor (ATC[▲]), placed 7 mm from transistor edge

C5 = C7 = C14 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)

C6 = C8 = 330 nF polyester capacitor

C9 = 43 pF (500 V) multilayer ceramic chip capacitor (ATC[▲])

C10 = C13 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

C11 = 10 μF /40 V solid aluminium electrolytic capacitorC12 = 18 pF (500 V) multilayer ceramic chip capacitor (ATC[▲])

L1 = 49 nH; 4 turns enamelled Cu wire (1,0 mm); int. dia. 3,6 mm; length 6,3 mm; leads 2 x 5 mm

L2 = L5 = 30 Ω stripline (10,0 mm x 6,0 mm)L3 = 0,1 μH ; microchoke (cat. no. 4322 057 01070)

L4 = 130 nH; 6 turns enamelled Cu wire (1,0 mm); int. dia. 6,0 mm; length 10,7 mm; leads 2 x 5 mm

L6 = 60 Ω stripline (50,5 mm x 2,0 mm)

L7 = 30 nH; 4 turns enamelled Cu wire (1,0 mm); int. dia. 3,0 mm; length 7,9 mm; leads 2 x 5 mm

L2, L5 and L6 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16".R1 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

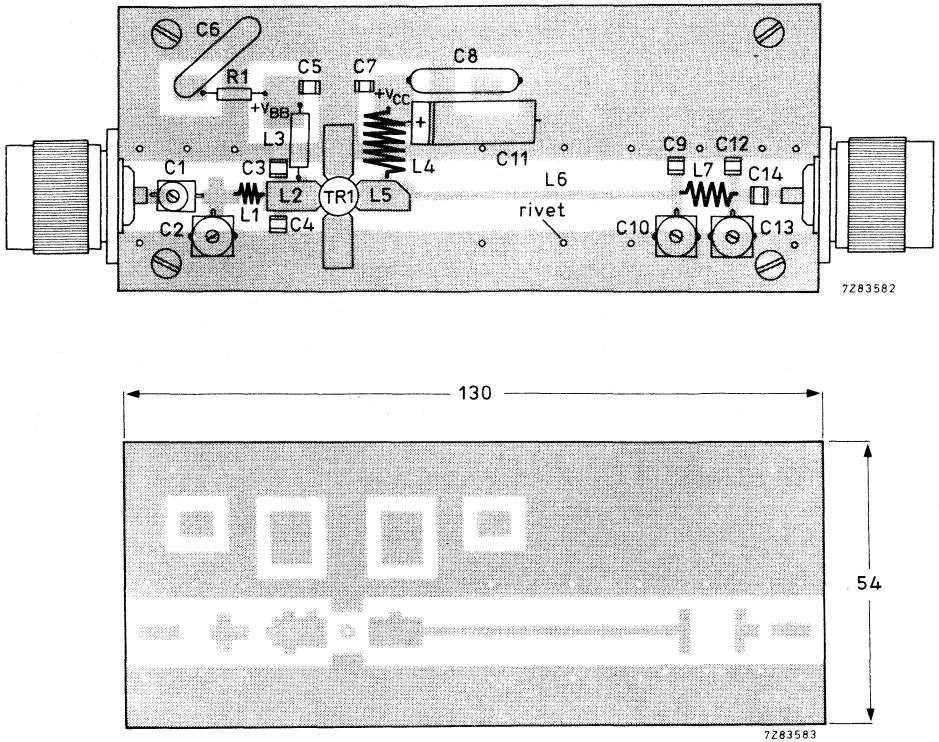


Fig. 9 Component layout and printed-circuit board for 224,25 MHz test circuit.

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, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

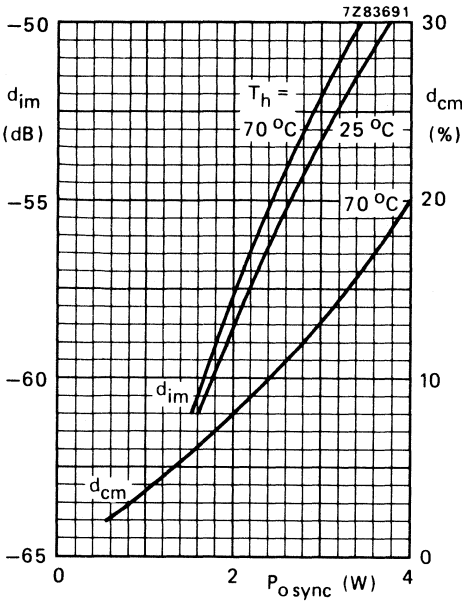


Fig. 10 Intermodulation distortion (d_{im}^*) and cross-modulation distortion (d_{cm}^{**}) as a function of output power.

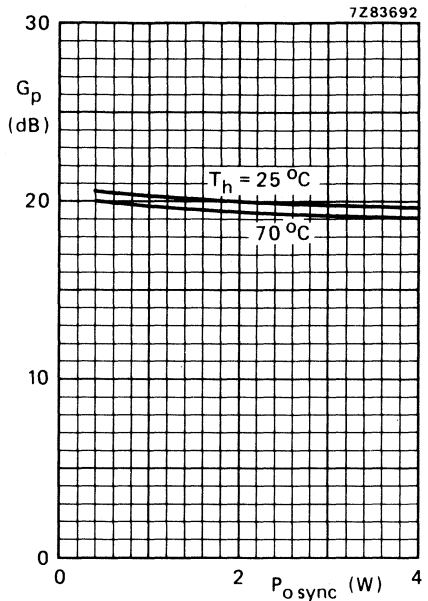


Fig. 11 Power gain as a function of output power.

Conditions for Figs 10 and 11:

Typical values; $V_{CE} = 25$ V; $I_C = 0,46$ A; $f_{\text{vision}} = 224,25$ MHz.

* 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.

** Two-tone test method (vision carrier 0 dB, sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB.

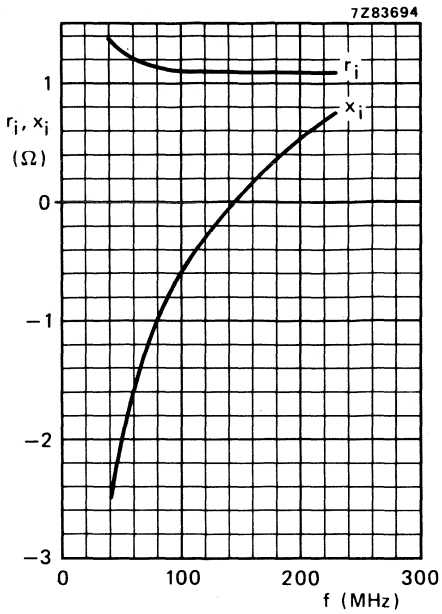


Fig. 12 Input impedance (series components).

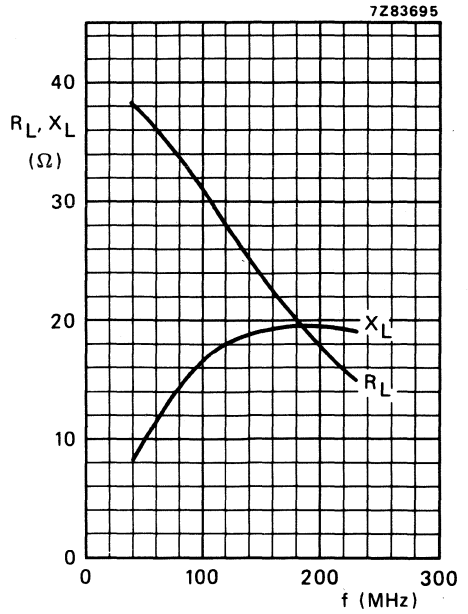


Fig. 13 Load impedance (series components).

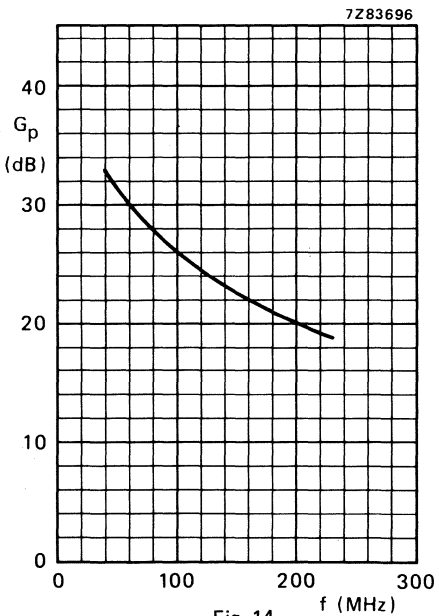


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 25 \text{ V}$; $I_C = 0,46 \text{ A}$;

$T_h = 70 \text{ }^\circ\text{C}$.

NOTES

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers for television transmitters and transposers. Diffused emitter ballasting resistors and the application of **gold sandwich metallization** ensure an optimum temperature profile and excellent reliability properties. The transistor has a $\frac{1}{4}$ " capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance

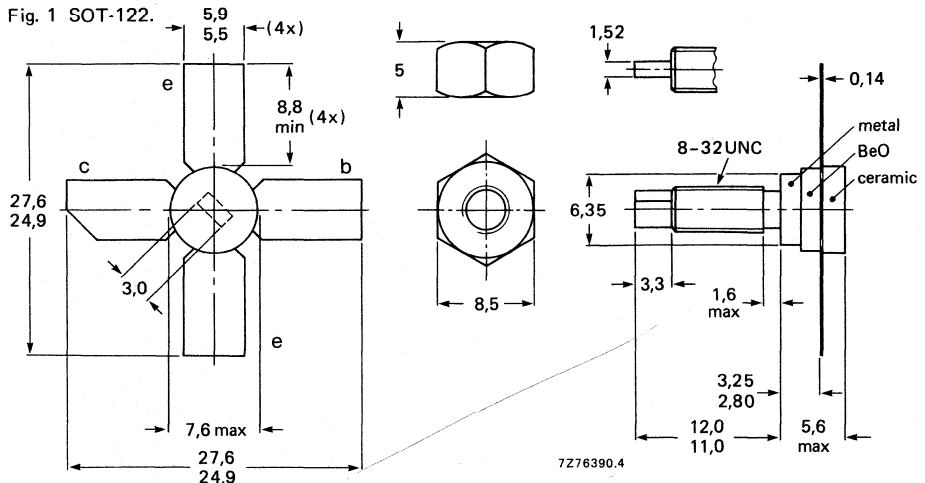
mode of operation	f_{vision} MHz	V_{CE} V	I_{C} A	T_{h} °C	d_{im}^* dB	$P_{\text{O sync}}^*$ W	G_{p} dB
class-A; linear amplifier	224,25	25	0,8	70	-58	> 5	> 15
	224,25	25	0,8	25	-58	typ. 7	typ. 16,5

* 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

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.

PRODUCT SAFETY 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. 60 V

open base

V_{CEO} max. 30 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

$I_C; I_{C(AV)}$ max. 3 A

d.c. or average

I_{CM} max. 6 A

(peak value); $f > 1$ MHz

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

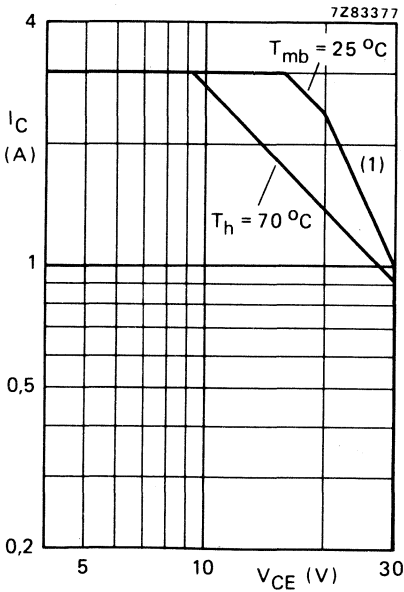
P_{tot} max. 48 W

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.

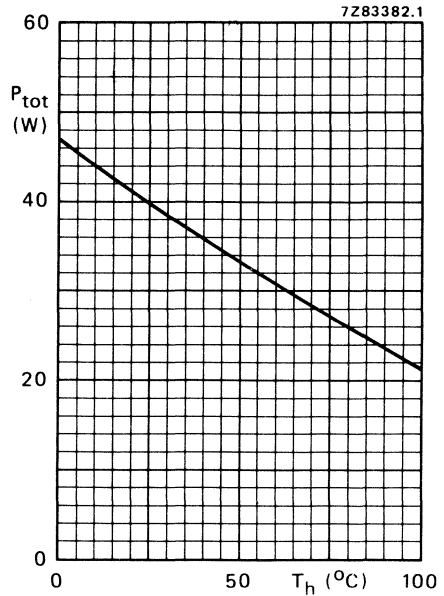


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base

(dissipation = 20 W; $T_{mb} = 82$ °C; i.e. $T_h = 70$ °)

$R_{th j-mb} = 3,45$ K/W

From mounting base to heatsink

$R_{th mb-h} = 0,6$ K/W

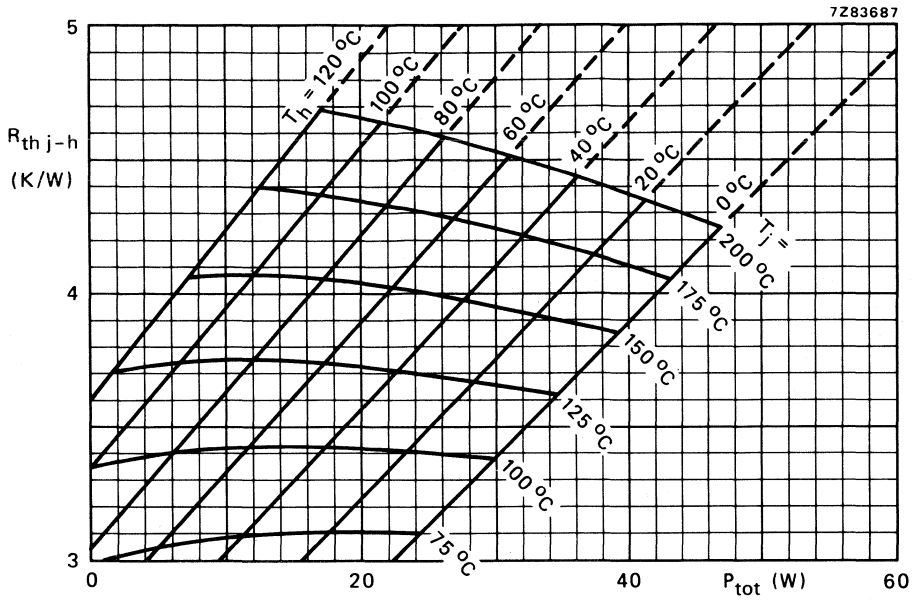


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,6\ K/W$.)

Example

Nominal class-A operation: $V_{CE} = 25\ V$; $I_C = 0,8\ A$; $T_h = 70\ ^\circ C$.

Fig. 4 shows: $R_{th\ j-h\ max.} = 4,05\ K/W$
 $T_j\ max. = 151\ ^\circ C$

Typical device: $R_{th\ j-h\ typ.} = 3,80\ K/W$
 $T_j\ typ. = 146\ ^\circ C$

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$$V_{BE} = 0; I_C = 25\text{ mA}$$

open base; $I_C = 100\text{ mA}$

$$V_{(BR)CES} > 60\text{ V}$$

$$V_{(BR)CEO} > 30\text{ V}$$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$

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

Collector cut-off current

$$V_{BE} = 0; V_{CE} = 30\text{ V}$$

$$I_{CES} < 10\text{ mA}$$

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

open base

$$E_{SBO} > 3\text{ mJ}$$

$$E_{SBR} > 3\text{ mJ}$$

$$R_{BE} = 10\ \Omega$$

D.C. current gain *

$$I_C = 0,8\text{ A}; V_{CE} = 25\text{ V}$$

$$h_{FE} \text{ typ. } 75 \\ 15 \text{ to } 120$$

Collector-emitter saturation voltage *

$$I_C = 2,0\text{ A}; I_B = 0,2\text{ A}$$

$$V_{CEsat} \text{ typ. } 1,0\text{ V}$$

Transition frequency at $f = 500\text{ MHz}$ **

$$-I_E = 0,8\text{ A}; V_{CB} = 25\text{ V}$$

$$f_T \text{ typ. } 1,0\text{ GHz}$$

$$-I_E = 2,0\text{ A}; V_{CB} = 25\text{ V}$$

$$f_T \text{ typ. } 1,1\text{ GHz}$$

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

$$I_E = I_e = 0; V_{CB} = 25\text{ V}$$

$$C_c \text{ typ. } 35\text{ pF}$$

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

$$I_C = 100\text{ mA}; V_{CE} = 25\text{ V}$$

$$C_{re} \text{ typ. } 20\text{ pF}$$

→ Collector-stud capacitance

$$C_{cs} \text{ typ. } 1,2\text{ pF}$$

* Measured under pulse conditions: $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\ \mu\text{s}$; $\delta \leq 0,01$.

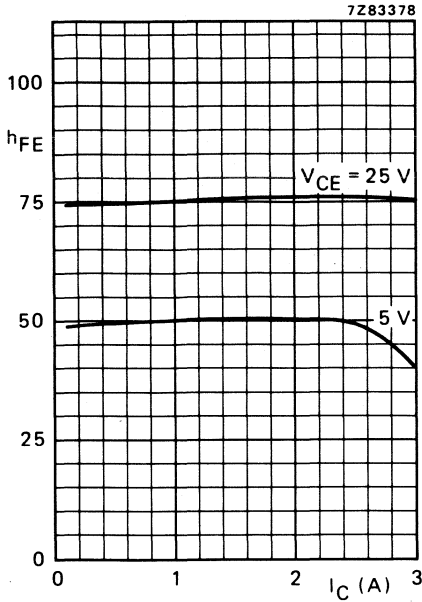


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

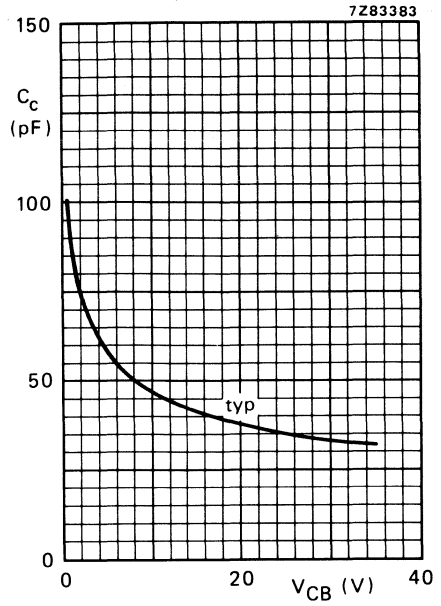


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

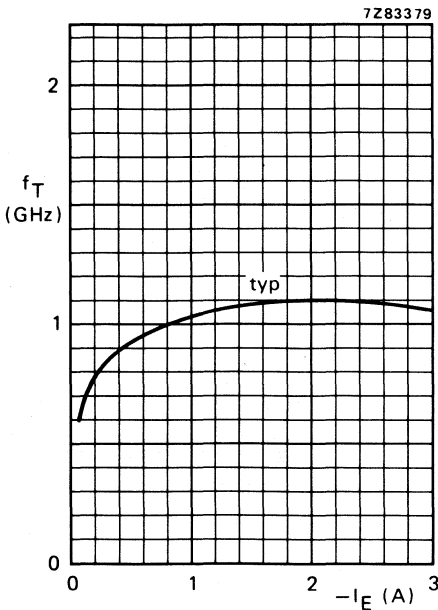


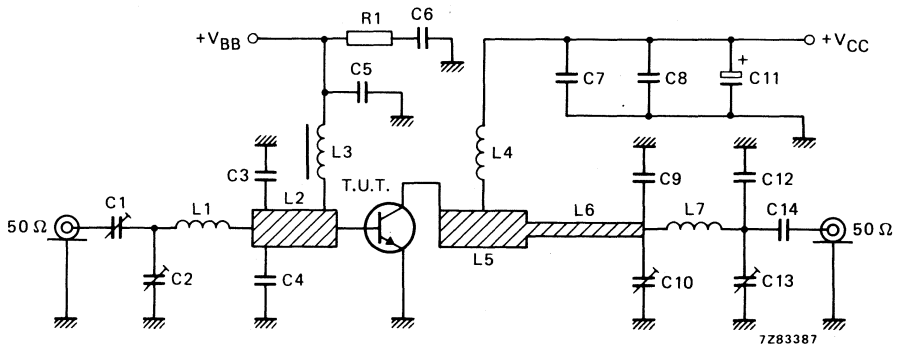
Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_{C} (A)	T_{h} ($^{\circ}\text{C}$)	d_{im} (dB)*	$P_{\text{O sync}}$ (W)*	G_{p} (dB)
224,25	25	0,8	70	-58	> 5	> 15
224,25	25	0,8	70	-58	typ. 5,8	typ. 16,2
224,25	25	0,8	25	-58	typ. 7	typ. 16,5

* 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 $f_{\text{vision}} = 224,25$ MHz.

List of components:

C1 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)

C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = C4 = 82 pF multilayer ceramic chip capacitor (ATC[▲]), placed 7 mm from transistor edge

C5 = C7 = C14 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)

C6 = C8 = 330 nF polyester capacitor

C9 = 43 pF (500 V) multilayer ceramic chip capacitor (ATC[▲])

C10 = C13 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

C11 = 10 μF /40 V solid aluminium electrolytic capacitorC12 = 18 pF (500 V) multilayer ceramic chip capacitor (ATC[▲])

L1 = 49 nH; 4 turns enamelled Cu wire (1,0 mm); int. dia. 3,6 mm; length 6,3 mm; leads 2 x 5 mm

L2 = L5 = 30 Ω stripline (10,0 mm x 6,0 mm)L3 = 0,1 μH ; microchoke (cat. no. 4322 057 01070)

L4 = 130 nH; 6 turns enamelled Cu wire (1,0 mm); int. dia. 6,0 mm; length 10,7 mm; leads 2 x 5 mm

L6 = 60 Ω stripline (50,5 mm x 2,0 mm)

L7 = 30 nH; 4 turns enamelled Cu wire (1,0 mm); int. dia. 3,0 mm; length 7,9 mm; leads 2 x 5 mm

L2, L5 and L6 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16".R1 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

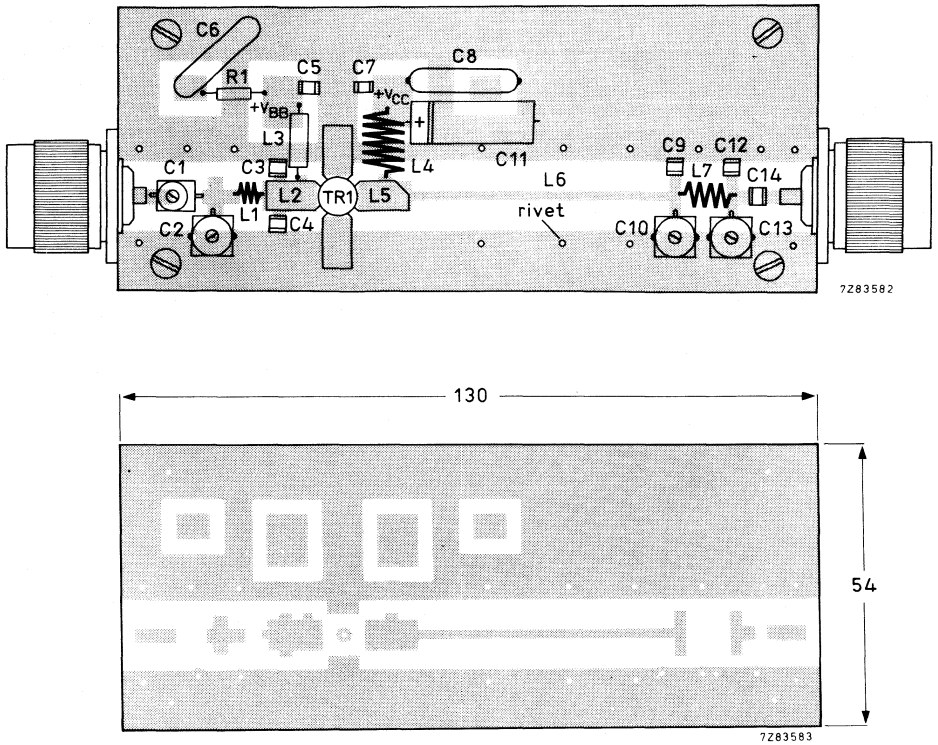


Fig. 9 Component layout and printed-circuit board for 224,25 MHz test circuit.

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, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

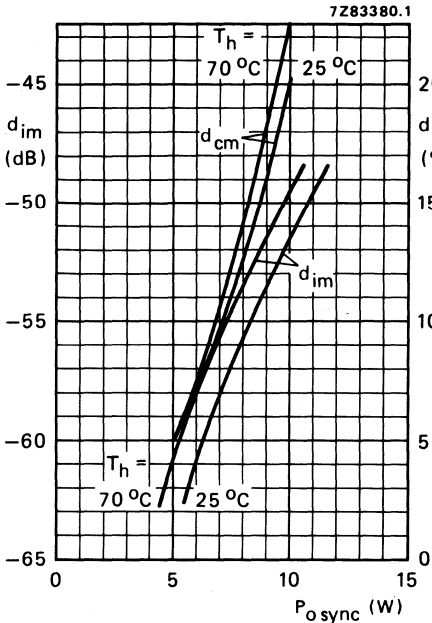


Fig. 10 Intermodulation distortion (d_{im}^*) and cross-modulation distortion (d_{cm}^{**}) as a function of output power.

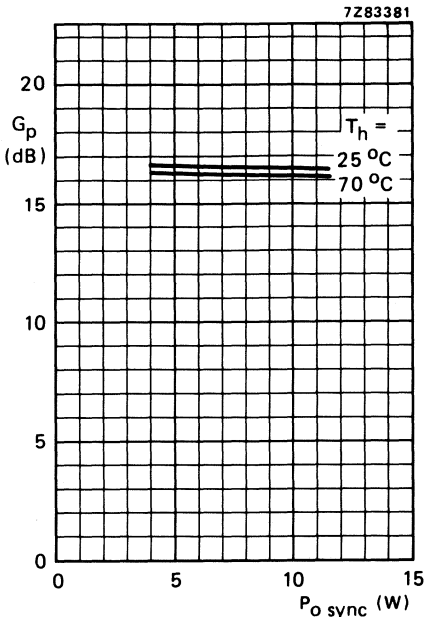


Fig. 11 Power gain as a function of output power.

Conditions for Figs 10 and 11:

Typical values; $V_{CE} = 25\text{ V}$; $I_C = 0,8\text{ A}$; $f_{vision} = 224,25\text{ MHz}$.

* 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 $\leq -75\text{ dB}$.

** Two-tone test method (vision carrier 0 dB , sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB .

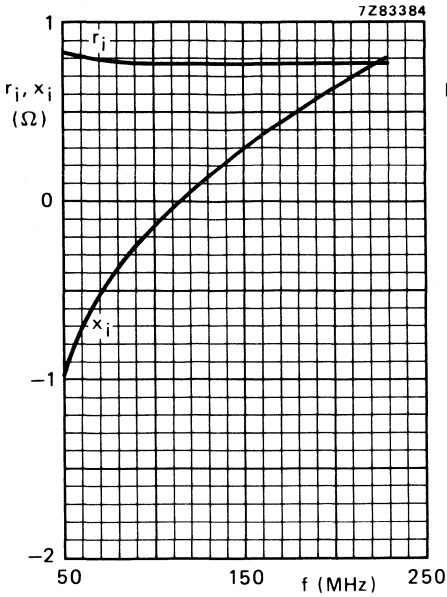


Fig. 12 Input impedance (series components).

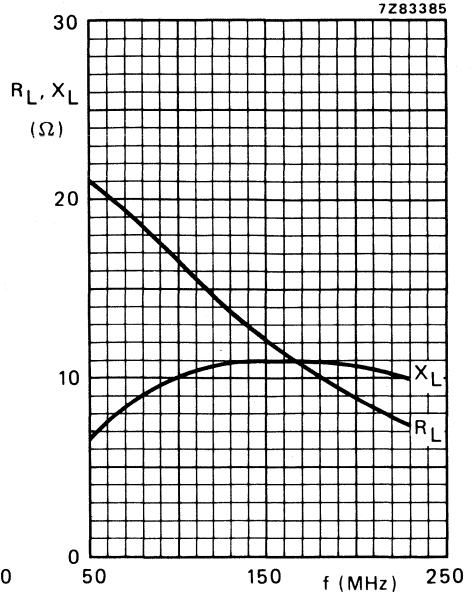


Fig. 13 Load impedance (series components).

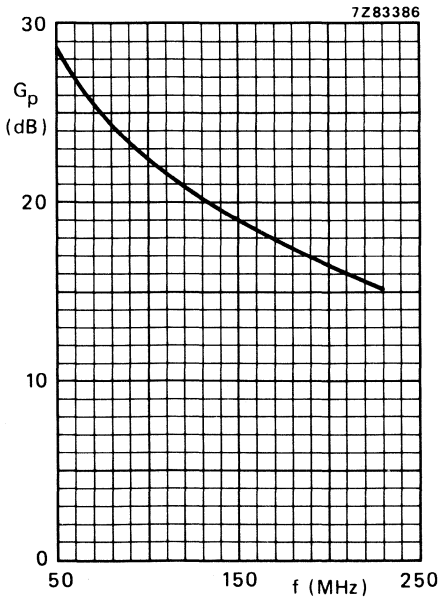


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 25$ V; $I_C = 0,8$ A;
 $T_h = 70$ °C.

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers of television transmitters and transposers.

Features:

- diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a $\frac{3}{8}$ " 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

mode of operation	f_{vision} MHz	V_{CE} V	I_{C} A	T_{h} °C	d_{im}^* dB	$P_{\text{O sync}}^*$ W	G_{p} dB
class-A	224,25	25	1,5	70	-55	> 10	> 16
class-A	224,25	25	1,5	25	-55	typ. 12,5	typ. 17,2

* 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

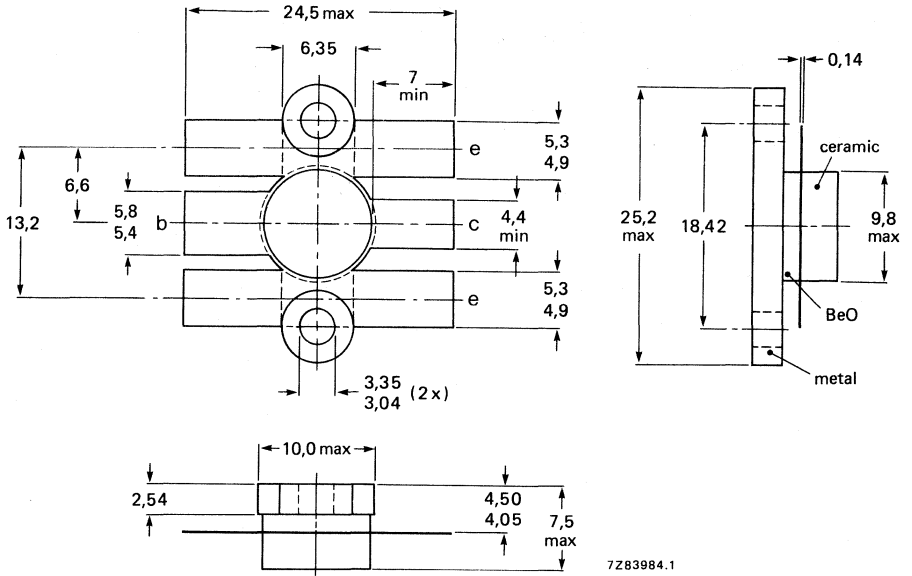
SOT-160 (see Fig. 1).

PRODUCT SAFETY 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-160.

Dimensions in mm



Torque on screw: min. 0,6 Nm (6 kg cm)

max. 0,75 Nm (7,5 kg cm)

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

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

V_{CESM} max. 60 V

open base

V_{CEO} max. 32 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

$I_C; I_{C(AV)}$ max. 4 A

d.c. or average

I_{CM} max. 12 A

(peak value); $f > 1$ MHz

Total power dissipation at $T_{mb} = 25^\circ\text{C}$

P_{tot} max. 82 W

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

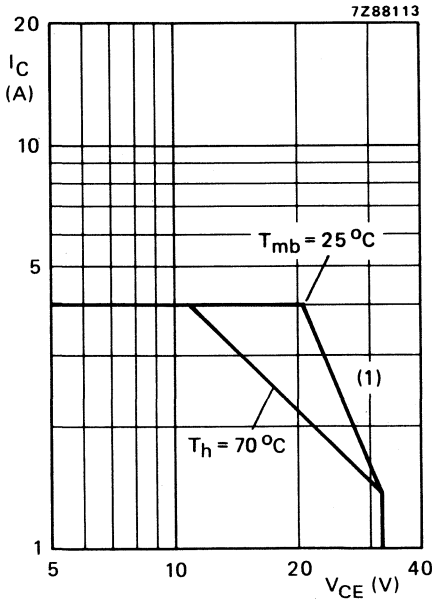
P_{rf} max. 100 W

Storage temperature

T_{stg} -65 to +150 $^\circ\text{C}$

Operating junction temperature

T_j max. 200 $^\circ\text{C}$



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

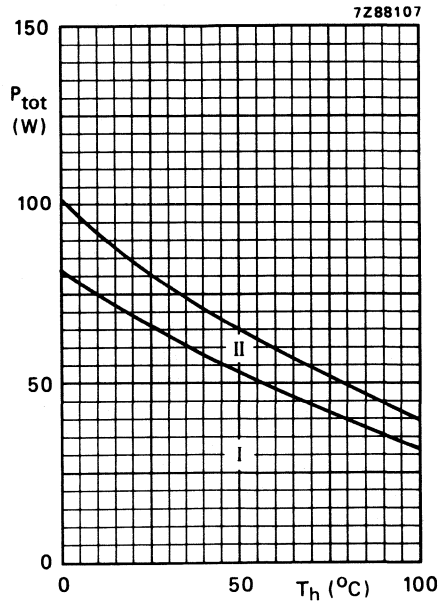


Fig. 3 Power derating curves vs. temperature.

- I Continuous d.c. (including r.f. class-A) operation
- II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 37,5 W; $T_{mb} = 82^\circ\text{C}$, i.e. $T_h = 70^\circ\text{C}$)

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

$R_{th\ j-mb(dc)}$ = 2,55 K/W

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

$R_{th\ j-mb(rf)}$ = 2,10 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 K/W

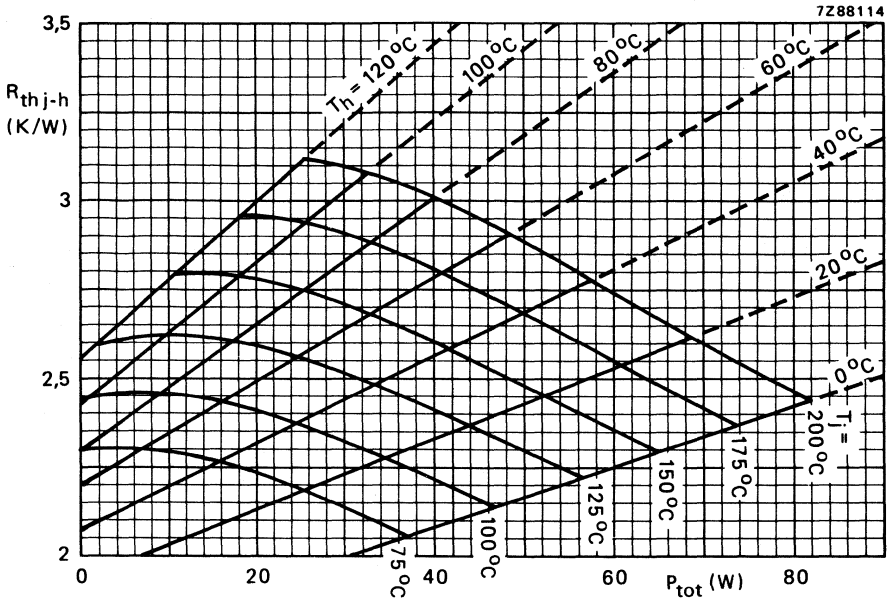


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{thmb-h} = 0,3 \text{ K/W.}$)

Example

Nominal class-A operation (without r.f. signal): $V_{CE} = 25 \text{ V}$; $I_C = 1,5 \text{ A}$; $T_h = 70 \text{ }^\circ\text{C}$.

Fig. 4 shows: R_{thj-h} max. 2,85 K/W
 T_j max. 177 °C

Typical device: R_{thj-h} typ. 2,30 K/W
 T_j typ. 156 °C

CHARACTERISTICS

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

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 15\text{ mA}$ $V_{(BR)CES} > 60\text{ V}$ open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 32\text{ V}$

Emitter-base breakdown voltage

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

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 32\text{ V}$ $I_{CES} < 5\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 4,5\text{ mJ}$ $R_{BE} = 10\text{ }\Omega$ $E_{SBR} > 4,5\text{ mJ}$

D.C. current gain*

 $I_C = 1,6\text{ A}; V_{CE} = 25\text{ V}$ h_{FE} typ. 50
20 to 120

Collector-emitter saturation voltage*

 $I_C = 3,5\text{ A}; I_B = 0,35\text{ A}$ V_{CEsat} typ. 1,4 VTransition frequency at $f = 500\text{ MHz}^{**}$ $-I_E = 1,6\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 2 GHz $-I_E = 3,5\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 2 GHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 25\text{ V}$ C_C typ. 50 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 25\text{ V}$ C_{re} typ. 31 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

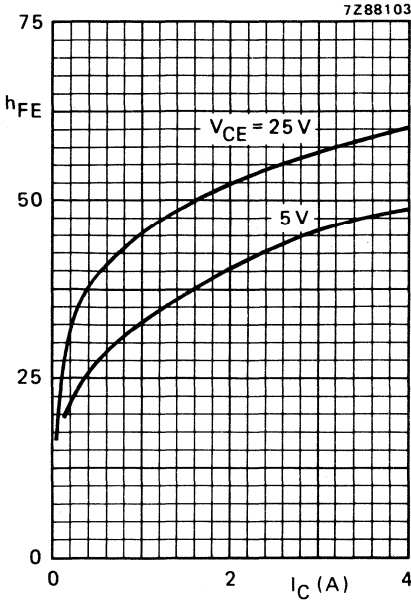


Fig. 5 Typical values; $T_j = 25^\circ\text{C}$.

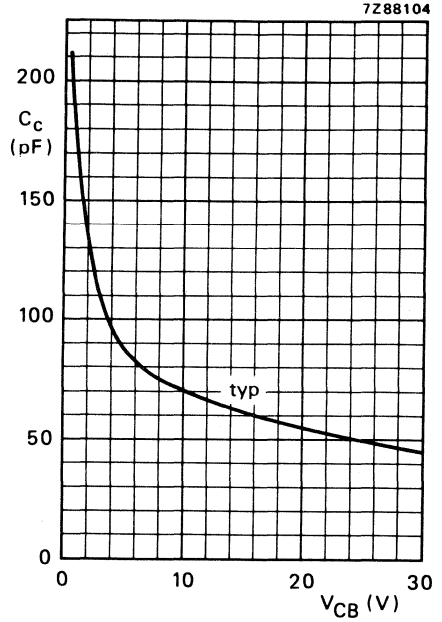


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

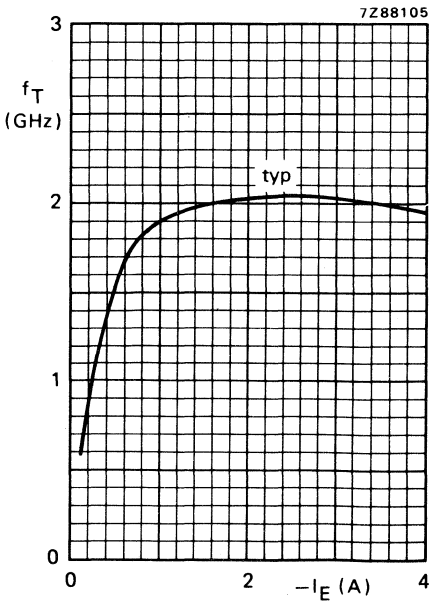


Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25^\circ\text{C}$.

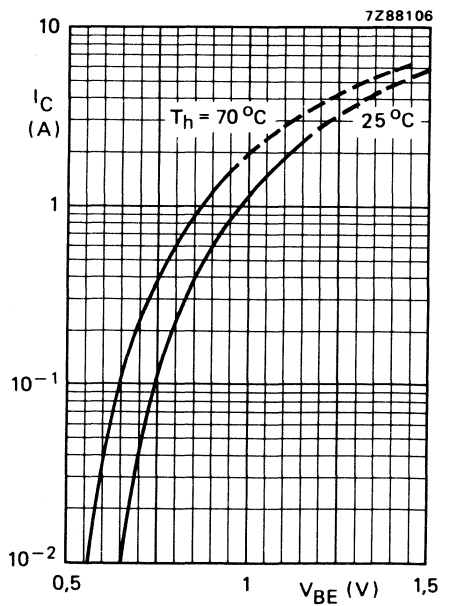


Fig. 8 Typical values; $V_{CE} = 25\text{ V}$.

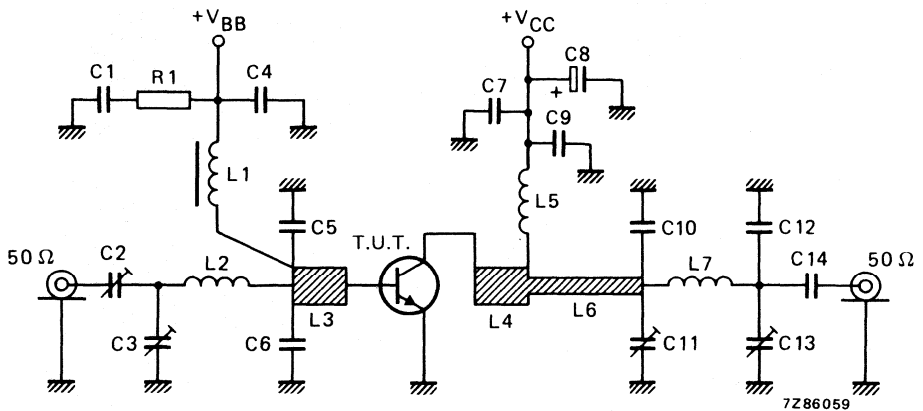
APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)*	I_{C} (A)	T_{h} (°C)	d_{im} (dB)**	$P_{\text{o sync}}$ (W)**	G_{p} (dB)
224,25	25	1,5	70	-55	> 10	> 16
			70	-55	typ. 11	typ. 16,8
			70	-52	typ. 13	typ. 16,8
			25	-55	typ. 12,5	typ. 17,2

* The transistor is capable of operating up to 28 V.

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

Fig. 9 Class-A test circuit at $f_{\text{vision}} = 224,25$ MHz.

List of components:

C1 = C9 = 330 nF polyester capacitor

C2 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 05003)

C3 = C11 = C13 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

C4 = C7 = C14 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)

C5 = C6 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC[▲])C8 = 10 μ F/63 V solid tantalum capacitorC10 = 82 pF (500 V) multilayer ceramic chip capacitor (ATC[▲])C12 = 30 pF (500 V) multilayer ceramic chip capacitor (ATC[▲])L1 = 1 μ H microchoke (cat. no. 4322 057 01080)

L2 = 3 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 14,0 mm; leads 2 x 3 mm

L3 = L4 = 32 Ω stripline (6,0 mm x 10,0 mm)

L5 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 5,5 mm; length 10,0 mm; leads 2 x 2 mm

L6 = 62 Ω stripline (2,0 mm x 22,5 mm)

L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 4,0 mm; leads 2 x 3 mm

L3, L4 and L6 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16".R1 = 27 Ω carbon resistor[▲] ATC means American Technical Ceramics.

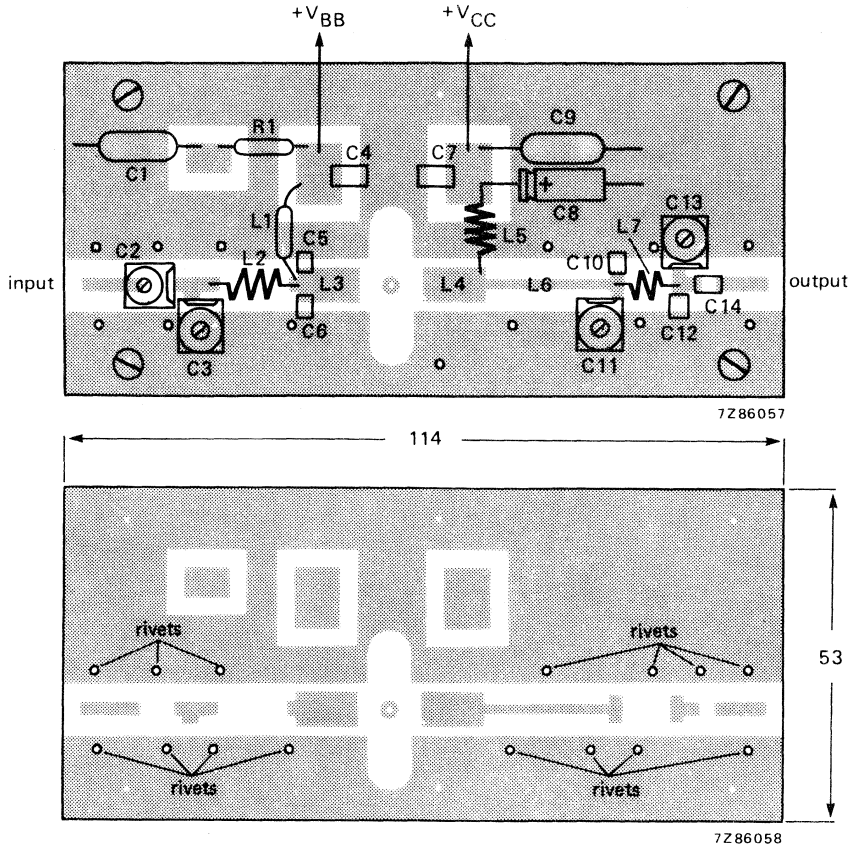


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

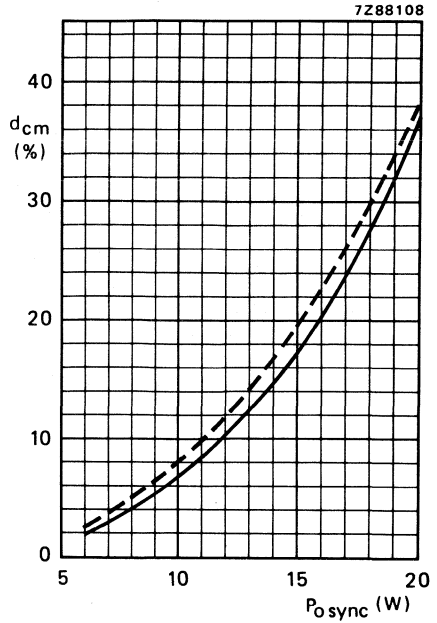
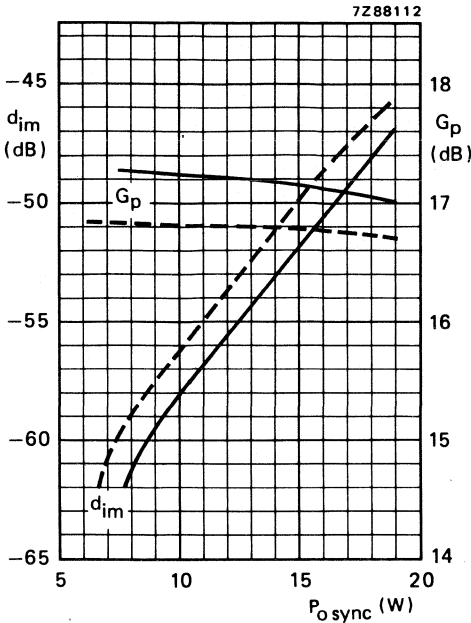


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; $V_{CE} = 25\text{ V}$; $I_C = 1,5\text{ A}$; ——— $T_h = 25^\circ C$; - - - $T_h = 70^\circ C$; $f_{vision} = 224,25\text{ MHz}$.

Ruggedness in class-A operation

The BLV32F is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 15 W (r.m.s. value) or 20 W (P.E.P.) under the following conditions:

$V_{CE} = 25\text{ V}$; $I_C = 1,5\text{ A}$; $T_h = 70^\circ C$; $f = 224,25\text{ MHz}$; $R_{th\ mb-h} = 0,3\text{ K/W}$.

* 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 $\leq -70\text{ dB}$.

** Two-tone test method (vision carrier 0 dB, sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB.

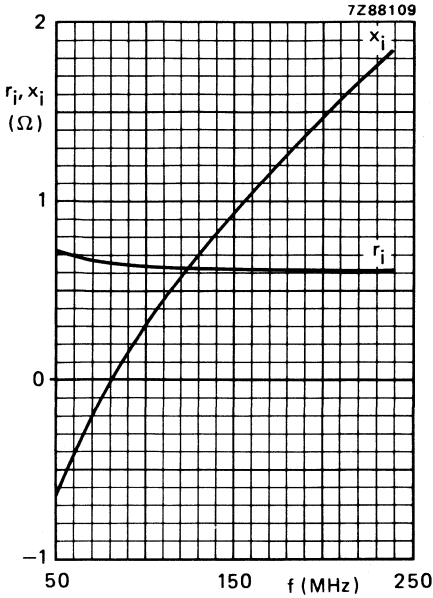


Fig. 13 Input impedance (series components).

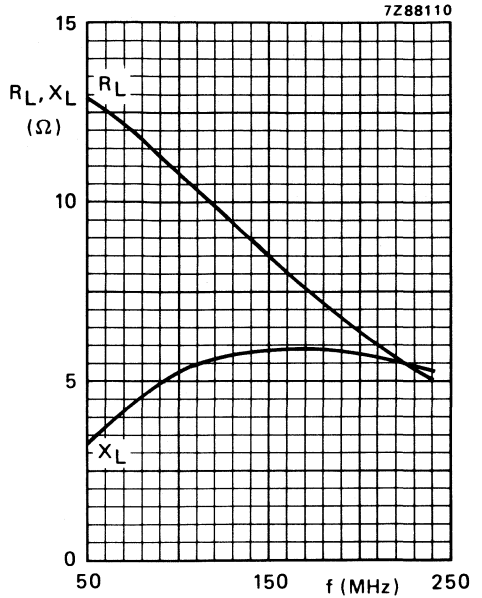


Fig. 14 Load impedance (series components).

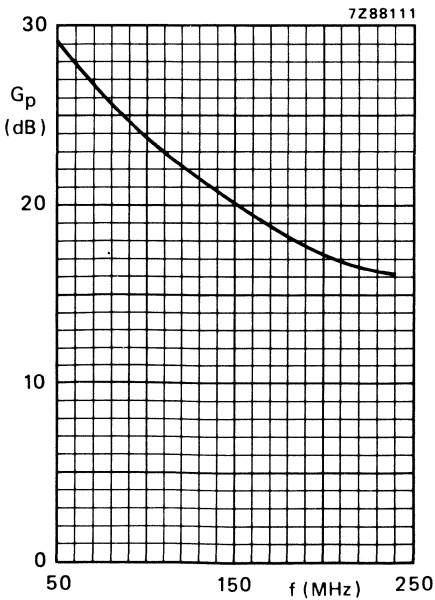


Fig. 15.

Conditions for Figs 13, 14 and 15:
 Typical values; $V_{CE} = 25$ V; $I_C = 1,5$ A;
 class-A operation; $T_h = 70$ °C.

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers for television transmitters and transposers. Diffused emitter ballasting resistors and the application of **gold sandwich metallization** ensure an optimum temperature profile and excellent reliability properties.

The transistor has a 1/2" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

mode of operation	f _{vision} MHz	V _{CE} V	I _C / I _{C(ZS)} A	T _h °C	d _{im} * dB	P _{o sync} * W	G _p dB	sync compr.** sync in (%) / sync out (%)
class-A	224,25	25	3,20	70 25	-55 -55	> 19 typ. 26	> 9 typ. 9,7	
class-AB	224,25	28	0,10	70		typ. 90	typ. 6,5	30/25

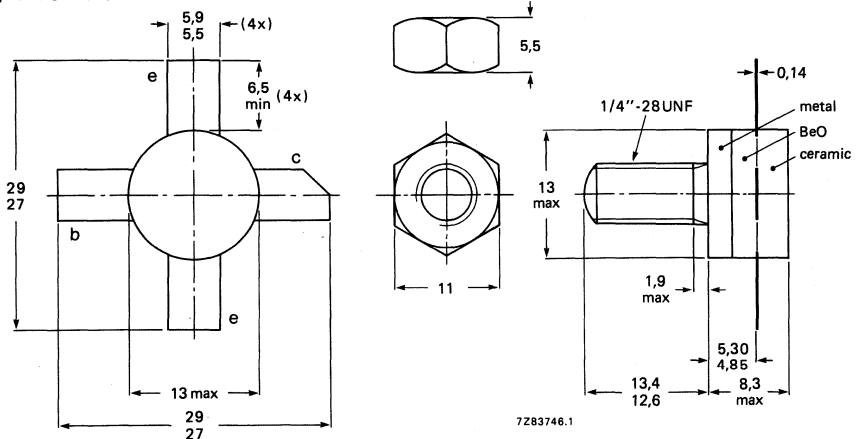
* Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), zero dB corresponds to peak sync level.

** Television service (negative modulation, C.C.I.R. system).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-147.



Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

Diameter of clearance hole in heatsink: max. 6,4 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.

PRODUCT SAFETY 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 $T_{mb} = 25$ °C

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

Storage temperature

Operating junction temperature

V_{CESM} max. 65 V

V_{CEO} max. 33 V

V_{EBO} max. 4 V

$I_C; I_{C(AV)}$ max. 12,5 A

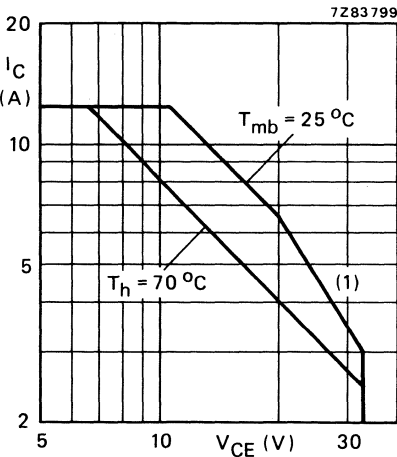
I_{CM} max. 20 A

P_{tot} max. 132 W

P_{rf} max. 165 W

T_{stg} -65 to + 150 °C

T_j max. 200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

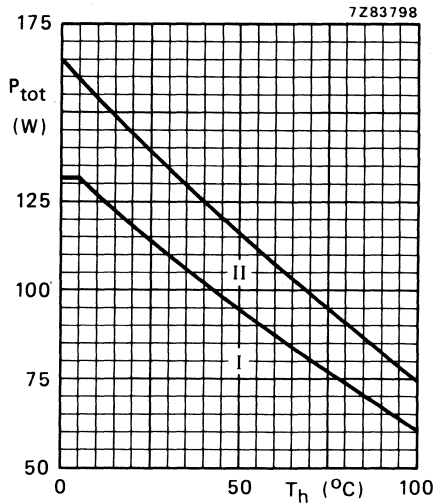


Fig. 3 Power derating curve vs. temperature.

- I Continuous d.c. (including r.f. class-A) operation
- II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 80 W; $T_{mb} = 82$ °C, i.e. $T_h = 70$ °C)

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

$R_{th\ j-mb(dc)}$ = 1,46 K/W

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

$R_{th\ j-mb(rf)}$ = 1,17 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,15 K/W

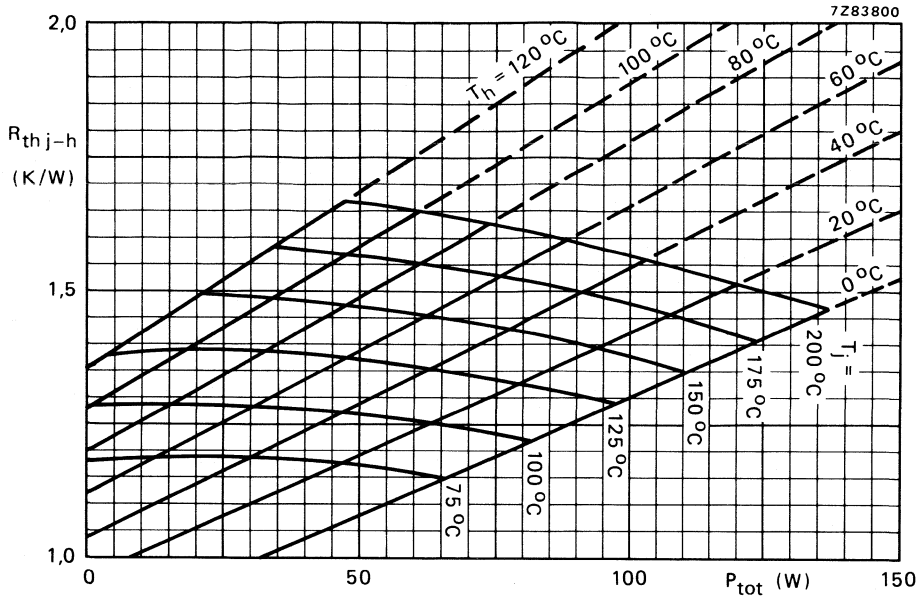


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,15\text{ K/W.}$)

Example

Nominal class-A operation: $V_{CE} = 25\text{ V}$; $I_C = 3,2\text{ A}$; $T_h = 70\text{ °C}$.

Fig. 4 shows: $R_{th\ j-h}$ max. 1,60 K/W
 T_j max. 198 °C

Typical device: $R_{th\ j-h}$ typ. 1,50 K/W
 T_j typ. 190 °C

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 25\text{ mA}$

open base; $I_C = 100\text{ mA}$

$V_{(BR)CES} > 65\text{ V}$

$V_{(BR)CEO} > 33\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$

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

Collector cut-off current

$V_{BE} = 0; V_{CE} = 30\text{ V}$

$I_{CES} < 10\text{ mA}$

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

open base

$ESBO > 12,5\text{ mJ}$

$R_{BE} = 10\ \Omega$

$ESBR > 12,5\text{ mJ}$

D.C. current gain*

$I_C = 3,0\text{ A}; V_{CE} = 25\text{ V}$

h_{FE} typ. 50
15 to 100

Collector-emitter saturation voltage*

$I_C = 6,0\text{ A}; I_B = 0,6\text{ A}$

V_{CEsat} typ. 0,75 V

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

$-I_E = 3,0\text{ A}; V_{CB} = 25\text{ V}$

f_T typ. 680 MHz

$-I_E = 6,0\text{ A}; V_{CB} = 25\text{ V}$

f_T typ. 750 MHz

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

$I_E = I_e = 0; V_{CB} = 25\text{ V}$

C_c typ. 155 pF

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

$I_C = 100\text{ mA}; V_{CE} = 25\text{ V}$

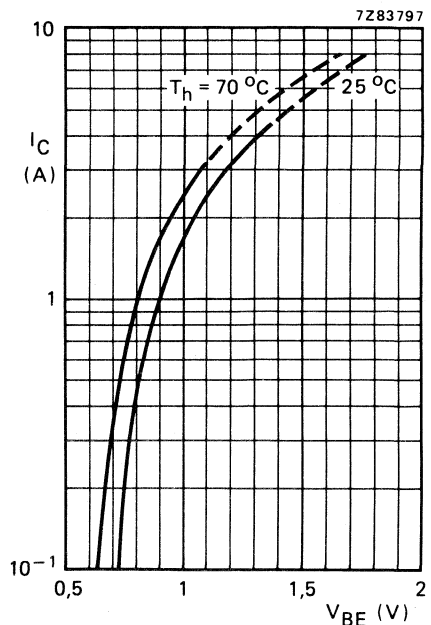
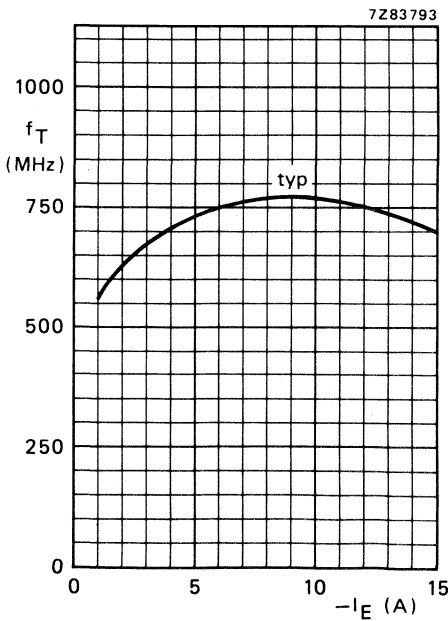
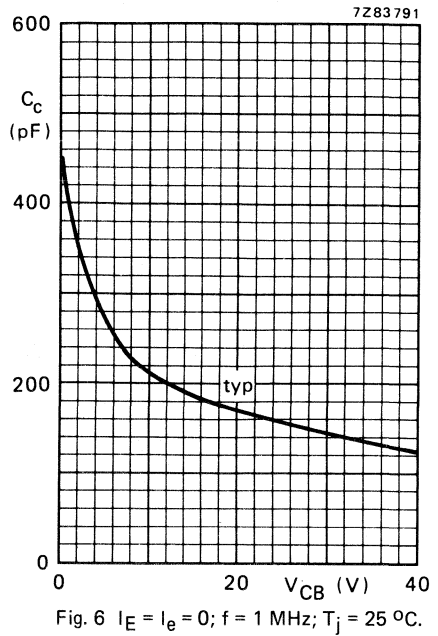
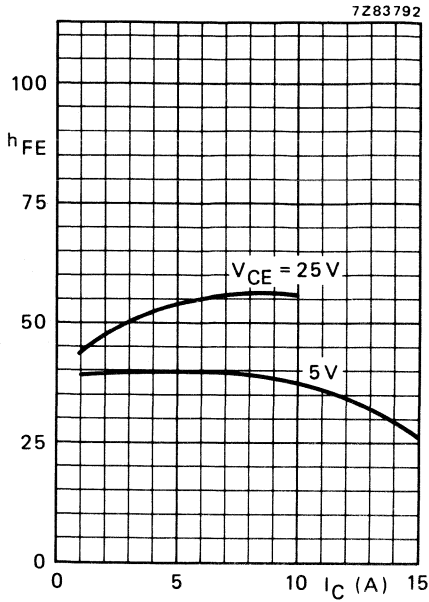
C_{re} typ. 88 pF

Collector-stud capacitance

C_{cs} typ. 3 pF

* Measured under pulse conditions: $t_p \leq 300\ \mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\ \mu\text{s}; \delta \leq 0,01$.



APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_{C} (A)	T_{h} (°C)	d_{im} (dB)*	$P_{\text{O sync}}$ (W)*	G_{p} (dB)
224,25	25	3,2	70	-55	> 19	> 9
			70	-55	typ. 22	typ. 9,3
			70	-52	typ. 26,5	typ. 9,3
			25	-55	typ. 26	typ. 9,7

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

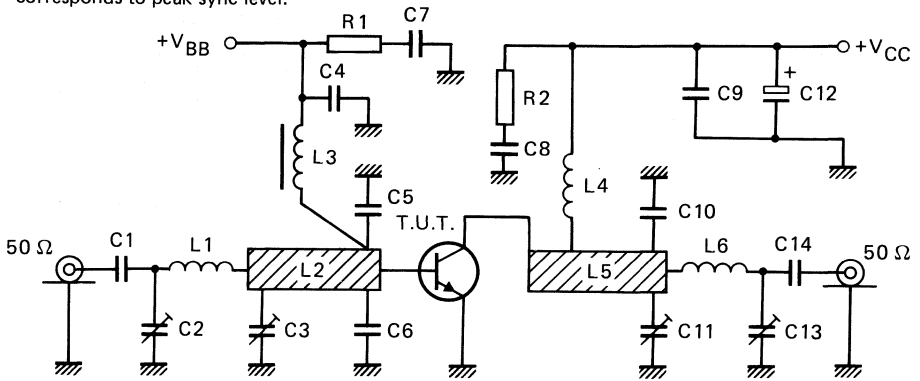


Fig. 9 Class-A test circuit at $f_{\text{vision}} = 224,25$ MHz.

7283801.1

List of components:

- C1 = C14 = 680 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
- C2 = C11 = C13 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
- C3 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
- C4 = C9 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
- C5 = C6 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC▲), placed 2 mm from transistor edge
- C7 = C8 = 470 nF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 856 48474)
- C10 = 24 pF (500 V) multilayer ceramic chip capacitor (ATC▲), positioned under C11
- C12 = 10 μ F/40 V solid aluminium electrolytic capacitor
- L1 = 1½ turns closely wound enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; leads 2 x 3 mm
- L2 = 30 Ω stripline (6,0 mm x 32,7 mm)
- L3 = 1 μ H microchoke (cat. no. 4322 057 01080)
- L4 = 27 nH; 2 turns enamelled Cu wire (1,1 mm); int. dia. 4,5 mm; length 2,9 mm; leads 2 x 5 mm
- L5 = 30 Ω stripline (6,0 mm x 24,0 mm)
- L6 = 19 nH; 2 turns enamelled Cu wire (1,1 mm); int. dia. 3,5 mm; length 3,5 mm; leads 2 x 5 mm
- L2 and L5 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16".
- R1 = R2 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

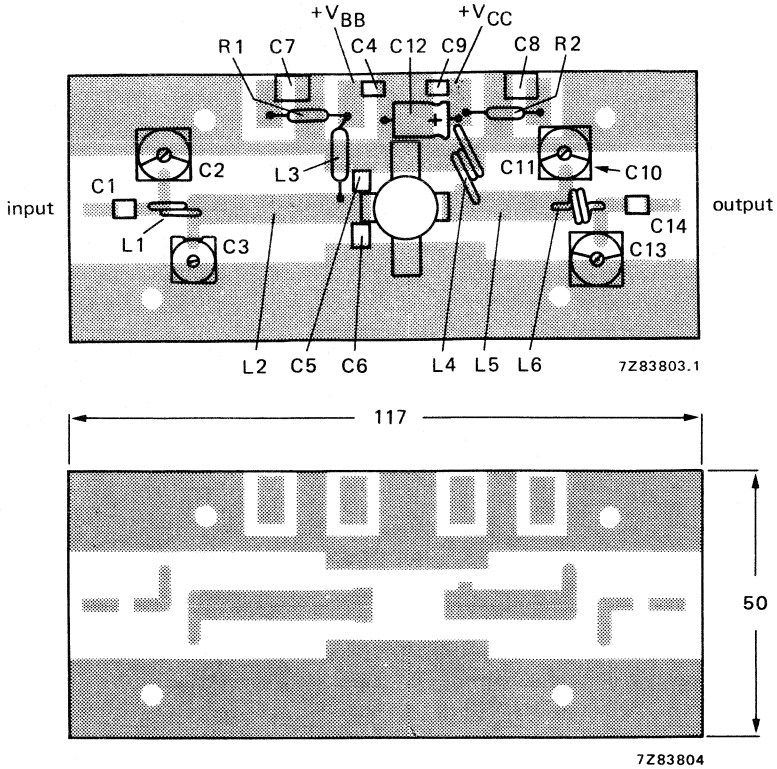


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is un-etched copper to serve as earth. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

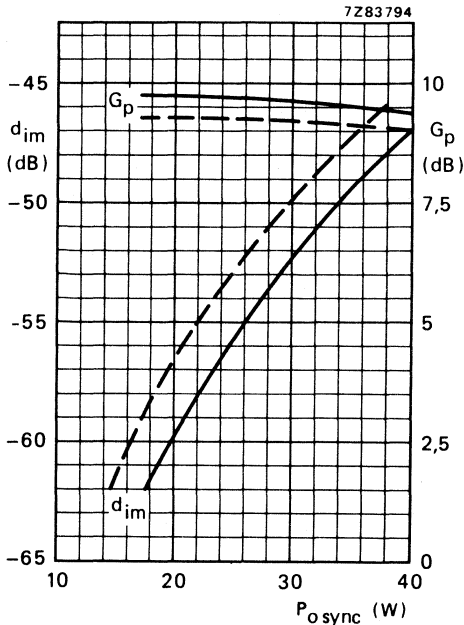


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

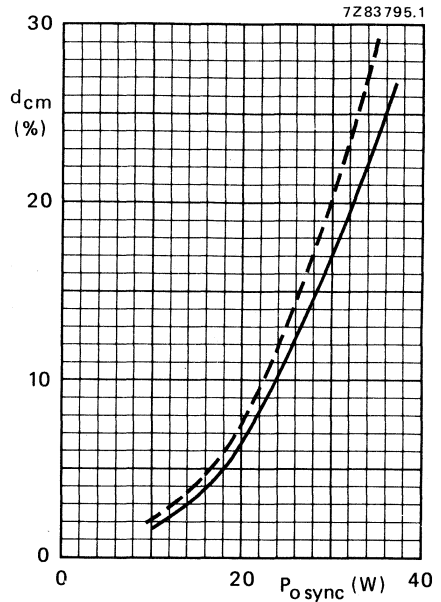


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; $V_{CE} = 25$ V; $I_C = 3,2$ A; — $T_h = 25$ °C; - - - $T_h = 70$ °C; $f_{vision} = 224,25$ MHz.

Ruggedness in class-A operation

The BLV33 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 30 W (r.m.s. value) or 40 W (P.E.P.) under the following conditions:

$V_{CE} = 25$ V; $I_C = 3,2$ A; $T_h = 70$ °C; $f = 224,25$ MHz; $R_{th mb-h} = 0,15$ K/W.

* 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 ≤ -70 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB.

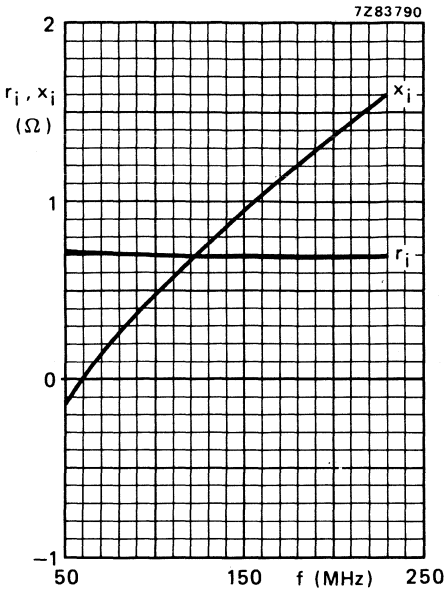


Fig. 13 Input impedance (series components).

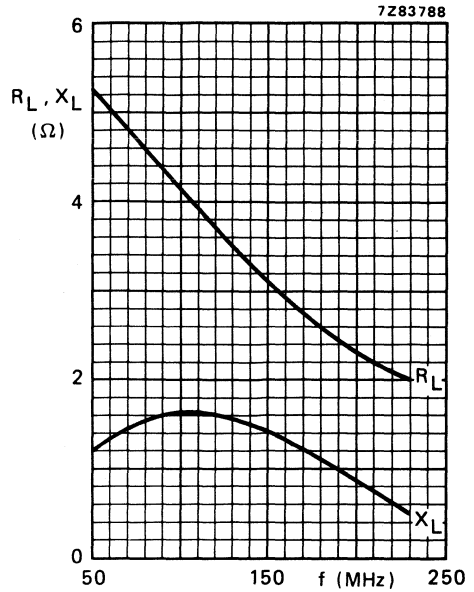


Fig. 14 Load impedance (series components).

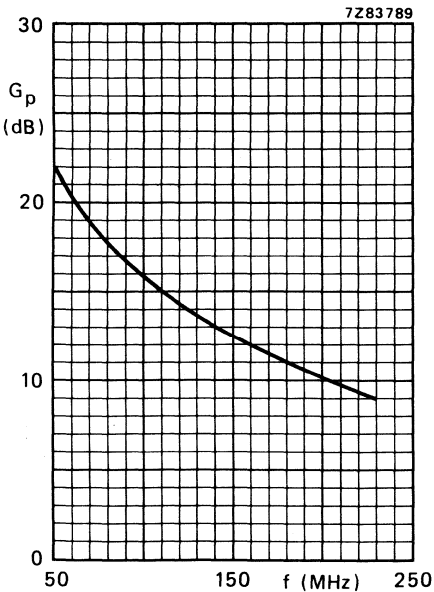


Fig. 15.

Conditions for Figs 13, 14 and 15:

Typical values; $V_{CE} = 25$ V; $I_C = 3,2$ A;
class-A operation; $T_h = 70$ °C.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-AB operation (c.w.)

f_{vision} (MHz)	V_{CE} (V)	$I_{\text{C(ZS)}}$ (A)	T_{h} (°C)	P_{L} (W)	I_{C} (A)	η (%)	G_{p} (dB)*
224,25	28	0,1	70	40	typ. 2,60	typ. 55	typ. 7,5
				90	typ. 4,46	typ. 72	typ. 6,5

* Gain compression point of 1 dB is at typical 90 W (minimum 80 W). Using a 3rd-order amplitude transfer characteristic, 1 dB compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

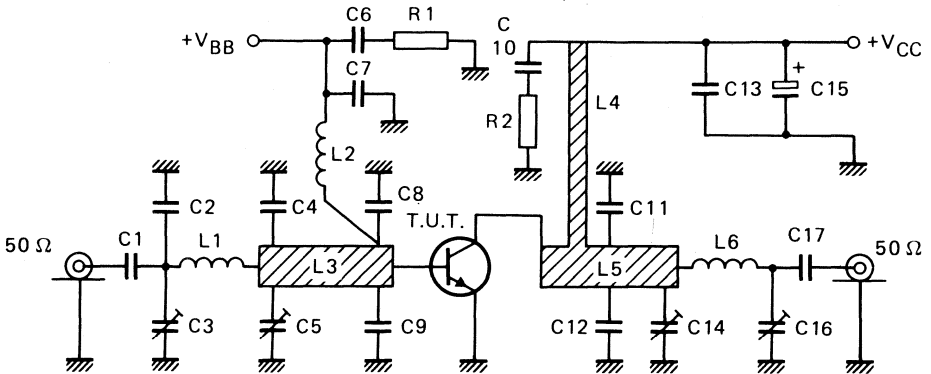


Fig. 16 Class-AB test circuit at $f_{\text{vision}} = 224,25$ MHz.

7Z83802

List of components:

- C1 = C17 = 680 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
- C2 = 39 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
- C3 = C16 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
- C4 = 43 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
- C5 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
- C6 = C10 = 330 nF polyester capacitor
- C7 = C13 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
- C8 = C9 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC▲); placed 2,5 mm from transistor edge
- C11 = C12 = 27 pF (500 V) multilayer ceramic chip capacitor (ATC▲); placed 7 mm from transistor edge
- C14 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 08003)
- C15 = 10 μ F/40 V solid aluminium electrolytic capacitor
- L1 = 25 nH; 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,3 mm; length 3,4 mm; leads 2 x 5 mm
- L2 = 120 nH; 4 turns closely wound enamelled Cu wire (1,1 mm); int. dia. 6,0 mm; leads 2 x 5 mm
- L3 = 30 Ω stripline (6,0 mm x 48,8 mm)
- L4 = 48 Ω stripline (3,0 mm x 27,0 mm) at 3 mm from transistor edge
- L5 = 30 Ω stripline (6,0 mm x 42,9 mm)
- L6 = 24 nH; 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,0 mm; length 3,4 mm; leads 2 x 5 mm
- L3, L4 and L5 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16".
- R1 = R2 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

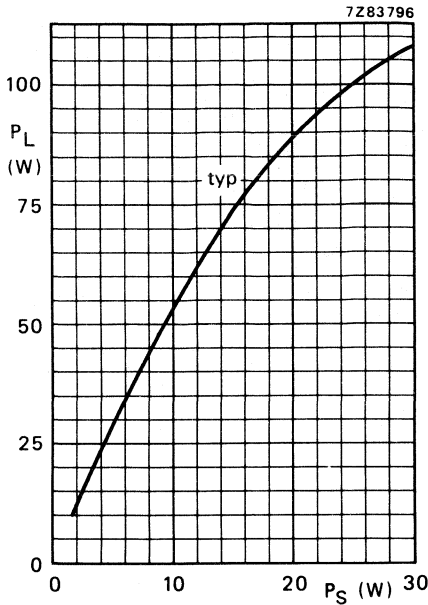


Fig. 17 $V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 0,1 \text{ A}$; $T_h = 70 \text{ }^\circ\text{C}$; $f_{\text{vision}} = 224,25 \text{ MHz}$.

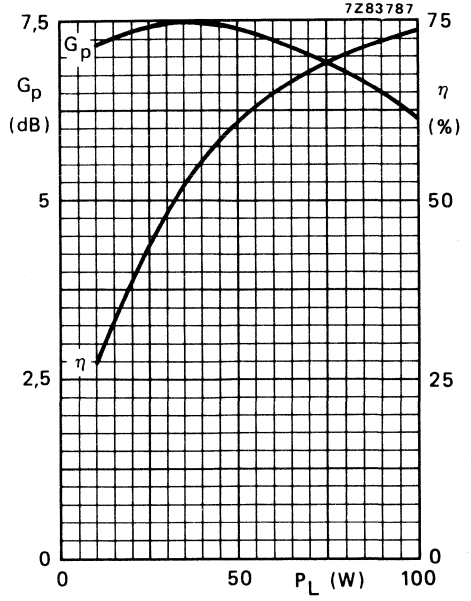


Fig. 18 $V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 0,1 \text{ A}$; $T_h = 70 \text{ }^\circ\text{C}$; $f_{\text{vision}} = 224,25 \text{ MHz}$; typical values.

Ruggedness in class-AB operation

The BLV33 is capable of withstanding a load mismatch ($V_{\text{SWR}} \leq 2$ through all phases) up to 60 W (r.m.s. value) and 90 W (P.E.P.) under the following conditions:
 $V_{CE} = 28 \text{ V}$; $T_h = 70 \text{ }^\circ\text{C}$; $f = 224,25 \text{ MHz}$; $R_{\text{th mb-h}} = 0,15 \text{ K/W}$.

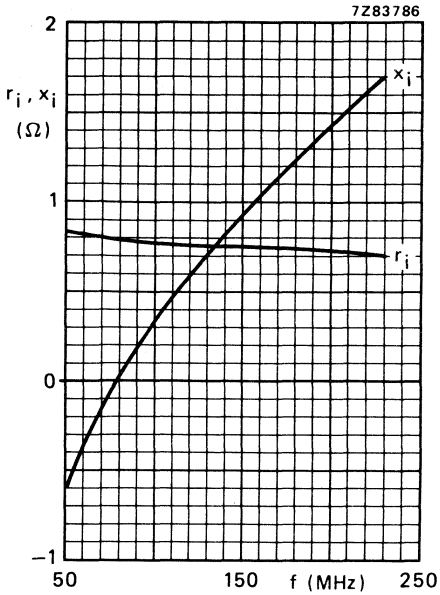


Fig. 19 Input impedance (series components).

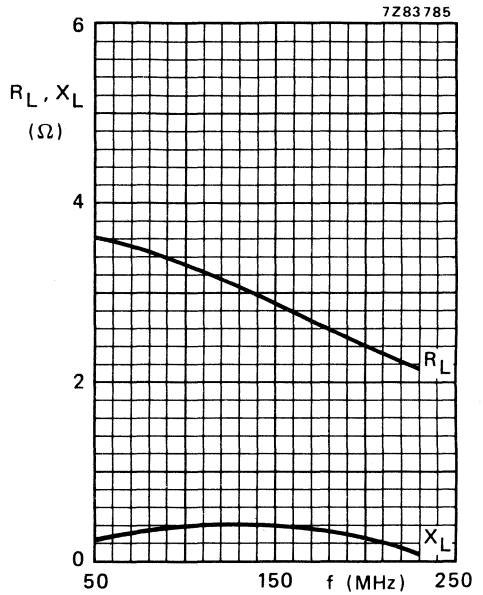


Fig. 20 Load impedance (series components).

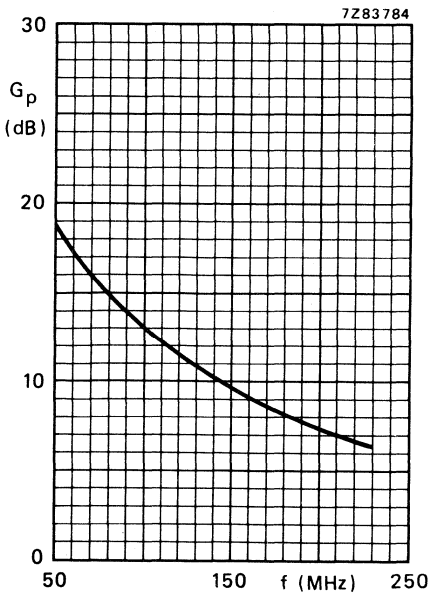


Fig. 21.

Conditions for Figs 19, 20 and 21:

Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 80 \text{ W (P.E.P.)}$;
class-AB operation; $T_h = 70 \text{ }^\circ\text{C}$.

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers for television transmitters and transposers.

Features of this product:

- internally matched input for wideband operation and high power gain;
- diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a 1/2" 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

mode of operation	f _{vision} MHz	V _{CE} V	I _C I _{C(ZS)} A	T _h °C	d _{im} * dB	P _o sync* W	G _p dB	sync compr.** sync in (%) / sync out (%)
class-A	224,25	25	3,20	70 25	-55 -55	> 16 typ. 22	> 13,5 typ. 14,8	
class-AB	224,25	28	0,20	70		typ. 85	typ. 10,5	30/25

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

** Television service (negative modulation, C.C.I.R. system).

MECHANICAL DATA

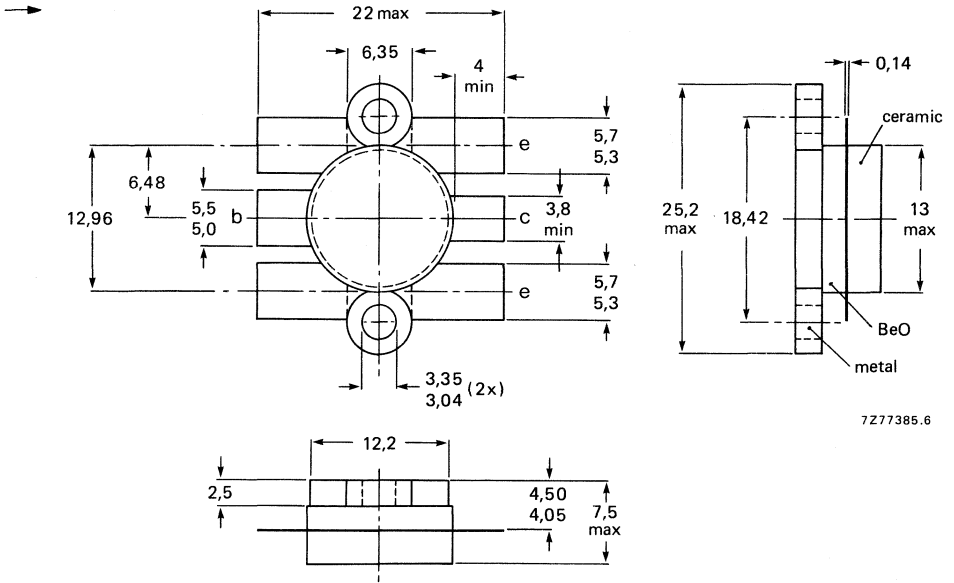
SOT-119 (see Fig. 1).

PRODUCT SAFETY 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



7277385.6

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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-emitter voltage

(peak value); $V_{BE} = 0$

open base

V_{CESM} max. 65 V

V_{CEO} max. 33 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

$I_C; I_{C(AV)}$ max. 12,5 A

(peak value); $f > 1$ MHz

I_{CM} max. 20 A

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

P_{tot} max. 133 W

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

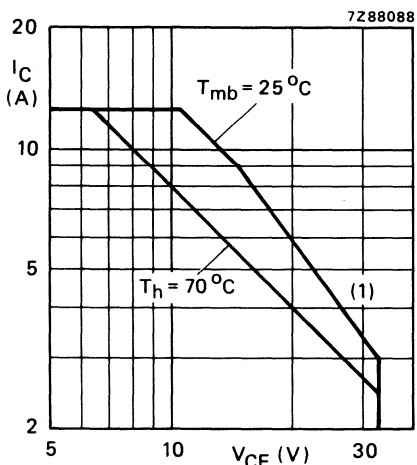
P_{rf} max. 162 W

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.

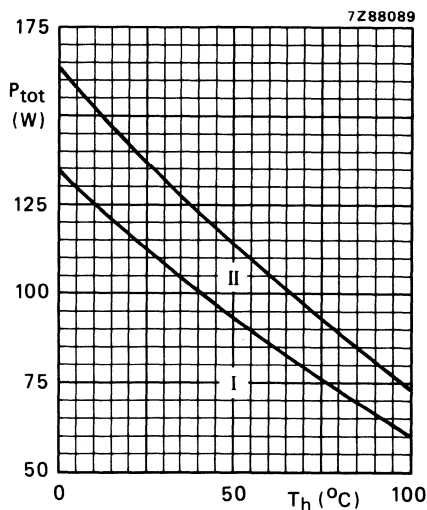


Fig. 3 Power derating curve vs. temperature.

- I Continuous d.c. (including r.f. class-A) operation
- II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 80 W; $T_{mb} = 86$ °C, i.e. $T_h = 70$ °C)

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

$R_{th j-mb(dc)}$ = 1,43 K/W

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

$R_{th j-mb(rf)}$ = 1,17 K/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,2 K/W

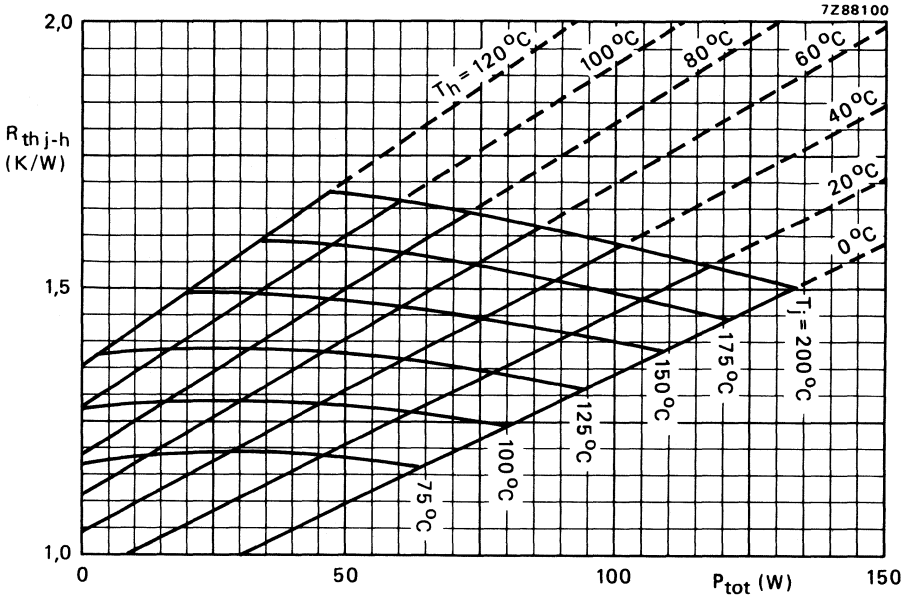


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,2\ K/W.$)

Example

Nominal class-A operation (without r.f. signal): $V_{CE} = 25\ V$; $I_C = 3,2\ A$; $T_h = 70\ ^\circ C.$

Fig. 4 shows: $R_{th\ j-h}$ max. 1,63 K/W
 T_j max. 200 °C

Typical device: $R_{th\ j-h}$ typ. 1,53 K/W
 T_j typ. 192 °C

CHARACTERISTICS

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

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 25\text{ mA}$ open base; $I_C = 100\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$ $V_{(BR)CEO} > 33\text{ V}$

Emitter-base breakdown voltage

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

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 30\text{ V}$ $I_{CES} < 10\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 12,5\text{ mJ}$ $R_{BE} = 10\text{ }\Omega$ $E_{SBR} > 12,5\text{ mJ}$

D.C. current gain*

 $I_C = 3,0\text{ A}; V_{CE} = 25\text{ V}$ h_{FE} typ. 50
15 to 100

Collector-emitter saturation voltage*

 $I_C = 6,0\text{ A}; I_B = 0,6\text{ A}$ V_{CEsat} typ. 0,75 VTransition frequency at $f = 100\text{ MHz}^{**}$ $-I_E = 3,0\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 680 MHz $-I_E = 6,0\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 750 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 25\text{ V}$ C_C typ. 155 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 25\text{ V}$ C_{re} typ. 88 pF

Collector-flange capacitance

 C_{cf} typ. 3 pF* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

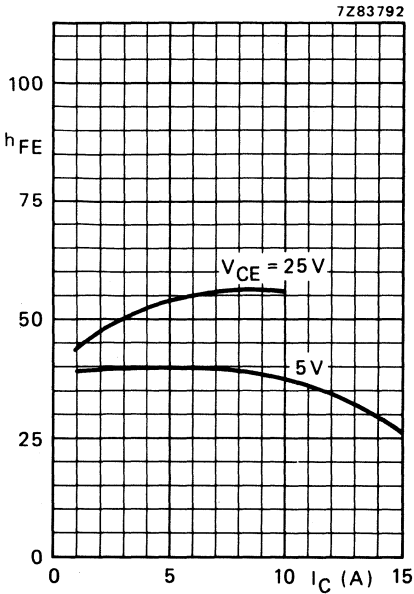


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

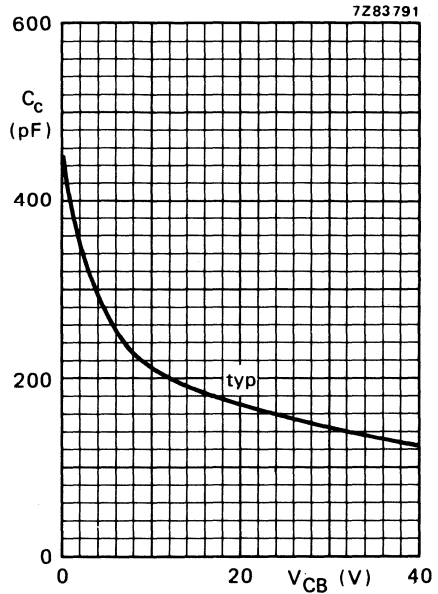


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

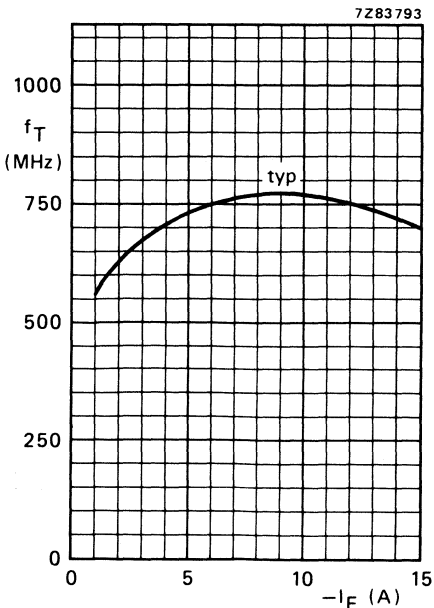


Fig. 7 $V_{CB} = 25\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

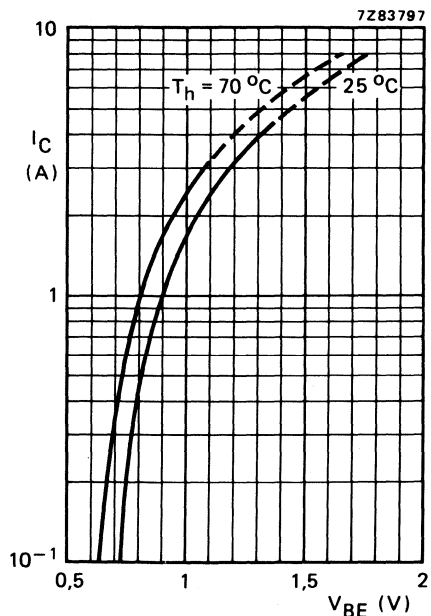


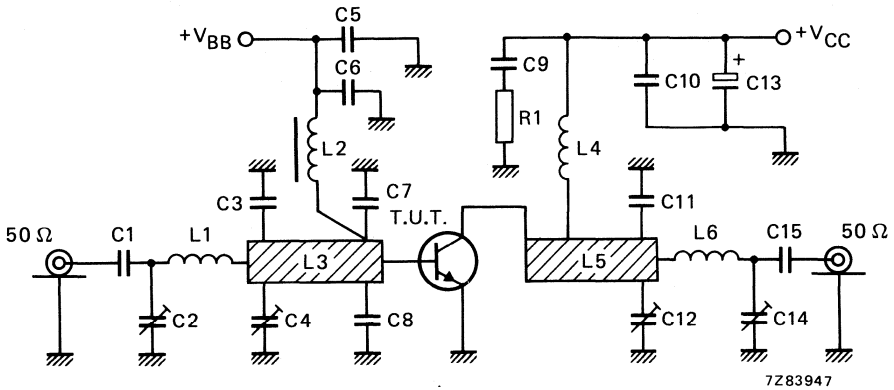
Fig. 8 Typical values; $V_{CE} = 25\text{ V}$.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_{C} (A)	T_{h} ($^{\circ}\text{C}$)	d_{im} (dB)*	$P_{\text{o sync}}$ (W)*	G_{p} (dB)
224,25	25	3,2	70	-55	> 16	> 13,5
			70	-55	typ. 17,5	typ. 14,5
			70	-52	typ. 22	typ. 14,5
			25	-55	typ. 22	typ. 14,8

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

Fig. 9 Class-A test circuit at $f_{\text{vision}} = 224,25$ MHz.

List of components:

- C1 = C15 = 560 pF (500 V) multilayer ceramic chip capacitor (ATC ▲)
 C2 = C4 = C12 = C14 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
 C3 = 10 pF (500 V) multilayer ceramic chip capacitor (ATC ▲)
 C5 = 470 nF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 856 48474)
 C6 = C10 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
 C7 = C8 = 47 pF (500 V) multilayer ceramic chip capacitor (ATC ▲); placed 8 mm from transistor edge
 C9 = 330 nF polyester capacitor
 C11 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC ▲)
 C13 = 6,8 μF /35 V solid tantalum capacitor

L1 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 5,0 mm; leads 2 x 3 mm

L2 = 1 μH microchoke (cat. no. 4322 057 01080)

L3 = 30 Ω stripline (6,0 mm x 32,7 mm)

L4 = 2 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 10 mm

L5 = 30 Ω stripline (6,0 mm x 24,0 mm)

L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,0 mm; length 4,5 mm; leads 2 x 3 mm

L3 and L5 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16".

R1 = 10 Ω carbon resistor

Component layout and printed-circuit board for 224,25 MHz class-A test circuit are shown in Fig. 10.

▲ ATC means American Technical Ceramics.

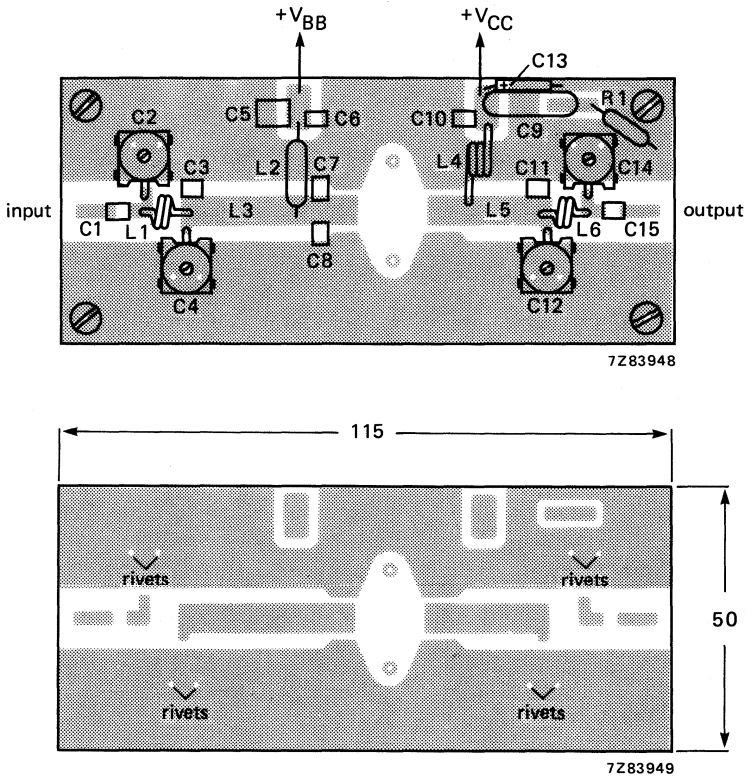


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as earth. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

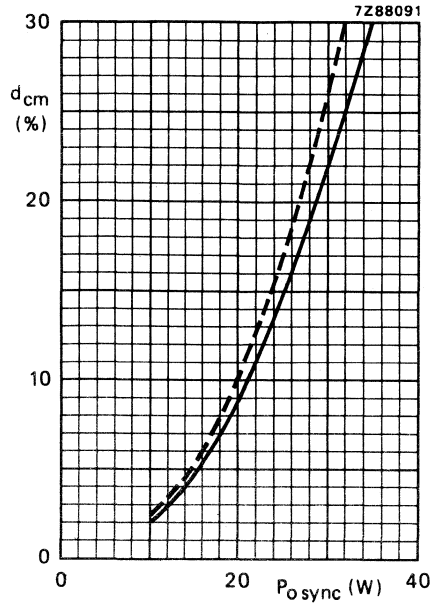
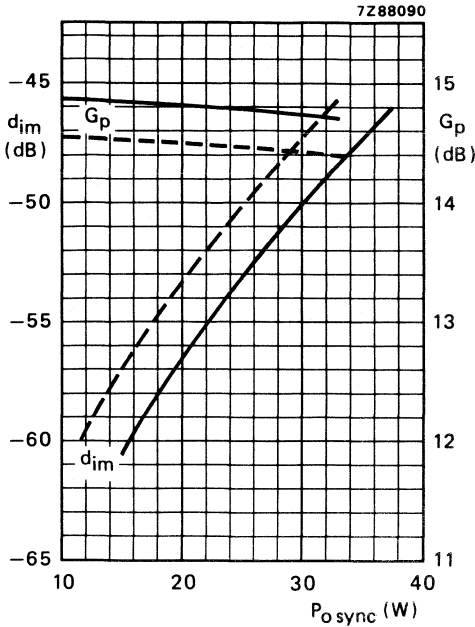


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; $V_{CE} = 25$ V; $I_C = 3,2$ A; ——— $T_h = 25^\circ C$; - - - $T_h = 70^\circ C$; $f_{vision} = 224,25$ MHz.

Ruggedness in class-A operation

The BLV33F is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 30 W (r.m.s. value) or 40 W (P.E.P.) under the following conditions:

$V_{CE} = 25$ V; $I_C = 3,2$ A; $T_h = 70^\circ C$; $f = 224,25$ MHz; $R_{th\ mb-h} = 0,2$ K/W.

* 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 ≤ -70 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB.

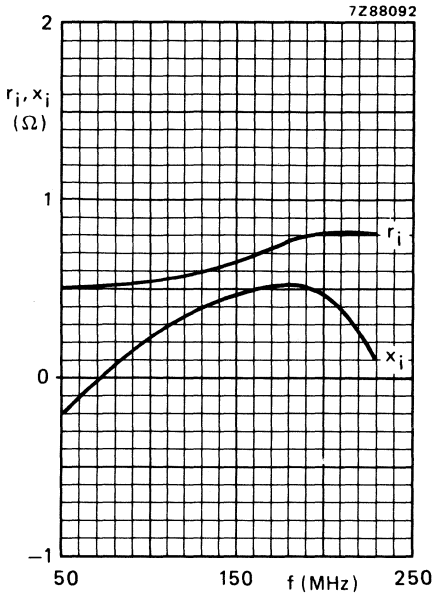


Fig. 13 Input impedance (series components).

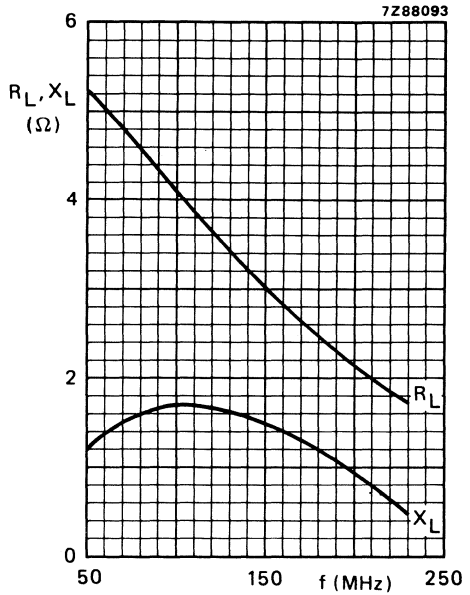


Fig. 14 Load impedance (series components).

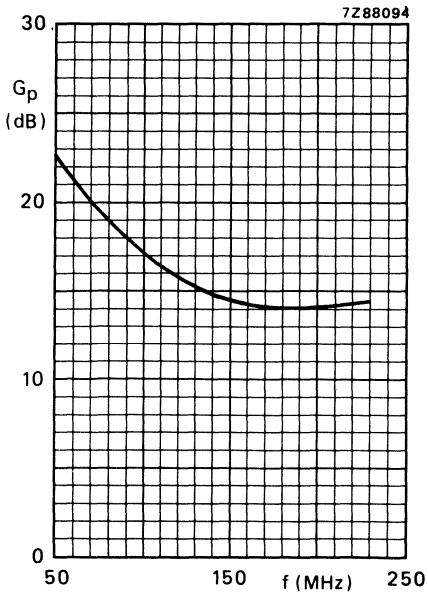


Fig. 15.

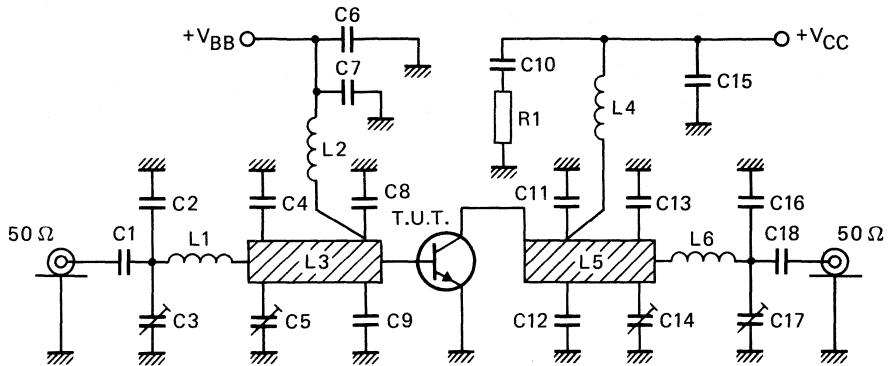
Conditions for Figs 13, 14 and 15:
 Typical values; $V_{CE} = 25$ V; $I_C = 3,2$ A;
 class-A operation; $T_h = 70$ °C.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-AB operation (c.w.)

f_{vision} (MHz)	V_{CE} (V)	$I_{\text{C(ZS)}}$ (A)	T_{h} (°C)	P_{L} (W)	I_{C} (A)	η (%)	G_{p} (dB)*
224,25	28	0,2	70	40	typ. 2,75	typ. 52	typ. 11,5
				85	typ. 4,25	typ. 71	typ. 10,5

* Gain compression point of 1 dB is at typical 85 W (minimum 75 W). Using a 3rd-order amplitude transfer characteristic, 1 dB compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

Fig. 16 Class-AB test circuit at $f_{\text{vision}} = 224,25$ MHz.

7283946

List of components (component layout and p.c.b. class-AB test circuit see Fig. 17):

- C1 = C18 = 620 pF (100 V) multilayer ceramic chip capacitor (ATC ▲)
- C2 = 27 pF (500 V) multilayer ceramic chip capacitor (ATC ▲)
- C3 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
- C4 = 30 pF (500 V) multilayer ceramic chip capacitor (ATC ▲)
- C5 = C14 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
- C6 = C10 = 470 nF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 856 48474)
- C7 = C15 = 680 pF (50 V) multilayer ceramic chip capacitor (2222 852 13681)
- C8 = C9 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC ▲); placed 6,4 mm from transistor edge
- C11 = C12 = 43 pF (500 V) multilayer ceramic chip capacitor (ATC ▲); placed 10 mm from transistor edge
- C13 = 39 pF (500 V) multilayer ceramic chip capacitor (ATC ▲)
- C16 = 3,3 pF (500 V) multilayer ceramic chip capacitor (ATC ▲)
- C17 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- L1 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 4,0 mm; leads 2 x 4 mm
- L2 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 7 mm
- L3 = 30 Ω stripline (6,0 mm x 47,8 mm)
- L4 = 2 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 8 mm
- L5 = 30 Ω stripline (6,0 mm x 42,9 mm)
- L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,0 mm; length 4,0 mm; leads 2 x 3 mm
- L3 and L5 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16".
- R1 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

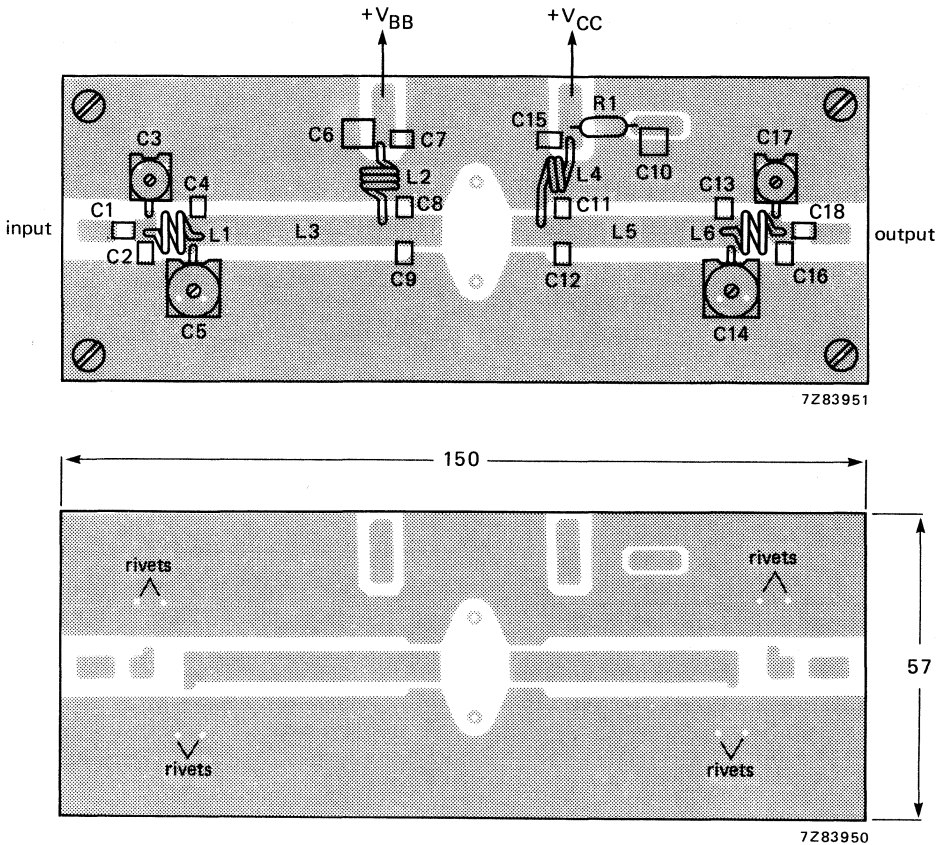


Fig. 17 Component layout and printed-circuit board for 224,25 MHz class-AB test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as earth. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

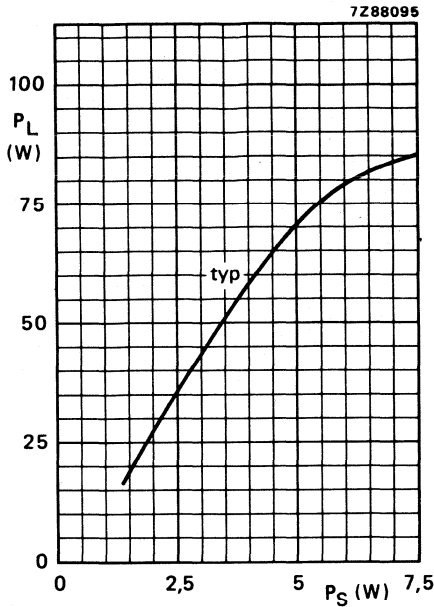


Fig. 18 $V_{CE} = 28$ V; $I_{C(ZS)} = 0,2$ A; $T_h = 70$ °C; $f_{vision} = 224,25$ MHz.

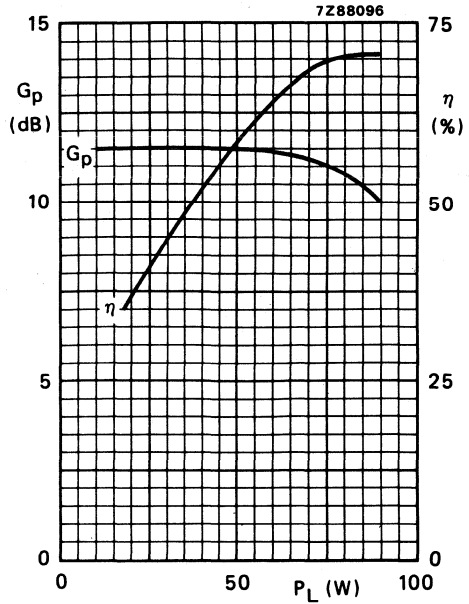


Fig. 19 $V_{CE} = 28$ V; $I_{C(ZS)} = 0,2$ A; $T_h = 70$ °C; $f_{vision} = 224,25$ MHz; typical values.

Ruggedness in class-AB operation

The BLV33F is capable of withstanding a load mismatch ($V_{SWR} \leq 2$ through all phases) up to 60 W (r.m.s. value) and 85 W (P.E.P.) under the following conditions:
 $V_{CE} = 28$ V; $T_h = 70$ °C; $f = 224,25$ MHz; $R_{th\ mb-h} = 0,2$ K/W.

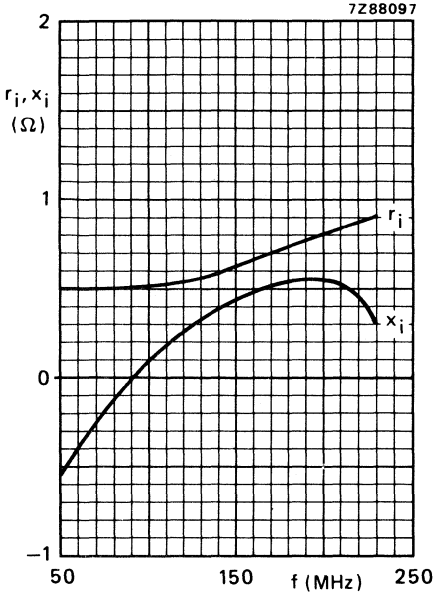


Fig. 20 Input impedance (series components).

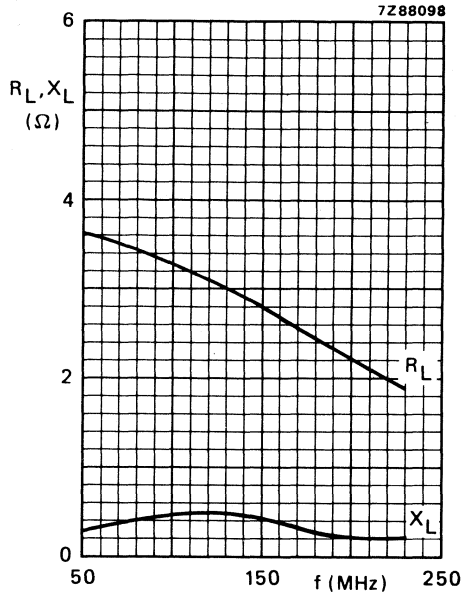


Fig. 21 Load impedance (series components).

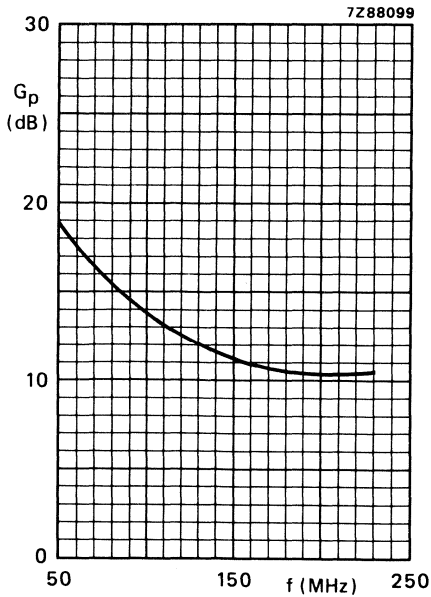


Fig. 22.

Conditions for Figs 20, 21 and 22:

Typical values; $V_{CE} = 28$ V; $P_L = 80$ W (P.E.P.);
class-AB operation; $T_h = 70$ °C.

V.H.F. LINEAR PUSH-PULL POWER TRANSISTOR

Two N-P-N silicon planar epitaxial transistor sections in one envelope to be used as a push-pull amplifier. This device is primarily intended for use in linear v.h.f. television transmitters and transposers (vision or sound amplifier).

Features:

- internally matched input for wideband operation and high power gain;
- internal midpoint (r.f. ground) reduces negative feedback and improves power gain;
- increased input and output impedance (compared with single-ended transistors) simplify wideband matching;
- length of external emitter leads is not critical;
- diffused emitter balancing resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance in push-pull amplifier

mode of operation	V _{CE} V	I _{C(ZS)} A	f MHz	P _L W	T _h °C	G _p dB	η _c %	gain compression dB
c.w. ; class-AB	28	2 x 0,25	224,25	115	25	≥ 11,0 typ. 13,0	≥ 48 typ. 55	≤ 1,0 *

* Assuming a 3rd order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

MECHANICAL DATA

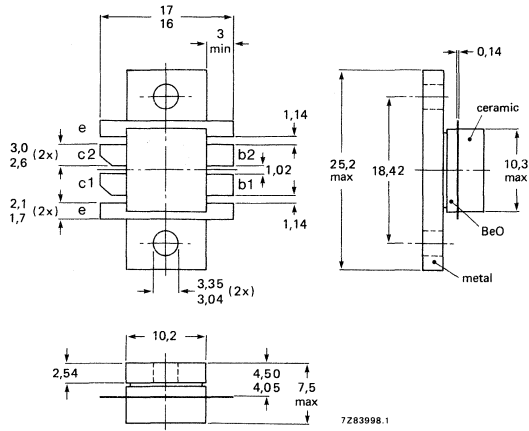
SOT-161 (see Fig. 1).

PRODUCT SAFETY 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-161.

Dimensions in mm



Torque on screw: min. 0,60 Nm
 max. 0,75 Nm

Recommended screw: cheese-head 4-40 UNC/2A
 Heatsink compound must be sparingly applied and evenly distributed.

RATINGS

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

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

open base

Emitter-base voltage (open collector)

Collector current per transistor section
d.c. or average

(peak value); $f > 1$ MHz

Total d.c. power dissipation; $T_{mb} = 25$ °C

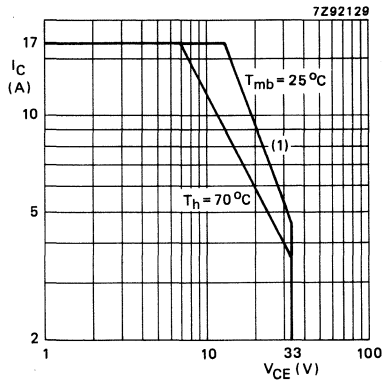
R.F. power dissipation

$f > 1$ MHz; $T_{mb} = 25$ °C

Storage temperature

Operating junction temperature

V_{CESM}	max.	65 V
V_{CEO}	max.	33 V
V_{EBO}	max.	4 V
$I_C, I_C(AV)$	max.	8,5 A
I_{CM}	max.	17,5 A
$P_{tot(d.c.)}$	max.	218 W*
$P_{tot(r.f.)}$	max.	270 W*
T_{stg}		-65 to +150 °C
T_j	max.	200 °C



(1) Second breakdown limit.

Fig. 2 D.C. SOAR.

Conditions for Figs 2 and 3:

$R_{th mb-h} = 0,25$ K/W; Total device*.

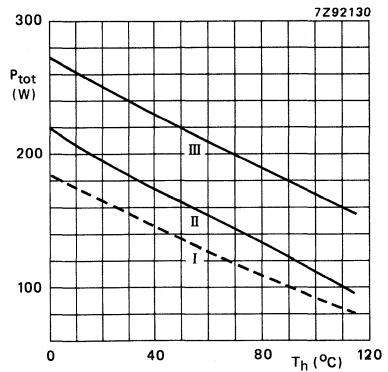


Fig. 3 Power/temperature derating curves.

- I Continuous d.c. operation
- II Continuous r.f. operation; ($f > 1$ MHz)
- III Short-time operation during mismatch; ($f > 1$ MHz)

THERMAL RESISTANCE

(dissipation = 180 W; $T_{mb} = 25$ °C)**

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

$R_{th j-mb(dc)} = 0,85$ K/W

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

$R_{th j-mb(rf)} = 0,64$ K/W

From mounting base to heatsink

$R_{th mb-h} = 0,25$ K/W

* Dissipation of either transistor section shall not exceed half rated power.

** Both transistor sections equally loaded.

CHARACTERISTICS

Apply to either transistor section unless otherwise specified. $T_j = 25\text{ }^\circ\text{C}$.

Collector-emitter breakdown voltage

$$V_{BE} = 0; I_C = 25\text{ mA}$$

$$V_{(BR)CES} > 65\text{ V}$$

open base; $I_C = 100\text{ mA}$

$$V_{(BR)CEO} > 33\text{ V}$$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$

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

Collector cut-off current

$$V_{BE} = 0; V_{CE} = 33\text{ V}$$

$$I_{CES} < 10\text{ mA}$$

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

$$R_{BE} = 10\ \Omega$$

$$E_{SBR} > 10\text{ mJ}$$

D.C. current gain*

$$I_C = 3,5\text{ A}; V_{CE} = 25\text{ V}$$

$$h_{FE} \begin{array}{l} \text{typ.} \\ 15 \text{ to} \end{array} \begin{array}{l} 45 \\ 100 \end{array}$$

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

$$-I_E = 3,3\text{ A}; V_{CB} = 25\text{ V}$$

$$f_T \text{ typ. } 575\text{ MHz}$$

$$-I_E = 10\text{ A}; V_{CB} = 25\text{ V}$$

$$f_T \text{ typ. } 600\text{ MHz}$$

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

$$I_E = i_e = 0; V_{CB} = 25\text{ V}$$

$$C_c \text{ typ. } 155\text{ pF}$$

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

$$I_C = 50\text{ mA}; V_{CE} = 25\text{ V}$$

$$C_{re} \text{ typ. } 88\text{ pF}$$

Collector-flange capacitance

$$C_{cf} \text{ typ. } 2\text{ pF}$$

* Measured under pulse conditions: $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0,02$.

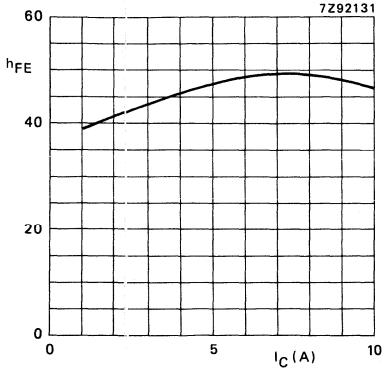


Fig. 4 $V_{CE} = 25$ V; $T_j = 25$ °C; typ. values. typ. values.

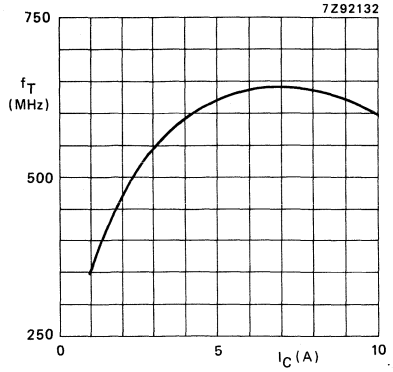


Fig. 5 $V_{CE} = 25$ V; $f = 100$ MHz; $T_j = 25$ °C; typ. values.

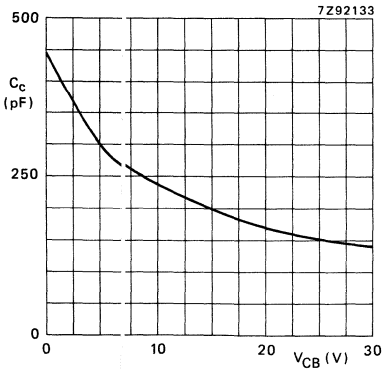


Fig. 6 $I_E = i_e = 0$; $f = 1$ MHz; typ. values.

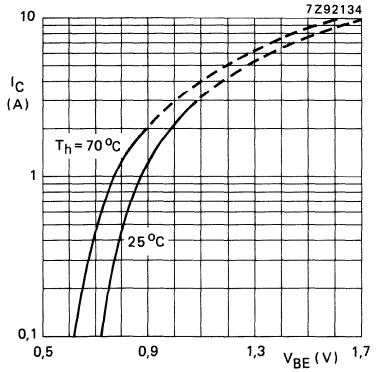


Fig. 7 $V_{CE} = 25$ V; typ. values.

The above graphs apply to either transistor section.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-AB operation (linear push-pull power amplifier) $V_{CE} = 28 \text{ V}$;
 $T_h = 25 \text{ }^\circ\text{C}$; $f = 224,25 \text{ MHz}$

mode of operation	P_L W	$I_C(ZS)$ A	G_p dB	η_C %	gain compression dB
class-AB; c.w.	115	$2 \times 0,15$	$\geq 11,0$ typ. 13,0	≥ 48 typ. 55	$\leq 1,0^*$ typ. 0,5*

* Assuming a 3rd order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

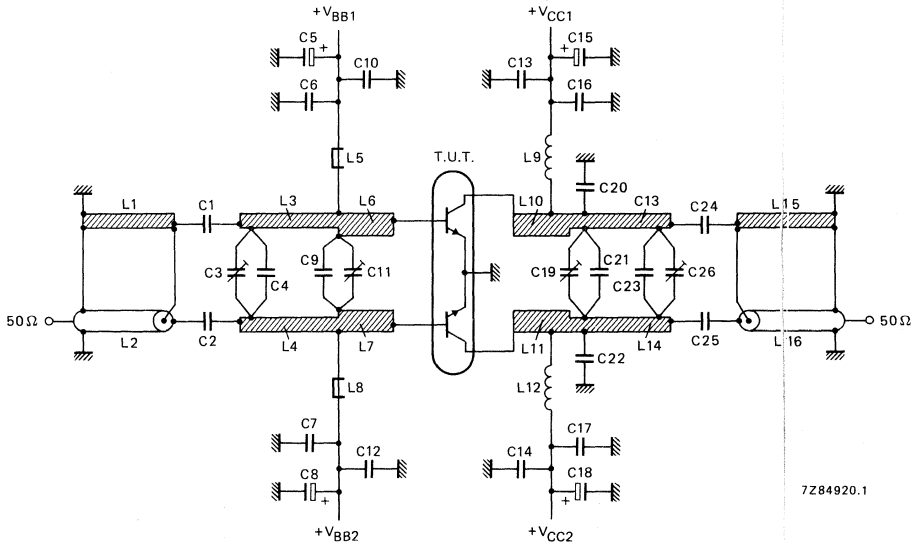


Fig. 8 Class-AB test circuit at 234,25 MHz.

List of components:

- C1 = C2 = C24 = C25 = 68 pF (500 V) multilayer ceramic chip capacitor.**
 C3 = C11 = C26 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002).
 C4 = 33 pF (500 V) multilayer ceramic chip capacitor.**
 C5 = C8 = 4,7 μF (63 V) electrolytic capacitor.
 C6 = C7 = C16 = C17 = 100 nF multilayer ceramic chip capacitor (cat. no. 2222 855 48104).
 C9 = 2 x 47 pF (500 V) multilayer ceramic chip capacitors in parallel.**
 C10 = C12 = C13 = C14 = 470 pF multilayer ceramic chip capacitor (cat. no. 2222 852 13471).
 C15 = C18 = 10 μF (63 V) electrolytic capacitor.
 C19 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 0003).
 C20 = C22 = 3,3 pF (500 V) multilayer ceramic chip capacitor.**
 C21 = parallel connection of 2 x 27 pF (500 V) ceramic chip capacitors.**
 C23 = 5,6 pF (500 V) multilayer ceramic chip capacitor.**

(C9 and C11 are connected 11 mm from transistor edge and C19 and C21 18 mm from transistor edge.)

** American Technical Ceramics capacitor type 100A or capacitor of same quality.

L1 = L15 = 50 Ω stripline (2,8 mm x 91,3 mm).

L2 = L16 = 50 Ω semi-rigid cable; outer diameter 2,2 mm; outer conductor length 91,3 mm.

L3 = L4 = L13 = L14 = 60 Ω stripline (2,0 mm x 27,9 mm).

L5 = L8 = 100 nH microchoke.

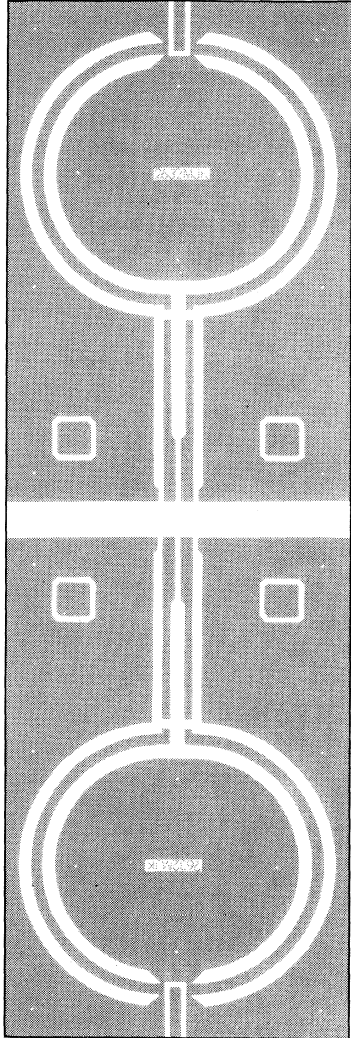
L6 = L7 = L10 = L11 = 48 Ω stripline (3,0 mm x 14,6 mm).

L9 = L12 = 20,5 nH; 2 turns enamelled Cu wire (1,0 mm); int. dia. 4,5 mm; length 3 mm; leads
leads 2 x 10 mm; connected 15 mm from transistor edge.

L1, L3, L4, L6, L7, L10, L11, L13, L14 and L15 are striplines on a double Cu-clad p.c. board with epoxy fibre-glass dielectric ($\epsilon_r = 4,5$); thickness 1/16 inch.

The printed circuit board and component layout for a 224,25 MHz, class-AB test are given in Fig. 9 and Fig. 10 respectively.

The circuit and the components are on one side of the epoxy fibre-glass board; the other side is unetched copper to serve as ground plane. Earth connections are made by hollow rivets and in addition by fixing screws and also by copper straps under the emitters and at the input and output.



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Fig. 9 Printed circuit board for 224,25 MHz class-AB test circuit.

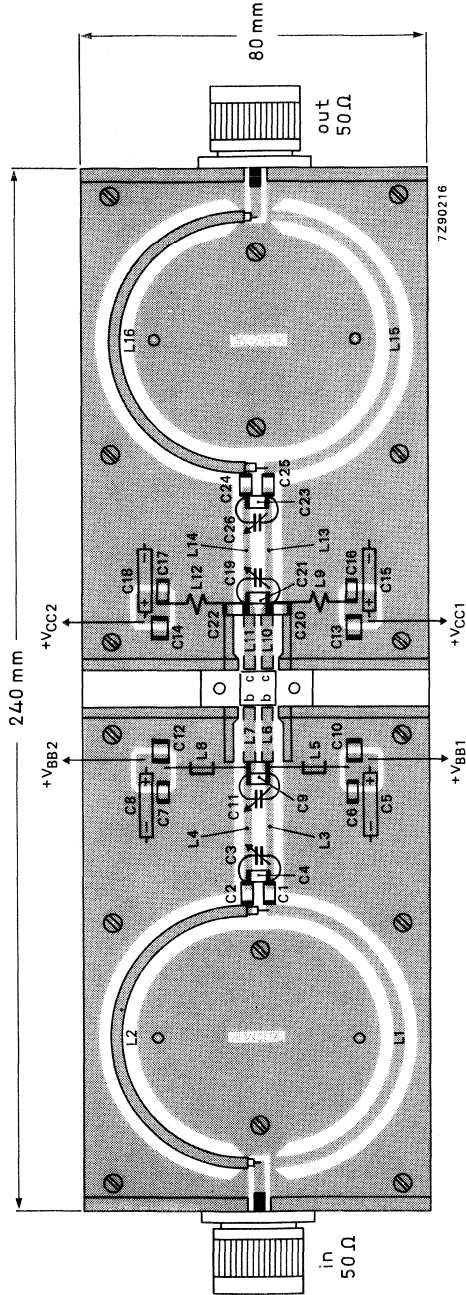


Fig. 10 Component layout of a 224.25 MHz class-AB test circuit.

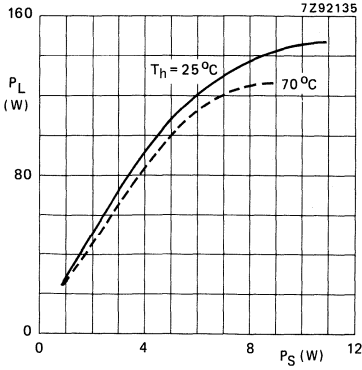


Fig. 11 Output power; typ. values.

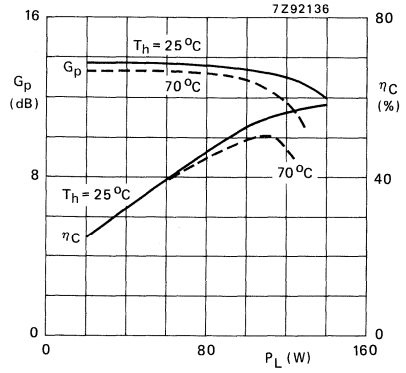


Fig. 12 Power gain and efficiency; typ. values.

Conditions for Figs 11 and 12:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 2 \times 0,15 \text{ A}$; $f = 224,25 \text{ MHz}$; class-AB.

RUGGEDNESS

The BLV36 is capable of continuously withstanding a load mismatch (VSWR = 5, through all phases) up to 80 W under the following conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 2 \times 0,15 \text{ A}$; $T_h = 25 \text{ }^\circ\text{C}$; $f = 224,25 \text{ MHz}$; $R_{th \text{ mb-h}} = 0,25 \text{ K/W}$.

The instantaneous collector current should not exceed 10 A.

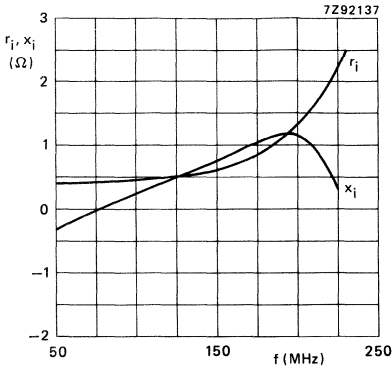


Fig. 13 Input impedance (series components); typ. values.

Conditions for Figs 13, 14 and 15:

The graphs apply to either transistor section assuming class-AB push-pull operation

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 0,15 \text{ A}$; $P_L = 70 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$.

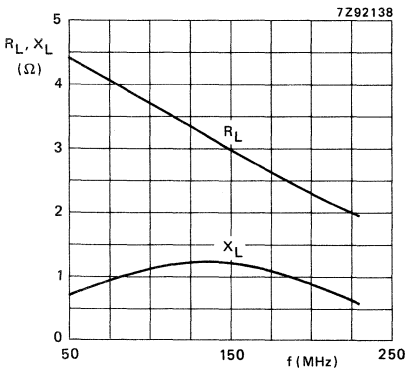


Fig. 14 Load impedance (series components); typ. values.

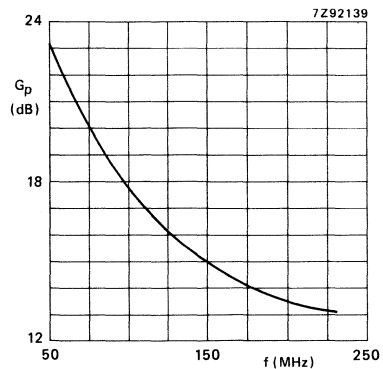


Fig. 15 Power gain; typ. values.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 175 MHz communications band.

Features

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability
- internal matching to achieve an optimum wideband capability and high power gain

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

QUICK REFERENCE DATA

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

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	175	45	>6,5	>55

MECHANICAL DATA

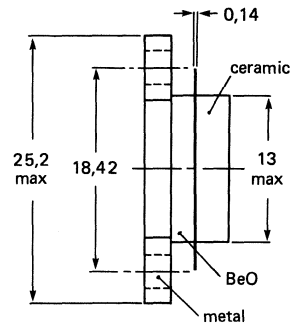
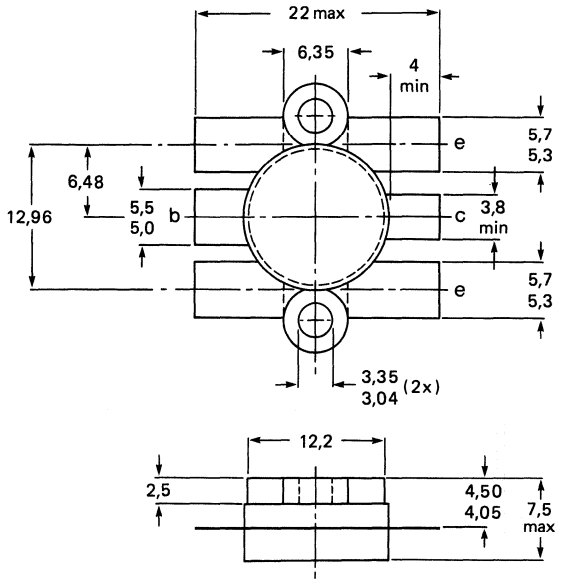
SOT-119 (see Fig. 1)

PRODUCT SAFETY 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



7277385.6

Torque on screw: min. 0,6 Nm
 max. 0,75 Nm
 Recommended screw: cheese-head 4-40 UNC/2A
 Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter)
peak value

V_{CBOM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 16,5 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

I_C max. 9 A

peak value; $f > 1$ MHz

I_{CM} max. 27 A

Total power dissipation

at $T_{mb} = 25^\circ\text{C}$; $f > 1$ MHz

P_{tot} max. 90 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

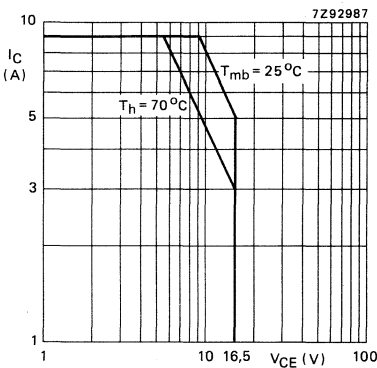


Fig. 2 D.C. soar.
 $R_{th\ mb-h} = 0,2\ \text{K/W}$.

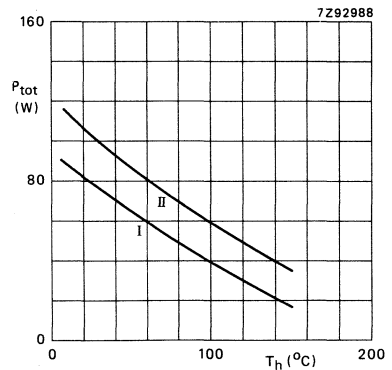


Fig. 3 Power/temperature derating curves; $R_{th\ mb-h} = 0,2\ \text{K/W}$.
I Continuous operation ($f > 1$ MHz)
II Short-time operation during mismatch; ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 68 W; $T_{mb} = 25^\circ\text{C}$

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

$R_{th\ j-mb} = 1,58\ \text{K/W}$

From mounting base to heatsink

$R_{th\ mb-h} = 0,2\ \text{K/W}$

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 50\text{ mA}$

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

Collector-emitter breakdown voltage
open base; $I_C = 100\text{ mA}$

$V_{(BR)CEO} > 16,5\text{ V}$

Emitter-base breakdown voltage
open collector; $I_E = 10\text{ mA}$

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

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 16\text{ V}$

$I_{CES} < 22\text{ mA}$

Second breakdown energy
 $L = 25\text{ mH}; f = 50\text{ Hz}; R_{BE} = 10\text{ }\Omega$

$E_{SBR} > 12,5\text{ mJ}$

D.C. current gain
 $V_{CE} = 10\text{ V}; I_C = 6\text{ A}$

$h_{FE} > 15$
typ. 55

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = i_e = 0; V_{CB} = 12,5\text{ V}$

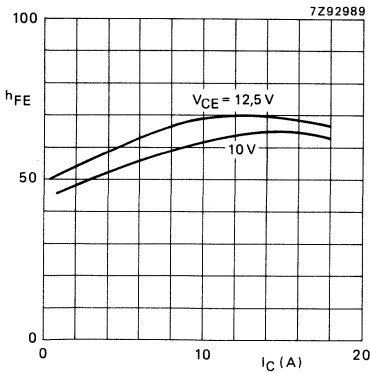
C_C typ. 130 pF

Collector-flange capacitance

C_{Cf} typ. 3 pF

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 0; V_{CE} = 12,5\text{ V}$

C_{re} typ. 80 pF



→ Fig. 4 D.C. current gain versus collector current; $T_j = 25\text{ }^\circ\text{C}$.

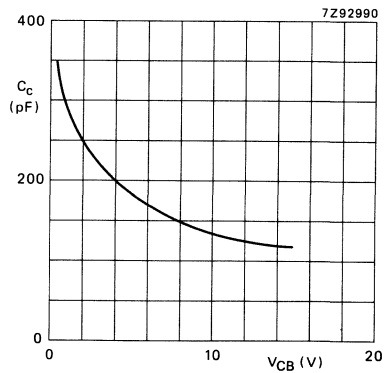
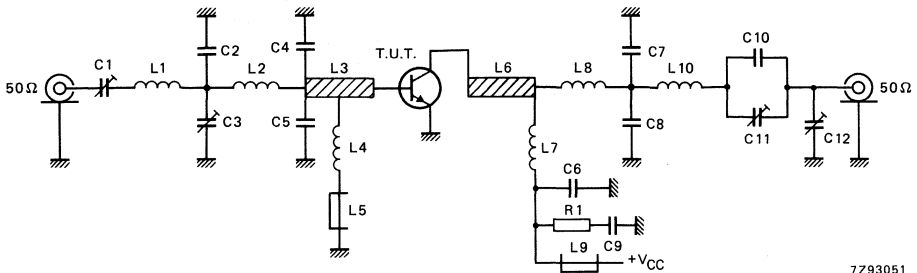


Fig. 5 Output capacitance versus V_{CB} ; $I_E = i_e = 0; f = 1\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B)
 $f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	45	> 6,5 typ. 8,0	> 55 typ. 67



7293051

Fig. 6 Class-B test circuit at $f = 175 \text{ MHz}$.

List of components:

- C1 = C11 = C12 = 4 to 40 film dielectric trimmer (cat.no. 2222 809 07008)
 - C2 = C10 = 10 pF multilayer ceramic chip capacitor *
 - C3 = 2,5 to 20 pF film dielectric trimmer (cat.no. 2222 809 07004)
 - C4 = C5 = 91 pF multilayer ceramic chip capacitor *
 - C6 = 820 pF multilayer ceramic chip capacitor *
 - C7 = C8 = 2 x 4,7 pF multilayer ceramic chip capacitors* in parallel
 - C9 = 100 nF polyester capacitor
 - L1 = strip, 28 mm x 4 mm
 - L2 = 4 turns Cu wire (1,0 mm); int.dia. 4,0 mm; length 7,5 mm; leads 2 x 3,5 mm
 - L3 = strip, 22 mm x 6 mm
 - L4 = 1 turn Cu wire (0,8 mm); int.dia. 3,0 mm; leads 2 x 9 mm
 - L5 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat.no. 4312 020 36640)
 - L6 = strip, 12 mm x 6 mm
 - L7 = 2 turns enamelled Cu wire (1,6 mm); int.dia. 5,0 mm; length 7,0 mm; leads 2 x 5 mm
 - L8 = 2 turns enamelled Cu wire (1,6 mm); int.dia. 5,0 mm; length 7,0 mm; leads 2 x 3 mm
 - L10 = strip, 18 mm x 4 mm
- L1, L3, L6 and L10 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16 inch.
- R1 = 4,7 Ω \pm 10%, carbon resistor

* American Technical Ceramics capacitor type 100B or capacitor of same quality.

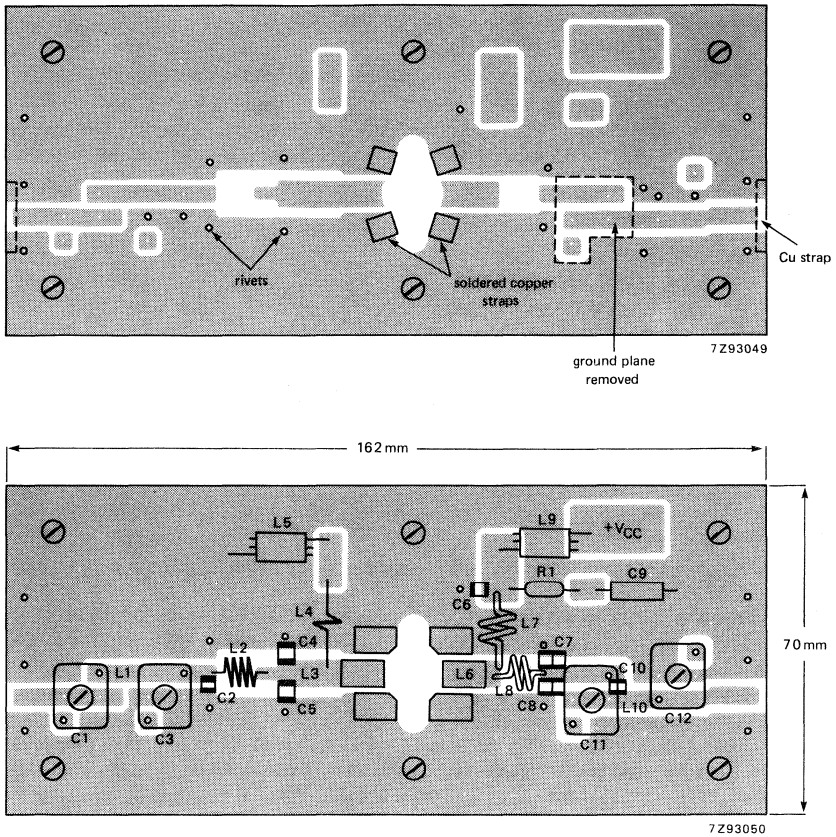


Fig. 7 Printed circuit board and component lay-out for 175 MHz class-B test circuit.

The circuit and components are on one side of the epoxy fibre-glass board. The other side, except for the area indicated by the dotted line, is unetched copper serving as a ground plane. If the p.c.b. is in direct contact with the heatsink, the heatsink area within the dotted line has to be raised at least 0,5 mm to minimize the dielectric losses. Earth connections are made by hollow rivets and additionally by fixing screws and copper straps under the emitters to provide a direct contact between the copper of the component side and the ground plane.

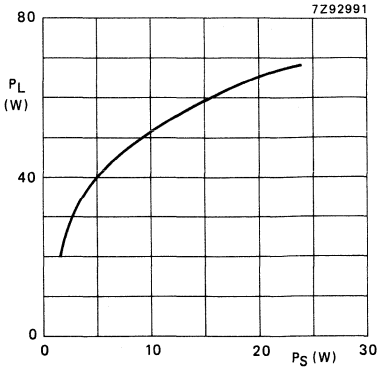


Fig. 8 Load power versus source power.

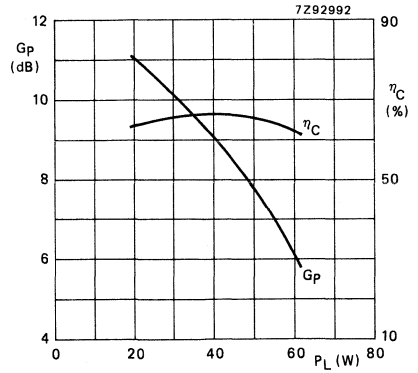


Fig. 9 Power gain and efficiency versus load power.

Condition for Figs 8 and 9:

Typical values; $V_{CE} = 12,5 \text{ V}$; $f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$.

Ruggedness in class-B operation

The BLV45/12 is capable of withstanding a load mismatch ($V_{SWR} = 20$ through all phases) at rated load power up to a supply voltage of $15,5 \text{ V}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$.

Power slump

If T_h is increased from $25 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$ the output power slump for constant P_S amounts to typ. 7 % ($V_{CE} = 12,5$; $f = 175 \text{ MHz}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$).

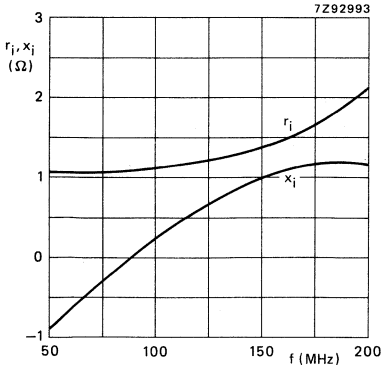


Fig. 10 Input impedance (series components).

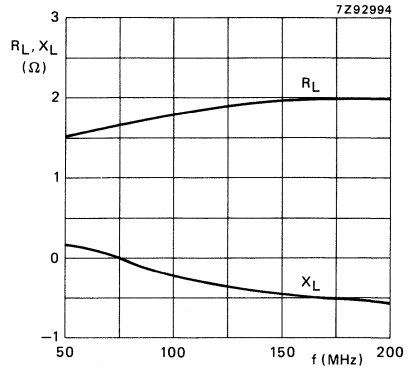


Fig. 11 Load impedance (series components).

Conditions for Figs 10, 11 and 12:

Typical values; $V_{CE} = 12,5$ V; $P_L = 45$ W; $f = 50$ to 200 MHz; $R_{th\ mb-h} = 0,2$ K/W.

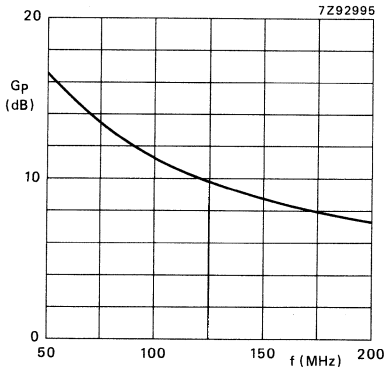


Fig. 12 Power gain versus frequency.

U.H.F. LINEAR PUSH-PULL POWER TRANSISTOR

Two n-p-n silicon planar epitaxial transistor sections in one envelope to be used as push-pull amplifier, primarily intended for use in linear u.h.f. television transmitters and transposers.

Features:

- internally matched input for wideband operation and high power gain;
- internal midpoint (r.f. ground) reduces negative feedback and improves power gain;
- increased input and output impedances (compared with single-ended transistors) simplify wideband matching;
- length of the external emitter leads is not critical;
- diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

mode of operation	f_{vision} MHz	V_{CE} V	$I_{\text{C1}} = I_{\text{C2}}$ A	$I_{\text{C(ZS)}}$ A	T_{h} °C	d_{im}^* dB	$P_{\text{o sync}}^*$ W	P_{L} W	G_{p} dB
class-A	860	25	0,85	—	70 25	-60 -55	> 6 typ. 12	—	> 8,0 typ. 9,0
class-AB	860	25	1,25	2 x 0,1	25	—	—	typ. 38**	typ. 6,5**

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

** Power gain compression is 1 dB.

MECHANICAL DATA

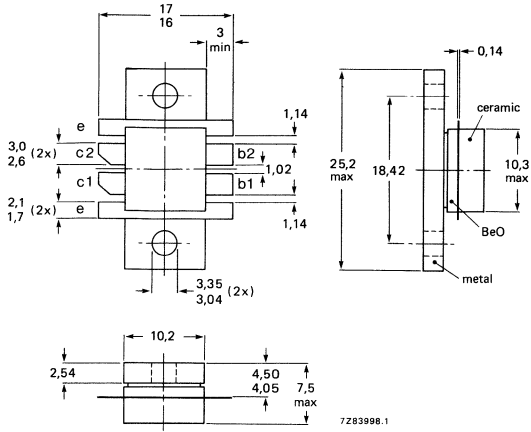
SOT-161 (see Fig. 1).

PRODUCT SAFETY 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

Dimensions in mm

Fig. 1 SOT-161.



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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-emitter voltage

(peak value); $V_{BE} = 0$

open base

V_{CESM} max. 50 V

V_{CEO} max. 27 V

Emitter-base voltage (open collector)

V_{EBO} max. 3,5 V

Collector current per transistor section

d.c. or average

$I_C; I_{C(AV)}$ max. 2 A

(peak value); $f > 1$ MHz

I_{CM} max. 4 A

Total power dissipation at $T_{mb} = 25\text{ }^\circ\text{C}^*$

P_{tot} max. 77 W*

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25\text{ }^\circ\text{C}^*$

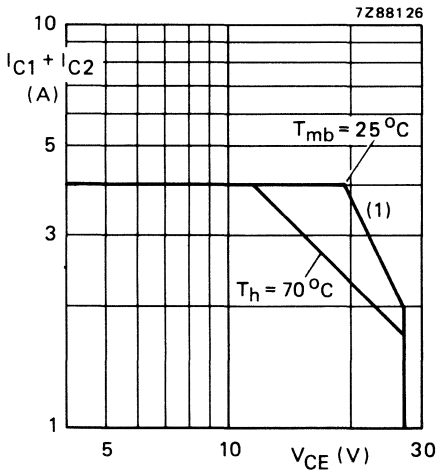
P_{rf} max. 93 W*

Storage temperature

T_{stg} -65 to $+150\text{ }^\circ\text{C}$

Operating junction temperature

T_j max. $200\text{ }^\circ\text{C}$



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.*

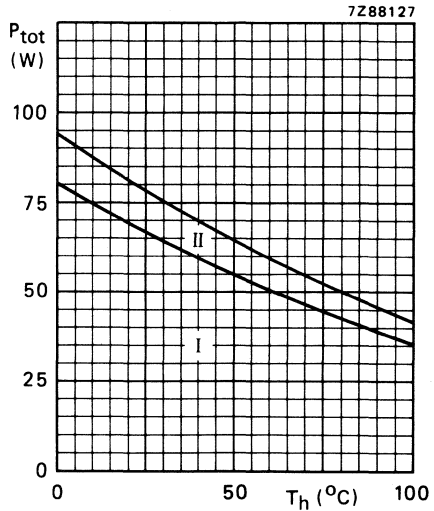


Fig. 3 Power derating curves vs. temperature.*

- I Continuous d.c. (including r.f. class-A) operation
- II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 42 W; $T_{mb} = 80,5\text{ }^\circ\text{C}$, i.e. $T_h = 70\text{ }^\circ\text{C}$)

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

$R_{th\ j-mb(dc)}$ = 2,43 K/W

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

$R_{th\ j-mb(rf)}$ = 1,91 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,25 K/W

* Dissipation of either transistor section should not exceed half rated dissipation.

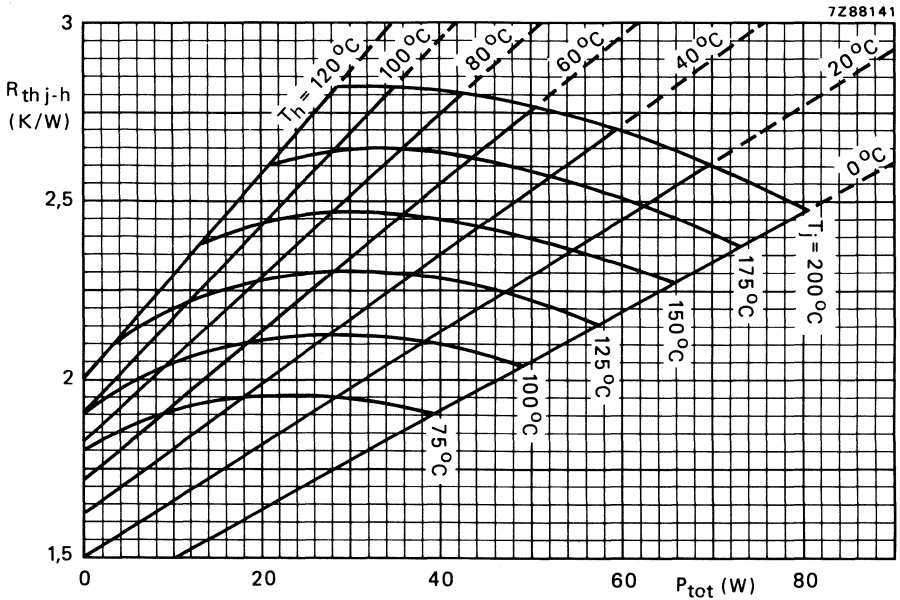


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,25\text{ K/W.}$)

Example

Nominal class-A push-pull operation (without r.f. signal): $V_{CE} = 25\text{ V}$; $I_{C1} = I_{C2} = 0,85\text{ A}$; $T_h = 70\text{ °C}$.

Fig. 4 shows: $R_{th\ j-h}$ max. 2,68 K/W
 T_j max. 184 °C

Typical device: $R_{th\ j-h}$ typ. 2,28 K/W
 T_j typ. 167 °C

CHARACTERISTICS apply to either transistor section unless otherwise specified $T_j = 25\text{ }^\circ\text{C}$

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 10\text{ mA}$ $V_{(BR)CES} > 50\text{ V}$ open base; $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 27\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 5\text{ mA}$ $V_{(BR)EBO} > 3,5\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 27\text{ V}$ $I_{CES} < 10\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

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

D.C. current gain*

 $I_C = 0,85\text{ A}; V_{CE} = 25\text{ V}$ $h_{FE} > 15$
typ. 40

D.C. current gain ratio of transistor sections

 $I_C = 0,85\text{ A}; V_{CE} = 25\text{ V}$

0,67 to 1,5

Collector-emitter saturation voltage*

 $I_C = 1,7\text{ A}; I_B = 0,17\text{ A}$ V_{CEsat} typ. 0,75 VTransition frequency at $f = 100\text{ MHz}^{**}$ $-I_E = 0,85\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 2,5 GHz $-I_E = 1,7\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 2,5 GHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 25\text{ V}$ C_C typ. 24 pF
< 30 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 25\text{ V}$ C_{re} typ. 15 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF* Measured under pulse conditions: $t_p \leq 300\ \mu\text{s}; \delta \leq 0,02$.** Measured under pulse conditions: $t_p \leq 50\ \mu\text{s}; \delta \leq 0,01$.

The graphs apply to either transistor section.

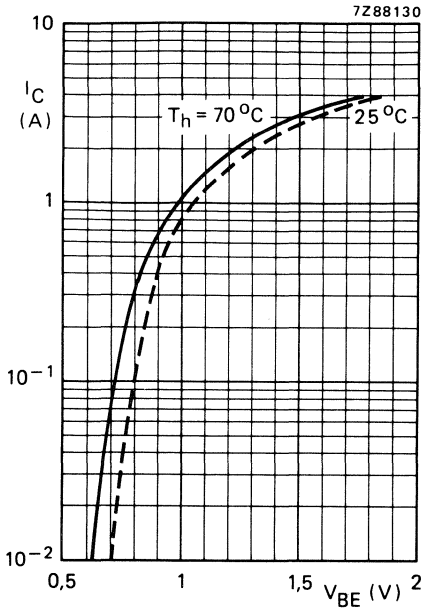


Fig. 5 Typical values; $V_{CE} = 25\text{ V}$.

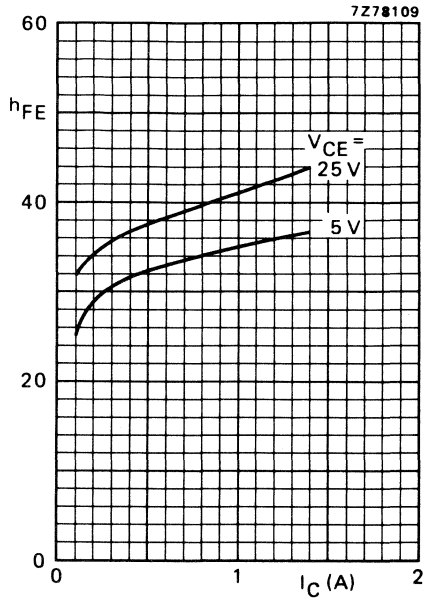


Fig. 6 Typical values; $T_j = 25^\circ\text{C}$.

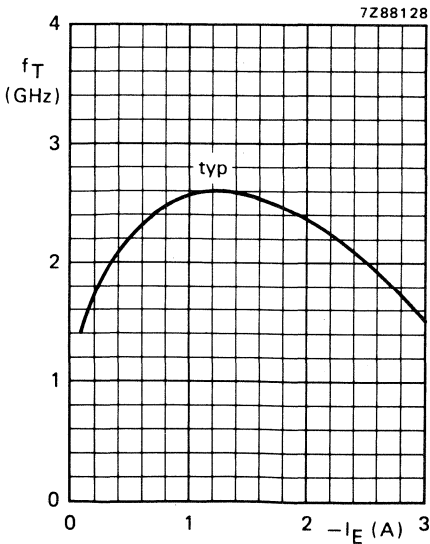


Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25^\circ\text{C}$.

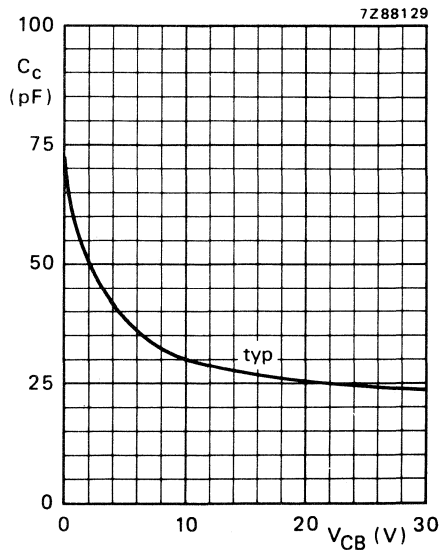


Fig. 8 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-A operation (linear push-pull power amplifier)

f_{vision} (MHz)	V_{CE} (V)	$I_{\text{C1}} = I_{\text{C2}}$ (A)	T_{h} (°C)	d_{im}^* (dB)	$P_{\text{o sync}}^*$ (W)	G_{p} (dB)
860	25	0,85	70	-60	> 6	> 8,0
			70	-60	typ. 7,5	typ. 8,5
			70	-55	typ. 10	typ. 8,5
			25	-55	typ. 12	typ. 9,0

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

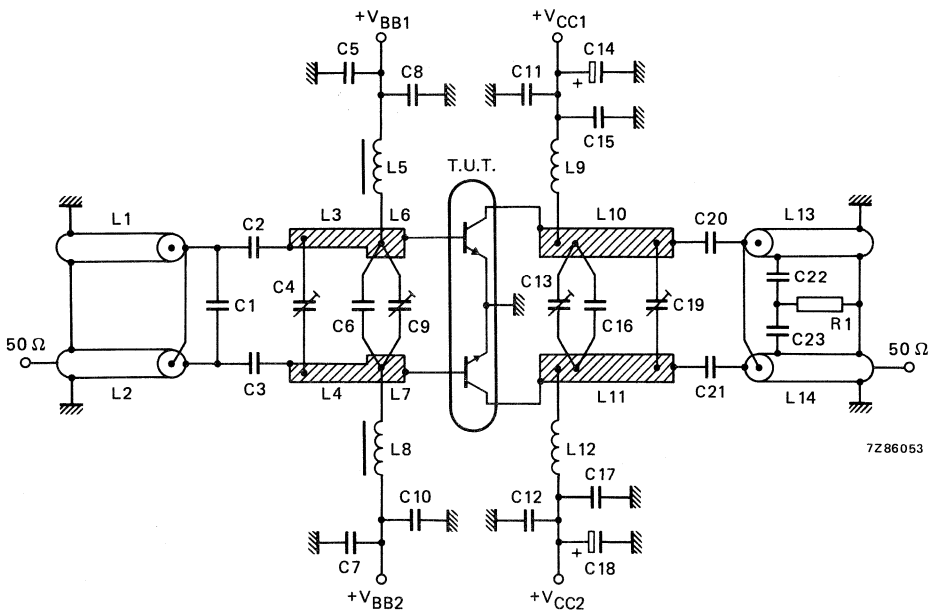


Fig. 9 Class-A test circuit at $f_{\text{vision}} = 860$ MHz.

List of components:

- $C_1 = C_6 = C_{16} = 4,7$ pF (500 V) multilayer ceramic chip capacitor (ATC▲)
 $C_2 = C_3 = C_{20} = C_{21} = 33$ pF multilayer ceramic chip capacitor (cat. no. 2222 851 13339)
 $C_4 = C_9 = C_{13} = C_{19} = 1,2$ to $3,5$ pF film dielectric trimmer (cat. no. 2222 809 05001)
 $C_5 = C_7 = C_{15} = C_{17} = 100$ nF multilayer ceramic chip capacitor (cat. no. 2222 852 59104)
 $C_8 = C_{10} = C_{11} = C_{12} = 220$ pF multilayer ceramic chip capacitor (cat. no. 2222 852 13221)
 $C_{14} = C_{18} = 6,8$ $\mu\text{F}/40$ V solid aluminium electrolytic capacitor
 $C_{22} = C_{23} = 1$ pF (500 V) multilayer ceramic chip capacitor (ATC▲)
 C_9 and C_{13} are placed 8,0 and 14,0 mm from transistor edge, respectively.

▲ ATC means American Technical Ceramics.

L1 = L2 = L13 = L14 = 50 Ω semi-rigid cable; outer diameter 2,2 mm; length 29,0 mm. These cables are soldered on 75 Ω striplines (1,1 mm x 28,0 mm). The centre conductors of the cables L1 and L13 are not connected.

L3 = L4 = 52 Ω stripline (2,0 mm x 16,5 mm)

L5 = L8 = 470 nH microchoke

L6 = L7 = 39 Ω stripline (3,1 mm x 8,0 mm)

L9 = L12 = 1 turn Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 3,5 mm

L10 = L11 = 39 Ω stripline (3,1 mm x 34,0 mm)

L3, L4, L6, L7, L10 and L11 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/32".

R1 = 10 Ω carbon resistor

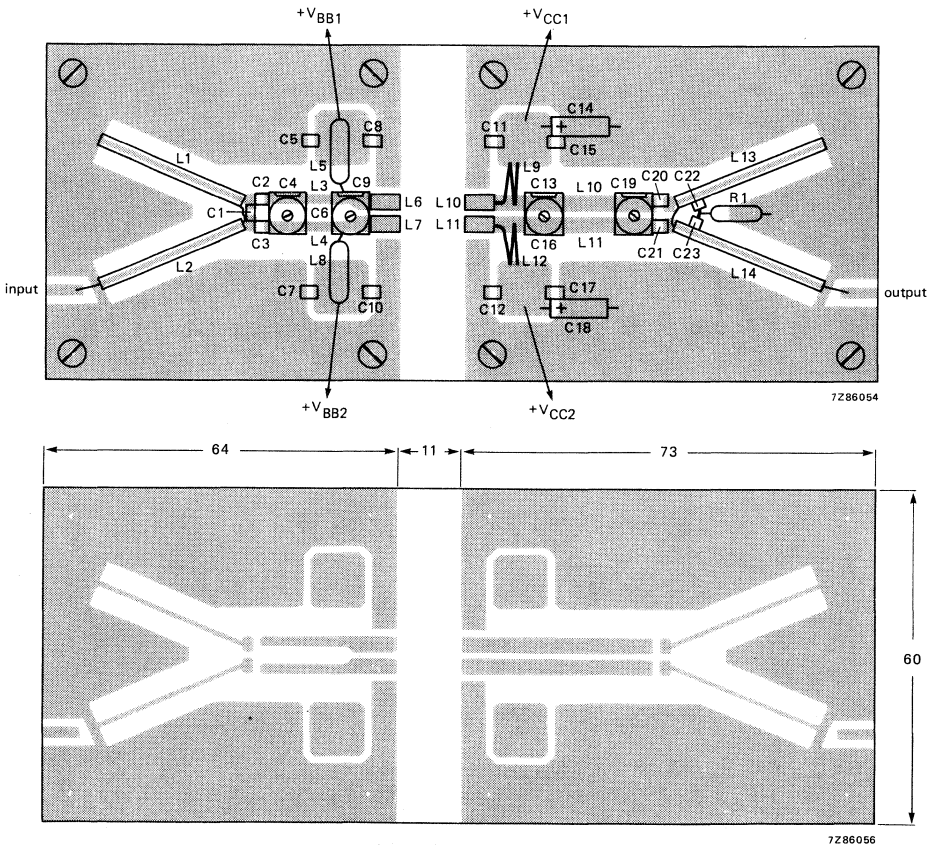


Fig. 10 Component layout and printed-circuit board for 860 MHz class-A test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by means of bolts. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

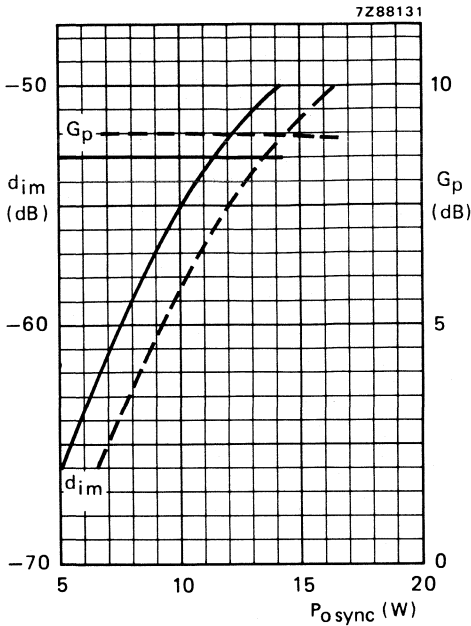


Fig. 11 Intermodulation distortion (d_{im})^{*} and power gain as a function of output power.

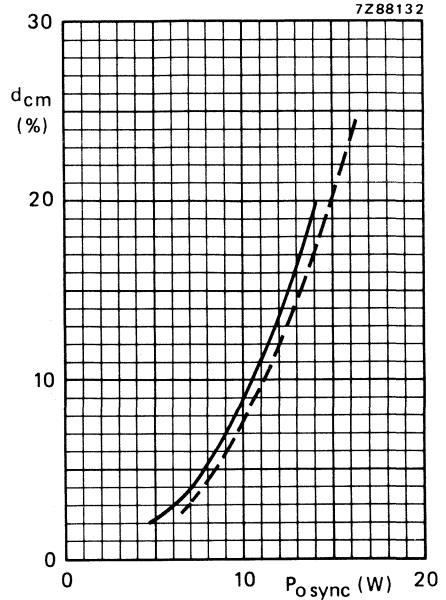


Fig. 12 Cross-modulation distortion (d_{cm})^{**} as a function of output power.

Conditions for Figs 11 and 12:

Typical values; $V_{CE} = 25 \text{ V}$; $I_C = 2 \times 0,85 \text{ A}$; --- $T_h = 25 \text{ }^\circ\text{C}$; — $T_h = 70 \text{ }^\circ\text{C}$; $f_{vision} = 860 \text{ MHz}$.

Ruggedness in push-pull class-A operation

The BLV57 is capable of withstanding full load mismatch (VSWR = 50 through all phases) under the following conditions:

$V_{CE} = 25 \text{ V}$; $I_C = 2 \times 0,85 \text{ A}$; $T_h = 70 \text{ }^\circ\text{C}$; $P_{o_sync}^* \leq 12,5 \text{ W}$; $f = 860 \text{ MHz}$; $R_{th \text{ mb-h}} = 0,25 \text{ K/W}$.

At any other composition of the output signal: P_L (r.m.s. value) $\leq 5 \text{ W}$.

* 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 $\leq -70 \text{ dB}$.

** Two-tone test method (vision carrier 0 dB, sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB.

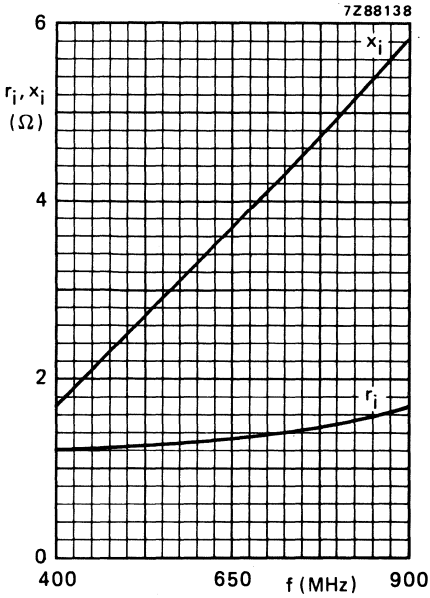


Fig. 20 Input impedance (series components).

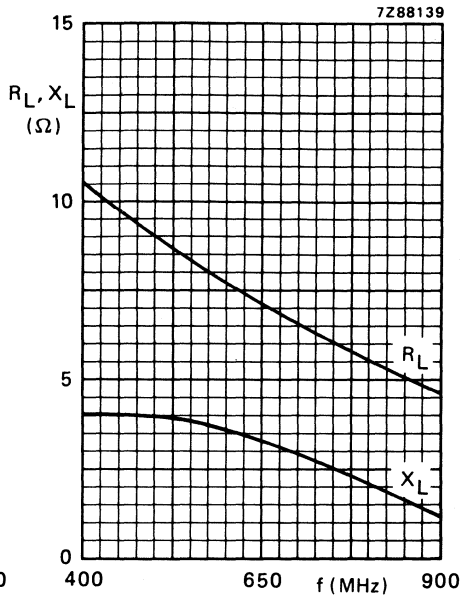


Fig. 21 Load impedance (series components).

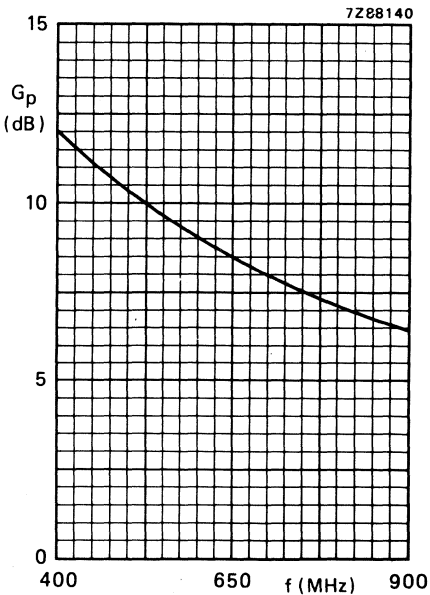


Fig. 22.

Conditions for Figs 20; 21 and 22:

The graphs apply to either transistor section assuming class-AB push-pull operation.

Typical values; $V_{CE} = 25$ V; $I_{C(ZS)} = 0,1$ A; $P_L = 17,5$ W (P.E.P.); $T_h = 70$ °C.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-AB operation (c.w.)

f_{vision} (MHz)	V_{CE} (V)	$I_{\text{C(ZS)}}$ (A)	T_{h} ($^{\circ}\text{C}$)	P_{L} (W)	$I_{\text{C1}} = I_{\text{C2}}$ (A)	η (%)	G_{p}^* (dB)
860	25	$2 \times 0,1$	25	12,5 38	typ. 1,25	typ. 60	typ. 7,5 typ. 6,5
860	25	$2 \times 0,1$	70	12,5 30	typ. 1,10	typ. 55	typ. 7,0 typ. 6,0

* Typical values are based on 1 dB gain compression. Using a 3rd order amplitude transfer characteristic, 1 dB compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

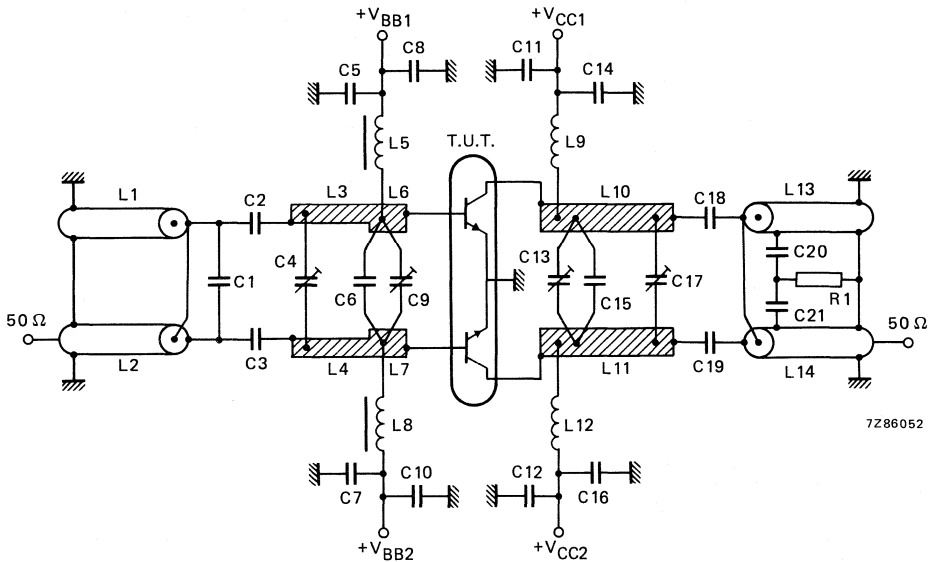


Fig. 16 Class-AB test circuit at $f_{\text{vision}} = 860$ MHz.

List of components:

- C1 = C6 = C15 = 4,7 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
 - C2 = C3 = C18 = C19 = 33 pF multilayer ceramic chip capacitor (cat. no. 2222 851 13339)
 - C4 = C9 = C13 = C17 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
 - C5 = C7 = C14 = C16 = 100 nF multilayer ceramic chip capacitor (cat. no. 2222 852 59104)
 - C8 = C10 = C11 = C12 = 220 pF multilayer ceramic chip capacitor (cat. no. 2222 852 13221)
 - C20 = C21 = 1 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
- C9 and C13 are placed 8,0 and 14,0 mm from transistor edge, respectively.

▲ ATC means American Technical Ceramics.

L1 = L2 = L13 = L14 = 50 Ω semi-rigid cable; outer diameter 2,2 mm; length 29,0 mm. These cables are soldered on 75 Ω striplines (1,1 mm x 28,0 mm). The centre conductors of the cables L1 and L13 are not connected.

L3 = L4 = 52 Ω stripline (2,0 mm x 16,5 mm)

L5 = L8 = 470 nH microchoke

L6 = L7 = 39 Ω stripline (3,1 mm x 8,0 mm)

L9 = L12 = 1 turn Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 3,5 mm

L10 = L11 = 39 Ω stripline (3,1 mm x 34,0 mm)

L3, L4, L6, L7, L10 and L11 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/32".

R1 = 10 Ω carbon resistor

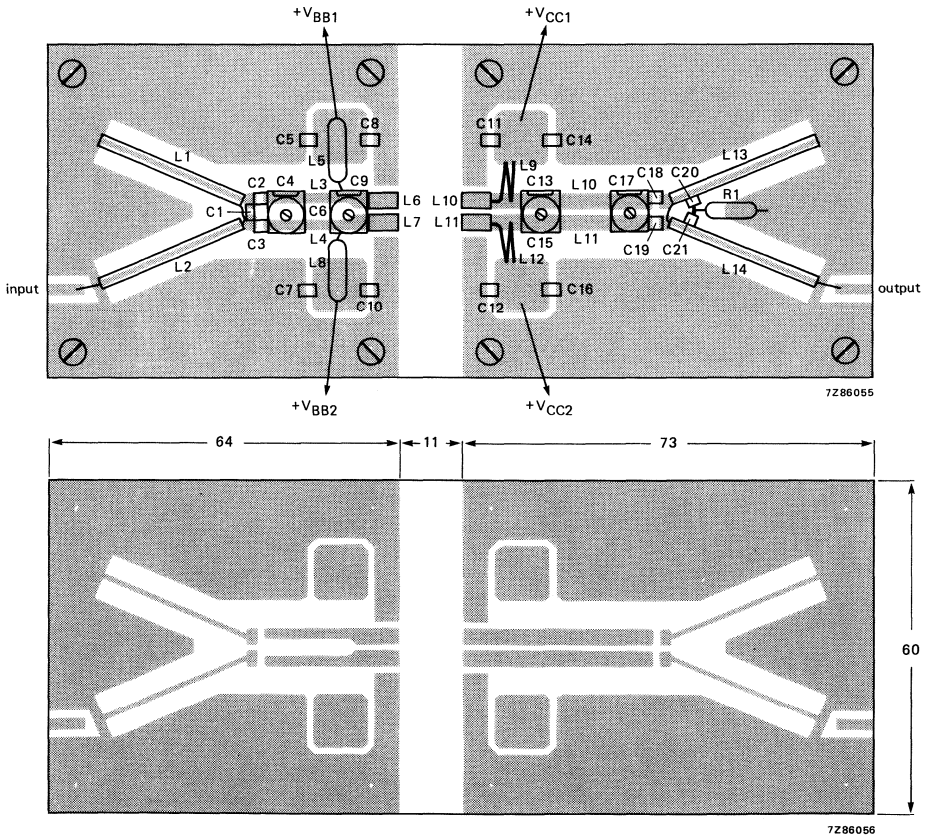


Fig. 17 Component layout and printed-circuit board for 860 MHz class-AB test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by means of bolts. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

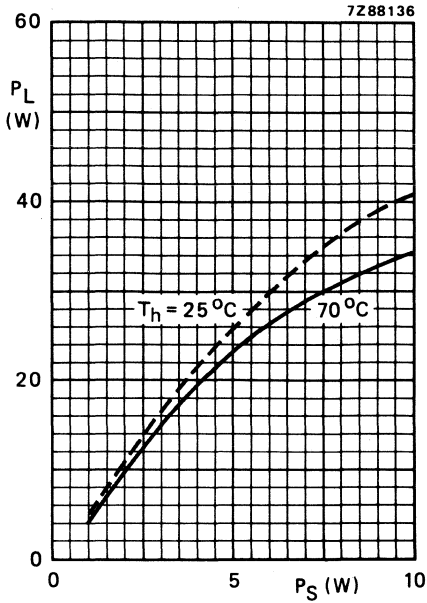


Fig. 18 Typical values; $V_{CE} = 25\text{ V}$;
 $I_{C(ZS)} = 2 \times 0,1\text{ A}$; $f_{\text{vision}} = 860\text{ MHz}$.

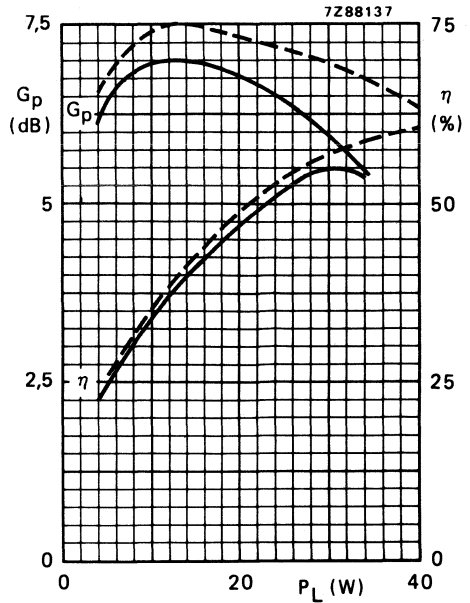


Fig. 19 Typical values; $V_{CE} = 25\text{ V}$;
 $I_{C(ZS)} = 2 \times 0,1\text{ A}$; --- $T_h = 25^\circ\text{C}$;
 — $T_h = 70^\circ\text{C}$; $f_{\text{vision}} = 860\text{ MHz}$.

Ruggedness in class-AB operation

The BLV57 is capable of withstanding a load mismatch ($V_{\text{SWR}} \leq 2$ through all phases) up to 30 W (r.m.s. value) or ($V_{\text{SWR}} \leq 50$ through all phases) up to 19 W under the following conditions: $V_{CE} = 25\text{ V}$; $T_h = 70^\circ\text{C}$; $f = 860\text{ MHz}$; $R_{\text{th mb-h}} = 0,25\text{ K/W}$.

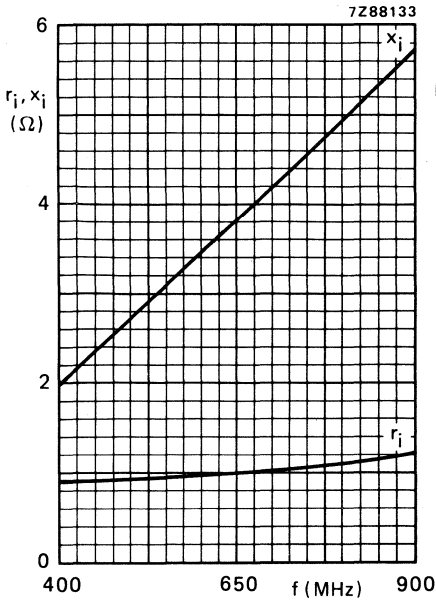


Fig. 13 Input impedance (series components).

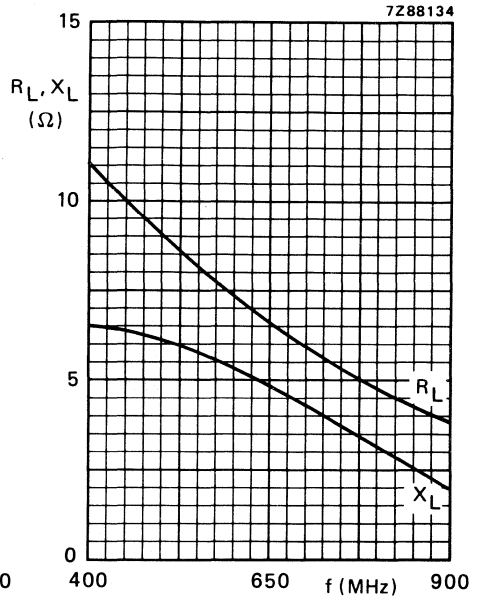


Fig. 14 Load impedance (series components).

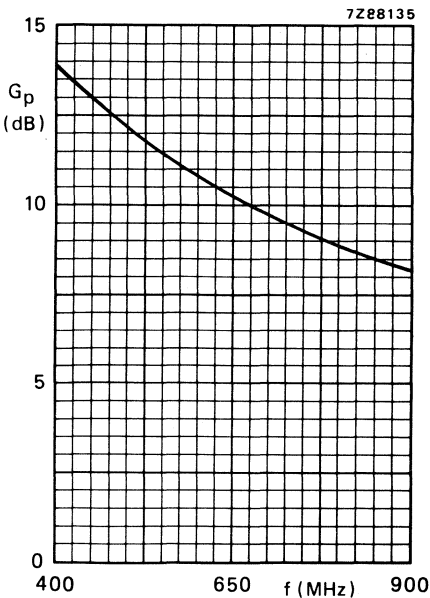


Fig. 15.

Conditions for Figs 13, 14 and 15:

The graphs apply to either transistor section assuming class-A push-pull operation.
 Typical values; $V_{CE} = 25$ V; $I_C = 0,85$ A;
 $T_h = 70$ °C.

U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-171 envelope primarily intended for use as linear amplifier in u.h.f. television transmitters.

Features:

- internal input matching to achieve an optimum wideband capability and high power gain
 - emitter-ballasting resistors for lower junction temperatures.
 - titanium-platinum-gold ensures long life and excellent reliability.
- The transistor has a 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 common emitter class-AB circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
class AB; c.w.	25	860	30	min. 7,0	min. 50

MECHANICAL DATA

Dimensions in mm

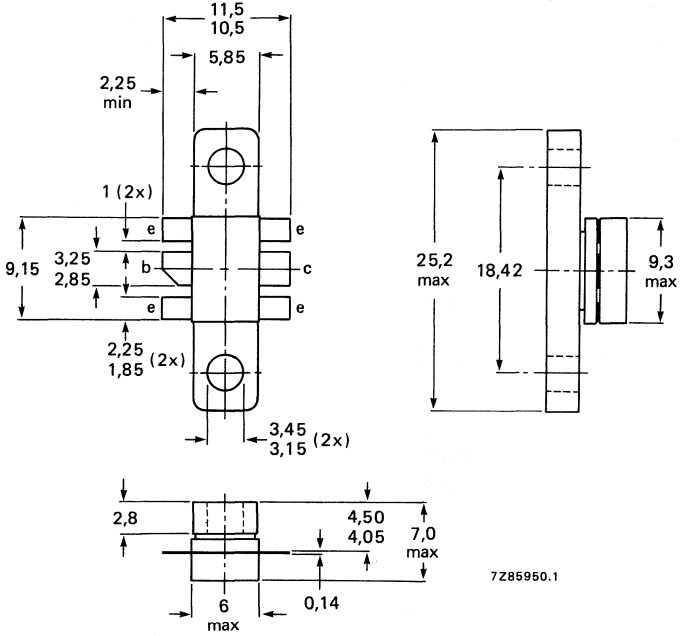
SOT-171 (see Fig. 1).

PRODUCT SAFETY 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

Dimensions in mm

Fig. 1 SOT-171.



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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	50 V
Collector-emitter voltage (open base)	V_{CE0}	max.	27 V
Emitter-base voltage (open collector)	V_{EB0}	max.	3,5 V
Collector current			
d.c. or average	I_C	max.	3 A
(peak value); $f > 1$ MHz	I_{CM}	max.	9 A
Total power dissipation			
at $T_{mb} = 25\text{ }^\circ\text{C}$; $f > 1$ MHz	P_{tot}	max.	70 W
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

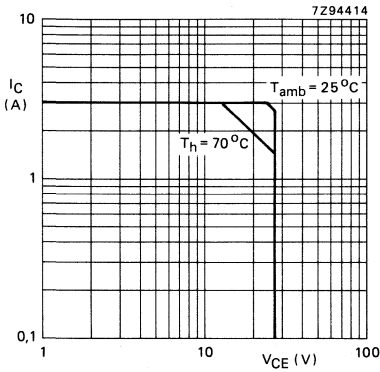


Fig. 2 D.C. SOAR; $R_{th\ mb-h} = 0,4\text{ K/W}$.

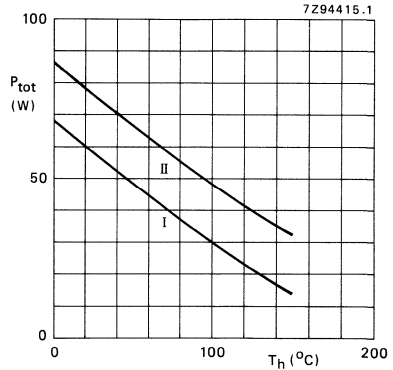


Fig. 3 Power/temperature derating curves versus heatsink temperature.

- I Continuous operation ($f > 1$ MHz)
- II Short-time operation during mismatch ($f > 1$ MHz)

MAXIMUM THERMAL RESISTANCE

Dissipation = 50 W; $T_{amb} = 25\text{ }^\circ\text{C}$

From junction to mounting base

$R_{th\ j-mb}$ max. 2,3 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ max. 0,4 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 50\text{ mA}$

$V_{(BR)CBO}$ min. 50 V

Collector-emitter breakdown voltage
open base; $I_C = 100\text{ mA}$

$V_{(BR)CEO}$ min. 27 V

Emitter-base breakdown voltage
open collector; $I_E = 10\text{ mA}$

$V_{(BR)EBO}$ min. 3,5 V

Collector leakage current
 $V_{BE} = 0$; $V_{CE} = 27\text{ V}$

I_{CES} max. 10 mA

Second breakdown energy
 $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

$ESBR$ min. 4 mJ

D.C. current gain

$V_{CE} = 20\text{ V}$; $I_C = 2\text{ A}$

h_{FE} min. 15

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

$I_E = i_e = 0$; $V_{CB} = 25\text{ V}$

C_c typ. 44 pF

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

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

C_{re} typ. 30 pF

Collector-flange capacitance

C_{cf} typ. 2 pF

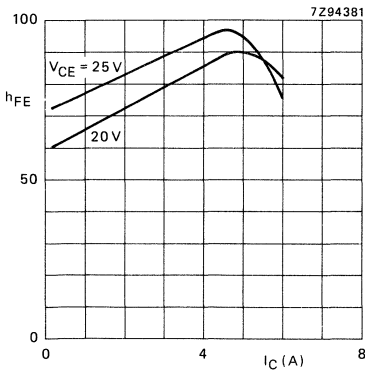


Fig. 4 D.C. current gain versus collector current; $T_j = 25\text{ }^\circ\text{C}$.

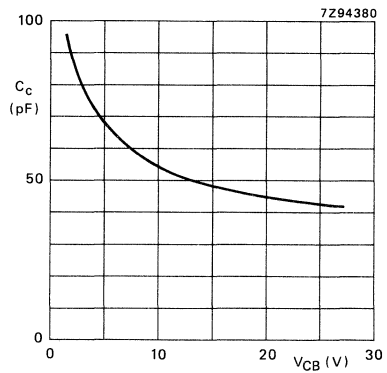


Fig. 5 Output capacitance versus V_{CB} ; $I_E = i_e = 0$; $f = 1\text{ MHz}$.

APPLICATION INFORMATION

R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in common emitter class-AB circuit (c.w.); $R_{th\text{ mb-h}} = 0,4\text{ K/W}$

f (MHz)	V_{CE} (V)	$I_{C(ZS)}$ (mA)	G_p (dB)	P_L (W)	η (%)	ΔG_p (dB) [▲]
860	25	60	min. 7,0 typ. 8,5	30	min. 50 typ. 55	max. 1,0 typ. 0,2

▲ Assuming a 3rd-order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

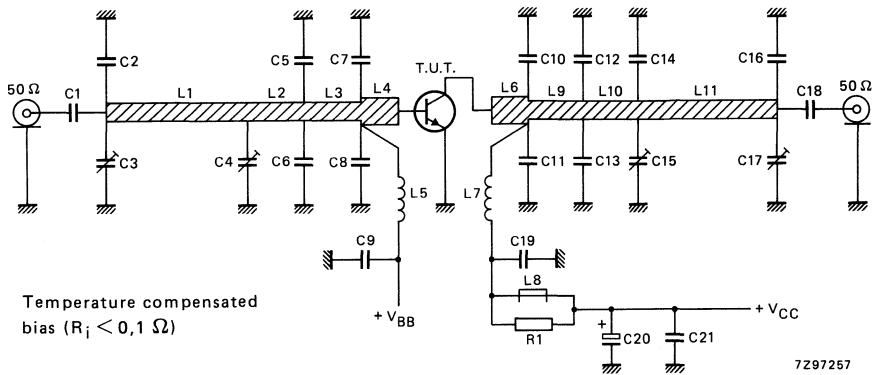


Fig. 6 Class-AB test circuit at $f = 860\text{ MHz}$.

List of components:

- C1 = C18 = 33 pF multilayer ceramic chip capacitor*
- C2 = C14 = C16 = 3,6 pF multilayer ceramic chip capacitor*
- C3 = C4 = C15 = C17 = 1,4 – 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C5 = C6 = 1,8 pF multilayer ceramic chip capacitor*
- C7 = C8 = 6,2 pF multilayer ceramic chip capacitor*
- C9 = C21 = 330 pF multilayer ceramic chip capacitor*
- C10 = C11 = 5,6 pF multilayer ceramic chip capacitor**
- C12 = 5,6 pF multilayer ceramic chip capacitor*
- C13 = 6,2 pF multilayer ceramic chip capacitor*
- C19 = 10 pF multilayer ceramic chip capacitor*
- C20 = 6,8 μF (63 V) electrolytic capacitor
- L1 = L11 = 50 Ω stripline (26 mm x 2,4 mm)
- L2 = L3 = 50 Ω stripline (9,5 mm x 2,4 mm)
- L4 = 42,6 Ω stripline (6,0 mm x 3,0 mm)
- L5 = 60 nH; 4 turns closely wound enamelled Cu-wire (0,4 mm) int. dia. 3 mm; leads 2 x 5 mm.
- L6 = 42,6 Ω stripline (4,0 mm x 3,0 mm)
- L7 = 45 nH; 4 closely wound enamelled Cu-wire (1 mm); int. dia. 4 mm; leads 2 x 5 mm
- L8 = Ferroxcube h.f. choke, grade 3B (cat.no. 4312 020 36642)
- L9 = 50 Ω stripline (9,0 mm x 2,4 mm)
- L10 = 50 Ω stripline (13,5 mm x 2,4 mm)
- R1 = 10 $\Omega \pm 5\%$, 1 W metal film resistor

The striplines are on a double Cu-clad printed circuit board with a P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch.

- * American Technical Ceramics type 100B or capacitor of the same quality.
- ** American Technical Ceramics type 100A or capacitor of the same quality.

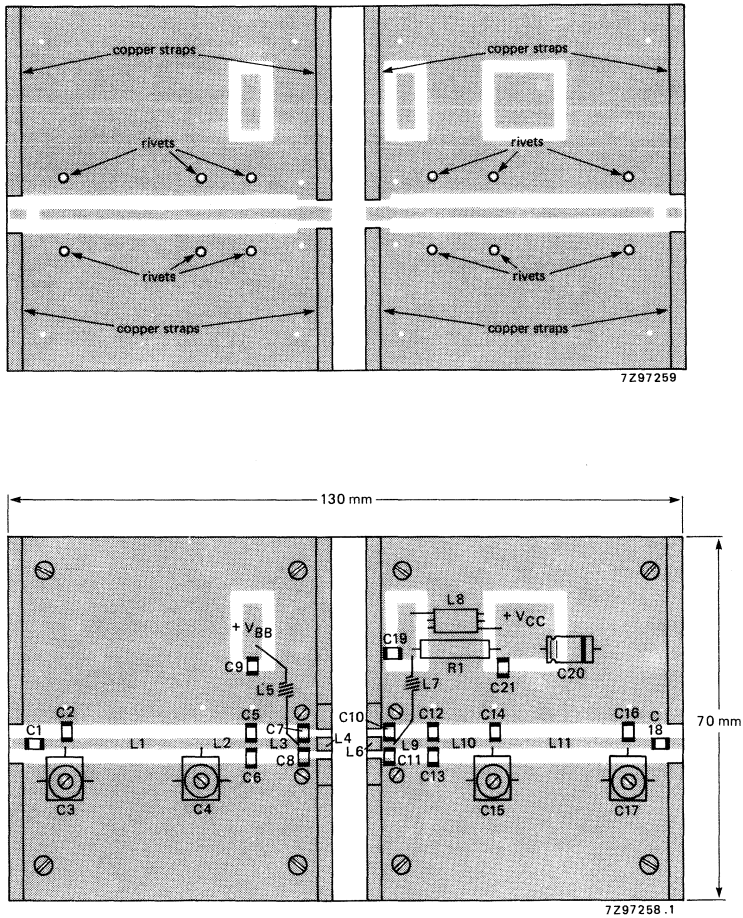


Fig. 7 Printed circuit board and component layout for 860 MHz class-AB test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

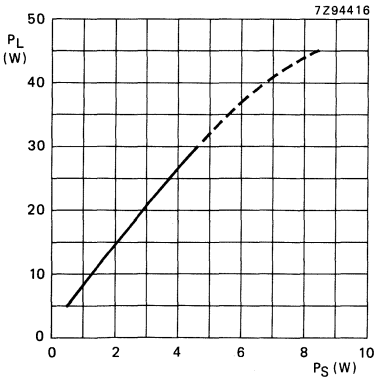


Fig. 8 Load power versus source power.

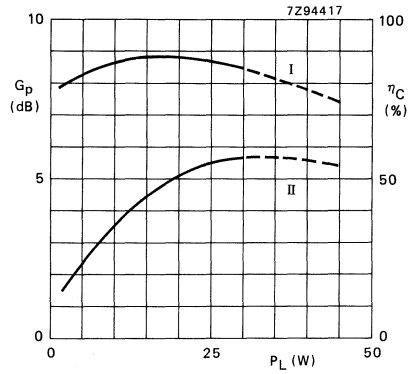


Fig. 9 Power gain (I) and efficiency versus load power (II).

Conditions for Figs 8 and 9:

Typical values; $V_{CE} = 25$ V; $f = 860$ MHz; $I_{C(ZS)} = 60$ mA; $T_h = 25$ °C
 $R_{th\ mb-h} = 0,4$ K/W; class-AB operation.

RUGGEDNESS

The BLV59 is capable of withstanding load mismatch ($V_{SWR} = 10$ through all phases) at rated load power under the following conditions; $V_{CE} = 25$ V; $f = 860$ MHz; $T_h = 25$ °C; $R_{th\ mb-h} = 0,4$ K/W; $I_{C(ZS)} = 60$ mA (class-AB operation).

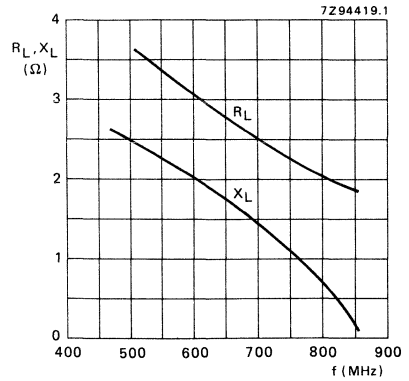
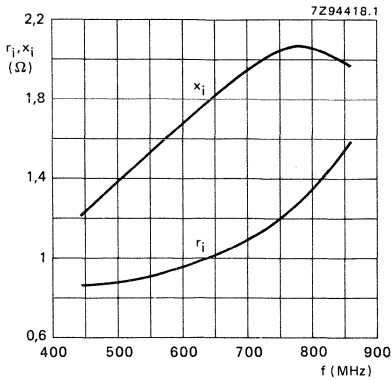


Fig. 10 Input impedance (series components).

Fig. 11 Load impedance (series components).

Conditions for Figs 10, 11 and 12

Typical values; $V_{CE} = 25$ V; $P_L = 30$ W; $f = 470$ to 860 MHz; $T_h = 25$ °C;
 $R_{th\ mb-h} = 0,4$ K/W; $I_C(ZS) = 60$ mA; class-AB operation.

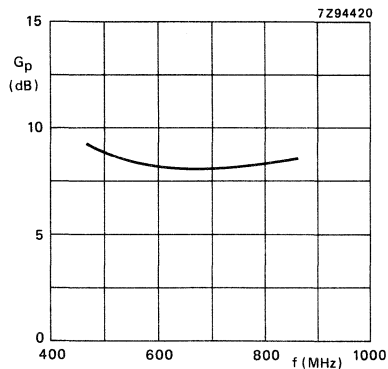


Fig. 12 Power gain versus frequency.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 175 MHz communications band.

Features

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability
- internal matching to achieve an optimum wideband capability and high power gain

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

QUICK REFERENCE DATA

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

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	175	75	> 6,5	> 55

MECHANICAL DATA

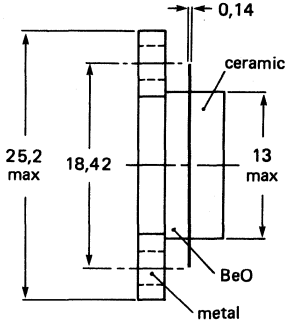
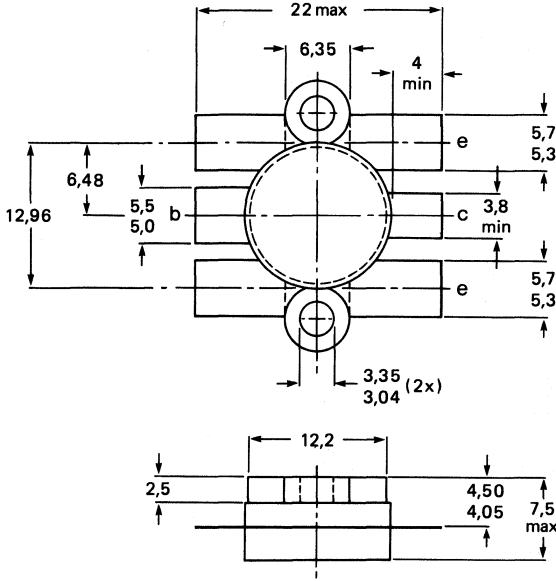
Fig. 1 SOT-119 (see Fig. 1)

PRODUCT SAFETY 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



7277385.6

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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current d.c. or average	I_C	max.	15 A
peak value; $f > 1$ MHz	I_{CM}	max.	45 A
Total power dissipation at $T_{mb} = 25\text{ }^\circ\text{C}$; $f > 1$ MHz	P_{tot}	max.	150 W
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

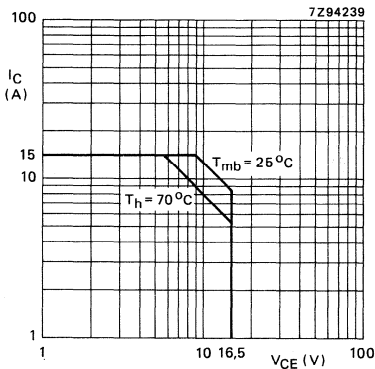


Fig. 2 D.C. soar.
 $R_{th\ mb-h} = 0,2\ \text{K/W}$.

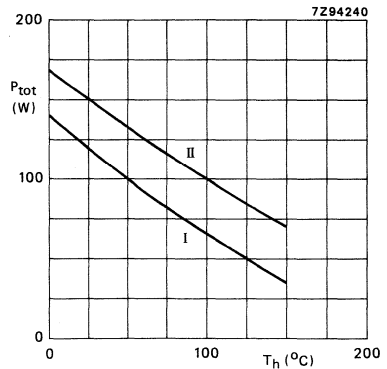


Fig. 3 Power/temperature derating curves; $R_{th\ mb-h} = 0,2\ \text{K/W}$.
I Continuous operation ($f > 1$ MHz)
II Short-time operation during mismatch; ($f > 1$ MHz).

THERMAL RESISTANCE

Dissipation = 96 W; $T_{mb} = 25\text{ }^\circ\text{C}$

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

$R_{th\ j-mb} = 1,05\ \text{K/W}$

From mounting base to heatsink

$R_{th\ mb-h} = 0,2\ \text{K/W}$

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 100\text{ mA}$

$V_{(BR)CBO}$ min. 36 V

Collector-emitter breakdown voltage
open base; $I_C = 200\text{ mA}$

$V_{(BR)CEO}$ min. 16,5 V

Emitter-base breakdown voltage
open collector; $I_E = 20\text{ mA}$

$V_{(BR)EBO}$ min. 4 V

Collector cut-off current
 $V_{BE} = 0$; $V_{CE} = 16\text{ V}$

I_{CES} max. 44 mA

Second breakdown energy
 $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

$ESBR$ min. 20 mJ

D.C. current gain
 $V_{CE} = 10\text{ V}$; $I_C = 10\text{ A}$

h_{FE} min. 15
typ. 55

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$

C_C typ. 240 pF

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 0$; $V_{CE} = 12,5\text{ V}$

C_{re} typ. 150 pF

Collector-flange capacitance

C_{cf} typ. 3 pF

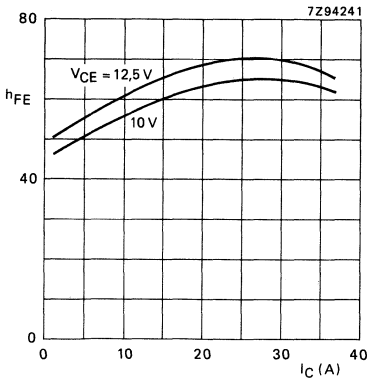


Fig. 4 D.C. current gain versus collector current; $T_j = 25\text{ }^\circ\text{C}$.

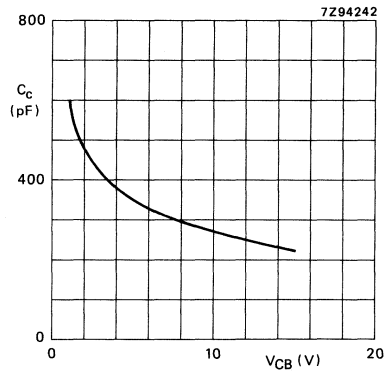


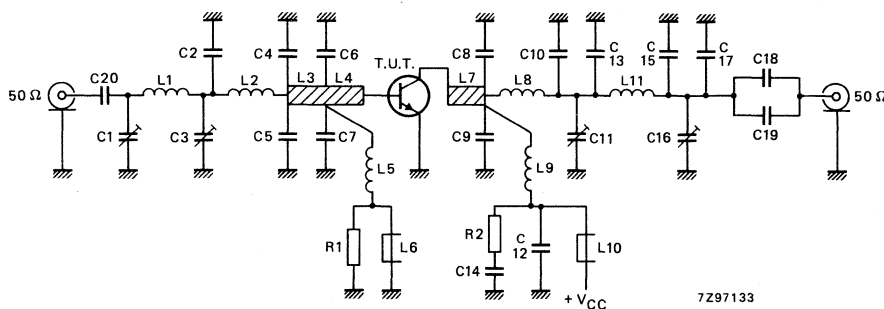
Fig. 5 Output capacitance versus V_{CB} ; $I_E = i_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION

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

 $f = 175 \text{ MHz}$; $T_H = 25 \text{ }^\circ\text{C}$; $R_{th\text{mb-h}} = 0,2 \text{ K/W}$

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	75	> 6,5 typ. 7,5	> 55 typ. 63

Fig. 6 Class-B test circuit at $f = 175 \text{ MHz}$.

List of components:

- C1 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
- C2 = 10 pF multilayer ceramic chip capacitor*
- C3 = C16 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
- C4 = C5 = 75 pF multilayer ceramic chip capacitor
- C6 = C7 = 100 pF multilayer ceramic chip capacitor*
- C8 = C9 = 2 x 75 pF multilayer ceramic chip capacitors* in parallel
- C10 = C13 = 39 pF multilayer ceramic chip capacitor*
- C11 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
- C12 = 2 x 820 pF multilayer ceramic chip capacitors in parallel*
- C14 = 100 nF polyester capacitor
- C15 = C17 = 12 pF multilayer ceramic chip capacitor*
- C18 = C19 = 470 pF multilayer ceramic chip capacitor*
- C20 = 820 pF multilayer ceramic chip capacitor*

* American Technical Ceramics capacitor type 100B or capacitor of the same quality.

- L1 = 1 turn silver-plated Cu-wire (2,0 mm); int. dia. 10 mm; leads 2 x 4 mm
- L2 = 1 turn silver-plated Cu-wire (2,0 mm); int. dia. 1 mm; leads 2 x 6 mm
- L3 = strip (14 mm x 6 mm)
- L4 = strip (8 mm x 6 mm)
- L5 = 100 nH, 7 turns closely wound enamelled Cu-wire (0,5 mm); int. dia. 3 mm; leads 2 x 7 mm
- L6 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36640)
- L7 = strip (12 mm x 6 mm)
- L8 = silver-plated copper U-shaped inductance (7 + 15 + 7) mm x 4 mm x 0,5 mm
- L9 = silver-plated copper U-shaped inductance (8 + 8,5 + 6) mm x 4 mm x 0,5 mm
- L10 = modified Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36640) with 3 parallel connected Cu wires (0,8 mm)
- L11 = 2 turns silver-plated Cu-wire (2,0 mm); int. dia. 9 mm; length 7,5 mm; leads 2 x 3,5 mm

→ L3, L4 and L7 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, ($\epsilon_r = 4,5$) thickness 1/16 inch).

- R1 = $10 \Omega \pm 10\%$, carbon resistor
- R2 = $4,7 \Omega \pm 10\%$, carbon resistor

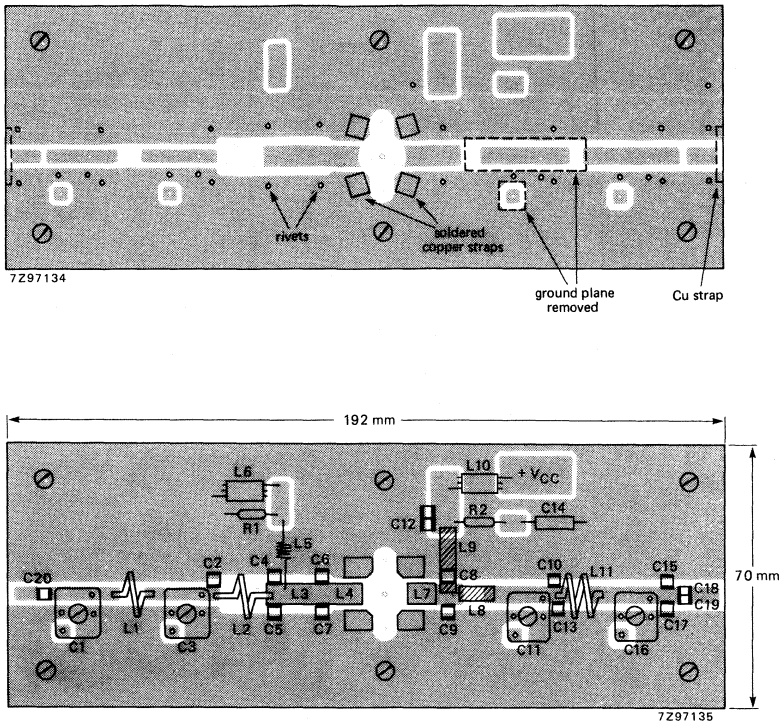


Fig. 7 Printed circuit board and component lay-out for 175 MHz class-B test circuit.

The circuit and components are on one side of the epoxy fibre-glass board. The other side, except for the area indicated by the dotted line, is unetched copper serving as a ground plane. If the p.c.b. is in direct contact with the heatsink, the heatsink area within the dotted line has to be raised at least 0,5 mm to minimize the dielectric losses. Earth connections are made by hollow rivets and additionally by fixing screws and copper straps under the emitters to provide a direct contact between the copper of the component side and the ground plane.

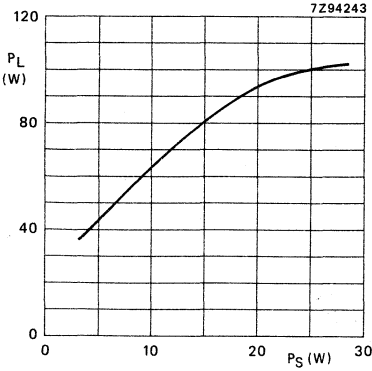


Fig. 8 Load power versus source power.

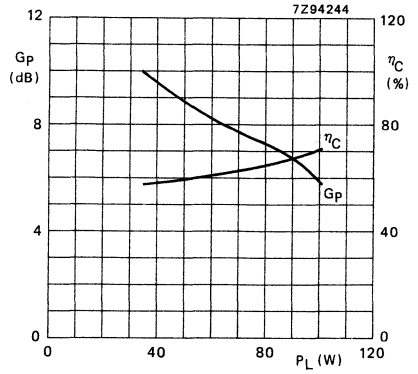


Fig. 9 Power gain and efficiency versus load power.

Condition for Figs 8 and 9:

Typical values; $V_{CE} = 12,5 \text{ V}$; $f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0,2 \text{ K/W}$.

Ruggedness in class-B operation

The BLV75/12 is capable of withstanding a load mismatch ($V_{SWR} = 20$ through all phases) at rated load power up to a supply voltage of $12,5 \text{ V}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0,2 \text{ K/W}$.

Power slump

If T_h is increased from $25 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$ the output power slump for constant P_S amounts to typ. 7% ($V_{CE} = 12,5$; $f = 175 \text{ MHz}$; $R_{th\text{ mb-h}} = 0,2 \text{ K/W}$).

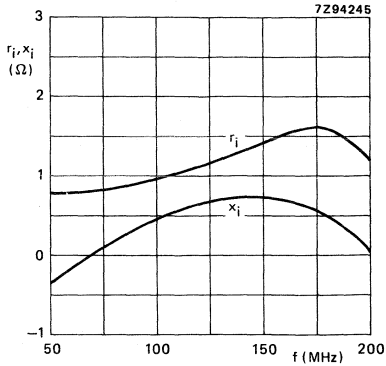


Fig. 10 Input impedance (series components).

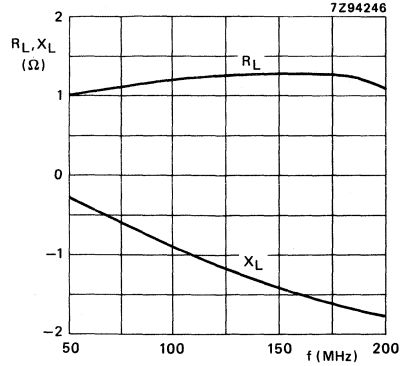


Fig. 11 Load impedance (series components).

Conditions for Figs 10, 11 and 12:

Typical values; $V_{CE} = 12,5 \text{ V}$; $P_L = 75 \text{ W}$; $f = 50 \text{ to } 200 \text{ MHz}$; class-B operation; $R_{th mb-h} = 0,2 \text{ K/W}$.

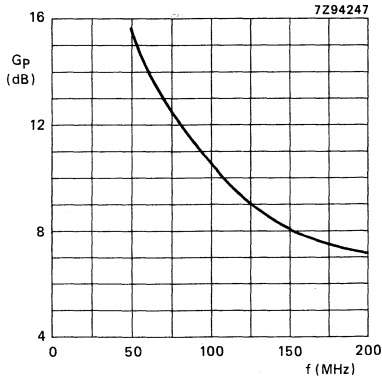


Fig. 12 Power gain versus frequency.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in base stations in the v.h.f. mobile radio band.

Features:

- multi-base structure and diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a 1/2 in. 4-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance at $T_H = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	P_S W	G_p dB	η %
narrow band; c.w.	28	175	80	< 17,9	> 6,5	> 70

MECHANICAL DATA

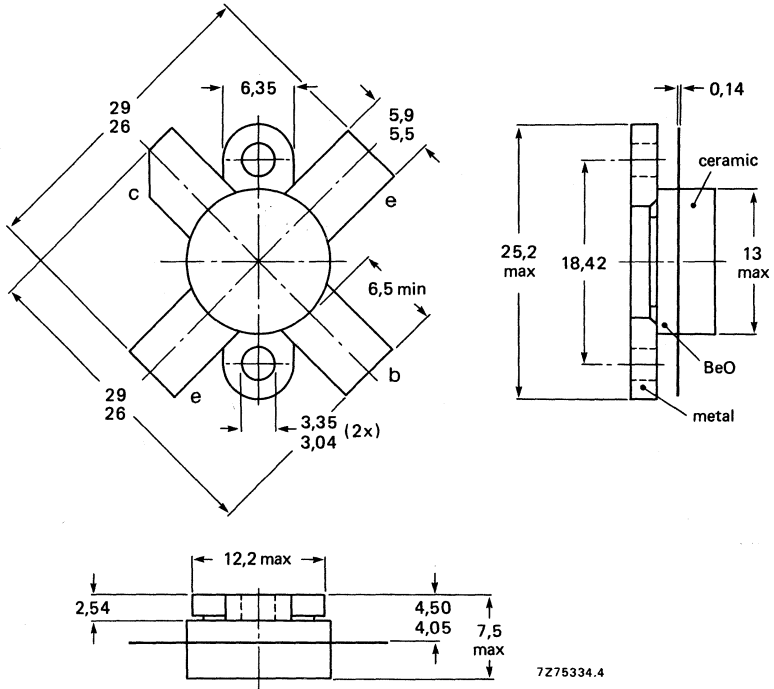
SOT-121 (see Fig. 1)

PRODUCT SAFETY 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

Dimensions in mm

Fig. 1 SOT-121.



Torque on screw: min. 0,60 Nm (6,0 kg cm)
max. 0,75 Nm (7,5 kg cm)

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-emitter voltage (peak-value);

$V_{BE} = 0$

open base

V_{CESM} max. 65 V

V_{CEO} max. 33 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

$I_C; I_{C(AV)}$ max. 8,5 A

(peak value); $f > 1$ MHz

I_{CM} max. 17,5 A

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

P_{tot} max. 116 W

R.F. power dissipation

$f > 1$ MHz; $T_{mb} = 25$ °C

P_{rf} max. 144 W

$f > 1$ MHz; $T_h = 70$ °C

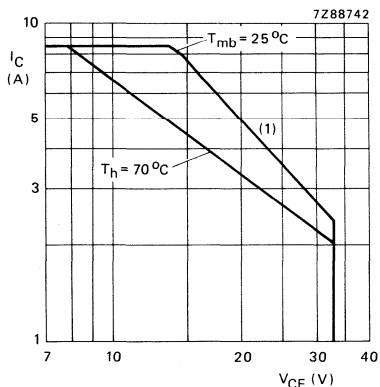
P_{rf} max. 80 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C



(1) Second breakdown limit.

Fig. 2 D.C. SOAR.

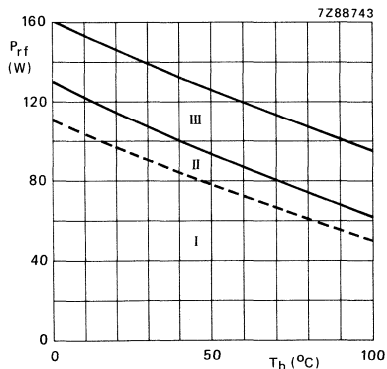


Fig. 3 Power derating curve vs. temperature.

- I Continuous d.c. operation
- II Continuous r.f. operation; ($f > 1$ MHz)
- III Short-time operation during mismatch; ($f > 1$ MHz)

THERMAL RESISTANCE (dissipation = 90 W; $T_{mb} = 60$ °C, i.e. $T_h = 33$ °C)

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

$R_{th\ j-mb(dc)}$ = 1,50 K/W

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

$R_{th\ j-mb(rf)}$ = 1,30 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 K/W

CHARACTERISTICS

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

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 25\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$ open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 33\text{ V}$

Emitter-base breakdown voltage

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

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 33\text{ V}$ $I_{CES} < 10\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

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

D.C. current gain*

 $I_C = 3,5\text{ A}; V_{CE} = 25\text{ V}$ h_{FE} typ. 45
15 to 100

Collector-emitter saturation voltage*

 $I_C = 10\text{ A}; I_B = 2\text{ A}$ V_{CEsat} typ. 1,6 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 3,5\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 575 MHz $-I_E = 10\text{ A}; V_{CB} = 25\text{ V}$ f_T typ. 600 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 25\text{ V}$ C_c typ. 155 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 25\text{ V}$ C_{re} typ. 88 pF

Collector-flange capacitance

 C_{cf} typ. 4,5 pF* Measured under pulse conditions: $t_p > 300\text{ }\mu\text{s}; \delta < 0,02$.

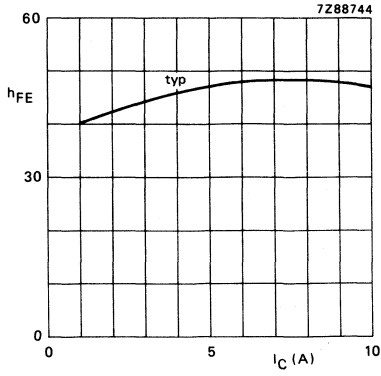


Fig. 4 $V_{CE} = 25$ V; $T_j = 25$ °C.

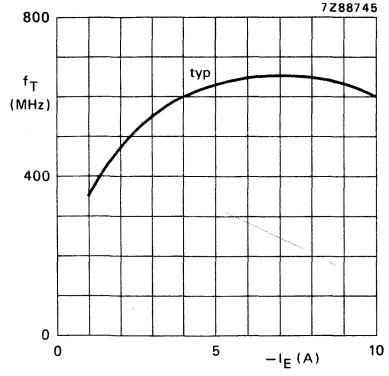


Fig. 5 $V_{CB} = 25$ V; $f = 100$ MHz; $T_j = 25$ °C.

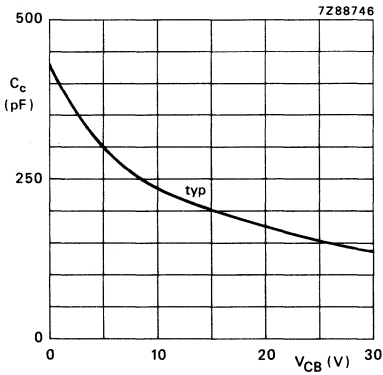


Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter class-B circuit)
 $f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$

mode of operation	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η %
narrow band; c.w.	28	80	< 17,9 typ. 16,0	> 6,5 typ. 7,0	< 4,1 typ. 3,8	> 70 typ. 75

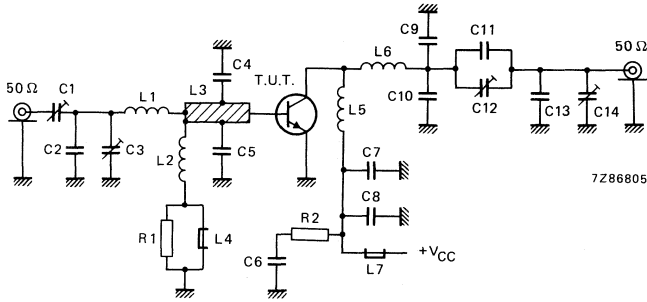


Fig. 7 Class-B test circuit at $f = 175 \text{ MHz}$.

List of components:

C1 = C12 = C14 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

C2 = 30 pF (500 V) multilayer ceramic chip capacitor*

C3 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C4 = C5 = 56 pF (500 V) multilayer ceramic chip capacitor*

C6 = 100 nF (50 V) multilayer ceramic chip capacitor

C7 = C8 = 220 pF (50 V) multilayer ceramic chip capacitor

C9 = C10 = 10 pF (500 V) multilayer ceramic chip capacitor*

C11 = 24 pF (500 V) multilayer ceramic chip capacitor*

C13 = 13 pF (500 V) multilayer ceramic chip capacitor*

L1 = Cu wire (1,8 mm); length 15 mm

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

L3 = strip (15 mm x 8 mm); taps for C4 and C5 at 7 mm from transistor edge

L4 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L5 = 1 turn Cu wire (1,8 mm); int. dia. 9 mm; leads 2 x 10 mm

L6 = 1/2 turn Cu wire (1,8 mm); int. dia. 13 mm; leads 2 x 5 mm

L3 is a strip on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16 in.

R1 = R2 = 10 Ω ($\pm 10\%$) carbon resistor (0,25 W)

* American Technical Ceramics capacitors or capacitors of same quality.

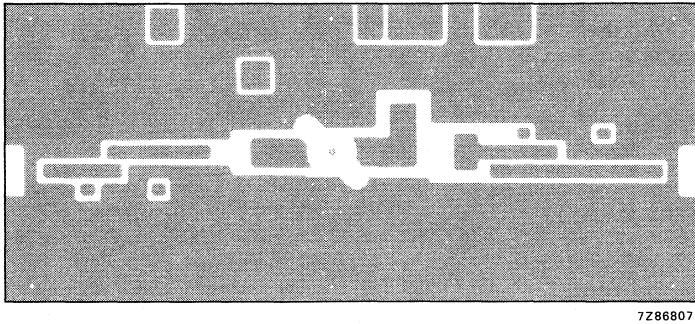
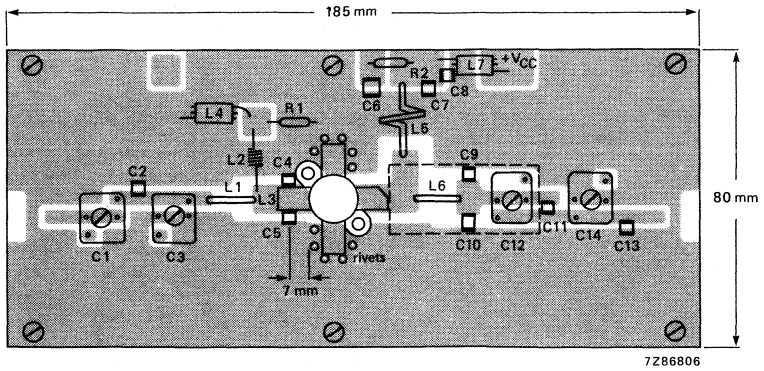


Fig. 8 Component layout and printed-circuit board for 175 MHz.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as ground-plane. Earth connections are made by hollow rivets and additionally by fixing screws and copper straps at the input and output to provide direct contact between the copper on the component side and the ground-plane.

To minimize the dielectric losses, the ground-plane under the interconnections of L6, C9, C10, C11 and C12 has been removed.

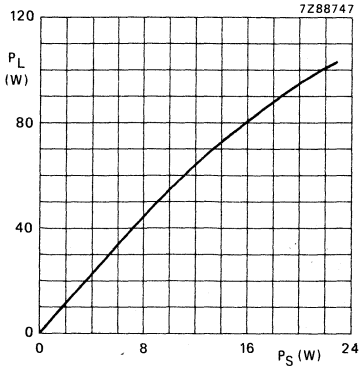


Fig. 9 Load power as a function of source power.

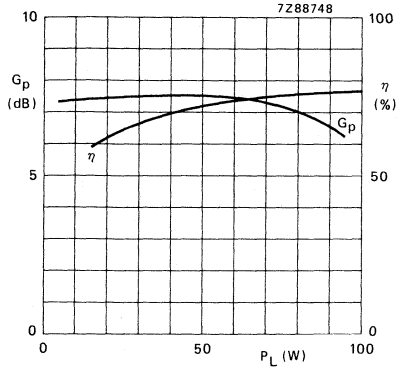


Fig. 10 Power gain and efficiency as a function of load power.

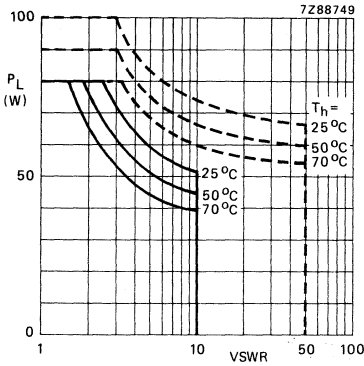


Fig. 11 R.F. SOAR at $V_{CE} = 28$ V.
 — $f > 1$ MHz (continuous);
 - - - short time operation during mismatch ($f > 1$ MHz).

Conditions for Figs 9 and 10:
 Test circuit tuned for each power level;
 typical values; $V_{CE} = 28$ V; $f = 175$ MHz;
 $T_H = 25$ °C; class-B operation.

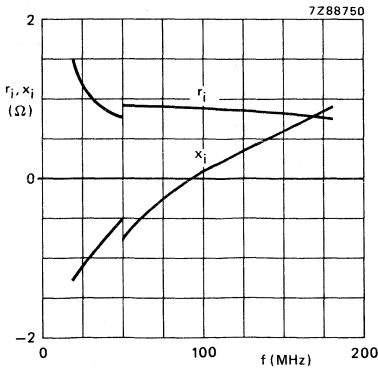


Fig. 12 Input impedance (series components).

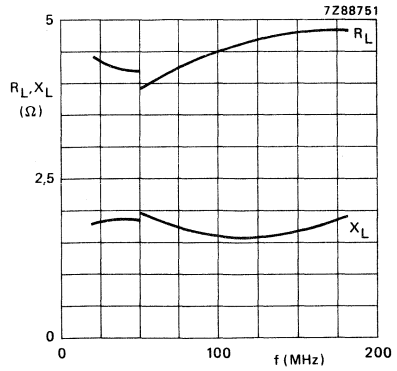


Fig. 13 Load impedance (series components).

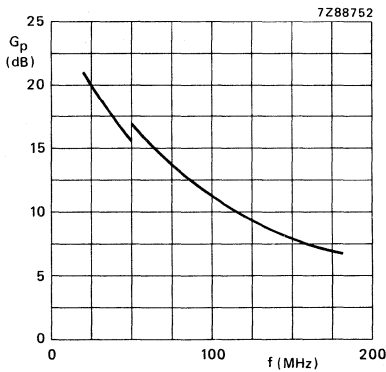


Fig. 14 Power gain as a function of frequency.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 80 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$; class-B operation.

OPERATING NOTE for Figs 12, 13 and 14:

Below 50 MHz a base-emitter resistor of $4,7 \text{ } \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- diffused emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-172). All leads are isolated from the stud.

QUICK REFERENCE DATA

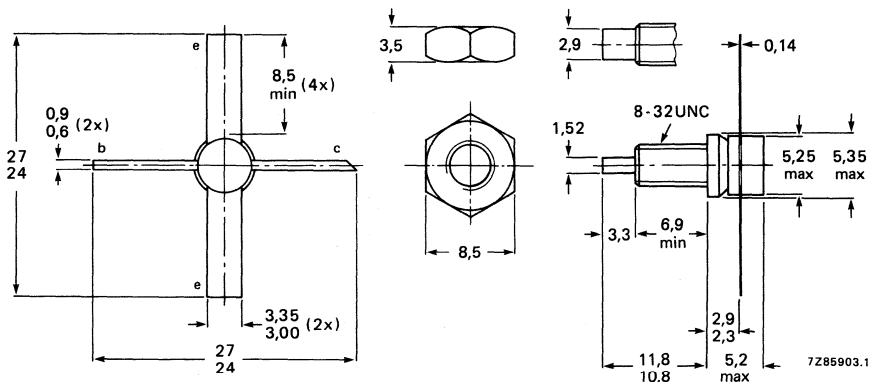
R.F. performance at $T_h = 25^\circ\text{C}$ in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	Gp dB	η_C %
narrow band; c.w.	12,5	900	1	> 7,5	> 50
	9,6	900	0,75	typ. 7,9	typ. 61

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172A1.



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

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

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
Deburring must leave surface flat; donot chamfer or countersink either end of hole.

PRODUCT SAFETY 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)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	$I_C; I_C(AV)$	max.	0,2 A
(peak value); $f > 1$ MHz	I_{CM}	max.	0,6 A
D.C. power dissipation			
at $T_{mb} = 115$ °C	$P_{tot(dc)}$	max.	2,25 W
R.F. power dissipation			
$f > 1$ MHz; $T_{mb} = 105$ °C	$P_{tot(rf)}$	max.	3,5 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

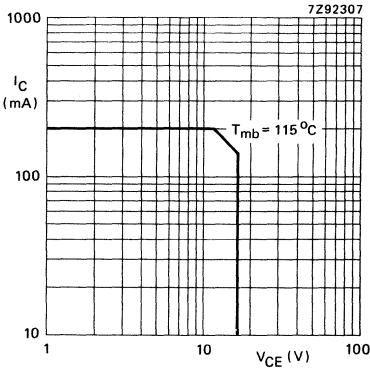


Fig. 2 D.C. SOAR.

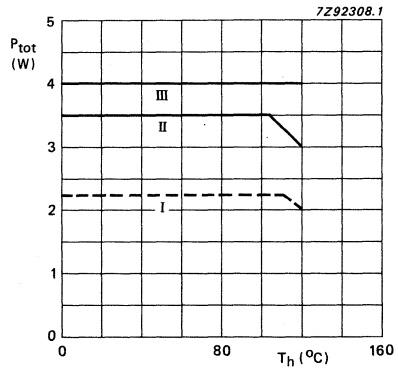


Fig. 3 Power/temperature derating curves.

- I Continuous d.c. operation
- II Continuous r.f. operation ($f > 1$ MHz)
- III Short-time r.f. operation during mismatch ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 2,25 W; $T_{mb} = 25$ °C.

From junction to mounting base

- (d.c. dissipation)
- (r.f. dissipation)

$R_{th j-mb(d.c.)}$	max.	25 K/W
$R_{th j-mb(r.f.)}$	max.	19 K/W

From mounting base to heatsink

$R_{th mb-h}$	max.	0,8 K/W
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CHARACTERISTICS

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

Collector-base breakdown voltage, open emitter; $I_C = 2,5\text{ mA}$

Collector-emitter breakdown voltage, open base; $I_C = 10\text{ mA}$

Emitter-base breakdown voltage, open collector; $I_E = 0,5\text{ mA}$

Collector cut-off current, $V_{BE} = 0$; $V_{CE} = 16\text{ V}$

Second breakdown energy, $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

D.C. current gain, $I_C = 0,15\text{ A}$; $V_{CE} = 10\text{ V}$

Transition frequency at $f = 500\text{ MHz}^*$, $-I_E = 0,15\text{ A}$; $V_{CB} = 12,5\text{ V}$
 $-I_E = 0,5\text{ A}$; $V_{CB} = 12,5\text{ V}$

Collector capacitance at $f = 1\text{ MHz}$, $I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$

Feedback capacitance at $f = 1\text{ MHz}$, $I_C = 0$; $V_{CE} = 12,5\text{ V}$

Collector-stud capacitance

$V_{(BR)CBO}$	>	36 V
$V_{(BR)CEO}$	>	16 V
$V_{(BR)EBO}$	>	3 V
I_{CES}	<	1 mA
E_{SBR}	>	0,3 mJ
h_{FE}	>	25
f_T	typ.	4,8 GHz
f_T	typ.	1,4 GHz
C_c	typ.	1,8 pF
C_{re}	typ.	1,0 pF
C_{cs}	typ.	0,5 pF

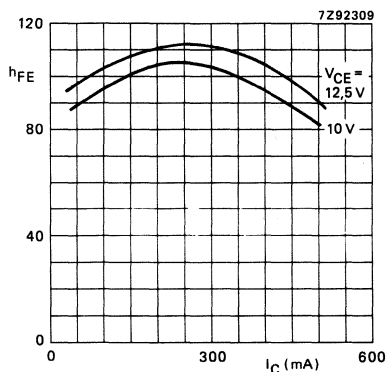


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; typical values.

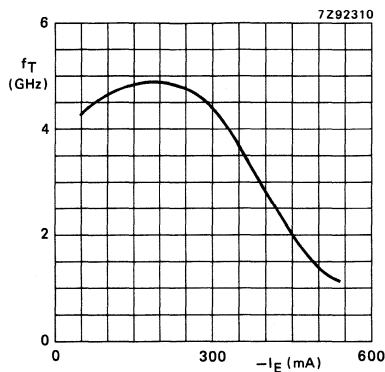


Fig. 5 $V_{CB} = 12,5\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

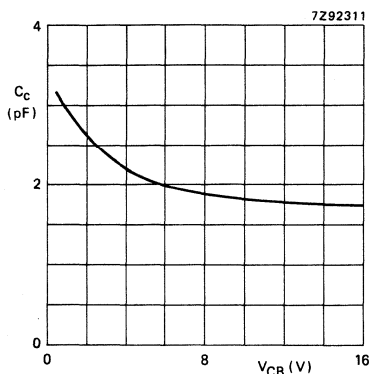


Fig. 6 $I_E = i_e = 0$; $f = 1\text{ MHz}$; typical values.

* Measured under pulse conditions: $t_p = 50\text{ }\mu\text{s}$; $\delta < 1\%$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$.

mode of operation	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η_C %
narrow band; c.w.	12,5 9,6	1 0,75	< 0,178 typ. 0,126 typ. 0,122	> 7,5 typ. 9,0 typ. 7,9	< 0,160 typ. 0,133 typ. 0,128	> 50 typ. 60 typ. 61

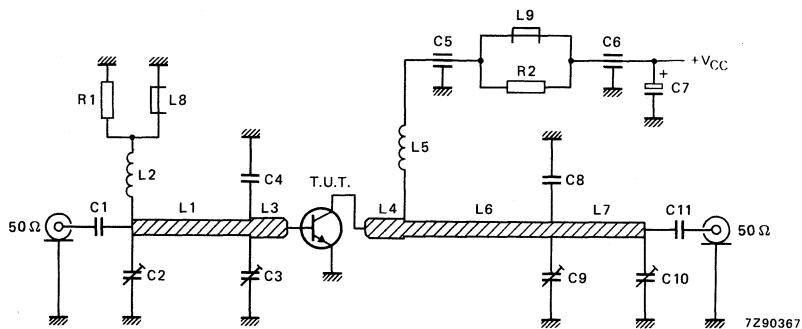


Fig. 7 Class-B test circuit at $f = 900 \text{ MHz}$.

List of components:

C1 = C11 = 33 pF multilayer ceramic chip capacitor

C2 = C10 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C3 = C9 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)

C4 = 5,6 pF multilayer ceramic chip capacitor*

C5 = 10 pF ceramic feed-through capacitor

C6 = 330 pF ceramic feed-through capacitor

C7 = 2,2 μF (35 V) tantalum electrolytic capacitor

C8 = 3,9 pF multilayer ceramic chip capacitor*

L1 = L7 = 50 Ω stripline (28,2 mm x 4,0 mm)

L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm

L3 = 38 Ω stripline (14,6 mm x 6,0 mm)

L4 = 38 Ω stripline (10,0 mm x 6,0 mm)

L5 = 280 nH; 15 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm

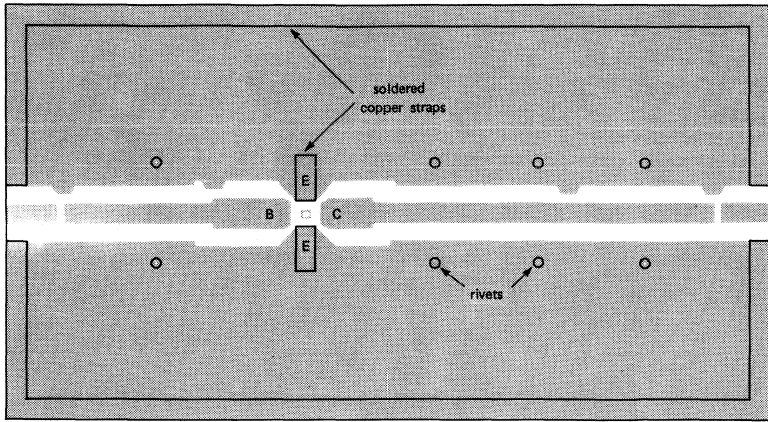
L6 = 50 Ω stripline (37,7 mm x 4,0 mm)

L8 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)

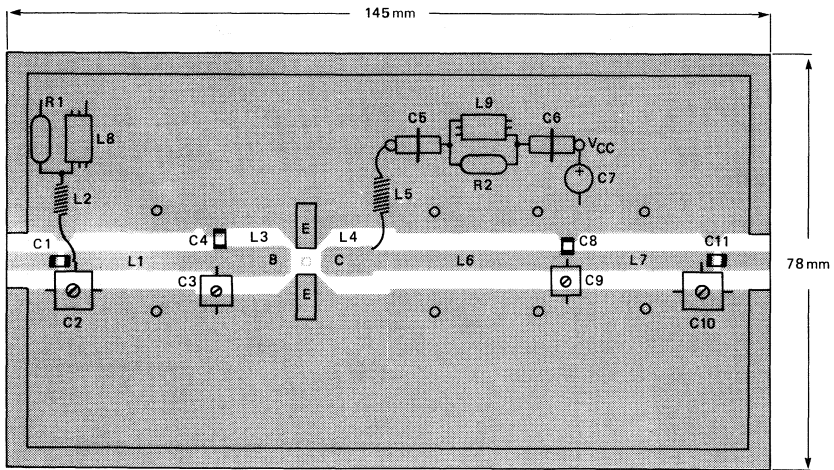
R1 = R2 = 10 $\Omega \pm 10\%$; 0,25 W metal film resistor

L1, L3, L4, L6 and L7 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.



7Z90368



7Z90369

Fig. 8 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

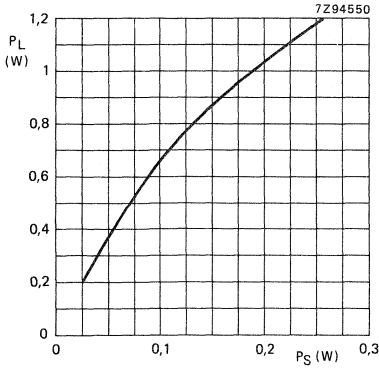


Fig. 9 Load power vs. source power.

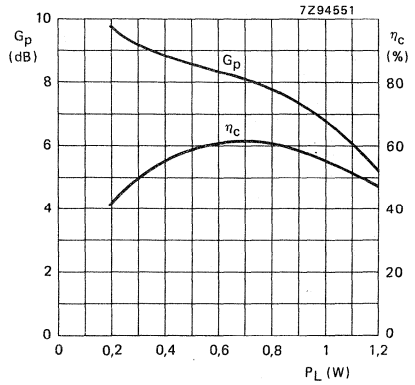


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:

$V_{CE} = 9,6$ V; $f = 900$ MHz; $T_h = 25$ °C; class-B operation; typical values.

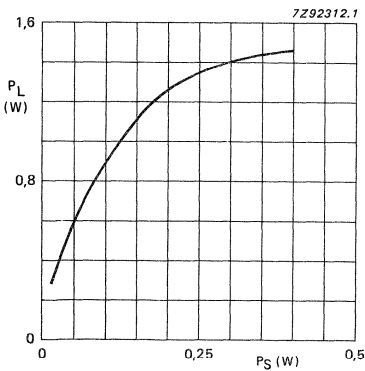


Fig. 11 Input impedance (series components).

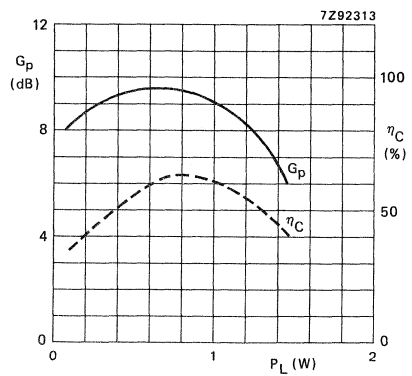


Fig. 12 Load impedance (series components).

Conditions for Figs 11 and 12:

$V_{CE} = 12,5$ V; $P_L = 1$ W; $f = 900$ MHz; $T_h = 25$ °C; class-B operation; typical values.

RUGGEDNESS

The device is capable to withstand a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V at $T_h = 25\text{ }^\circ\text{C}$.

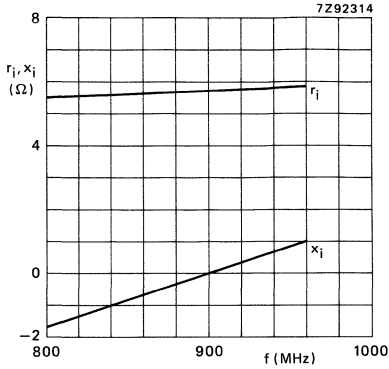


Fig. 13 Input impedance (series components).

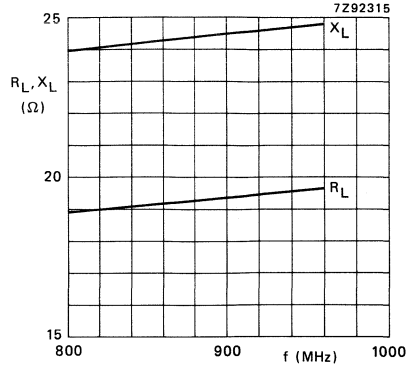


Fig. 14 Load impedance (series components).

Conditions for Figs 13 and 14:

$V_{CE} = 12,5\text{ V}$; $P_L = 1\text{ W}$; $f = 800\text{--}960\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

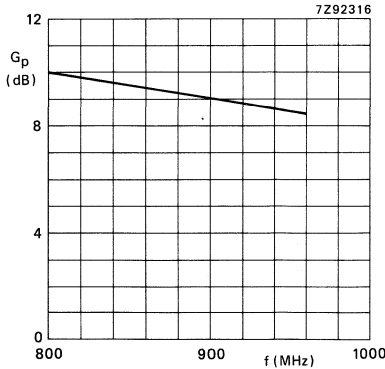


Fig. 15 Power gain vs. frequency.

$V_{CE} = 12,5\text{ V}$; $P_L = 1\text{ W}$; $f = 800\text{--}960\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- diffused emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.
- the device can be applied at rated output power without an external heatsink when it is mounted on a printed circuit board (see Fig. 6).

The transistor has a 4-lead envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

R.F. performance at $T_a = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit.*

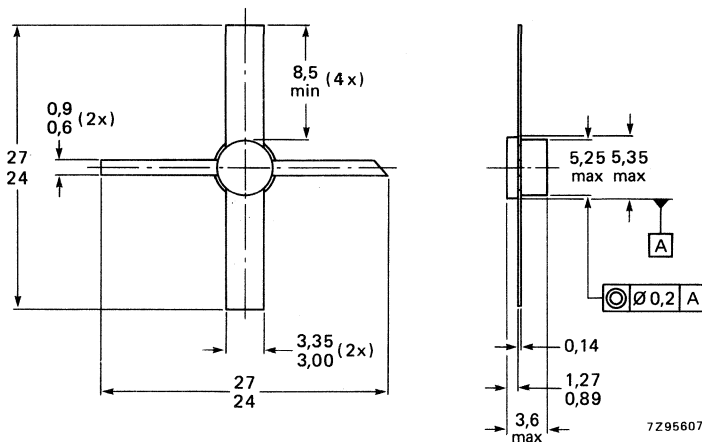
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
Narrow band; c.w.	12,5 9,6	900 900	1 1	> 7,5 typ. 7,0	> 50 typ. 57

* Device mounted on a printed circuit board (see Fig. 6).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172D.



PRODUCT SAFETY 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)	V_{CB0}	max.	36 V
Collector-emitter voltage (open base)	V_{CE0}	max.	16 V
Emitter-base voltage (open collector)	V_{EB0}	max.	3 V
Collector current			
d.c. or average	$I_C; I_{C(AV)}$	max.	0,2 A
(peak value); $f > 1$ MHz	I_{CM}	max.	0,6 A
Total power dissipation			
$f > 1$ MHz; $T_{mb} < 105$ °C	$P_{tot(rf)}$	max.	3,5 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

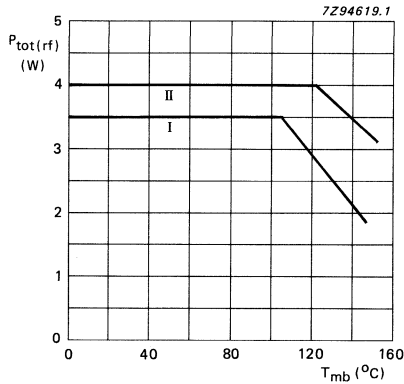


Fig. 2 Power/temperature curve

- I Continuous r.f. operation ($f > 1$ MHz)
- II Short-time r.f. operation during mismatch ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 2,25 W

From junction to ambient* ($f > 1$ MHz)

$T_a = 25$ °C

$R_{th j-a}$ (r.f.) max. 60 K/W

From junction to mounting base

$T_{mb} = 25$ °C ($f > 1$ MHz)

$R_{th j-mb}$ (r.f.) max. 19 K/W

* Device mounted on a printed circuit board (see Fig. 6).

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 2,5\text{ mA}$

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

Collector-emitter breakdown voltage
open base; $I_C = 10\text{ mA}$

$$V_{(BR)CEO} > 16\text{ V}$$

Emitter-base breakdown voltage
open collector; $I_E = 0,5\text{ mA}$

$$V_{(BR)EBO} > 3\text{ V}$$

Collector cut-off current

$$V_{BE} = 0; V_{CE} = 16\text{ V}$$

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

Second breakdown energy

$$L = 25\text{ mH}; f = 50\text{ Hz}; R_{BE} = 10\text{ }\Omega$$

$$E_{SBR} > 0,3\text{ mJ}$$

D.C. current gain

$$I_C = 0,15\text{ A}; V_{CE} = 10\text{ V}$$

$$h_{FE} > 25$$

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

$$I_E = i_e = 0; V_{CB} = 12,5\text{ V}$$

$$C_c \text{ typ. } 1,8\text{ pF}$$

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

$$I_C = 0; V_{CE} = 12,5\text{ V}$$

$$C_{re} \text{ typ. } 1,0\text{ pF}$$

Collector-mounting base capacitance

$$C_{c-mb} \text{ typ. } 0,5\text{ pF}$$

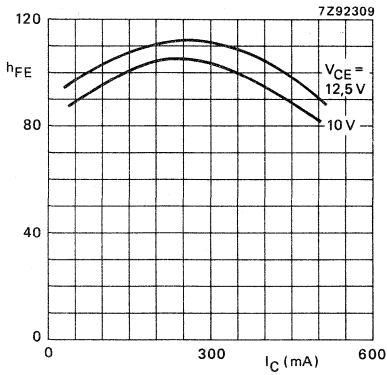


Fig. 3 $T_j = 25\text{ }^\circ\text{C}$; typical values.

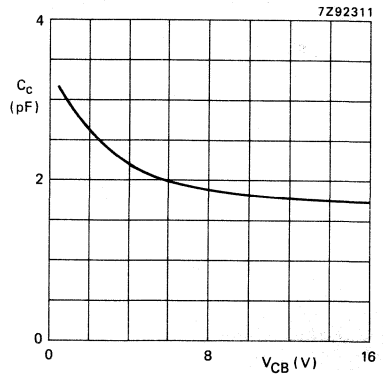


Fig. 4 $I_E = i_e = 0; f = 1\text{ MHz}$; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900 \text{ MHz}$; $T_a = 25 \text{ }^\circ\text{C}$

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	1	$> 7,5$ typ. 9,0	> 50 typ. 60
	9,6	1	typ. 7,0	typ. 57

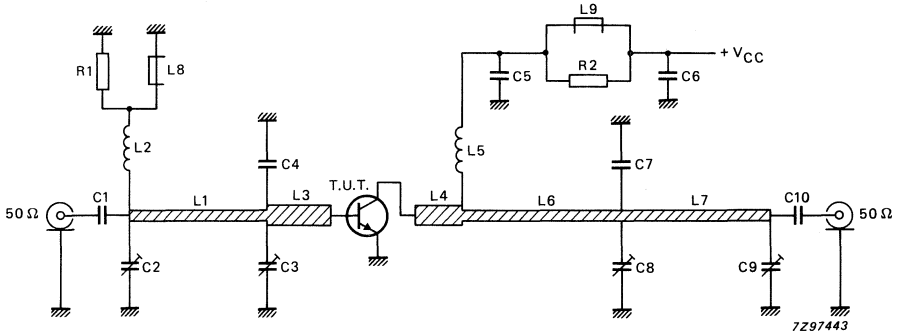


Fig. 5 Class-B test circuit at $f = 900 \text{ MHz}$.

List of components:

- C1 = C10 = 33 pF multilayer ceramic chip capacitor
 - C2 = C9 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
 - C3 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
 - C4 = 5,6 pF multilayer ceramic chip capacitor*
 - C5 = 10 pF multilayer ceramic chip capacitor
 - C6 = 330 pF multilayer ceramic chip capacitor
 - C7 = 3,9 pF multilayer ceramic chip capacitor*
 - C8 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
 - L1 = L7 = 50 Ω stripline (30,8 mm x 2,4 mm)
 - L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
 - L3 = 38 Ω stripline (16,0 mm x 3,5 mm)
 - L4 = 38 Ω stripline (11,0 mm x 3,5 mm)
 - L5 = 280 nH; 15 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
 - L6 = 50 Ω stripline (41,2 mm x 2,4 mm)
 - L8 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
 - R1 = R2 = 10 $\Omega \pm 5\%$; 0,25 W metal film resistor
- L1, L3, L4, L6 and L7 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch; thickness of copper-sheet 2 x 35 μm .

* American Technical Ceramics capacitor type 100A or capacitor of same quality.

** Device mounted on a printed circuit board (see Fig. 6).

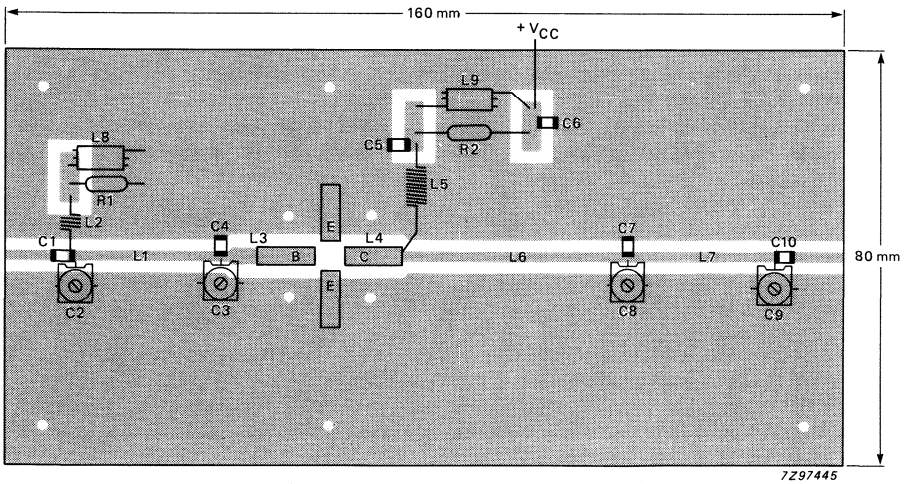
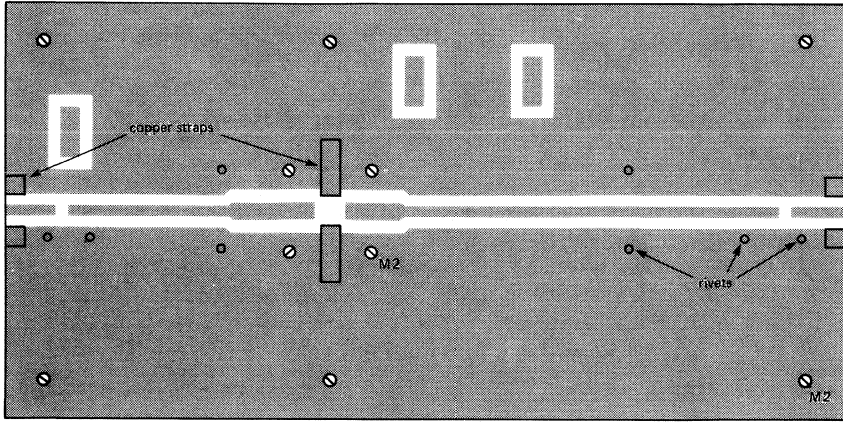


Fig. 6 P.c. board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

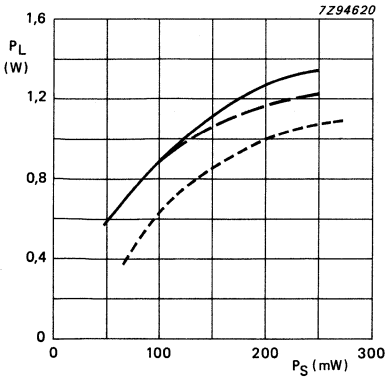


Fig. 7 Load power versus source power.

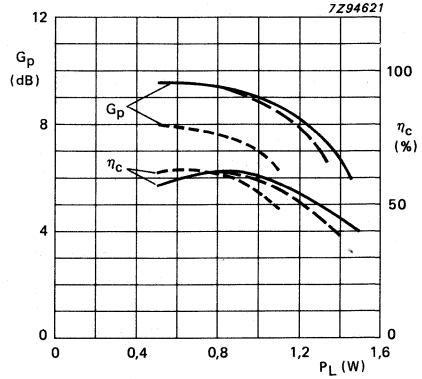


Fig. 8 Power gain and efficiency versus load power

Conditions for Figs 7 and 8:

$f = 900 \text{ MHz}$; class-B operation; typical values.

(—— $T_{mb} = 25 \text{ }^\circ\text{C}$; $V_{CE} = 12,5 \text{ V}$; ---- $T_a = 25 \text{ }^\circ\text{C}$; $V_{CE} = 12,5 \text{ V}$; - · - · - $T_a = 25 \text{ }^\circ\text{C}$; $V_{CE} = 9,6 \text{ V}$)

RUGGEDNESS

The device is capable to withstand a full load mismatch ($VSWR = 50$; all phases) at rated load power up to a supply voltage of $15,5 \text{ V}$ at $T_a = 25 \text{ }^\circ\text{C}$. Device mounted on a printed circuit board (see Fig. 6).

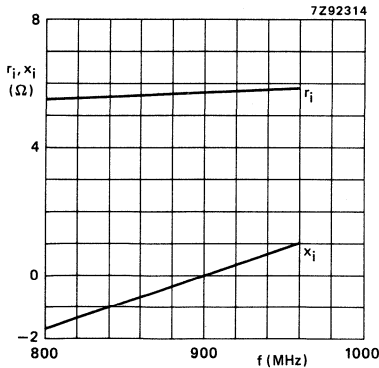


Fig. 9 Input impedance (series components).

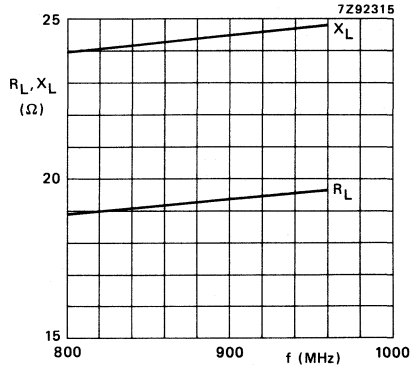


Fig. 10 Load impedance (series components).

Conditions for Figs 9 and 10:

$V_{CE} = 12,5 \text{ V}$; $P_L = 1 \text{ W}$; $f = 800 - 960 \text{ MHz}$; $T_{mb} = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

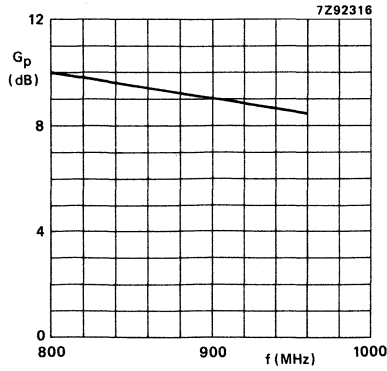


Fig. 11 Power gain versus frequency.

$V_{CE} = 12,5 \text{ V}$; $P_L = 1 \text{ W}$; $f = 800 - 960 \text{ MHz}$; $T_{mb} = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- multi-base structure and diffused emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-172). All leads are isolated from the stud.

QUICK REFERENCE DATA

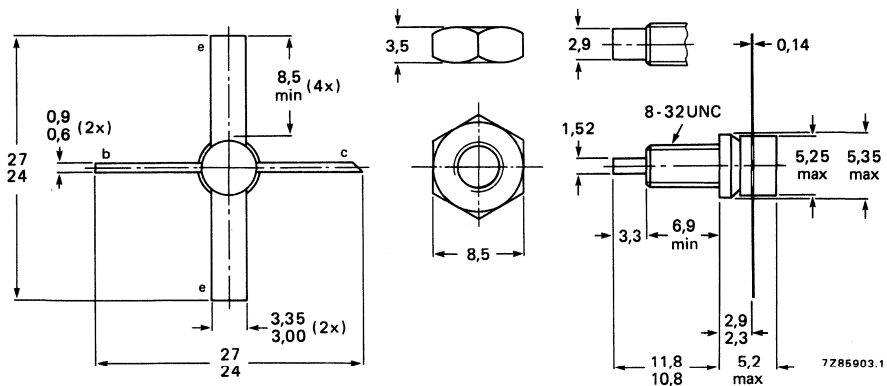
R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	900	2	> 6,5	> 50
	9,6	900	1,5	typ. 6,6	typ. 60

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172A1.



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

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

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
Deburring must leave surface flat; donot chamfer or countersink either end of hole.

PRODUCT SAFETY 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)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	$I_C; I_C(AV)$	max.	0,4 A
(peak value); $f > 1$ MHz	I_{CM}	max.	1,2 A
D.C. power dissipation			
at $T_{mb} = 90^\circ C$	$P_{tot(dc)}$	max.	4,5 W
R.F. power dissipation			
$f > 1$ MHz; $T_{mb} = 90^\circ C$	$P_{tot(rf)}$	max.	6 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

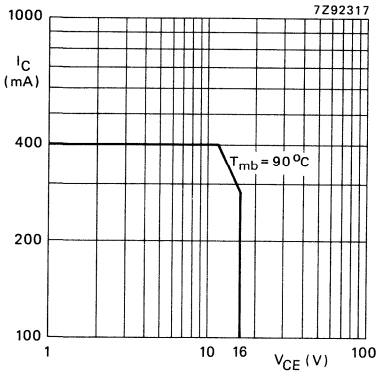


Fig. 2 D.C. SOAR.

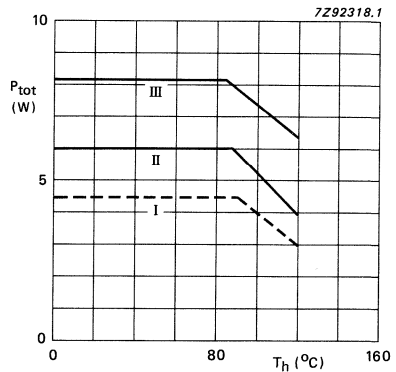


Fig. 3 Power/temperature derating curves

- I Continuous d.c. operation
- II Continuous r.f. operation ($f > 1$ MHz)
- III Short-time r.f. operation during mismatch ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 4,5 W; $T_{mb} = 25^\circ C$

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

$R_{th\ j-mb(d.c.)}$	max.	20 K/W
$R_{th\ j-mb(r.f.)}$	max.	15 K/W
$R_{th\ mb-h}$	max.	0,8 K/W

From mounting base to heatsink

CHARACTERISTICS

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

Collector-base breakdown voltage, open emitter; $I_C = 5\text{ mA}$

Collector-emitter breakdown voltage, open base; $I_C = 10\text{ mA}$

Emitter-base breakdown voltage, open collector; $I_E = 0,5\text{ mA}$

Collector cut-off current, $V_{BE} = 0$; $V_{CE} = 16\text{ V}$

Second breakdown energy, $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

D.C. current gain, $I_C = 0,3\text{ A}$; $V_{CE} = 10\text{ V}$

Transition frequency at $f = 500\text{ MHz}^*$, $-I_E = 0,3\text{ A}$; $V_{CB} = 12,5\text{ V}$

$-I_E = 1,0\text{ A}$; $V_{CB} = 12,5\text{ V}$

Collector capacitance at $f = 1\text{ MHz}$, $I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$

Feed-back capacitance at $f = 1\text{ MHz}$, $I_C = 0$; $V_{CE} = 12,5\text{ V}$

Collector-stud capacitance

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

$V_{(BR)CEO} > 16\text{ V}$

$V_{(BR)EBO} > 3\text{ V}$

$I_{CES} < 2,5\text{ mA}$

$E_{SBR} > 0,55\text{ mJ}$

$h_{FE} > 25$

f_T typ. 4 GHz

f_T typ. 1 GHz

C_c typ. $3,5\text{ pF}$

C_{re} typ. $2,0\text{ pF}$

C_{cs} typ. $0,5\text{ pF}$

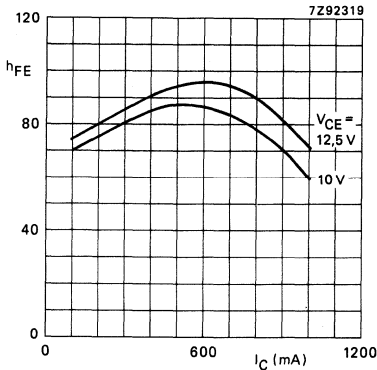


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; typical values.

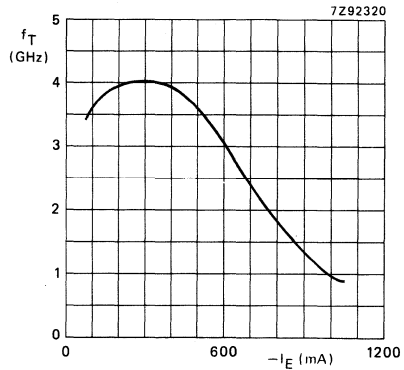


Fig. 5 $V_{CB} = 12,5\text{ V}$; $t_p = 50\text{ }\mu\text{s}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

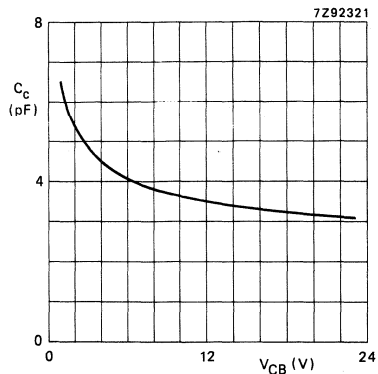


Fig. 6 $I_E = i_e = 0$; $f = 1\text{ MHz}$; typical values.

* Measured under pulse conditions: $t_p = 50\text{ }\mu\text{s}$; $\delta < 1\%$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$.

mode of operation	V_{CE}	P_L W	P_S W	G_p dB	I_C A	η_C %
narrow band; c.w.	12,5	2	< 0,450 typ. 0,332	> 6,5 typ. 7,8	< 0,320 typ. 0,267	> 50 typ. 60
	9,6	1,5	typ. 0,328	typ. 6,6	typ. 0,260	typ. 60

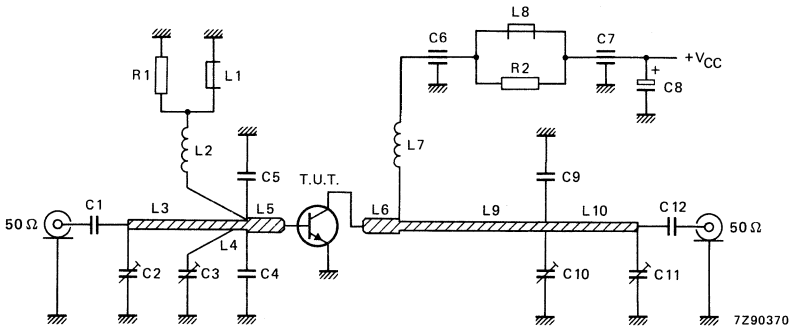


Fig. 7 Class-B test circuit at $f = 900 \text{ MHz}$.

List of components:

- C1 = C12 = 33 pF multilayer ceramic chip capacitor
 C2 = C3 = C11 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
 C4 = C5 = 5,6 pF multilayer ceramic chip capacitor*
 C6 = 10 pF ceramic feed-through capacitor
 C7 = 330 pF ceramic feed-through capacitor
 C8 = 2,2 μF (35 V) tantalum electrolytic capacitor
 C9 = 3,9 pF multilayer ceramic chip capacitor*
 C10 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
 L1 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
 L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
 L3 = 50 Ω stripline (23,3 mm x 1,85 mm)
 L4 = 50 Ω stripline (4,0 mm x 1,85 mm)
 L5 = L6 = 29 Ω stripline (14,0 mm x 4,0 mm)
 L7 = 280 nH; 15 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
 L9 = 50 Ω stripline (22,7 mm x 1,85 mm)
 L10 = 50 Ω stripline (28,0 mm x 1,85 mm)
 R1 = R2 = 10 $\Omega \pm 10\%$; 0,25 W metal film resistor
 L3, L4, L5, L6, L9 and L10 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.

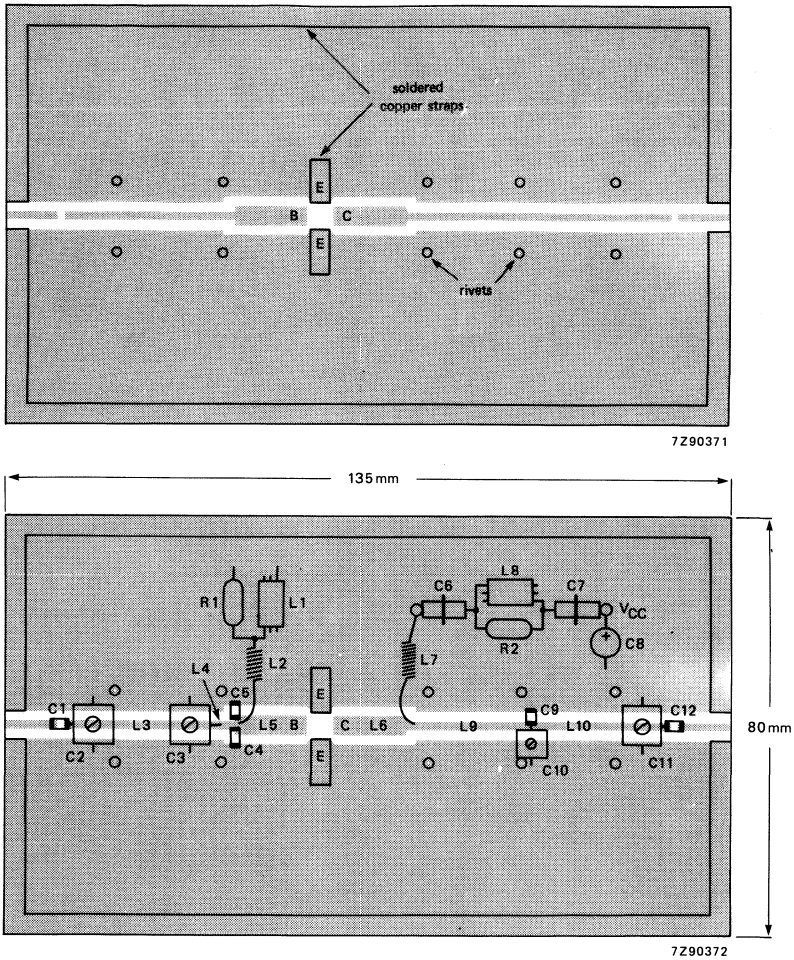


Fig. 8 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

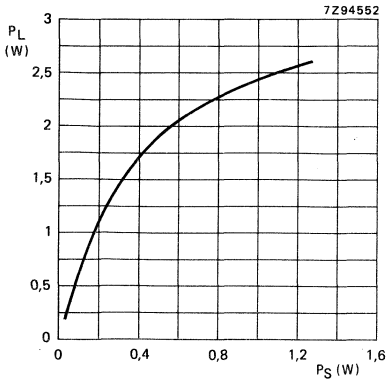


Fig. 9 Load power vs. source power.

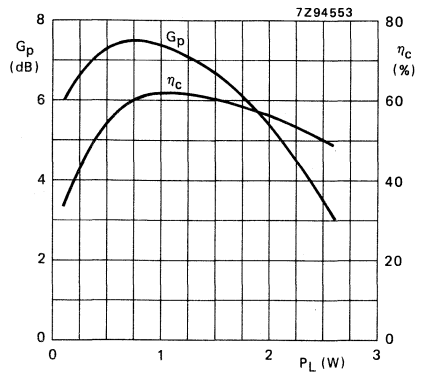


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:

$V_{CE} = 9,6$ V; $f = 900$ MHz; $T_h = 25$ °C; class-B operation; typical values.

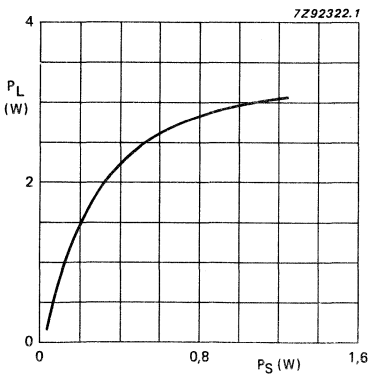


Fig. 11 Input impedance (series components).

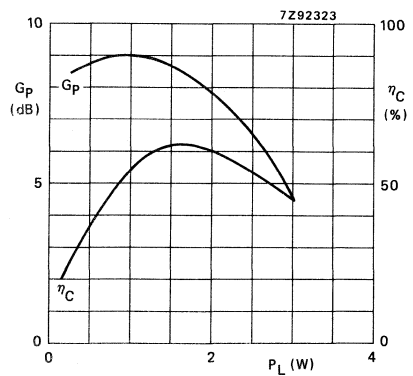


Fig. 12 Load impedance (series components).

Conditions for Figs 11 and 12:

$V_{CE} = 12,5$ V; $P_L = 2$ W; $f = 900$ MHz; $T_h = 25$ °C; class-B operation; typical values.

RUGGEDNESS

The device is capable to withstand a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V at $T_h = 25\text{ }^\circ\text{C}$.

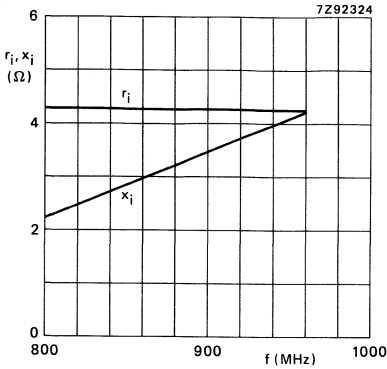


Fig. 13 Input impedance (series components).

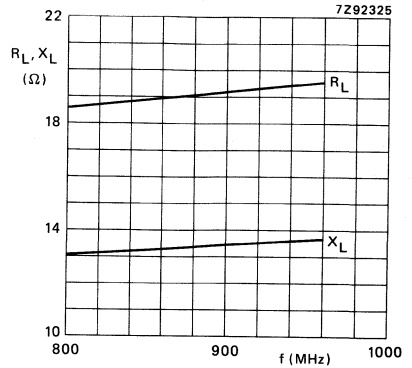


Fig. 14 Load impedance (series components).

Conditions for Figs 13 and 14:

$V_{CE} = 12,5\text{ V}$; $P_L = 2\text{ W}$; $f = 800\text{--}960\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

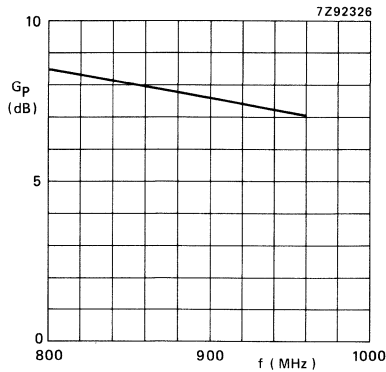


Fig. 15 Power gain vs. frequency.

$V_{CE} = 12,5\text{ V}$; $P_L = 2\text{ W}$; $f = 800\text{--}960\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- diffused emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.
- the device can be applied at rated load power, without an external heatsink, when it is mounted on a printed circuit board (see Fig. 6).

The transistor has a 4-lead envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

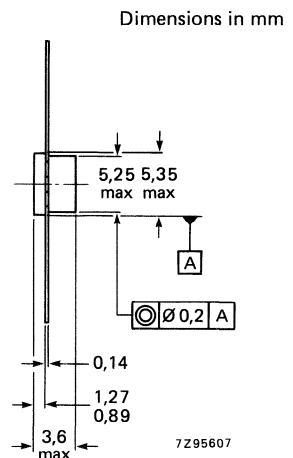
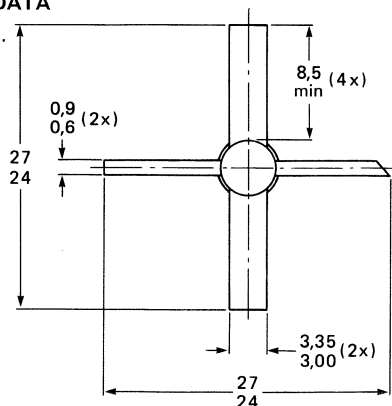
R.F. performance in a common-emitter class-B circuit.

mode of operation	T_{oc}	V_{CE} V	f MHz	P_L W	G_D dB	η_C %
narrow band; c.w.	$T_{mb} = 25$	12,5	900	2	$> 6,5$	> 50
	$T_a = 25^*$	12,5	900	1,5	$> 6,5$	> 50
	$T_a = 25^*$	9,6	900	1,5	typ. 6,6	typ. 60

* Device mounted on a printed circuit board (see Fig. 6).

MECHANICAL DATA

Fig. 1 SOT-172D.



PRODUCT SAFETY 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)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	$I_C; I_{C(AV)}$	max.	0,4 A
(peak value); $f > 1$ MHz	I_{CM}	max.	1,2 A
Total power dissipation			
$f > 1$ MHz; $T_{mb} \leq 90$ °C	$P_{tot(rf)}$	max.	6 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

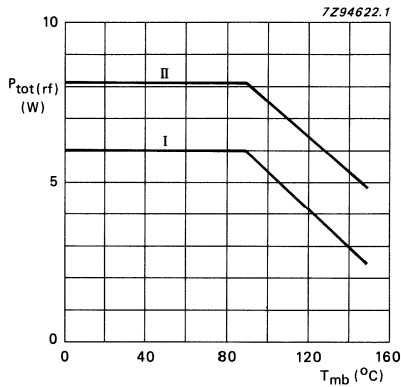


Fig. 2 Power/temperature curve.

- I Continuous r.f. operation ($f > 1$ MHz)
- II Short-time r.f. operation during mismatch ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 4,5 W

From junction to ambient* ($f > 1$ MHz)

$T_a = 25$ °C

$R_{th\ j-a}$ (r.f.) max. 55 K/W

From junction to mounting base

$T_{mb} = 25$ °C ($f > 1$ MHz)

$R_{th\ j-mb}$ (r.f.) max. 15 K/W

* Device mounted on a printed circuit board (see Fig. 6).

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 5\text{ mA}$

Collector-emitter breakdown voltage
open base; $I_C = 10\text{ mA}$

Emitter-base breakdown voltage
open collector; $I_E = 0,5\text{ mA}$

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 16\text{ V}$

Second breakdown energy
 $L = 25\text{ mH}; f = 50\text{ Hz}; R_{BE} = 10\text{ }\Omega$

D.C. current gain
 $I_C = 0,3\text{ A}; V_{CE} = 10\text{ V}$

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = i_e = 0; V_{CB} = 12,5\text{ V}$

Feedback capacitance at $f = 1\text{ MHz}$
 $I_C = 0; V_{CE} = 12,5\text{ V}$

Collector-mounting base capacitance

$V_{(BR)CBO}$	>	36 V
$V_{(BR)CEO}$	>	16 V
$V_{(BR)EBO}$	>	3 V
I_{CES}	<	2,5 mA
E_{SBR}	>	0,55 mJ
h_{FE}	>	25
C_c	typ.	3,5 pF
C_{re}	typ.	2,0 pF
C_{c-mb}	typ.	0,5 pF

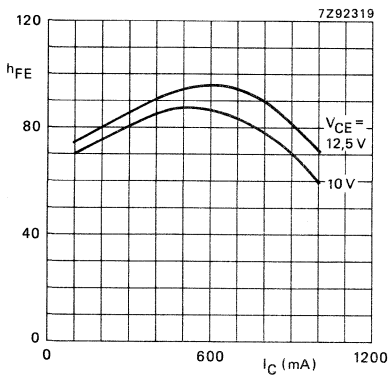


Fig. 3 $T_j = 25\text{ }^\circ\text{C}$; typical values.

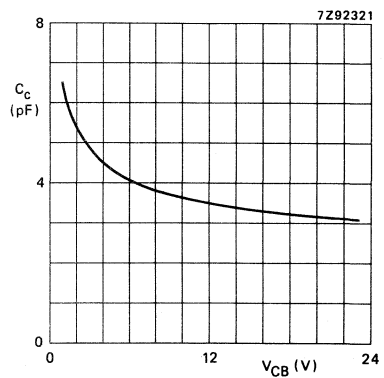
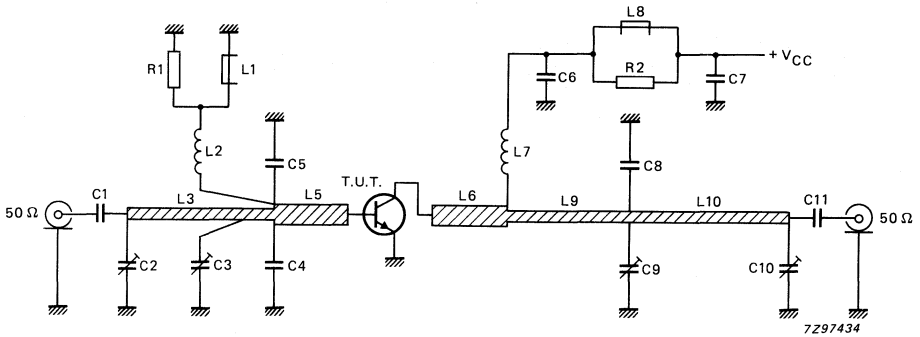


Fig. 4 $I_E = i_e = 0; f = 1\text{ MHz}$; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900$ MHz

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %	T °C
narrow band; c.w.	12,5	2	$> 6,5$	> 50	$T_{mb} = 25$
	12,5	2	typ. 7,8	typ. 60	$T_{mb} = 25$
	12,5	1,5	$> 6,5$	> 50	$T_a = 25^{**}$
	9,6	1,5	typ. 6,6	typ. 60	$T_a = 25^{**}$

Fig. 5 Class-B test circuit at $f = 900$ MHz.

List of components:

- C1 = C11 = 33 pF multilayer ceramic chip capacitor
 C2 = C3 = C10 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
 C4 = C5 = 5,6 pF multilayer ceramic chip capacitor*
 C6 = 10 pF multilayer ceramic chip capacitor
 C7 = 330 pF multilayer ceramic chip capacitor
 C8 = 3,9 pF multilayer ceramic chip capacitor*
 C9 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
 L1 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
 L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
 L3 = 50 Ω stripline (25,4 mm x 2,4 mm)
 L4 = 50 Ω stripline (4,4 mm x 2,4 mm)
 L5 = L6 = 34 Ω stripline (14,0 mm x 4,0 mm)
 L7 = 280 nH; 15 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
 L9 = 50 Ω stripline (24,8 mm x 2,4 mm)
 L10 = 50 Ω stripline (30,5 mm x 2,4 mm)
 R1 = R2 = 10 $\Omega \pm 5\%$; 0,25 W metal film resistor

L3, L4, L5, L6, L9 and L10 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch; thickness of copper-sheet 2 x 35 μm .

* American Technical Ceramics capacitor type 100A or capacitor of same quality.

** Device mounted on a printed circuit board (see Fig. 6).

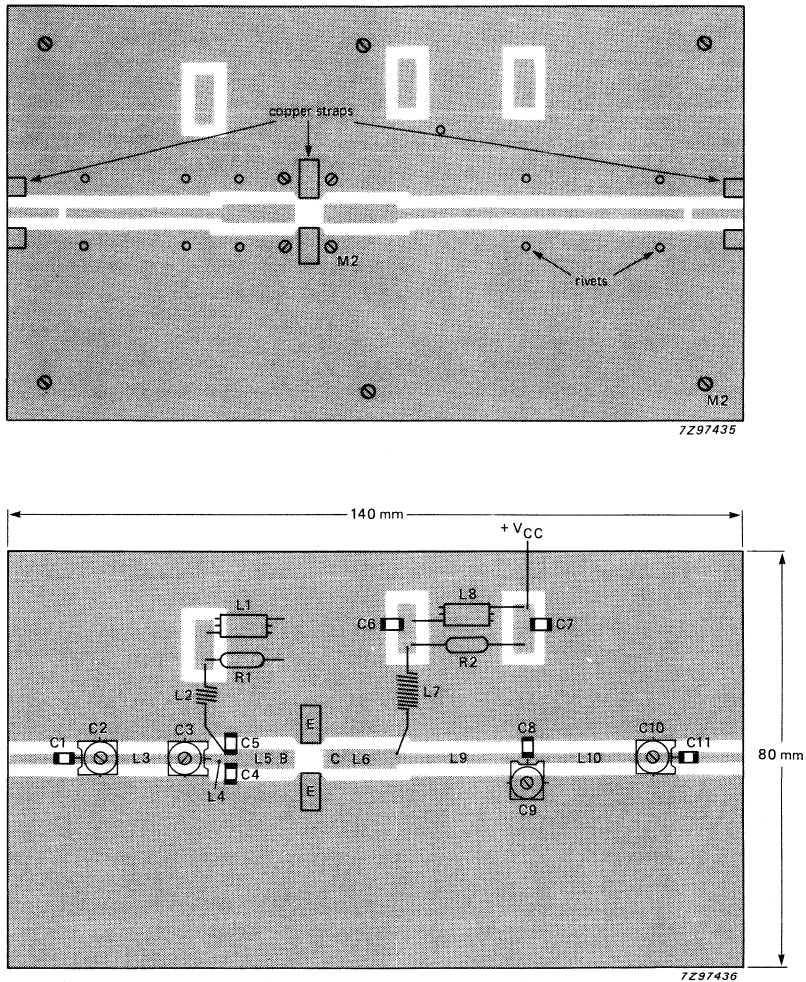


Fig. 6 P.c. board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

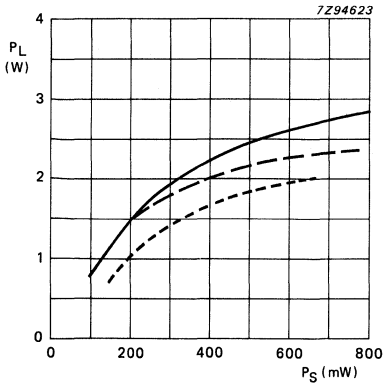


Fig. 7 Load power versus source power.

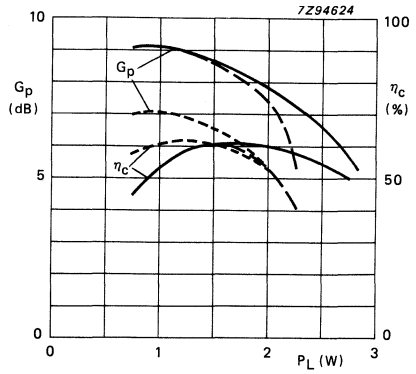


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

$f = 900 \text{ MHz}$; class-B operation; typical values.

(— $T_{mb} = 25 \text{ }^\circ\text{C}$; $V_{CE} = 12,5 \text{ V}$; - - - $T_a = 25 \text{ }^\circ\text{C}$; $V_{CE} = 12,5 \text{ V}$; - · - · - $T_a = 25 \text{ }^\circ\text{C}$; $V_{CE} = 9,6 \text{ V}$)

RUGGEDNESS

The device is capable to withstand a full load mismatch ($VSWR = 50$; all phases) at $P_L = 1,5 \text{ W}$ up to a supply voltage of $15,5 \text{ V}$ at $T_a = 25 \text{ }^\circ\text{C}$. Device mounted on a printed circuit board (see Fig. 6).

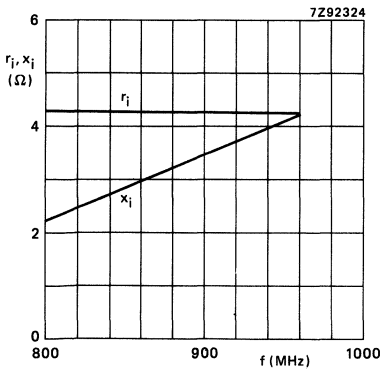


Fig. 9 Input impedance (series components).

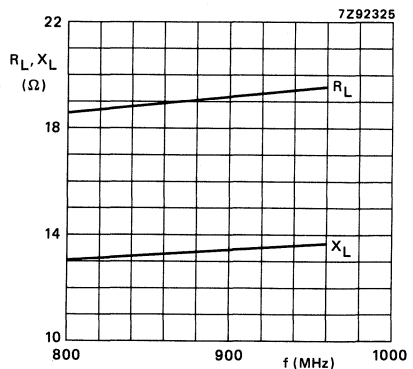


Fig. 10 Load impedance (series components).

Conditions for Figs 9 and 10:

$V_{CE} = 12,5 \text{ V}$; $P_L = 2 \text{ W}$; $f = 800 - 960 \text{ MHz}$; $T_{mb} = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

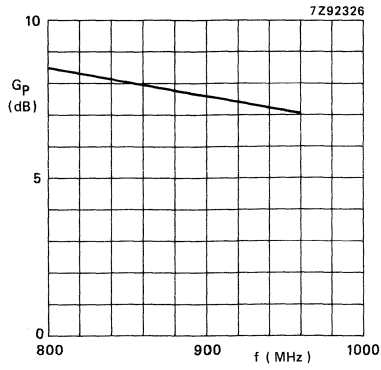


Fig. 11 Power gain versus frequency.

$V_{CE} = 12,5 \text{ V}$; $P_L = 2 \text{ W}$; $f = 800 - 960 \text{ MHz}$; $T_{mb} = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 900 MHz communications band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- internal input matching to achieve an optimum wideband capability and high power gain
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-171). All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in a common-emitter class-B test circuit

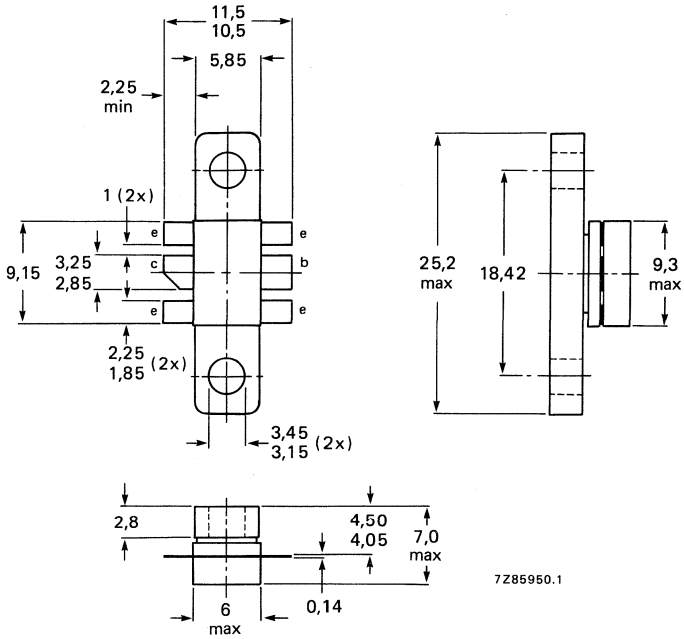
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	900	4	> 7,5	> 50
	9,6	900	3	typ. 7,3	typ. 56

PRODUCT SAFETY 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

Dimensions in mm

Fig. 1 SOT-171.



Torque on screw: min. 0,6 Nm (6 kg.cm)

max. 0,75 Nm (7,5 kg.cm)

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current d.c. or average (peak value); $f > 1$ MHz	I_C I_{CM}	max.	0,8 A 2,4 A
Total power dissipation at $T_{mb} = 94$ °C at $T_{mb} = 94$ °C; $f > 1$ MHz	$P_{tot(dc)}$ $P_{tot(rf)}$	max.	9 W 12 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

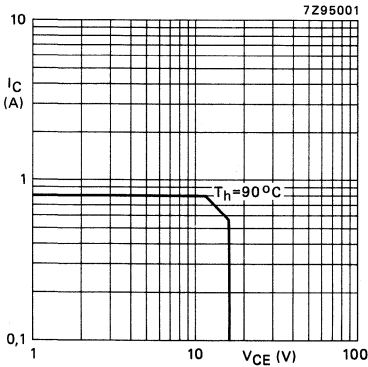


Fig. 2 D.C. SOAR.
 $R_{th\ mb-h} = 0,4$ K/W.

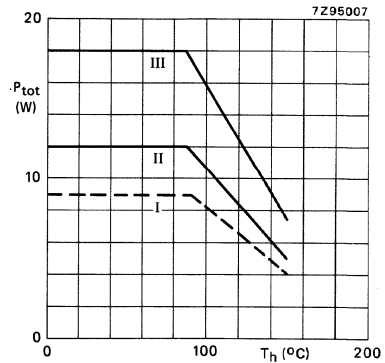


Fig. 3 Power/temperature derating curves.
I Continuous operation
II Continuous operation ($f > 1$ MHz)
III Short-time operation during mismatch;
($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 6 W; $T_{mb} = 128$ °C

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

From mounting base to heatsink

$R_{th\ j-mb(dc)}$	max.	12 K/W
$R_{th\ j-mb(rf)}$	max.	9 K/W
$R_{th\ mb-h}$	max.	0,4 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage, open emitter; $I_C = 10\text{ mA}$

Collector-emitter breakdown voltage, open base; $I_C = 20\text{ mA}$

Emitter-base breakdown voltage, open collector; $I_E = 1\text{ mA}$

Collector cut-off current, $V_{BE} = 0$; $V_{CE} = 16\text{ V}$

Second breakdown energy, $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

D.C. current gain, $I_C = 0,6\text{ A}$; $V_{CE} = 10\text{ V}$

Transition frequency at $f = 500\text{ MHz}^*$, $-I_E = 0,6\text{ A}$; $V_{CE} = 12,5\text{ V}$

Collector capacitance at $f = 1\text{ MHz}$, $I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$

Feed-back capacitance at $f = 1\text{ MHz}$, $I_C = 0$; $V_{CE} = 12,5\text{ V}$

Collector-flange capacitance

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

$V_{(BR)CEO} > 16\text{ V}$

$V_{(BR)EBO} > 3\text{ V}$

$I_{CES} < 5\text{ mA}$

$E_{SBR} > 1\text{ mJ}$

$h_{FE} > 25$

f_T typ. 4 GHz

C_c typ. 8 pF

C_{re} typ. 5 pF

C_{cf} typ. 2 pF

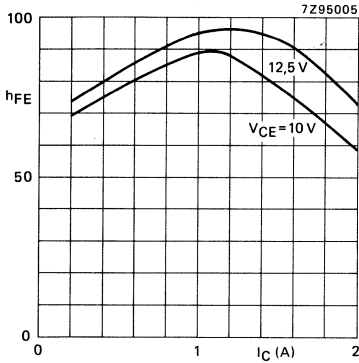


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; typical values.

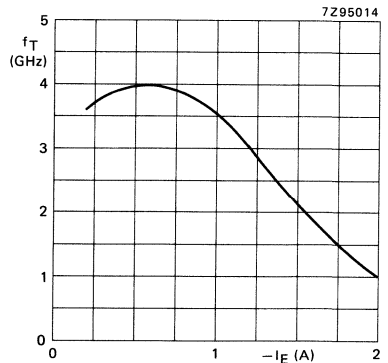


Fig. 5 $V_{CB} = 12,5\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

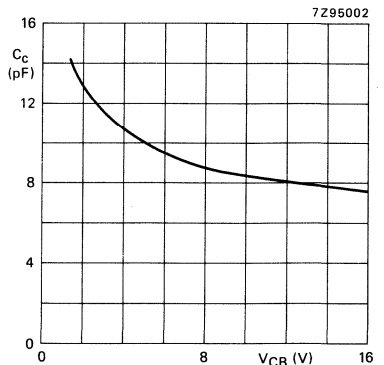


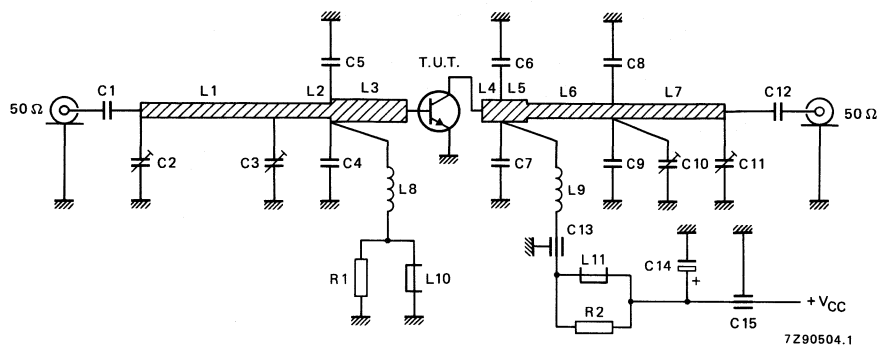
Fig. 6 $I_E = i_e = 0$; $f = 1\text{ MHz}$; typical values.

* Measured under pulse conditions: $t_p = 50\text{ }\mu\text{s}$; $\delta < 1\%$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$.

mode of operation	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η_C %
narrow band; c.w.	12,5	4	< 0,71 typ. 0,57	> 7,5 typ. 8,5	< 0,64 typ. 0,56	> 50 typ. 57
	9,6	3	typ. 0,56	typ. 7,3	typ. 0,56	typ. 56

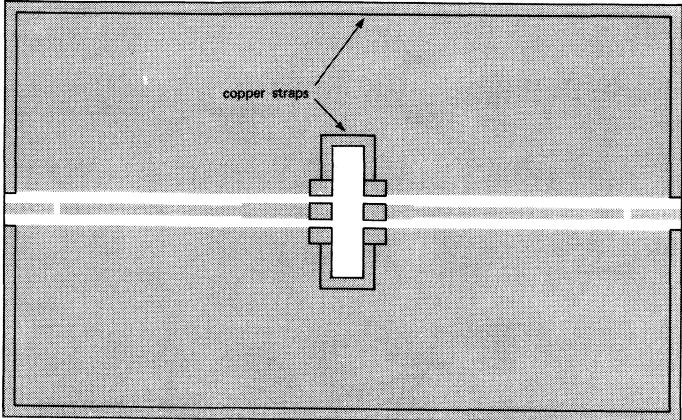
Fig. 7 Class-B test circuit at $f = 900 \text{ MHz}$.

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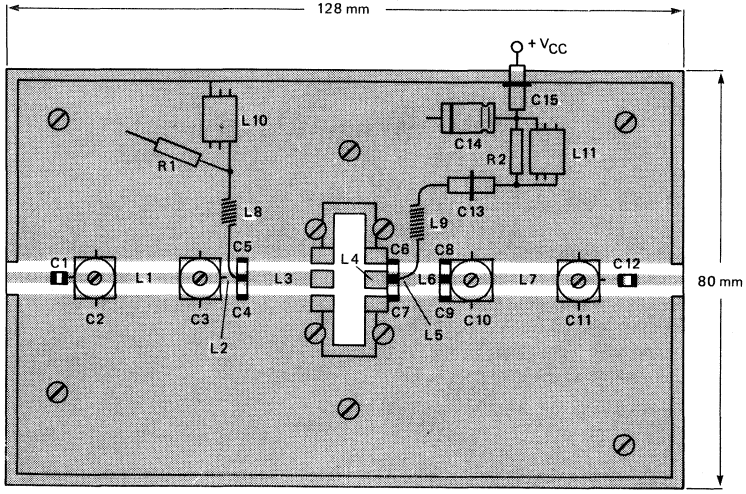
List of components:

- C1 = C12 = 33 pF multilayer ceramic chip capacitor
 C2 = C3 = C10 = C11 = 1,4 to 5,5 pF film dielectric trimmer
 (cat. no. 2222 809 09001)
 C4 = C5 = 3,9 pF multilayer ceramic chip capacitor*
 C6 = C7 = C8 = C9 = 6,2 pF multilayer ceramic chip capacitor*
 C13 = 10 pF ceramic feed-through capacitor
 C14 = 6,8 μF (63 V) electrolytic capacitor
 C15 = 330 pF ceramic feed-through capacitor
 L1 = 50 Ω stripline (29,5 mm x 2,4 mm)
 L2 = 50 Ω stripline (5,5 mm x 2,4 mm)
 L3 = 42,7 Ω stripline (16,8 mm x 3,0 mm)
 L4 = 42,7 Ω stripline (7,5 mm x 3,0 mm)
 L5 = 42,7 Ω stripline (2,0 mm x 3,0 mm)
 L6 = 50 Ω stripline (8,5 mm x 2,4 mm)
 L7 = 50 Ω stripline (28,0 mm x 2,4 mm)
 L8 = 60 nH; 4 turns closely wound enamelled Cu-wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
 L9 = 45 nH; 4 turns enamelled Cu-wire (1,0 mm); length 6 mm; int. dia. 4 mm; leads 2 x 5 mm
 L10 = L11 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
 R1 = R2 = 10 $\Omega \pm 10\%$; 0,25 W, metal film resistor
 L1 to L7 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch.

* American Technical Ceramics capacitors type 100A or capacitor of same quality.



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Fig. 8 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is un-etched copper serving as ground plane. Earth connections are made by fixing screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

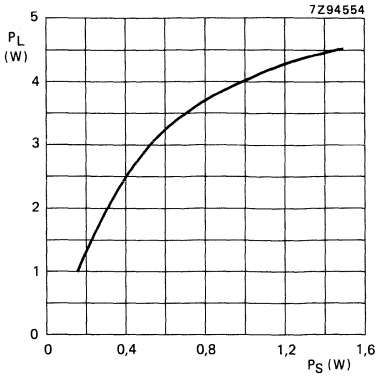


Fig. 9 Load power vs. source power.

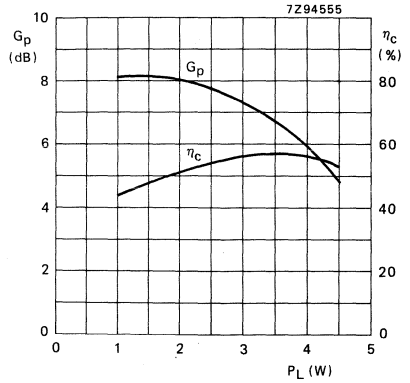


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:

$V_{CE} = 9,6 \text{ V}$; $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

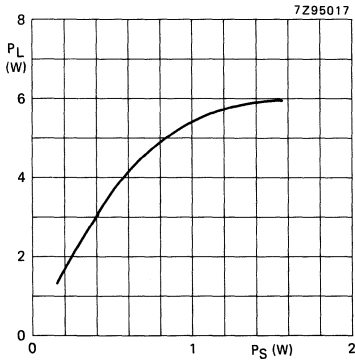


Fig. 11 Load power vs. source power.

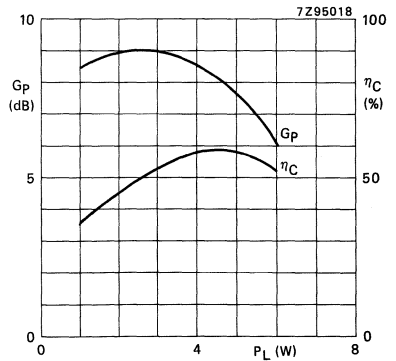


Fig. 12 Power gain and efficiency vs. load power.

Conditions for Figs 11 and 12:

$V_{CE} = 12,5 \text{ V}$; $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V and at $T_h = 25\text{ }^\circ\text{C}$.

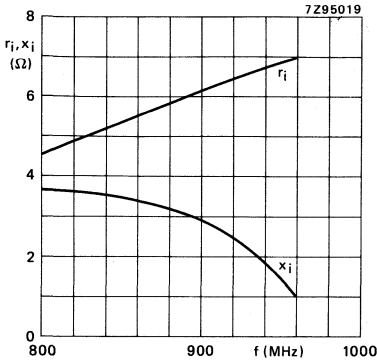


Fig. 13 Input impedance (series components).

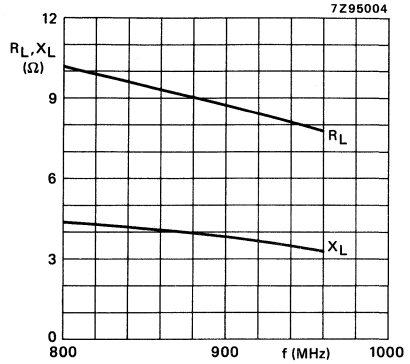


Fig. 14 Load impedance (series components).

Conditions for Figs 13 and 14:

$V_{CE} = 12,5\text{ V}$; $P_L = 4\text{ W}$; $f = 800\text{--}960\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

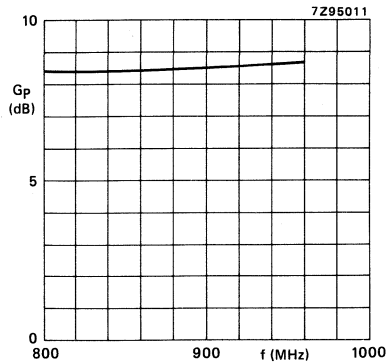


Fig. 15 Power gain vs. frequency.

$V_{CE} = 12,5\text{ V}$; $P_L = 4\text{ W}$; $f = 800\text{--}960\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 900 MHz communications band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- internal input matching to achieve an optimum wideband capability and high power gain
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-171). All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in a common-emitter class-B test circuit

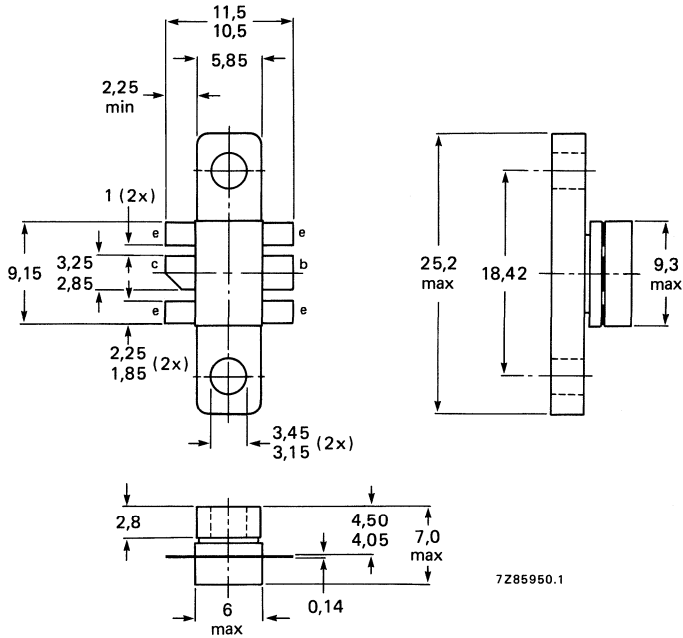
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	900	8	> 6,5	> 50
	9,6	900	6	typ. 6,0	typ. 59

PRODUCT SAFETY 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

Dimensions in mm

Fig. 1 SOT-171.



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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter)
peak value

V_{CBOM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 16 V

Emitter-base voltage (open collector)

V_{EBO} max. 3 V

Collector current

d.c. or average

(peak value); $f > 1$ MHz

$I_C; I_{CAV}$ max. 1,6 A

I_{CM} max. 4,8 A

Total power dissipation

at $T_{mb} = 67^\circ\text{C}$

at $T_{mb} = 67^\circ\text{C}; f > 1$ MHz

$P_{tot(dc)}$ max. 18 W

$P_{tot(rf)}$ max. 24 W

Storage temperature

T_{stg} -65 to $+150^\circ\text{C}$

Operating junction temperature

T_j max. 200°C

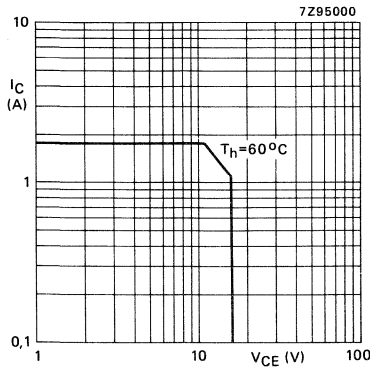


Fig. 2 D.C.-SOAR.

$R_{th\ mb-h} = 0,4$ K/W

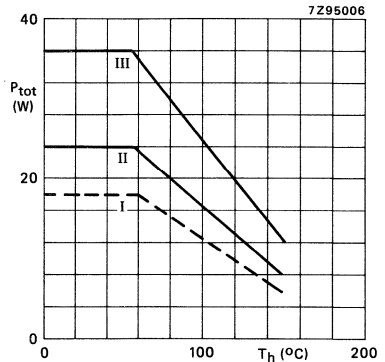


Fig. 3 Power/temperature derating curves.

- I Continuous operation
- II Continuous operation ($f > 1$ MHz)
- III Short-time operation during mismatch; ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 12 W; $T_{mb} = 112^\circ\text{C}$

From junction to mounting base

(d.c. dissipation)

(r.f. dissipation)

$R_{thj-mb(dc)}$ max. 7,0 K/W

$R_{thj-mb(rf)}$ max. 5,2 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ max. 0,4 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 20\text{ mA}$

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

Collector-emitter breakdown voltage
open base; $I_C = 40\text{ mA}$

$$V_{(BR)CEO} > 16\text{ V}$$

Emitter-base breakdown voltage
open collector; $I_E = 2\text{ mA}$

$$V_{(BR)EBO} > 3\text{ V}$$

Collector cut-off current
 $V_{BE} = 0; V_{CE} = 16\text{ V}$

$$I_{CES} < 10\text{ mA}$$

Second breakdown energy
 $L = 25\text{ mH}; f = 50\text{ Hz}; R_{BE} = 10\text{ }\Omega$

$$E_{SBR} > 2\text{ mJ}$$

D.C. current gain

$$I_C = 1,2\text{ A}; V_{CE} = 10\text{ V}$$

$$h_{FE} > 25$$

Transition frequency at $f = 500\text{ MHz}^*$

$$-I_E = 1,2\text{ A}; V_{CE} = 12,5\text{ V}$$

$$f_T \text{ typ. } 4\text{ GHz}$$

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

$$I_E = i_e = 0; V_{CB} = 12,5\text{ V}$$

$$C_C \text{ typ. } 15\text{ pF}$$

Feed-back capacitance at $f = 1\text{ MHz}$

$$I_C = 0; V_{CE} = 12,5\text{ V}$$

$$C_{re} \text{ typ. } 9\text{ pF}$$

Collector-flange capacitance

$$C_{cf} \text{ typ. } 2\text{ pF}$$

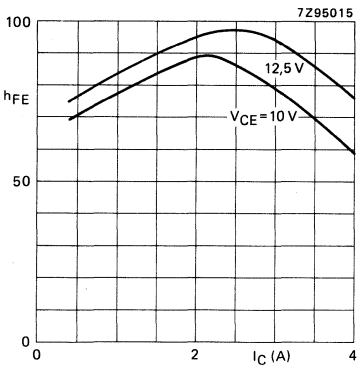


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; typical values.

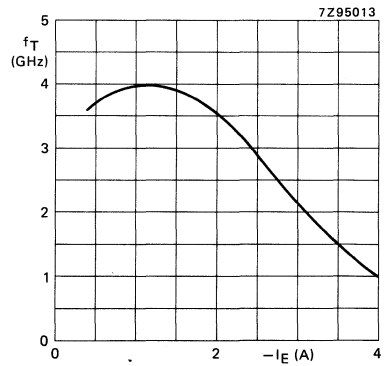


Fig. 5 $V_{CB} = 12,5\text{ V}; f = 500\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$; typical values.

* Measured under pulse conditions: $t_p = 50\text{ }\mu\text{s}; \delta < 1\%$.

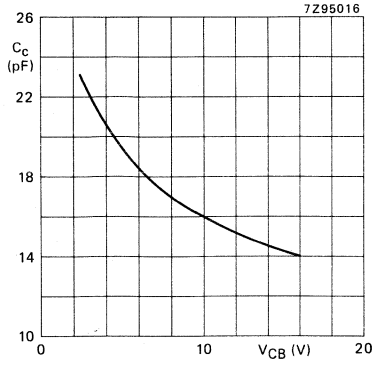


Fig. 6 $I_E = i_e = 0$; $f = 1$ MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): $f = 900$ MHz; $T_H = 25$ °C.

mode of operation	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η_C %
narrow band; c.w.	12,5	8	< 1,8 typ. 1,5	> 6,5 typ. 7,3	< 1,28 typ. 1,1	> 50 typ. 58
	9,6	6	typ. 1,5	typ. 6,0	typ. 1,05	typ. 59

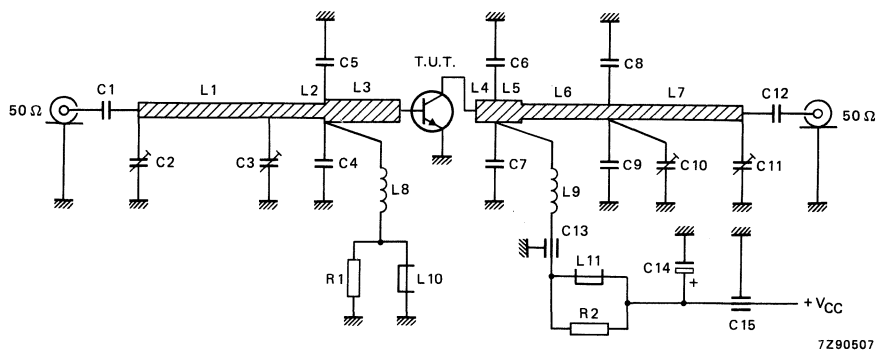


Fig. 7 Class-B test circuit at $f = 900$ MHz.

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List of components:

C1 = C12 = 33 pF multilayer ceramic chip capacitor

C2 = C3 = C10 = C11 = 1,4 to 5,5 pF film dielectric trimmer
(cat. no. 2222 809 09001)

C4 = C5 = 4,7 pF multilayer ceramic chip capacitor*

C6 = C7 = 5,6 pF multilayer ceramic chip capacitor*

C8 = C9 = 3,3 pF multilayer ceramic chip capacitor*

C13 = 10 pF ceramic feed-through capacitor

C14 = 6,8 μ F (63 V) electrolytic capacitor

C15 = 330 pF ceramic feed-through capacitor

L1 = L7 = 50 Ω stripline (29,0 x 2,4 mm)

L2 = 50 Ω stripline (6,0 mm x 2,4 mm)

L3 = 42,7 Ω stripline (13,1 mm x 3,0 mm)

L4 = 42,7 Ω stripline (4,4 mm x 3,0 mm)

L5 = 42,7 Ω stripline (4,6 mm x 3,0 mm)

L6 = 50 Ω stripline (11,0 x 2,4 mm)

L8 = 60 nH; 4 turns closely wound enamelled Cu-wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm

L9 = 45 nH; 4 turns enamelled Cu-wire (1,0 mm); length 6 mm; int. dia 4 mm; leads 2 x 5 mm

L10 = L11 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)

R1 = R2 = 10 Ω \pm 10%; 0,25 W, metal film resistor

L1 to L7 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.

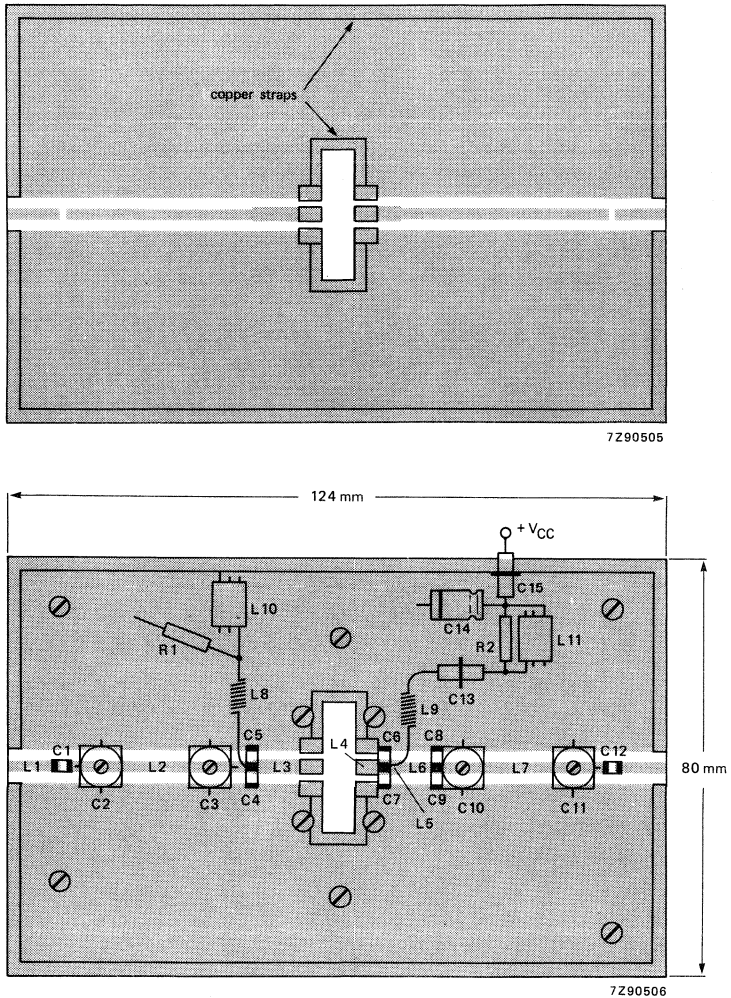


Fig. 8 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is un-etched copper serving as ground plane. Earth connections are made by fixing screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

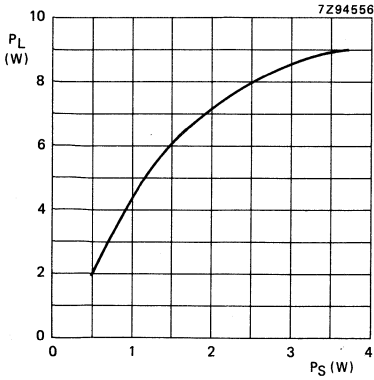


Fig. 9 Load power vs. source power.

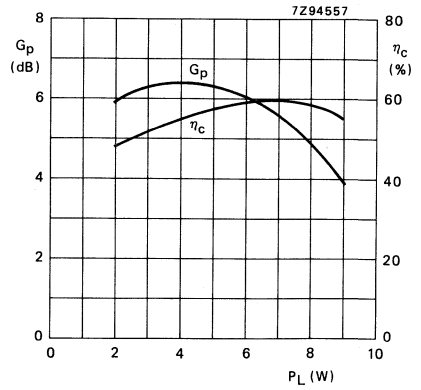


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:

$V_{CE} = 9,6 \text{ V}$; $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

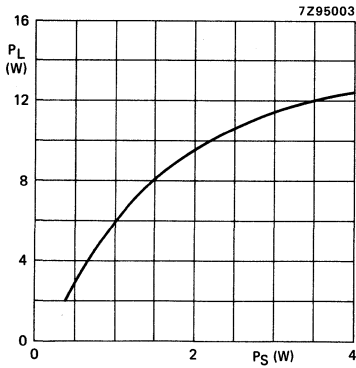


Fig. 11 Load power vs. source power.

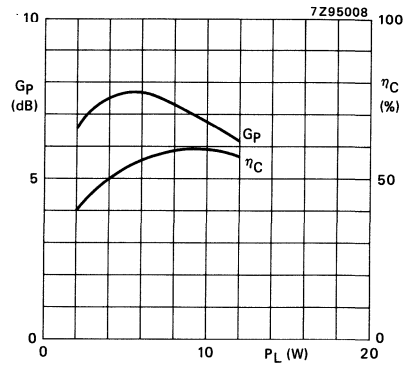


Fig. 12 Power gain and efficiency vs. load power.

Conditions for Figs 11 and 12:

$V_{CE} = 12,5 \text{ V}$; $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V and at $T_h = 25\text{ }^\circ\text{C}$.

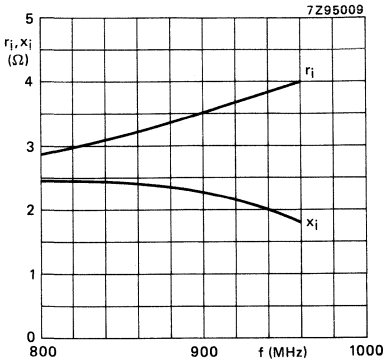


Fig. 13 Input impedance (series components).

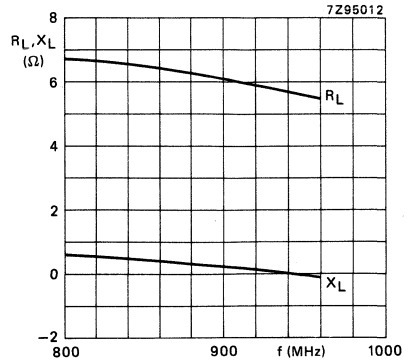


Fig. 14 Load impedance (series components).

Conditions for Figs 13 and 14:

$V_{CE} = 12,5\text{ V}$; $P_L = 8\text{ W}$; $f = 800\text{--}960\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

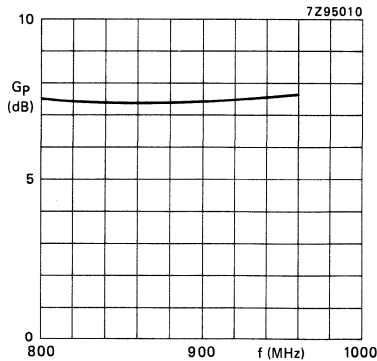


Fig. 15 Power gain vs. frequency.

$V_{CE} = 12,5\text{ V}$; $P_L = 8\text{ W}$; $f = 800\text{--}960\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for common base, class-B operation in mobile radio transmitters for the 900 MHz communication band.

Features:

- emitter-ballasting resistors for an optimum temperature profile
 - gold metallization ensures excellent reliability
 - internal input matching to achieve an optimum wideband capability and stable operation
- The transistor has a 6-lead flange envelope with a ceramic cap (SOT-171). All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to $T_H = 25\text{ }^\circ\text{C}$ in a common-base class-B circuit

mode of operation	V_{CB} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	900	15	> 6	> 50

MECHANICAL DATA

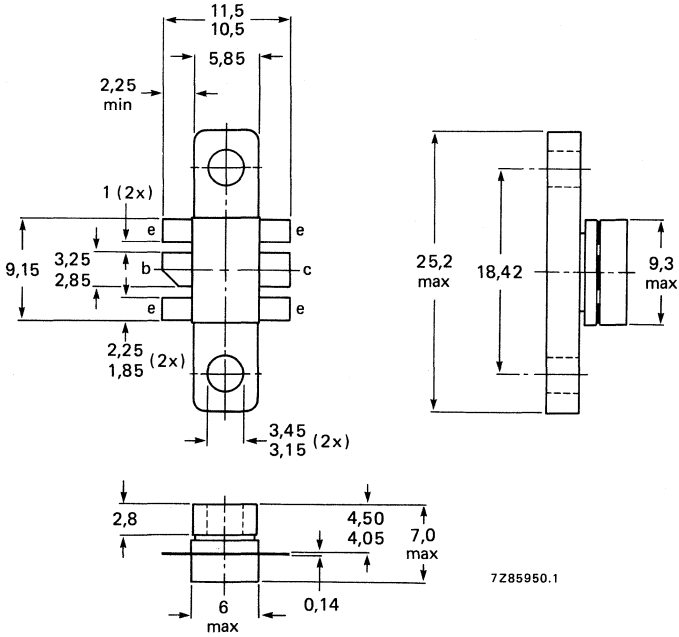
SOT-171 (see Fig. 1).

PRODUCT SAFETY 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

Dimensions in mm

Fig. 1 SOT-171.



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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current			
d.c. or average	I_C	max.	3 A
peak value; $f > 1$ MHz	I_{CM}	max.	9 A
Total power dissipation			
at $T_{mb} = 25$ °C; $f > 1$ MHz	P_{tot}	max.	45 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

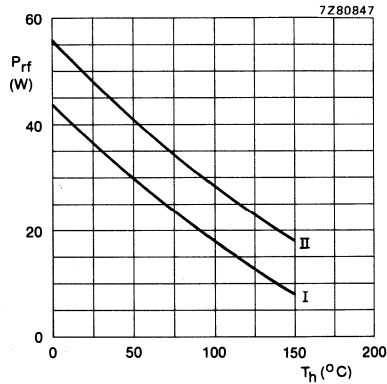


Fig. 2 Power/temperature derating curves;
 I Continuous operation ($f > 1$ MHz)
 II Short-time operation during mismatch;
 ($f > 1$ MHz)

THERMAL RESISTANCE

From junction to mounting base (r.f. operation)	$R_{th\ j-mb}$	max.	4 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,4 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 25\text{ mA}$

Collector-emitter breakdown voltage
open base; $I_C = 50\text{ mA}$

Emitter-base breakdown voltage
open collector; $I_E = 5\text{ mA}$

Collector cut-off current
 $V_{BE} = 0$; $V_{CE} = 16\text{ V}$

Second breakdown energy
 $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

D.C. current gain
 $V_{CE} = 10\text{ V}$; $I_C = 2\text{ A}$

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = I_e = 0$; $V_{CB} = 12,5\text{ V}$

Feedback capacitance at $f = 1\text{ MHz}$
 $I_E = 0$; $V_{CB} = 12,5\text{ V}$

→ Collector-flange capacitance

$V_{(BR)CBO}$	min.	36 V
$V_{(BR)CEO}$	min.	16 V
$V_{(BR)EBO}$	min.	3,5 V
I_{CES}	max.	10 mA
ESBR	min.	4,5 mJ
h_{FE}	min. typ.	15 65
C_c	typ.	33 pF
C_{rb}	typ.	9 pF
C_{cf}	typ.	2 pF

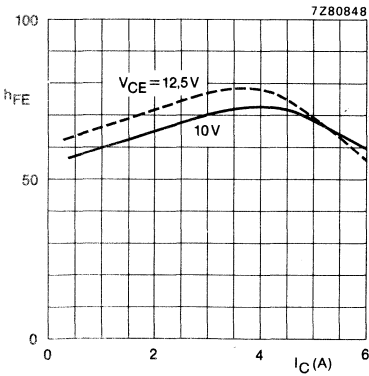


Fig. 3 D.C. current gain versus collector current; $T_j = 25\text{ }^\circ\text{C}$. Typical values.

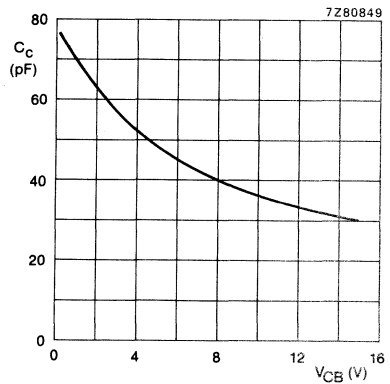


Fig. 4 Output capacitance versus V_{CB} ; $I_E = I_e = 0$; $f = 1\text{ MHz}$. Typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-base circuit; class-B)
 $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$

mode of operation	V_{CB} V	PL W	G_p dB	η_C %
narrow band; c.w.	12,5	15	> 6,0 typ. 7,0	> 50 typ. 61

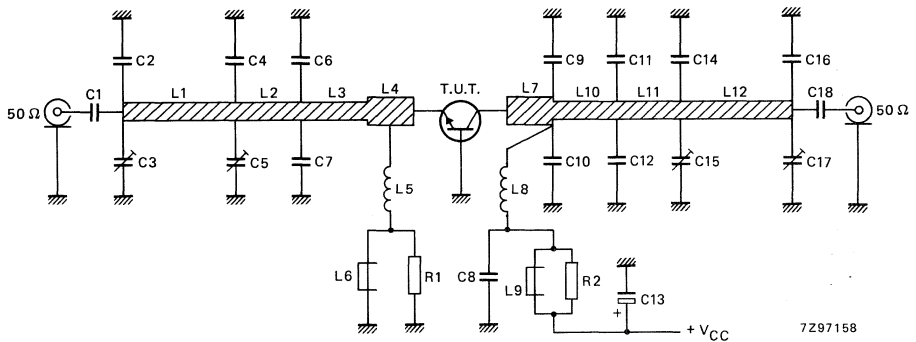


Fig. 5 Class-B test circuit at $f = 900 \text{ MHz}$.

List of components:

- $C_1 = C_{18} = 330 \text{ pF}$ multilayer ceramic chip capacitor *
- $C_2 = C_4 = C_{16} = 5,6 \text{ pF}$ multilayer ceramic chip capacitor *
- $C_3 = C_5 = C_{15} = C_{17} = 1,4 \text{ to } 5,5 \text{ pF}$ film dielectric trimmer
(cat. no. 2222 809 09001)
- $C_6 = C_7 = 4,3 \text{ pF}$ multilayer ceramic chip capacitor *
- $C_8 = 330 \text{ pF}$ multilayer ceramic chip capacitor
- $C_9 = C_{10} = 5,6 \text{ pF}$ multilayer ceramic chip capacitors **
- $C_{11} = C_{12} = 6,2 \text{ pF}$ multilayer ceramic chip capacitor *

C₁₃ = 6,8 μF (63 V) electrolytic capacitor

C₁₄ = 2,2 pF multilayer ceramic chip capacitor *

L₁ = L₁₂ = 50 Ω stripline (24 mm x 2,4 mm)

L₂ = L₁₁ = 50 Ω stripline (10 mm x 2,4 mm)

L₃ = 50 Ω stripline (8 mm x 2,4 mm)

L₄ = L₇ = 41 Ω (3 mm x 3,2 mm)

L₅ = L₈ = 4 turns Cu-wire (1,0 mm); int. dia. 4 mm; length 5 mm;
leads 2 x 7 mm

L₆ = L₉ = Ferroxcube wideband h.f. choke; grade 3B (cat. no 4312 020 36642)

L₁₀ = 50 Ω stripline (7 mm x 2,4 mm)

R₁ = R₂ = 10 Ω ± 10 %; 0,25 W, metal film resistor

The striplines are on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ε_r = 2,2); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100B or capacitor of the same quality.

** Idem type 100A.

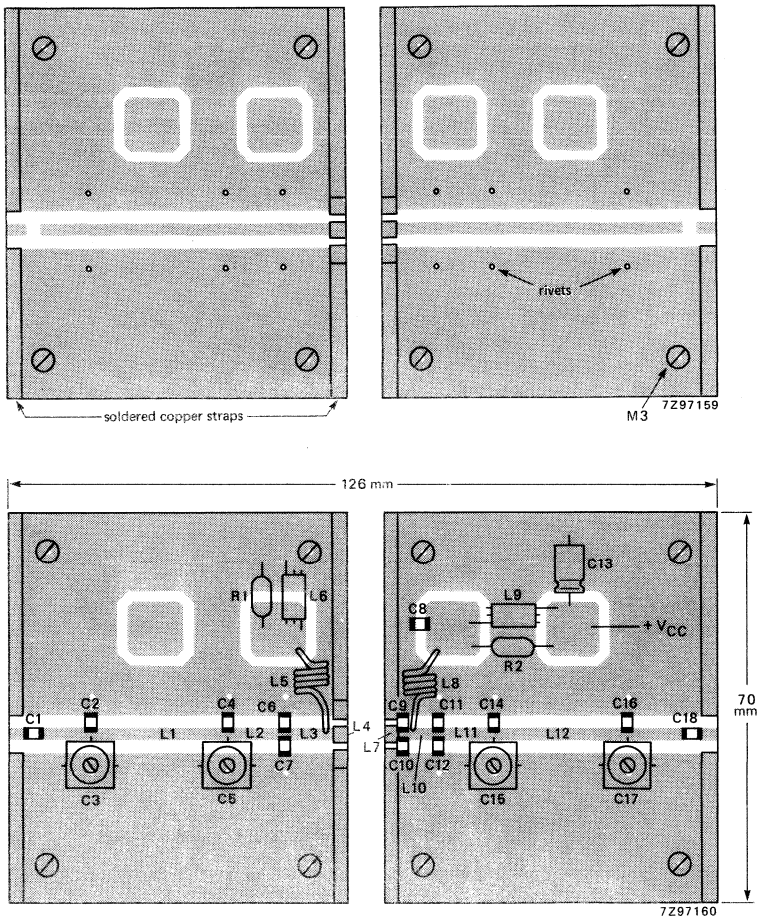


Fig. 6 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

The circuit and components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as a ground plane.

Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper of the component side and the ground plane.

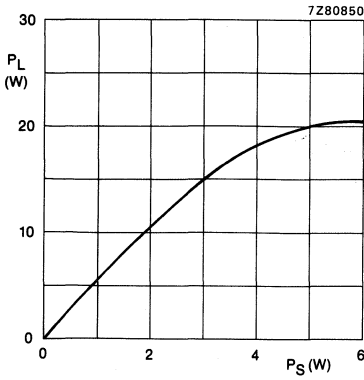


Fig. 7 Load power versus source power.

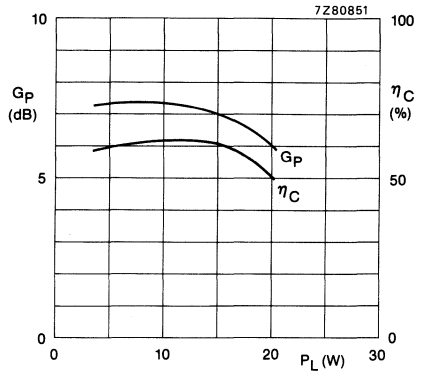


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

$V_{CB} = 12,5 \text{ V}$; $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; class-B operation;
 $R_{th \text{ mb-h}} = 0,4 \text{ K/W}$; typical values.

RUGGEDNESS

The BLV94 is capable of withstanding a load mismatch ($VSWR = 50$ through all phases) at rated load power up to a supply voltage of $15,5 \text{ V}$ at $T_h = 25 \text{ }^\circ\text{C}$ and $R_{th \text{ mb-h}} = 0,4 \text{ K/W}$.

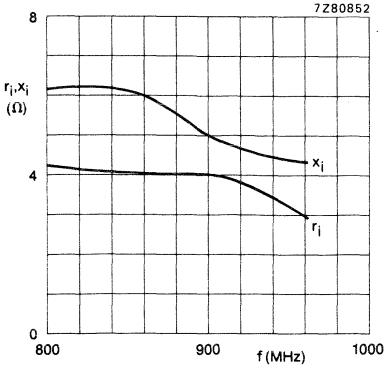


Fig. 9 Input impedance (series components).

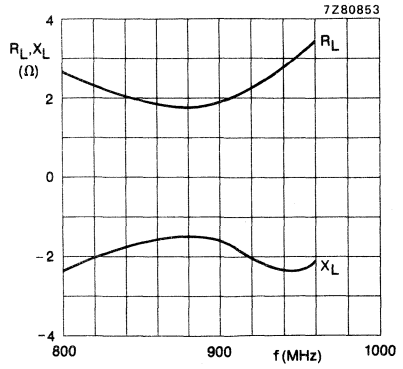


Fig. 10 Load impedance (series components).

Conditions for Figs 9, 10 and 11:

Typical values; $V_{CE} = 12,5$ V; $P_L = 15$ W; $f = 800$ to 960 MHz;
 $R_{th\ mb-h} = 0,4$ K/W; $T_h = 25$ °C.

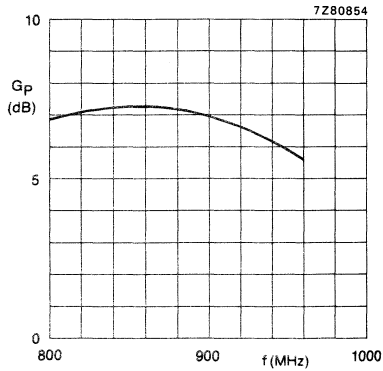


Fig. 11 Power gain versus frequency.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BLV95

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-171 envelope and intended for use in class-B operated mobile radio transmitters in the 900 MHz communications band.

Features:

- internal input matching to achieve an optimum wideband capability and stable operation;
- emitter-ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

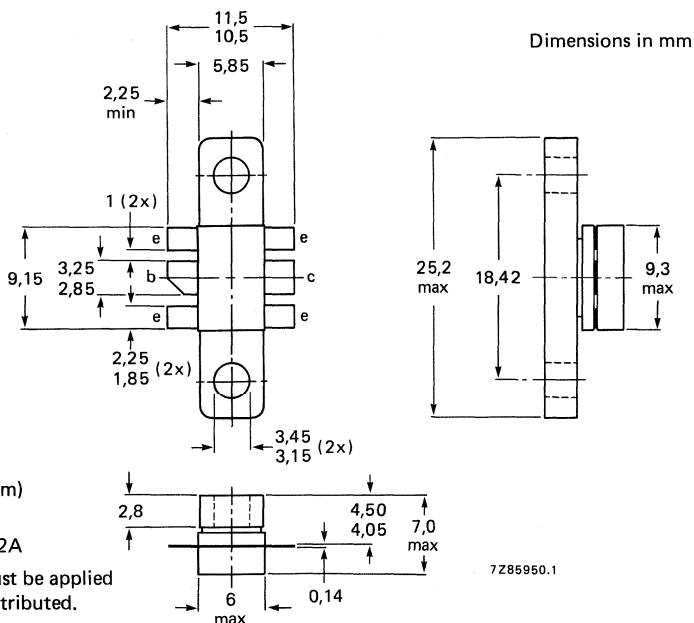
QUICK REFERENCE DATA

R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in a common-base class-B circuit

mode of operation	V_{CB} V	f MHz	P_L W	Gp dB	η_C %
narrow band; c.w.	12,5	900	22	> 5,5	> 50

MECHANICAL DATA

Fig. 1 SOT-171.



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

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

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY 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)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current; d.c.	I_C	max.	5 A
Total power dissipation → at $T_{mb} = 25\text{ °C}$; $f > 1\text{ MHz}$	P_{tot}	max.	70 W
Storage temperature	T_{stg}		-65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

CHARACTERISTICS $T_j = 25\text{ °C}$ unless otherwise specified

Collector-base breakdown voltage open emitter; $I_C = 50\text{ mA}$	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 100\text{ mA}$	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; $I_E = 10\text{ mA}$	$V_{(BR)EBO}$	>	3,5 V
D.C. current gain $V_{CE} = 10\text{ V}$; $I_C = 3,5\text{ A}$	h_{FE}	>	15
Collector capacitance at $f = 1\text{ MHz}$ $I_E = i_e = 0$; $V_{CB} = 12,5\text{ V}$	C_c	typ.	62 pF
→ Collector-flange capacitance	C_{cf}	typ.	2 pF

RUGGEDNESS

The device is capable of withstanding a load mismatch ($V_{SWR} = 10$; all phases) at rated load power up to a supply voltage of 15,5 V and $T_H = 25\text{ °C}$.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-171 envelope intended for use in class-B operated base station transmitters in the 900 MHz communications band.

Features

- internal matching to achieve an optimum wideband capability and stable operation.
- emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.

The transistor has a 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 common-base class-B circuit.

mode of operation	V_{CB} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	24	900	30	> 7,0	> 55

MECHANICAL DATA

Dimensions in mm

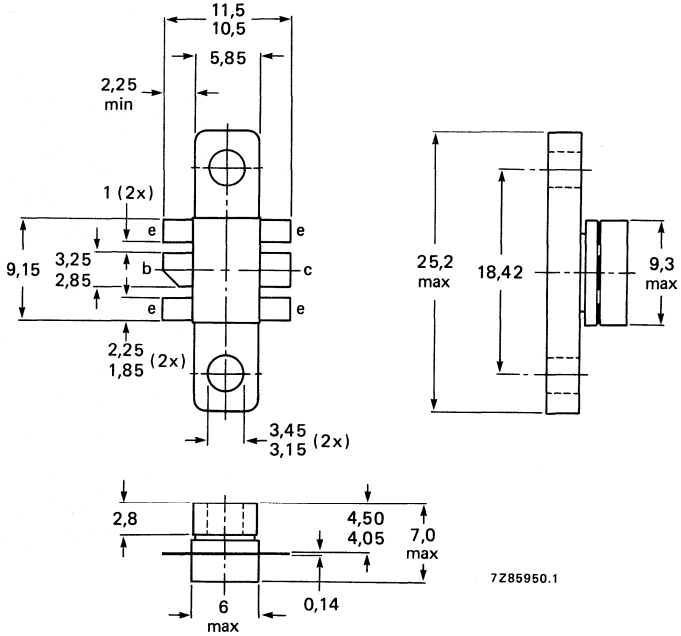
Fig. 1 SOT-171.

PRODUCT SAFETY 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-171.

Dimensions in mm



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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	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. or average	I_C	max.	3 A
peak value; $f > 1$ MHz	I_{CM}	max.	9 A
Total power dissipation			
at $T_{mb} = 25\text{ }^\circ\text{C}$; $f > 1$ MHz	P_{tot}	max.	60 W
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$

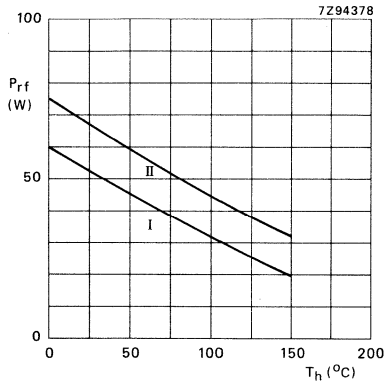


Fig. 2 Power/temperature derating curves.
 I Continuous operation ($f > 1$ MHz)
 II Short-time operating during mismatch ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 60 W; $T_{amb} = 25\text{ }^\circ\text{C}$.

From junction to mounting base (r.f. operation)	$R_{th\ j-mb}$	max.	2,9 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,4 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 50\text{ mA}$

$V_{(BR)CBO}$ min. 50 V

Collector-emitter breakdown voltage
open base; $I_C = 100\text{ mA}$

$V_{(BR)CEO}$ min. 27 V

Emitter-base breakdown voltage
open collector; $I_E = 10\text{ mA}$

$V_{(BR)EBO}$ min. 3,5 V

Collector-emitter leakage current
 $V_{BE} = 0$; $V_{CE} = 27\text{ V}$

I_{CES} max. 10 mA

Second breakdown energy
 $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

$ESBR$ min. 4 mJ

D.C. current gain

$V_{CE} = 20\text{ V}$; $I_C = 2\text{ A}$

h_{FE} min. 15

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

$I_E = i_e = 0$; $V_{CB} = 24\text{ V}$

C_c typ. 44 pF

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

$I_E = 0$; $V_{CB} = 24\text{ V}$

C_{rb} typ. 14 pF

→ Collector-flange capacitance
 C_{cf} typ. 2 pF

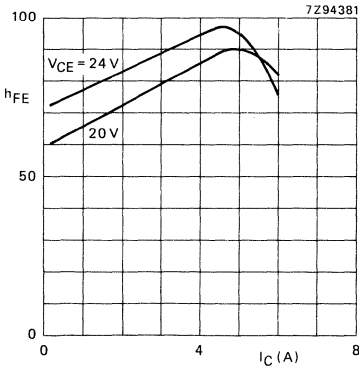


Fig. 3 D.C. current gain versus collector current; $T_j = 25\text{ }^\circ\text{C}$.

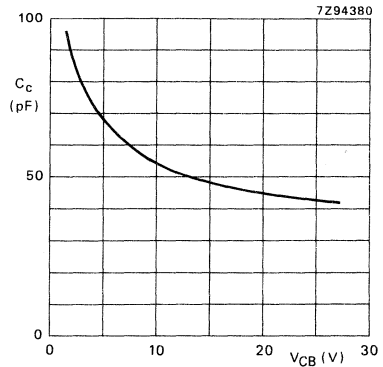
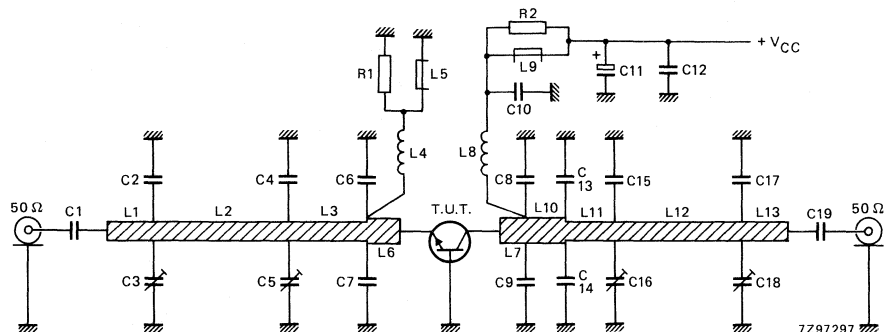


Fig. 4 Collector capacitance versus V_{CB} ; $I_E = i_e = 0$; $f = 1\text{ MHz}$.

APPLICATION INFORMATION

R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in common-base class-B circuit.

mode of operation	V_{CB} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	24	900	30	> 7,0 typ. 8,0	> 55 typ. 63

Fig. 5 Class-B test circuit at $f = 900\text{ MHz}$.

List of components:

- C1 = C10 = C19 = 330 pF multilayer ceramic chip capacitor
 C2 = C4 = C13 = C14 = C15 = C17 = 6,2 pF multilayer ceramic chip capacitor*
 C3 = C5 = C16 = C18 = 1,4 to 5,5 pF dielectric trimmer (cat. no. 2222 809 09001)
 C6 = 6,2 pF multilayer ceramic chip capacitor**
 C7 = C8 = C9 = 6,8 pF multilayer ceramic chip capacitor*
 C11 = 2,2 μF (63 V) electrolytic capacitor
 C12 = 3 x 100 nF multilayer ceramic chip capacitor in parallel
 L1 = L13 = 50 Ω stripline (9,0 mm x 2,4 mm)
 L2 = 50 Ω stripline (24,0 mm x 2,4 mm)
 L3 = 50 Ω stripline (13,0 mm x 2,4 mm)
 L4 = 250 nH; 9 turns closely wound enamelled Cu-wire (1,0 mm) int. dia. 4 mm; leads 2 x 7 mm
 L5 = L9 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 26642)
 L6 = 43 Ω stripline (5,5 mm x 3,0 mm)
 L7 = 43 Ω stripline (3,0 mm x 3,0 mm)
 L8 = 65 nH; 5 turns closely wound enamelled Cu-wire (1,0 mm) int. dia. 4 mm; leads 2 x 7 mm
 L10 = 43 Ω stripline (7,5 mm x 3,0 mm)
 L11 = 50 Ω stripline (8,0 mm x 2,4 mm)
 L12 = 50 Ω stripline (24,0 mm x 2,4 mm)
 R1 = 1 $\Omega \pm 5\%$ (0,25 W) metal film resistor
 R2 = 10 $\Omega \pm 5\%$ (0,25 W) metal film resistor

The striplines are on a double Cu-clad printed circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch.

* Americal Technical Ceramics capacitor type 100B or capacitor of the same quality.

** Idem type 100A.

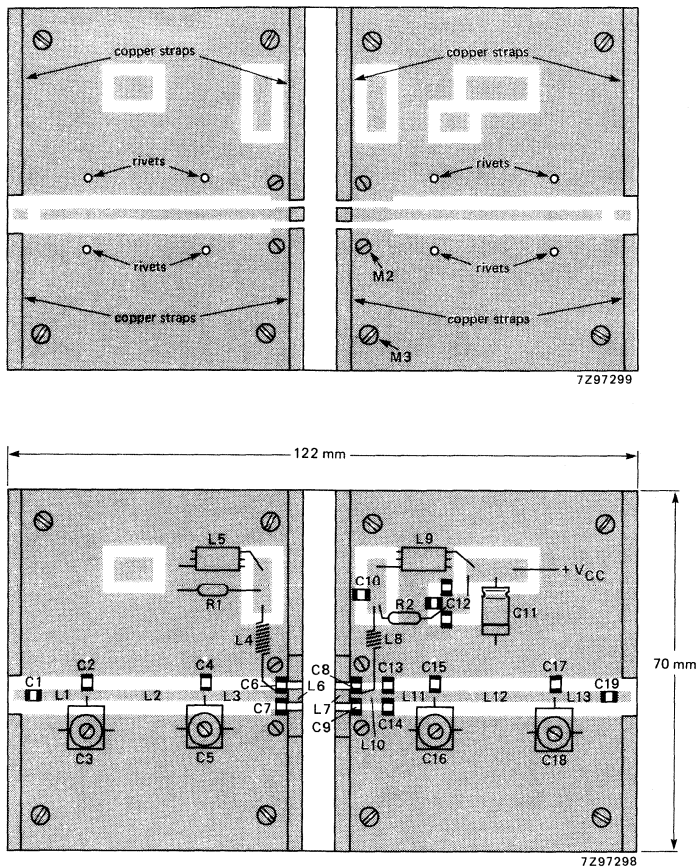


Fig. 6 Printed circuit board and component layout for 900 MHz class-B test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

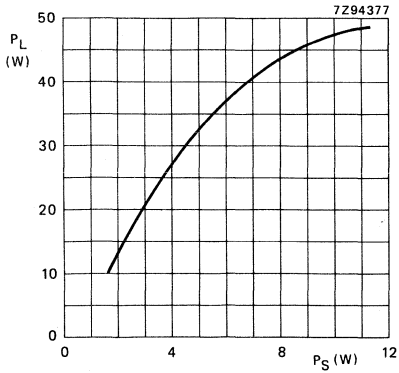


Fig. 7 Load power versus source power.

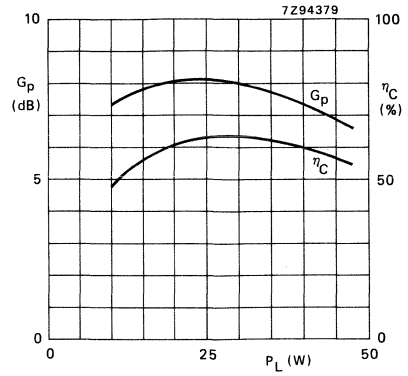


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

Typical values; $V_{CB} = 24$ V; $f = 900$ MHz; $T_h = 25$ °C; class-B operation; $R_{th\ mb-h} = 0,4$ K/W.

RUGGEDNESS

The BLV97 is capable of withstanding a full load mismatch (VSWR = 50 through all phases) at rated load power and supply voltage; when $T_h = 25$ °C and $R_{th\ mb-h} = 0,4$ K/W.

INPUT AND LOAD IMPEDANCES

$\bar{Z}_i = 1,6 + j\ 4,4\ \Omega$ and $\bar{Z}_L = 1,20 + j\ 3,0\ \Omega$ (series components).

Conditions: $V_{CB} = 24$ V; $P_L = 30$ W; $f = 900$ MHz, $T_h = 25$ °C; class-B operation; $R_{th\ mb-h} = 0,4$ K/W; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-171 envelope intended for use in class-B operated base station transmitters in the 900 MHz communications band.

Features

- internal matching to achieve an optimum wideband capability and stable operation.
- emitter ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.

The transistor has a 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 common-base class-B circuit.

mode of operation	V_{CB} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	24	900	14	> 8,5	> 55

MECHANICAL DATA

Dimensions in mm

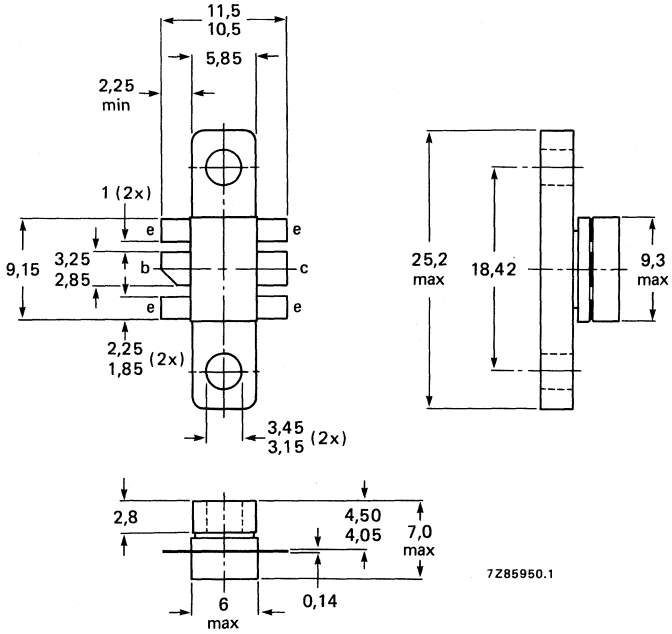
Fig. 1 SOT-171.

PRODUCT SAFETY 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-171.

Dimensions in mm



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

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	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. or average	I_C	max.	1,5 A
peak value; $f > 1$ MHz	I_{CM}	max.	4,5 A
Total power dissipation			
at $T_{mb} = 25$ °C; $f > 1$ MHz	P_{tot}	max.	40 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

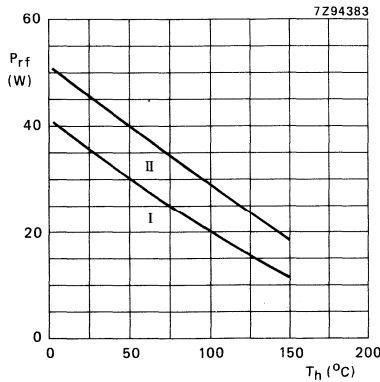


Fig. 2 Power/temperature derating curves.
 I Continuous operation ($f > 1$ MHz)
 II Short-time operation during mismatch ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 40 W; $T_{amb} = 25$ °C

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

$R_{th\ j-mb}$ max. 4,4 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ max. 0,4 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 25\text{ mA}$

$V_{(BR)CBO}$ min. 50 V

Collector-emitter breakdown voltage
open base; $I_C = 50\text{ mA}$

$V_{(BR)CEO}$ min. 27 V

Emitter-base breakdown voltage
open collector; $I_E = 5\text{ mA}$

$V_{(BR)EBO}$ min. 3,5 V

Collector-emitter leakage current
 $V_{BE} = 0$; $V_{CE} = 27\text{ V}$

I_{CES} max. 5 mA

Second breakdown energy
 $L = 25\text{ mH}$; $f = 50\text{ Hz}$; $R_{BE} = 10\text{ }\Omega$

E_{SBR} min. 2 mJ

D.C. current gain
 $V_{CE} = 20\text{ V}$; $I_C = 1\text{ A}$

h_{FE} min. 15

Collector capacitance at $f = 1\text{ MHz}$
 $I_E = i_e = 0$; $V_{CB} = 24\text{ V}$

C_c typ. 23 pF

Feedback capacitance at $f = 1\text{ MHz}$
 $I_E = 0$; $V_{CB} = 24\text{ V}$

C_{rb} typ. 7 pF

→ Collector-flange capacitance
 C_{cf} typ. 2 pF

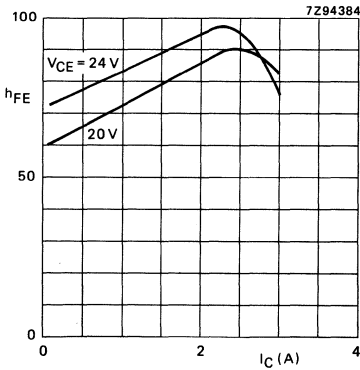


Fig. 3 D.C. current gain versus collector current; $T_j = 25\text{ }^\circ\text{C}$.

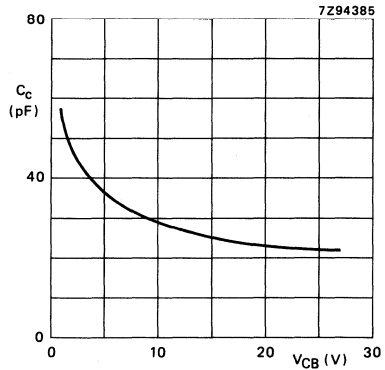
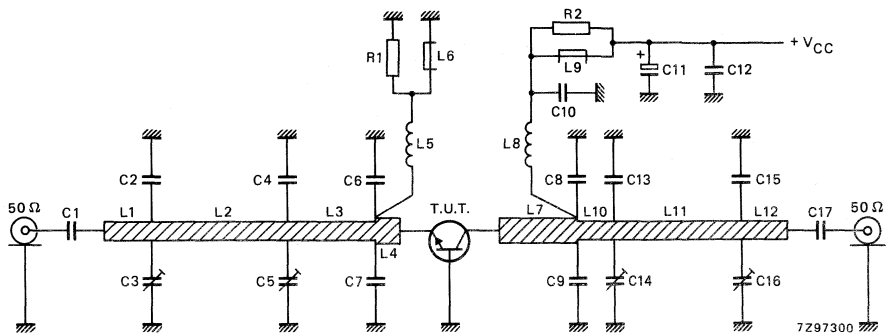


Fig. 4 Output capacitance versus V_{CB} ; $I_E = i_e = 0$; $f = 1\text{ MHz}$.

APPLICATION INFORMATION

R.F. performance at $T_h = 25^\circ\text{C}$ in common-base class-B circuit.

mode of operation	V_{CB} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	24	900	14	> 8,5 typ. 10,0	> 55 typ. 65

Fig. 5 Class-B test circuit at $f = 900$ MHz.

List of components:

C1 = C10 = C17 = 330 pF multilayer ceramic chip capacitor

C2 = C13 = 3,3 pF multilayer ceramic chip capacitor*

C3 = C5 = C14 = C16 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C4 = C8 = C9 = C15 = 6,2 pF multilayer ceramic chip capacitor*

C6 = C7 = 6,2 pF multilayer ceramic chip capacitor**

C11 = 2,2 μF (63 V) electrolytic capacitor

C12 = 3 x 100 nF multilayer ceramic chip capacitors in parallel

L1 = L12 = 50 Ω stripline (9,0 mm x 2,4 mm)L2 = L11 = 50 Ω stripline (24,0 mm x 2,4 mm)L3 = 50 Ω stripline (16,0 mm x 2,4 mm)L4 = 43 Ω stripline (3,0 mm x 3,0 mm)

L5 = 88 nH; 9 turns closely wound enamelled Cu-wire (0,8 mm); int. dia. 3 mm length 12 mm; leads 2 x 5 mm

L6 = L9 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36642)

L7 = 43 Ω stripline (14,5 mm x 3,0 mm)

L8 = 53 nH; 4 turns enamelled Cu-wire (1,0 mm); int. dia. 4 mm; length 5 mm; leads 2 x 5 mm

L10 = 50 Ω stripline (4,5 mm x 2,4 mm)R1 = 1 $\Omega \pm 5\%$ (0,25 W) metal film resistorR2 = 10 $\Omega \pm 5\%$ (0,25 W) metal film resistor

The striplines are on a double Cu-clad printed circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch.

* Americal Technical Ceramics capacitor type 100B or capacitor of the same quality.

** Idem type 100A.

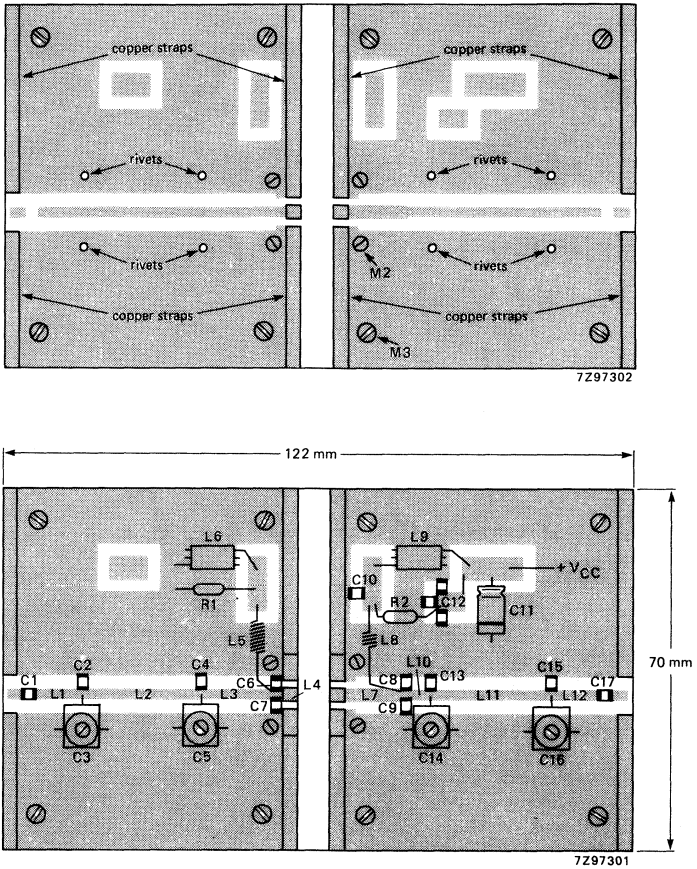


Fig. 6 Printed circuit board and component layout for 900 MHz class-B test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

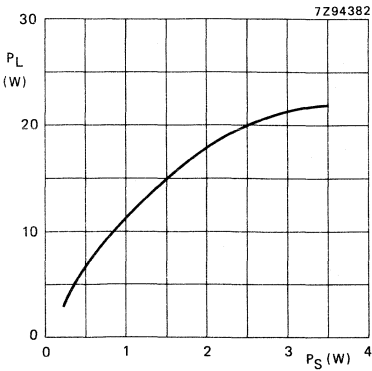


Fig. 7 Load power versus source power.

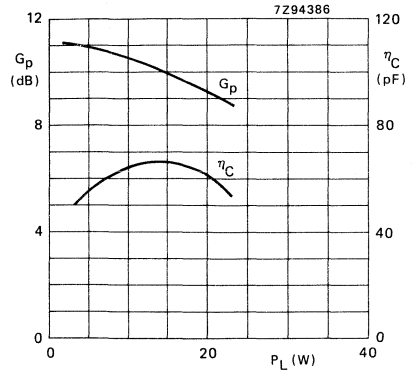


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

Typical values; $V_{CB} = 24$ V; $f = 900$ MHz; $T_h = 25$ °C; class-B operation; $R_{th\ mb-h} = 0,4$ K/W.

RUGGEDNESS

The BLV98 is capable of withstanding a full load mismatch (VSWR = 50 through all phases) at rated load power and supply voltage; when $T_h = 25$ °C and $R_{th\ mb-h} = 0,4$ K/W.

INPUT AND LOAD IMPEDANCES

$\bar{Z}_i = 5,1 + j 4,5 \Omega$ and $\bar{Z}_L = 2,2 + j 3,0 \Omega$ (series components).

Conditions: $V_{CB} = 24$ V; $P_L = 14$ W; $f = 900$ MHz, $T_h = 25$ °C; class-B operation; $R_{th\ mb-h} = 0,4$ K/W; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use as a driver-stage in base stations in the 900 MHz communications band.

Features:

- emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-172). All leads are isolated from the stud.

QUICK REFERENCE DATA

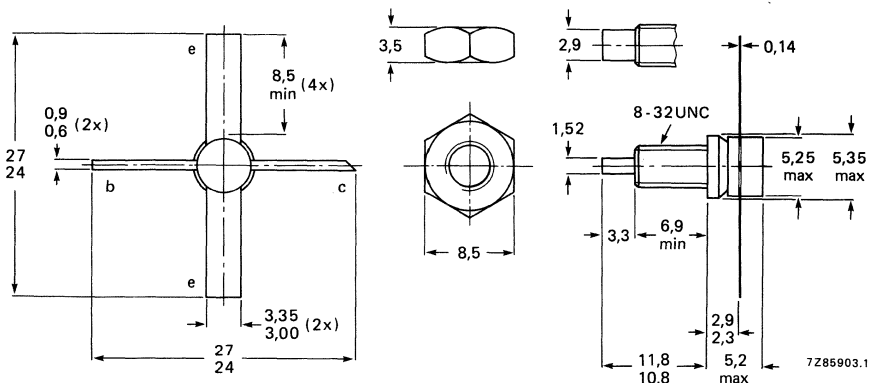
R.F. performance at $T_h = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	24	900	2	> 8,0	> 55

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172.



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

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

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

PRODUCT SAFETY 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)	V_{CB0}	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.	0,2 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	0,6 A
Total power dissipation at $T_{mb} = 50$ °C; $f > 1$ MHz	P_{tot}	max.	6 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

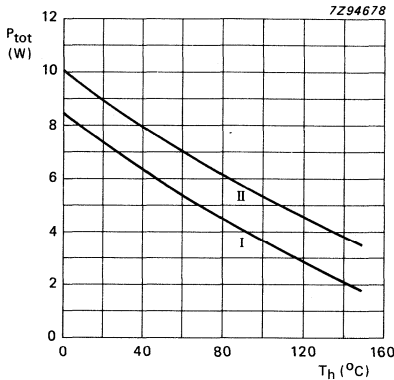


Fig. 2 Power/temperature derating curves.

I continuous r.f. operation ($f > 1$ MHz)

II short-time r.f. operation during mismatch ($f > 1$ MHz)

THERMAL RESISTANCE

$P = 4,5$ W; $T_{mb} = 25$ °C

From junction to mounting base ($f > 1$ MHz)

$R_{th\ j-mb}$ max. 20 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ max. 0,8 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage
open emitter; $I_C = 5\text{ mA}$

$V_{(BR)CBO}$ min. 50 V

Collector-emitter breakdown voltage
open base; $I_C = 10\text{ mA}$

$V_{(BR)CEO}$ min. 27 V

Emitter-base breakdown voltage
open collector; $I_E = 0,5\text{ mA}$

$V_{(BR)EBO}$ min. 3,5 V

Collector-emitter leakage current
 $V_{BE} = 0; V_{CE} = 27\text{ V}$

I_{CES} max. 2 mA

Second breakdown energy at $f = 50\text{ Hz}$
 $L = 25\text{ mH}; R_{BE} = 10\text{ }\Omega$

E_{SBR} min. 0,5 mJ

D.C. current gain

$I_C = 150\text{ mA}; V_{CE} = 20\text{ V}$

h_{FE} min. 25

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

$I_E = i_e = 0; V_{CB} = 24\text{ V}$

C_c typ. 3 pF

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

$I_C = 0; V_{CE} = 24\text{ V}$

C_{re} typ. 1,3 pF

Collector-stud capacitance

C_{cs} typ. 0,5 pF

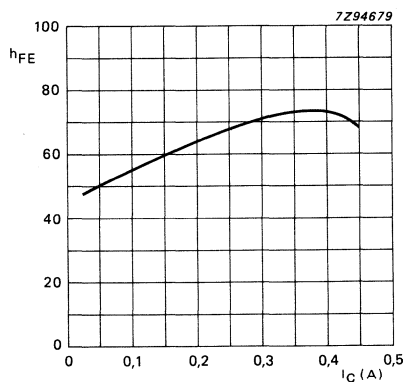


Fig. 3 $V_{CE} = 20\text{ V}; T_j = 25\text{ }^\circ\text{C};$
typical values.

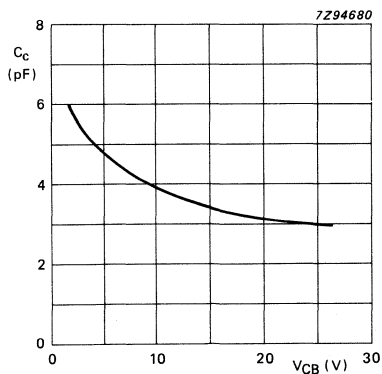


Fig. 4 $I_E = i_e = 0; f = 1\text{ MHz};$
typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B)
 $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0,8 \text{ K/W}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	24	900	2	min. 8,0 typ. 9,3	min. 55 typ. 63

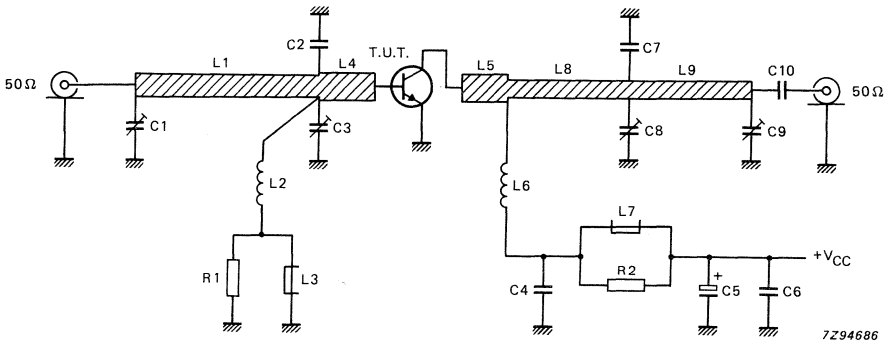


Fig. 5 class-B test circuit at $f = 900 \text{ MHz}$.

List of components

- C1 = C3 = C8 = C9 1,4 – 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C2 4,7 pF multilayer ceramic chip capacitor*
- C4 = C6 = C10 220 pF multilayer ceramic chip capacitor
- C5 1 μF (63 V) electrolytic capacitor
- C7 2,2 pF multilayer ceramic chip capacitor*
- L1 50 Ω stripline (48 mm x 2,4 mm)
- L2 60 nH; 7 turns closely wound enamelled Cu-wire (0,4 mm);
int. dia. 2 mm; leads 2 x 5 mm
- L3 = L7 Ferroxcube wide-band h.f. choke; grade 3B; (cat. no. 4312 020 36642)
- L4 = L5 35 Ω stripline (14 mm x 4,0 mm)
- L6 120 nH; 6 turns Cu-wire (1,0 mm); int. dia. 6 mm; length 10 mm
leads 2 x 5 mm
- L8 50 Ω stripline (31 mm x 2,4 mm)
- L9 50 Ω stripline (29 mm x 2,4 mm)
- R1 = R2 10 $\Omega \pm 5\%$ (0,4 W) metal film resistor

The striplines are on a Cu-clad printed-circuit board with a PTFE fibre-glass dielectric ($\epsilon_r = 2,2$); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100A or capacitor of the same quality.

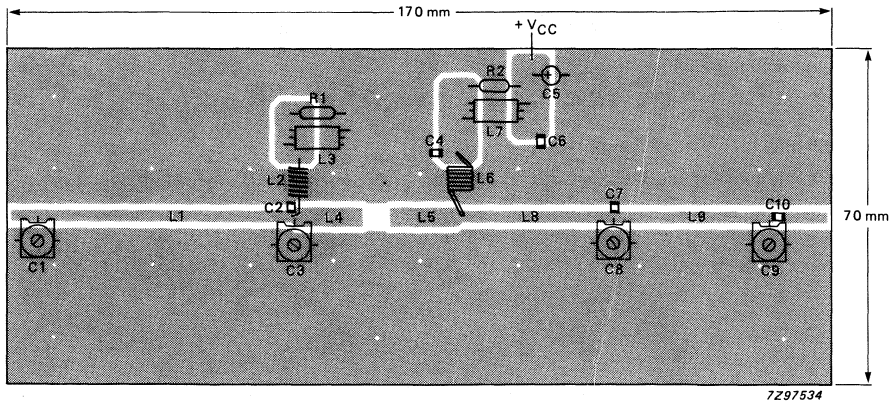
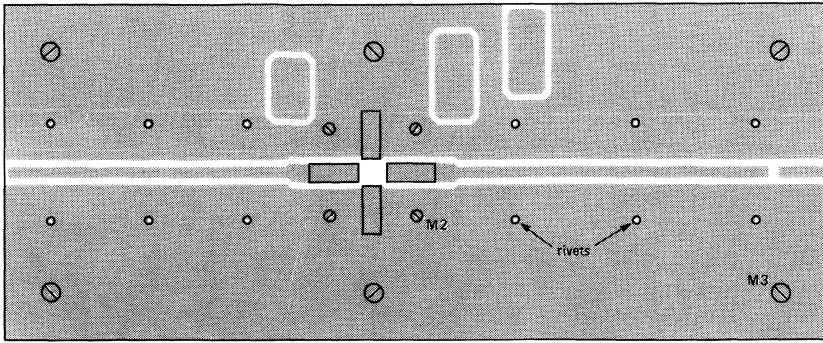


Fig. 6 Printed-circuit board and component layout for 900 MHz class-B test circuit.

Note:

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by hollow rivets and also by fixing screws and copper straps under the emitters to provide a direct contact between the copper on the component side and the ground plane.

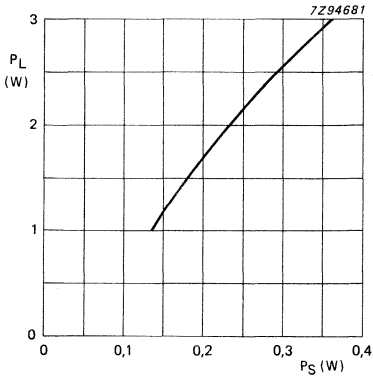


Fig. 7 Load power versus source power.

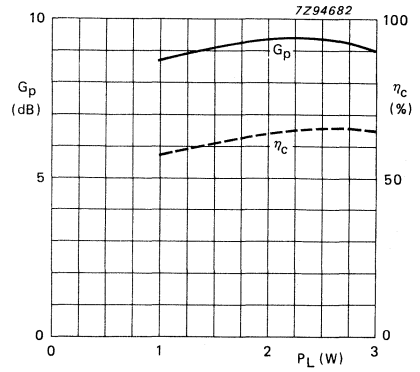


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

$V_{CE} = 24 \text{ V}$; $f = 900 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0,8 \text{ K/W}$; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch ($VSWR = 50$) through all phases, at rated load power and supply voltage ($T_h = 25 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0,8 \text{ K/W}$).

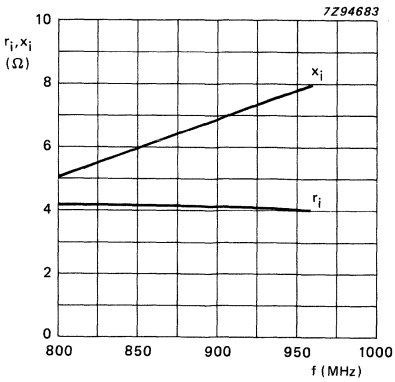


Fig. 9 Input impedance (series components).

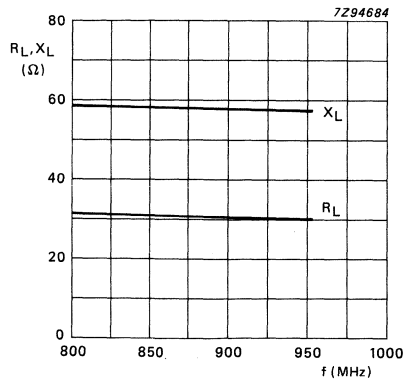


Fig. 10 Load impedance (series components).

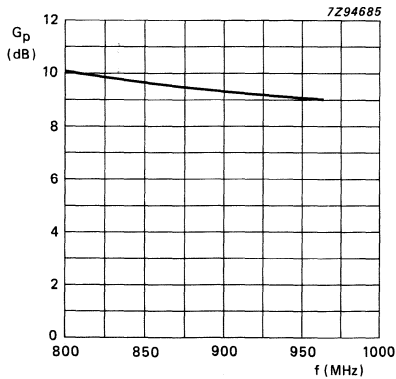


Fig. 11 Power gain versus frequency.

Conditions for Figs 9, 10 and 11:

$V_{CE} = 24$ V; $P_L = 2$ W; $f = 800 - 960$ MHz; $R_{th\ mb-h} = 0,8$ K/W; $T_h = 25$ °C; class-B operation; typical values.

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 BFQ42 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

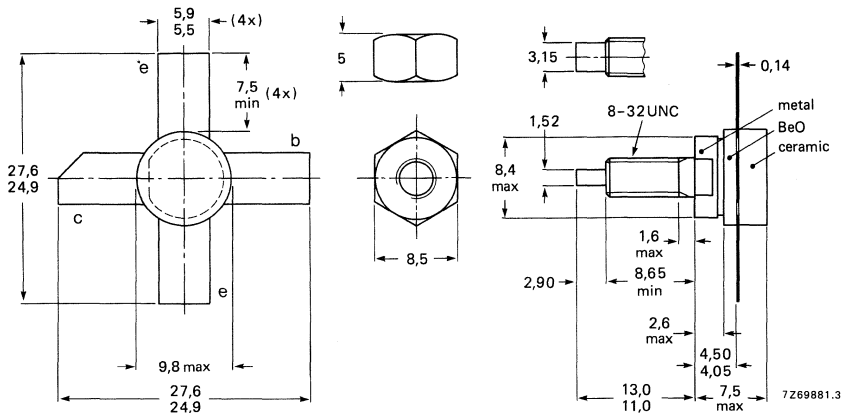
R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

PRODUCT SAFETY 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

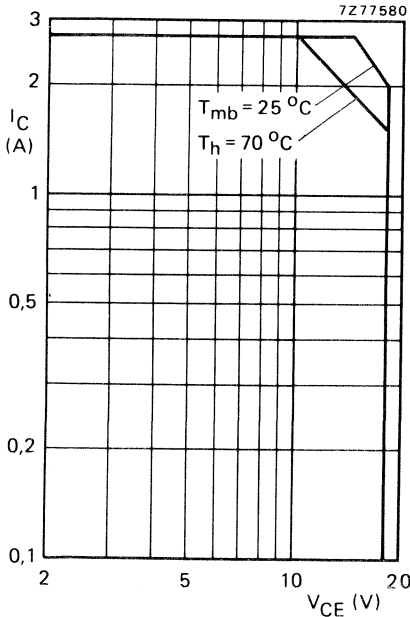


Fig. 2 D.C. SOAR.

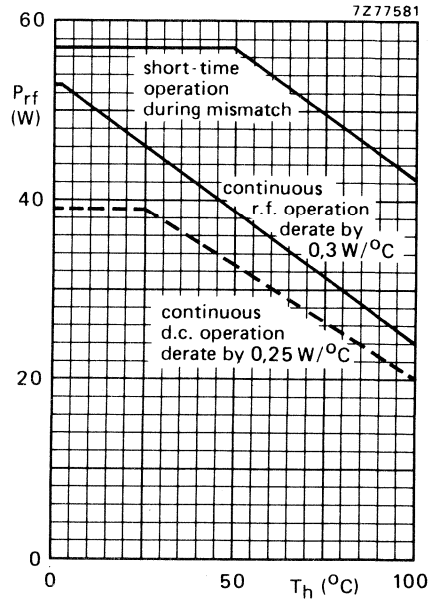


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f \geq 1$ MHz.

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 K/W

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

$R_{th j-mb(rf)}$ = 3,05 K/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,45 K/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

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

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: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

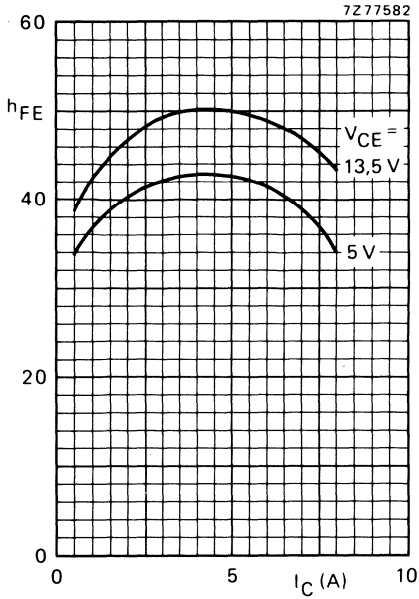


Fig. 4 Typical values; $T_j = 25^\circ\text{C}$.

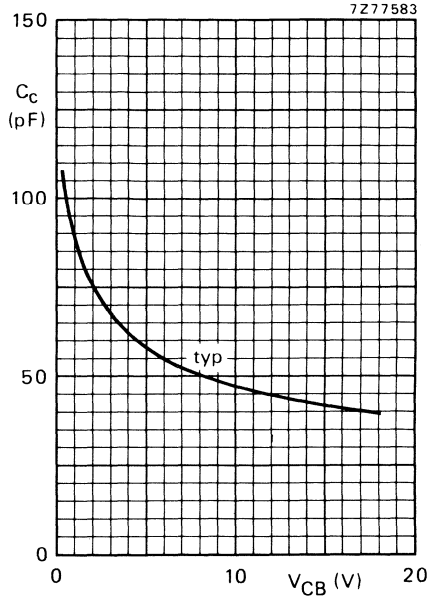


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ\text{C}$.

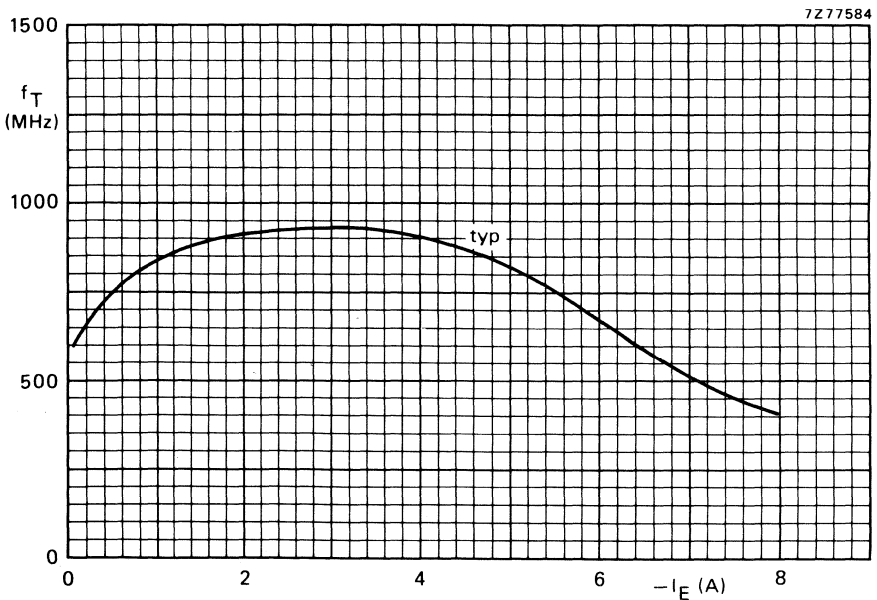


Fig. 6 $V_{CB} = 13.5$ V; $f = 100$ MHz; $T_j = 25^\circ\text{C}$.

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 (mS)
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	—	—

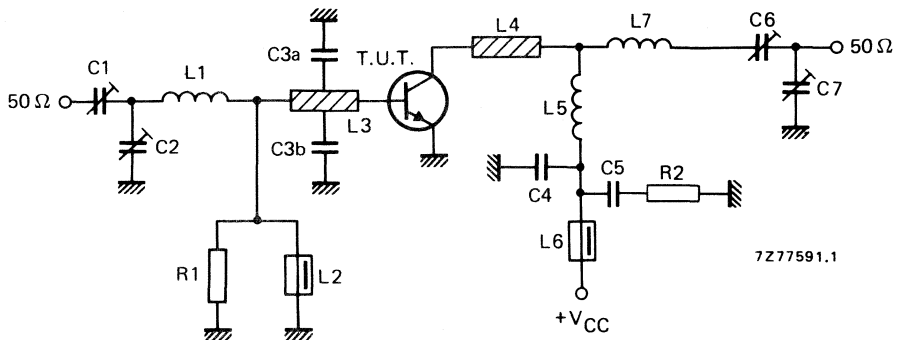


Fig. 7 Test circuit; c.w. class-B.

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)

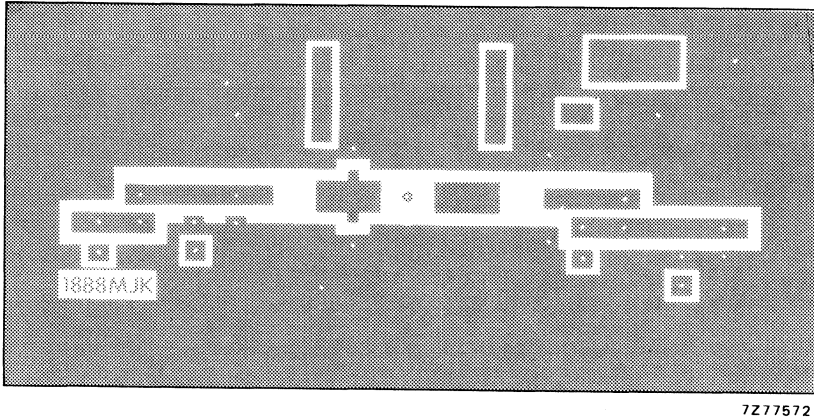
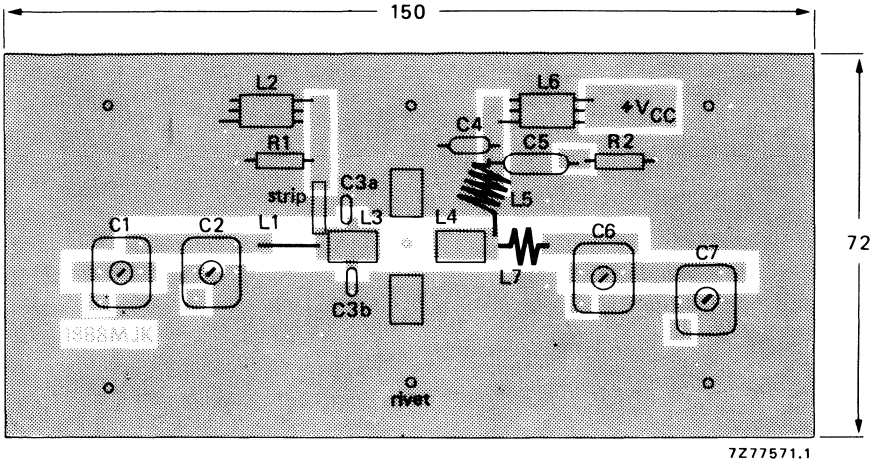


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

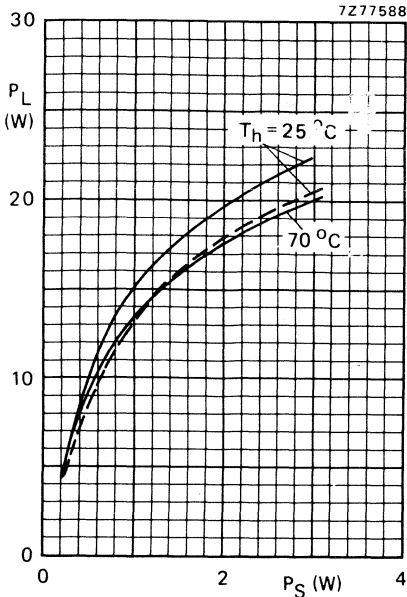


Fig. 9 Typical values; $f = 175\text{ MHz}$;
 — $V_{CE} = 13,5\text{ V}$; - - - $V_{CE} = 12,5\text{ V}$.

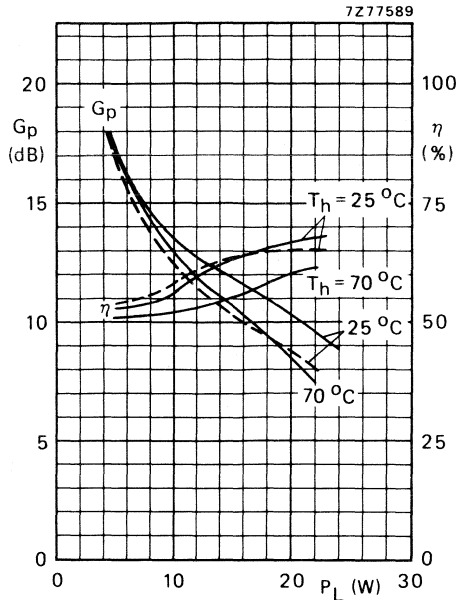


Fig. 10 Typical values; $f = 175\text{ MHz}$;
 — $V_{CE} = 13,5\text{ V}$; - - - $V_{CE} = 12,5\text{ V}$.

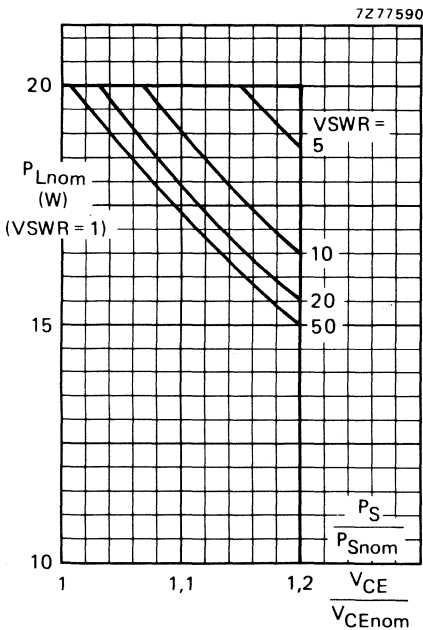


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175\text{ MHz}$; $T_h = 70^\circ\text{C}$;
 $R_{th\text{ mb-h}} = 0,45\text{ K/W}$; $V_{CEnom} = 13,5\text{ V}$ or $12,5\text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$

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

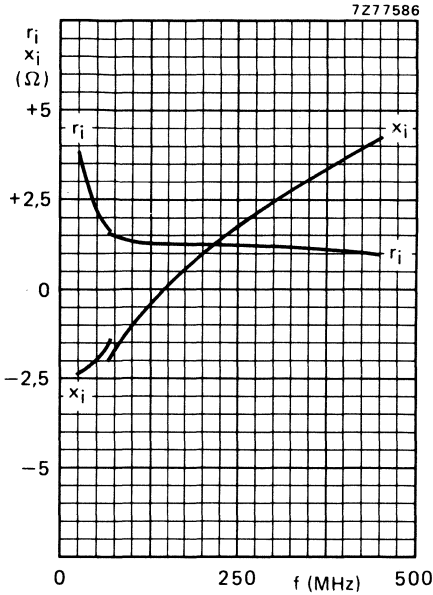


Fig. 12.

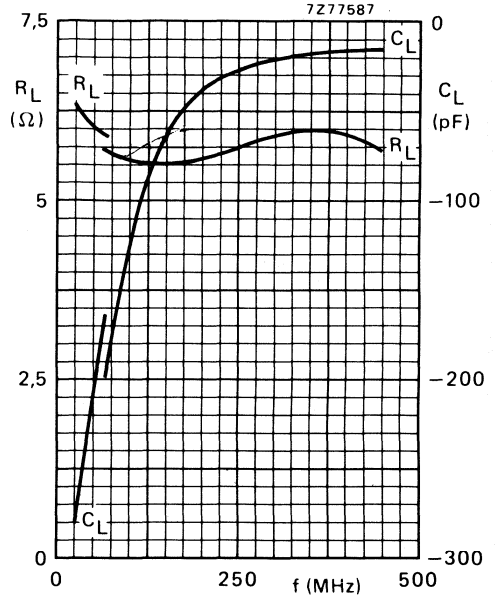
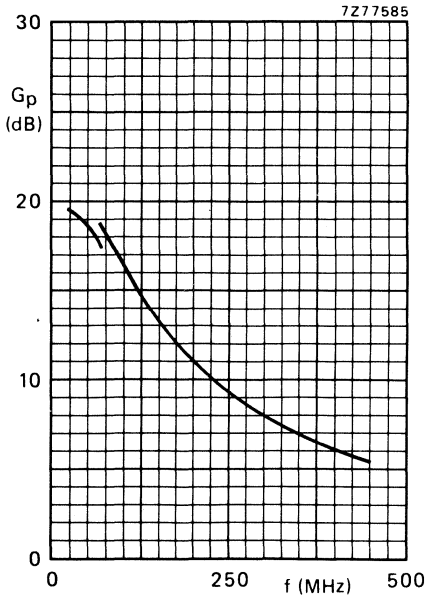


Fig. 13.



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

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 BFO43 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

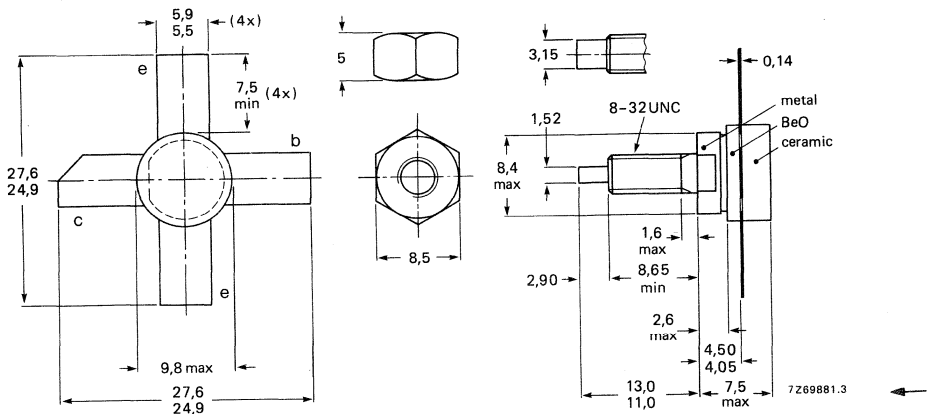
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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

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.

PRODUCT SAFETY 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

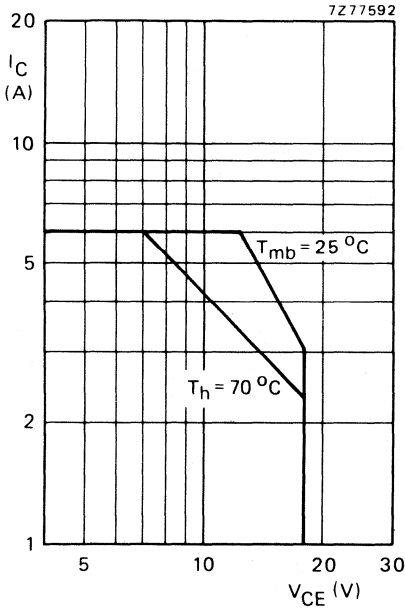


Fig. 2 D.C. SOAR.

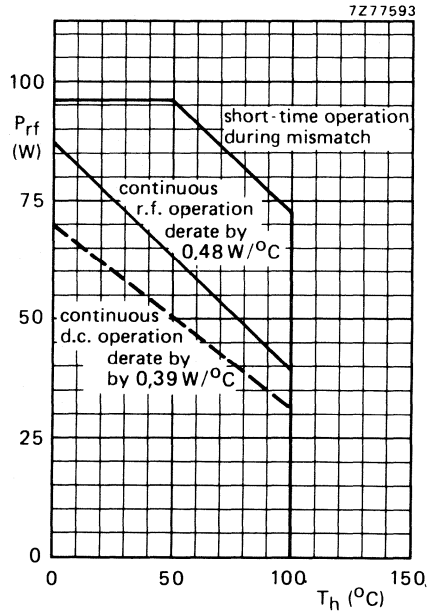


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f \geq 1$ MHz.

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 K/W

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

$R_{th\ j-mb(rf)}$ = 1,85 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,45 K/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

 $R_{BE} = 10\ \Omega$ $ESBO > 8\text{ mJ}$ $ESBR > 8\text{ mJ}$

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: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

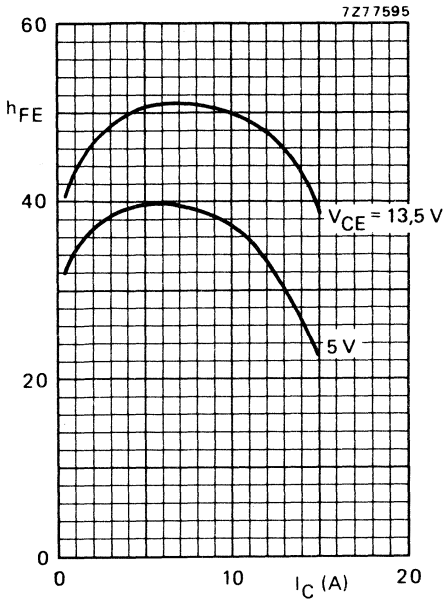


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

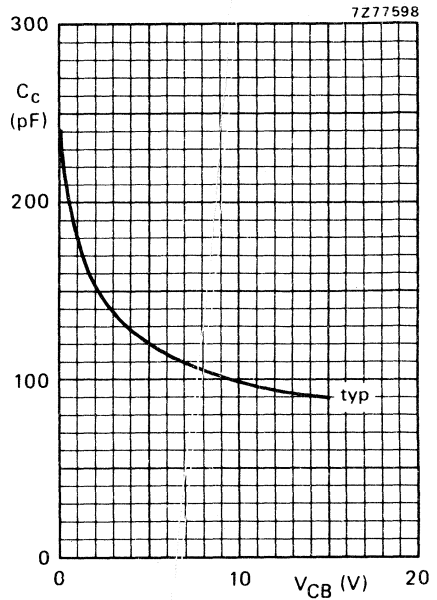


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

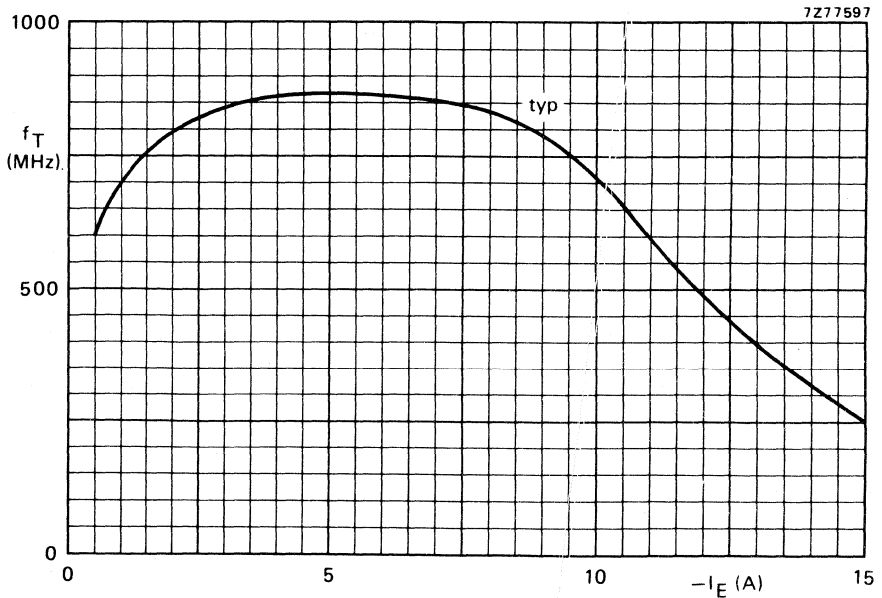


Fig. 6 $V_{CB} = 13,5\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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 (mS)
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	—	—

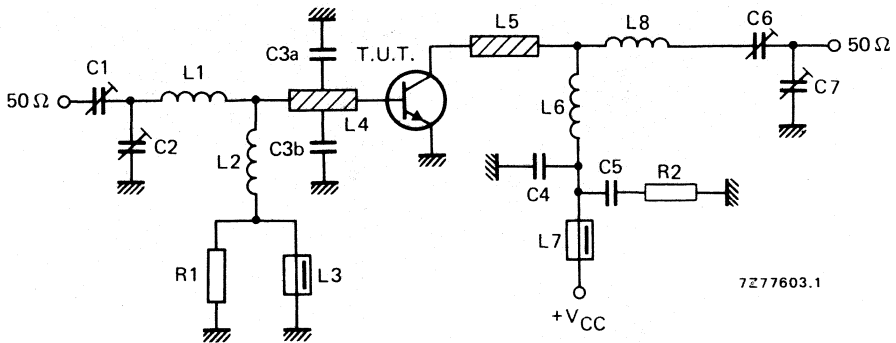


Fig. 7 Test circuit; c.w. class-B.

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 = ½ 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 = 3½ 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 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)

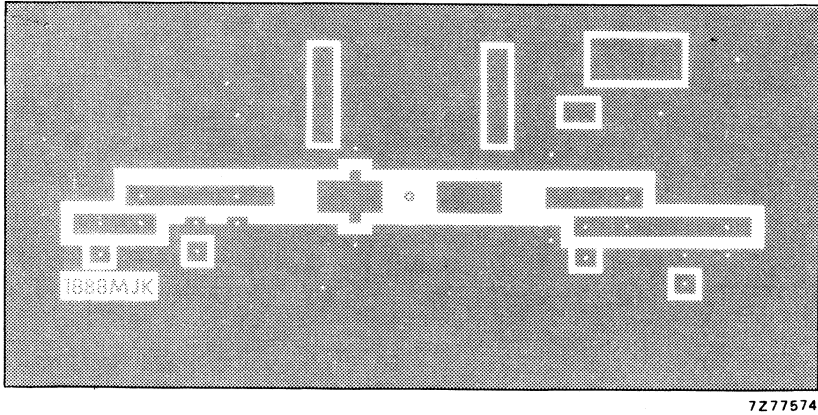
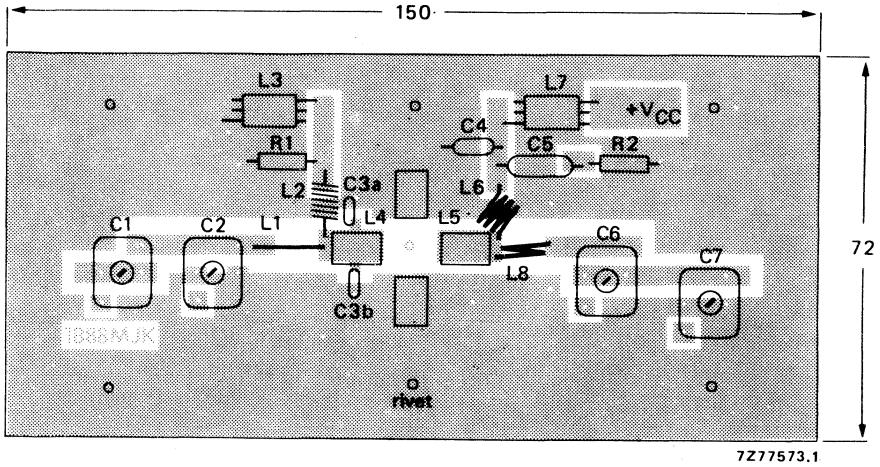


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

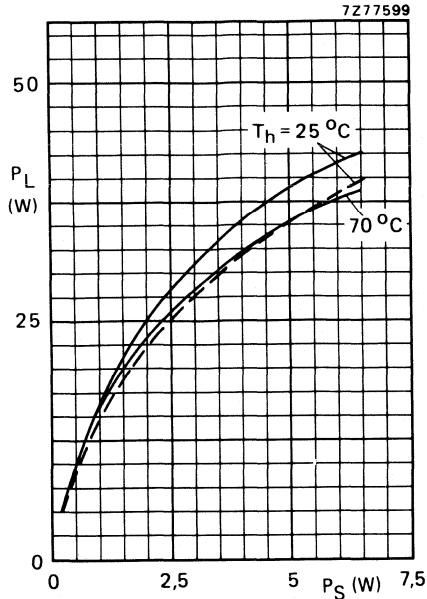


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

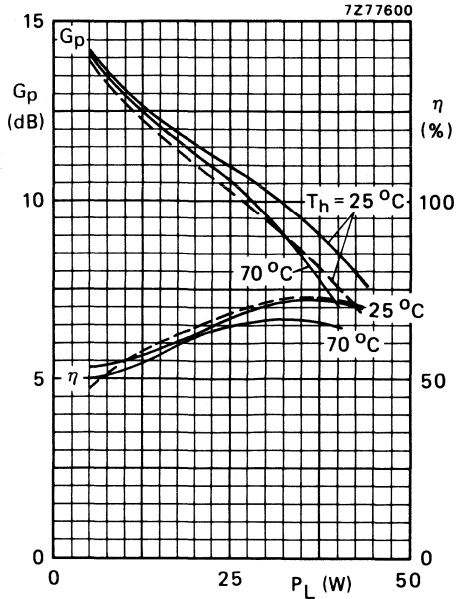


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

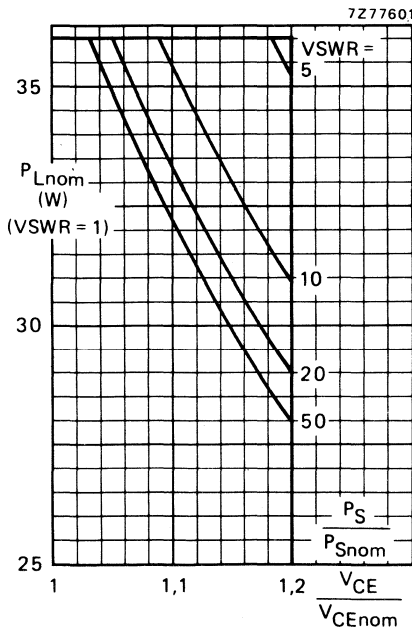


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70^\circ\text{C}$;
 $R_{th\text{ mb-h}} = 0,45 \text{ K/W}$; $V_{CE\text{ nom}} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{S\text{ nom}}$ at $V_{CE\text{ nom}}$ and $V_{SWR} = 1$

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.

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

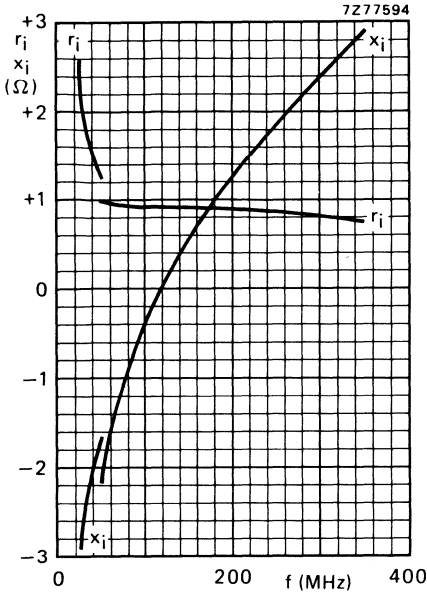


Fig. 12.

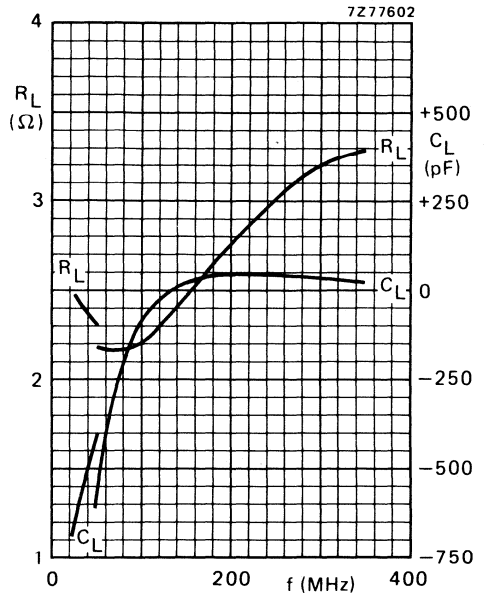
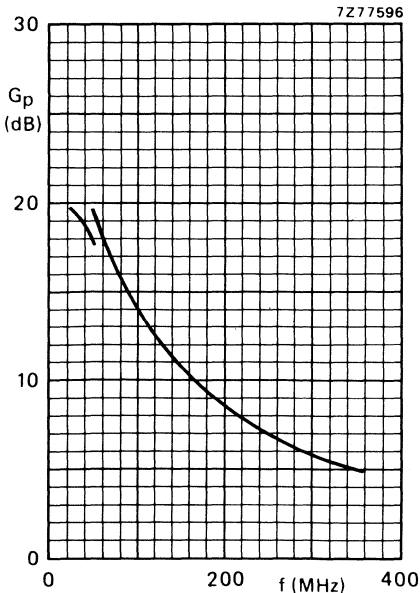


Fig. 13.



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

Fig. 14.

U.H.F. LINEAR 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

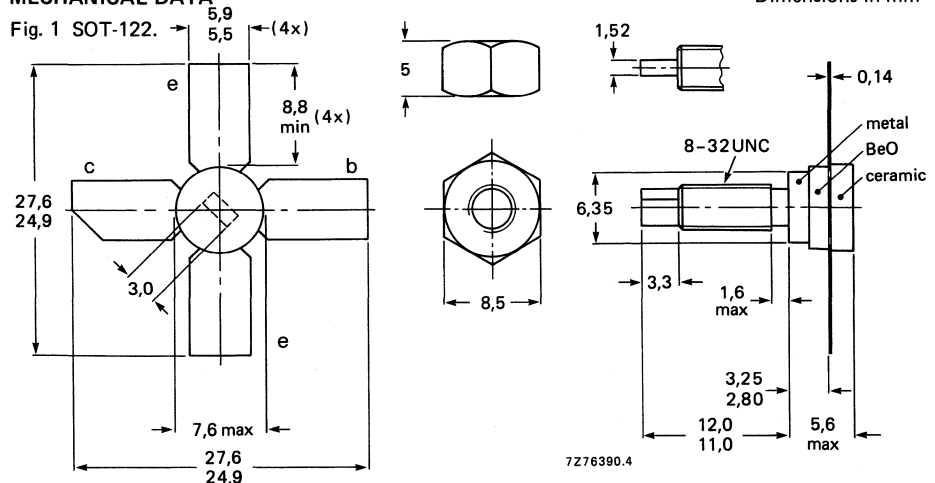
R.F. performance

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.

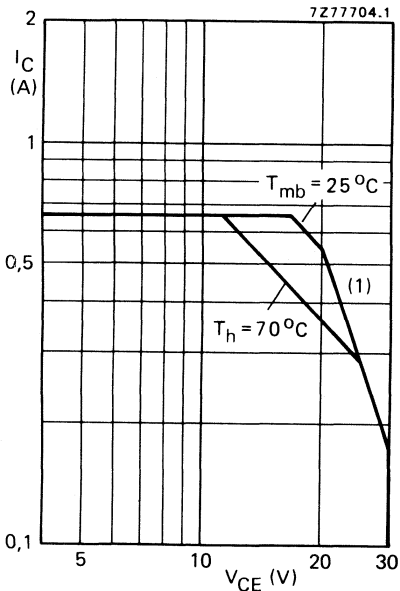
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY 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	V_{CESM}	max.	50 V
Emitter-base voltage (open collector)	V_{CEO}	max.	30 V
Collector current d.c. or average (peak value); $f > 1$ MHz	V_{EBO}	max.	4 V
Total power dissipation up to $T_{mb} = 25$ °C	I_C	max.	650 mA
Storage temperature	I_{CM}	max.	1000 mA
Operating junction temperature	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.

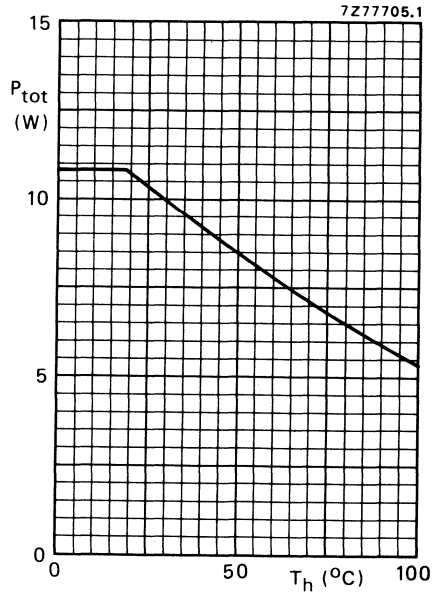


Fig. 3 Power derating curve vs. temperature.

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)

$R_{th\ j-mb} = 15,0$ K/W

From mounting base to heatsink

$R_{th\ mb-h} = 0,6$ K/W

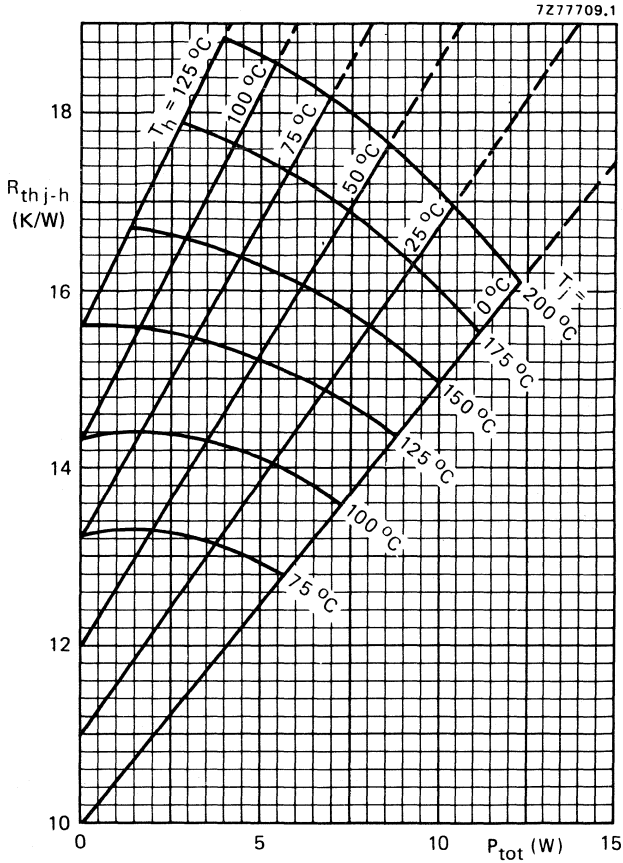


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,6\ \text{K/W}$.)

Example

Nominal class-A operation: $V_{CE} = 25\ \text{V}$; $I_C = 150\ \text{mA}$; $T_h = 70^\circ\text{C}$.

Fig. 4 shows: $R_{th\ j-h}$ max. 15,6 K/W
 T_j max. 130 $^\circ\text{C}$

Typical device: $R_{th\ j-h}$ typ. 13,5 K/W
 T_j typ. 120 $^\circ\text{C}$

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. 1,2 pF

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

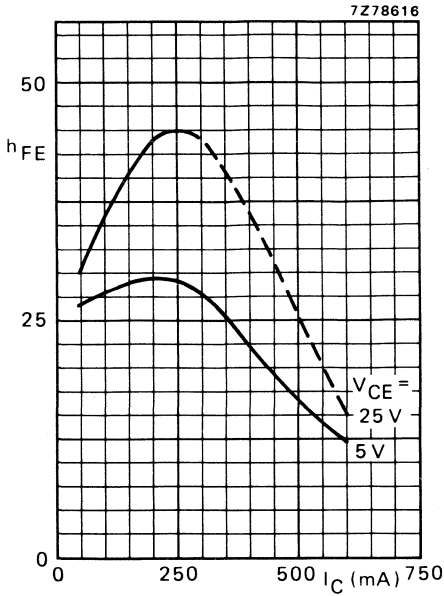


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

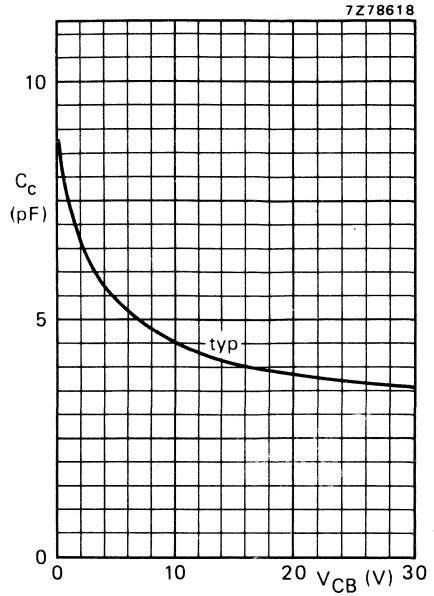


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

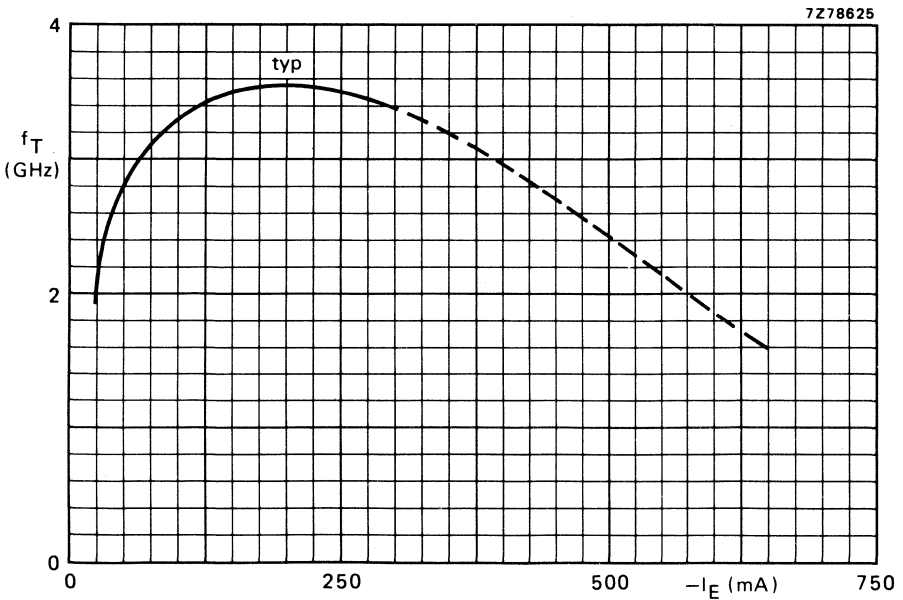


Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	T_{h} (°C)	d_{im} (dB) *	P_{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.

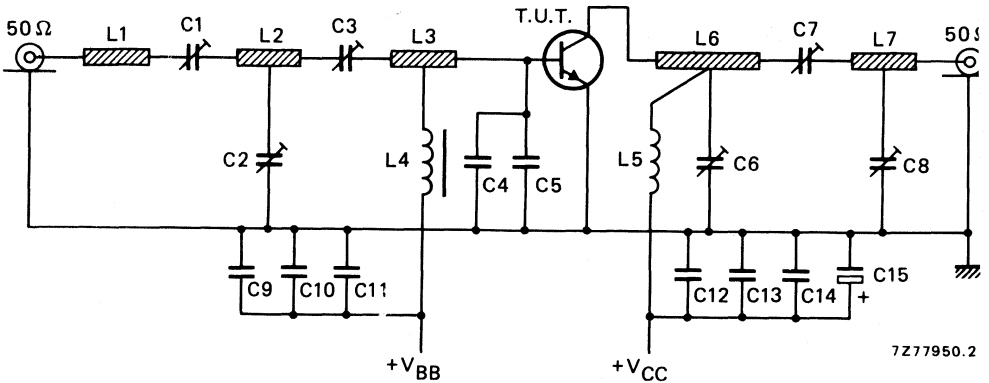
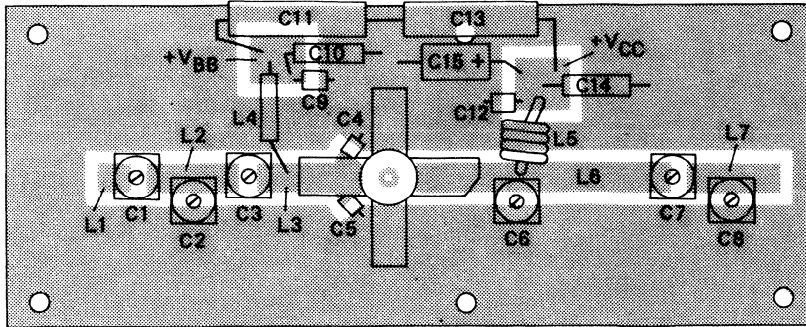


Fig. 8 Test circuit at $f_{\text{vision}} = 860$ MHz.

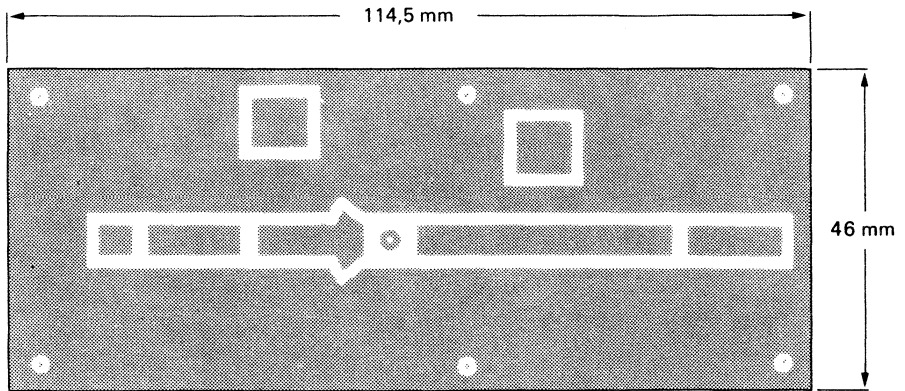
List of components:

- C1 = C7 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 05003)
- C2 = C6 = C8 = 1 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001) placed 24 mm, 17 mm and 45 mm respectively from transistor edge
- C3 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
- C4 = C5 = 3 pF multilayer chip capacitor (ATC 100A-3RO-C-PX-50)
- 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 (5,0 mm x 4,5 mm)
- L2 = stripline (13,2 mm x 4,5 mm)
- L3 = stripline (15,0 mm x 4,5 mm)
- L4 = micro choke 0,47 μH (cat. no. 4322 057 04770)
- L5 = 4 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 4 mm
- L6 = stripline (37,0 mm x 4,5 mm)
- L7 = stripline (13,5 mm x 4,5 mm)
- L1; L2; L3; L6 and L7 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".

Component layout and printed-circuit board for 860 MHz test circuit are shown in Fig. 9. For bias circuit see Fig. 10.



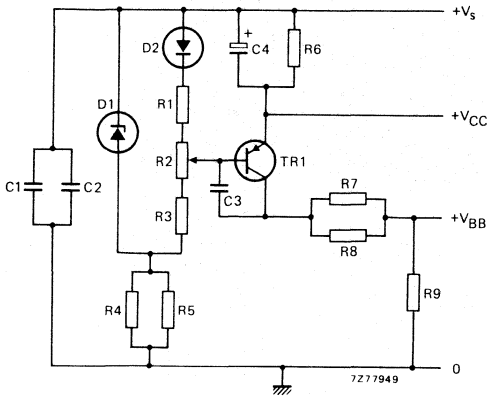
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Fig. 9 Component layout and printed-circuit board for 860 MHz test circuit.

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, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.



List of components:

- C1 = 100 pF ceramic capacitor
- 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 preset potentiometer (0,1 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 (0,25 W)
- R9 = 33 Ω carbon resistor (0,25 W)
- D1 = BZY88-C3V3
- D2 = BY206
- TR1 = BD136

Fig. 10 Bias circuit for class-A amplifier at $f_{\text{vision}} = 860 \text{ MHz}$.

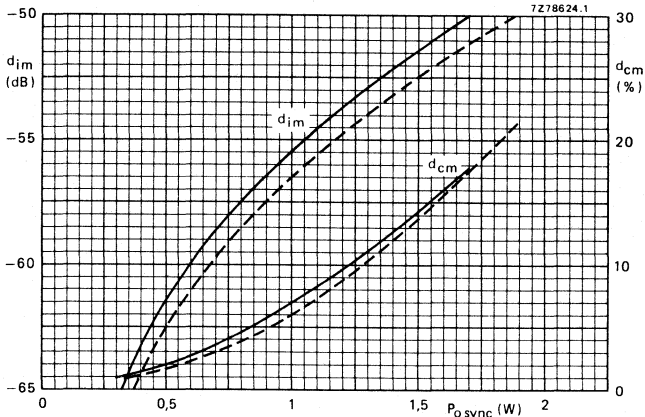


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; $V_{\text{CE}} = 25 \text{ V}$; $I_{\text{C}} = 150 \text{ mA}$; $f_{\text{vision}} = 860 \text{ MHz}$; --- $T_{\text{h}} = 25 \text{ °C}$; — $T_{\text{h}} = 70 \text{ °C}$.

Information for wideband application from 470 to 860 MHz 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 $\leq -75 \text{ dB}$.

** Two-tone test method (vision carrier 0 dB , sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB .

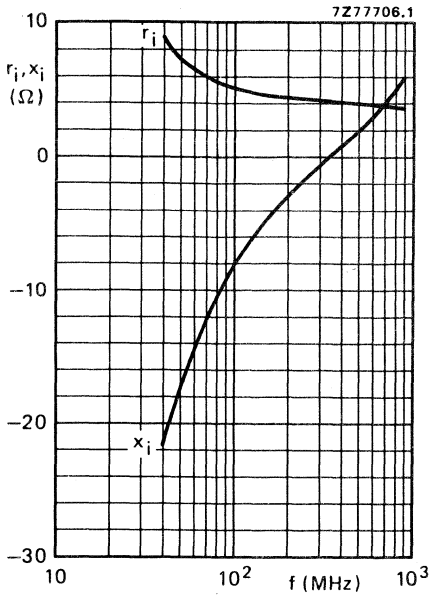


Fig. 12 Input impedance (series components).

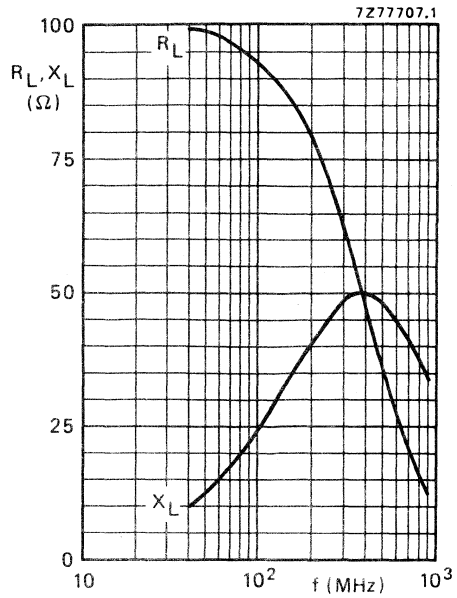


Fig. 13 Load impedance (series components).

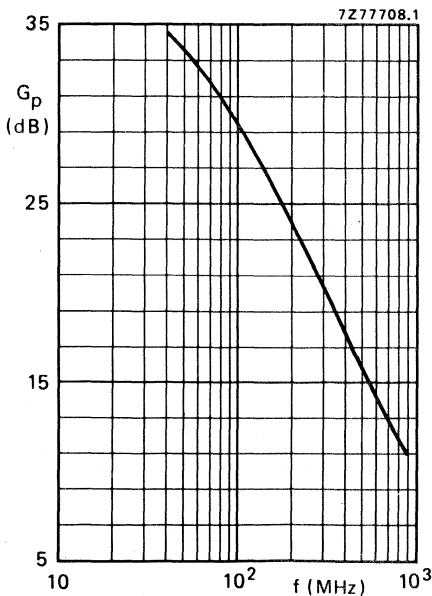


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 25 \text{ V}$; $I_C = 150 \text{ mA}$;
 $T_h = 70 \text{ }^\circ\text{C}$.

Ruggedness

The BLW32 is capable of withstanding a load mismatch (VSWR = 50 through all phases) under the following conditions:

$f = 860 \text{ MHz}$; $V_{CE} = 25 \text{ V}$; $I_C = 150 \text{ mA}$;
 $T_h = 70 \text{ }^\circ\text{C}$ and $P_L = 1 \text{ W}$.

U.H.F. LINEAR 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

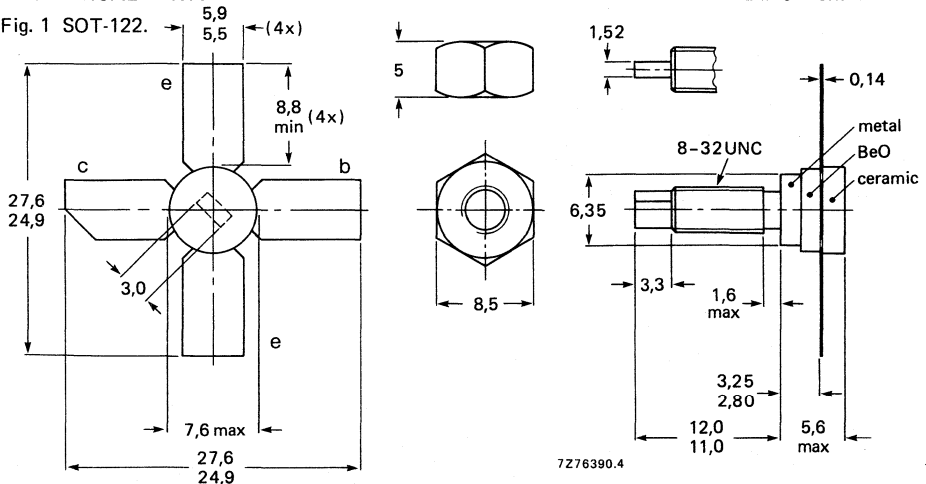
mode of operation	f_{vision} MHz	V_{CE} V	I_{C} mA	T_{h} °C	d_{im} * dB	$P_{\text{o sync}}$ * W	G_{p} dB
class-A; linear amplifier	860	25	300	70	-60	> 1,0	> 10,0
	860	25	300	25	-60	typ. 1,15	typ. 10,5

* 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

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.

PRODUCT SAFETY 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

V_{CESM} max. 50 V

V_{CEO} max. 30 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

I_C max. 1,25 A

(peak value); $f > 1$ MHz

I_{CM} max. 1,9 A

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

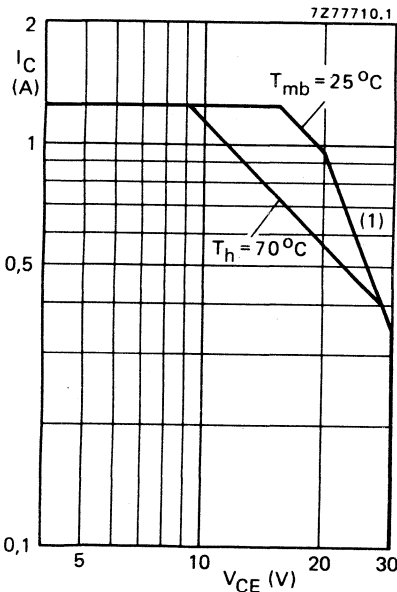
P_{tot} max. 19,3 W

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.

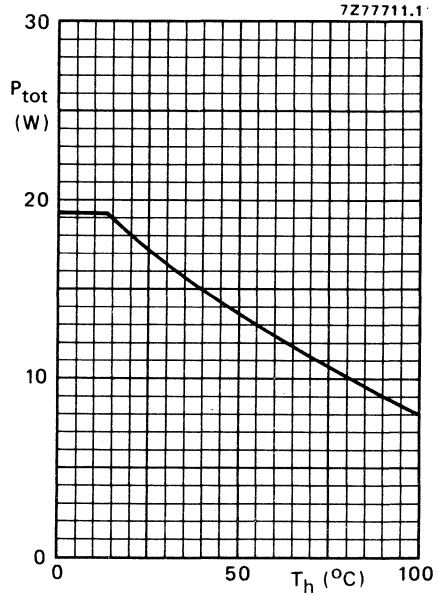


Fig. 3 Power derating curve vs. temperature.

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)

$R_{th\ j-mb} = 10,1$ K/W

From mounting base to heatsink

$R_{th\ mb-h} = 0,6$ K/W

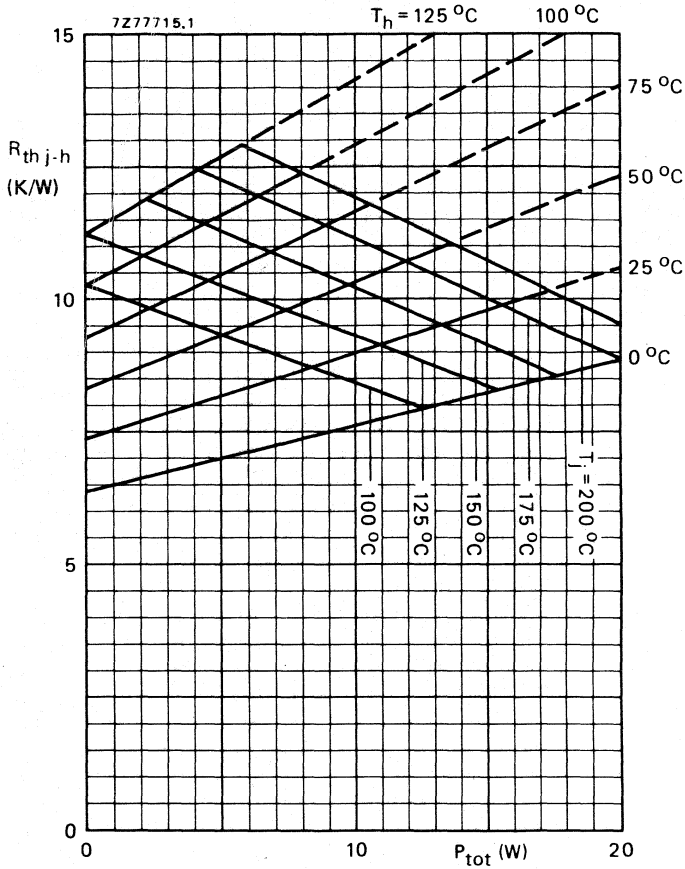


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{thmb-h} = 0,6 \text{ K/W}$.)

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_{thj-h} max. 10,7 K/W
 T_j max. 150 $^\circ\text{C}$

Typical device: R_{thj-h} typ. 8,25 K/W
 T_j typ. 132 $^\circ\text{C}$

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. 1,2 pF

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

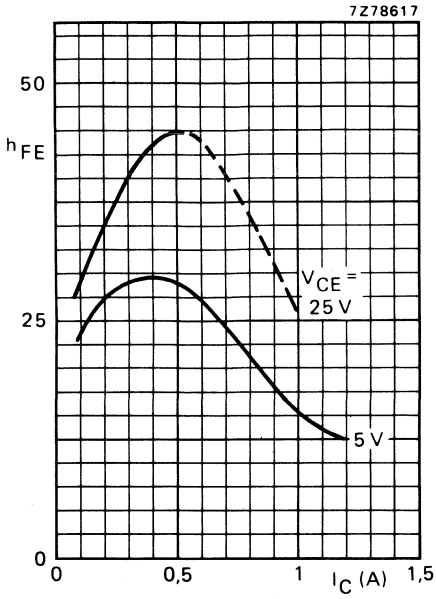


Fig. 5 Typical values; $T_j = 25^\circ C$.

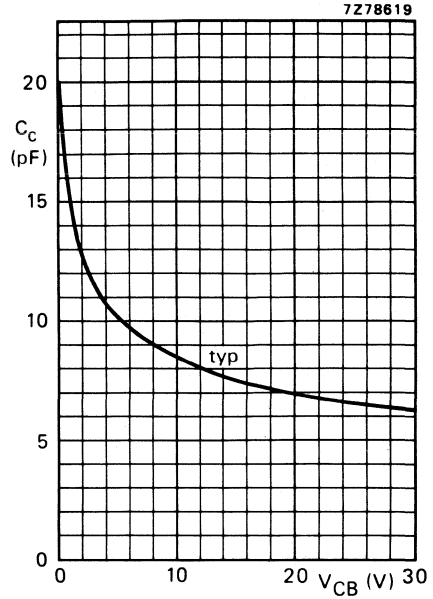


Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

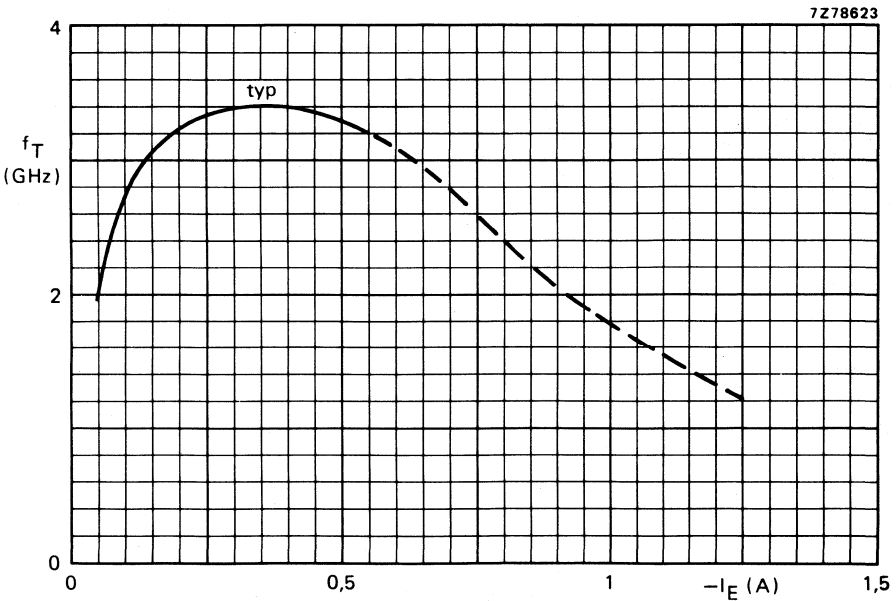


Fig. 7 $V_{CB} = 25 V$; $f = 500$ MHz; $T_j = 25^\circ C$.

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	T_{h} ($^{\circ}\text{C}$)	d_{im} (dB) *	$P_{\text{O sync}}$ (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.

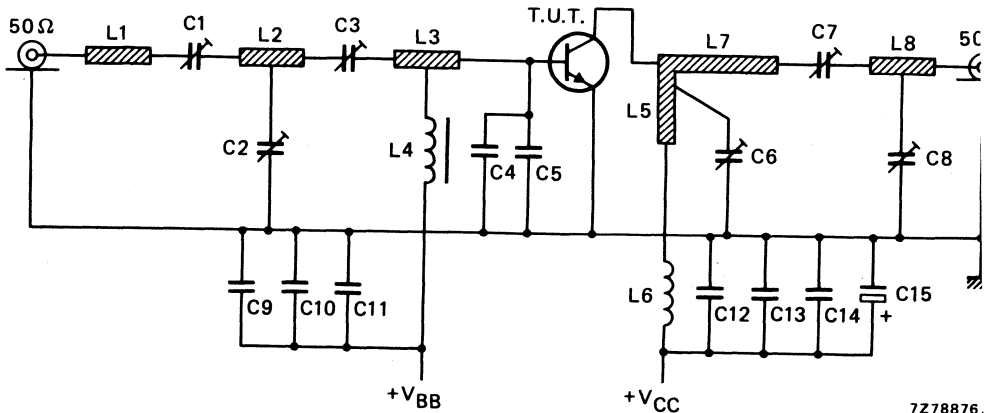


Fig. 8 Test circuit at $f_{\text{vision}} = 860$ MHz.

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List of components:

- C1 = C3 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 05003)
- C2 = C6 = C8 = 1 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001) placed 24 mm, 8 mm and 46 mm respectively from transistor edge
- C4 = C5 = 4,3 pF multilayer chip capacitor (ATC 100A-4R3-C-PX-50)
- C7 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
- 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 $\mu\text{F}/40$ F solid aluminium electrolytic capacitor

L1 = stripline (5,2 mm x 4,5 mm)

L2 = stripline (13,2 mm x 4,5 mm)

L3 = stripline (15,0 mm x 4,5 mm)

L4 = micro choke 0,47 μH (cat. no. 4322 057 04770)

L5 = stripline (see Fig. 9 printed-circuit board layout)

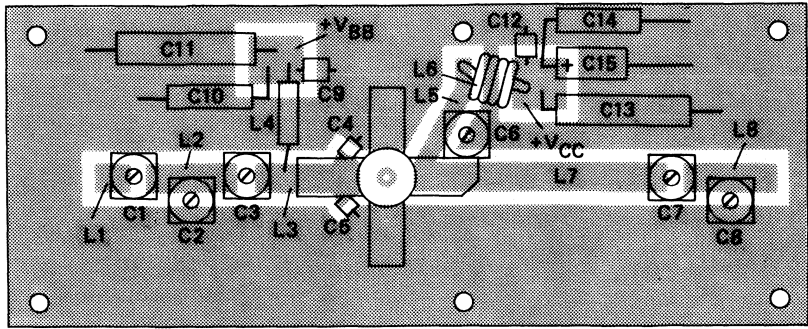
L6 = 4 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 4 mm

L7 = stripline (37,0 mm x 4,5 mm)

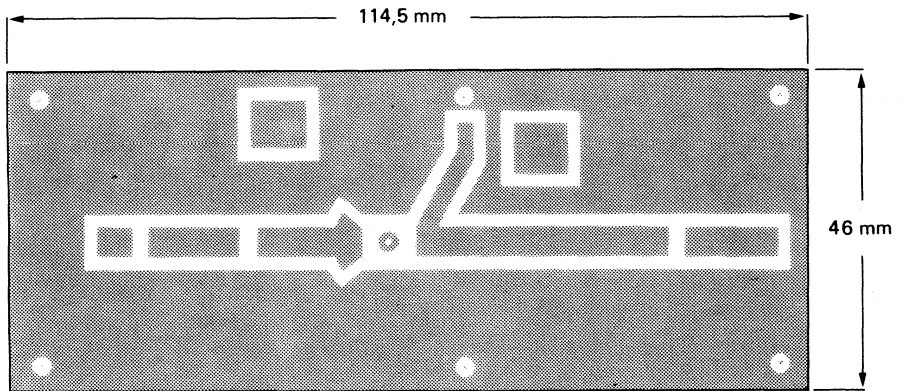
L8 = stripline (13,5 mm x 4,5 mm)

L1; L2; L3; L5; L7 and L8 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".

For bias circuit see Fig. 10.



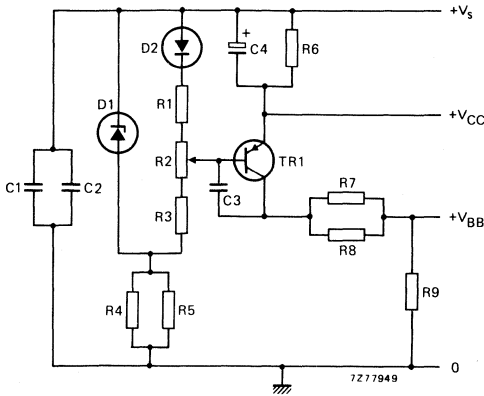
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7Z78879

Fig. 9 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, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.



List of components:

- C1 = 100 pF ceramic capacitor
- 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 preset potentiometer (0,1 W)
- R3 = 82 Ω carbon resistor (0,25 W)
- R4 = R5 = 2,2 kΩ carbon resistor (0,25 W)
- R6 = 6 Ω; parallel connection of 2 x 12 Ω carbon resistors (0,5 W each)
- R7 = R8 = 820 Ω carbon resistor (0,25 W)
- R9 = 33 Ω carbon resistor (0,25 W)

- D1 = BZY88-C3V3
- D2 = BY206
- TR1 = BD136

Fig. 10 Bias circuit for class-A linear amplifier at $f_{\text{vision}} = 860 \text{ MHz}$.

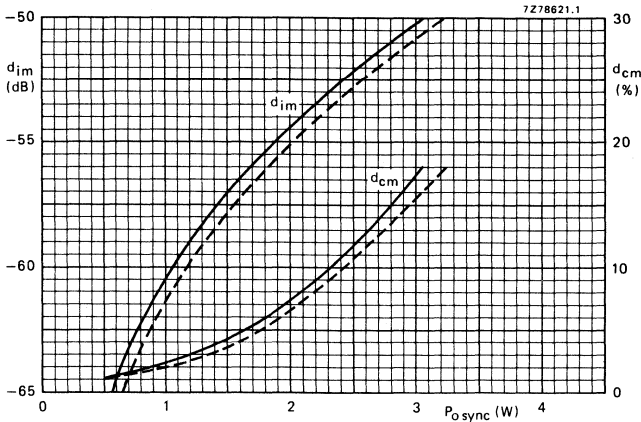


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; $V_{CE} = 25 \text{ V}$; $I_C = 300 \text{ mA}$; $f_{\text{vision}} = 860 \text{ MHz}$; --- $T_h = 25 \text{ °C}$; — $T_h = 70 \text{ °C}$.

Information for wideband application from 470 to 860 MHz 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 $\leq -75 \text{ dB}$.

** Two-tone test method (vision carrier 0 dB , sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB .

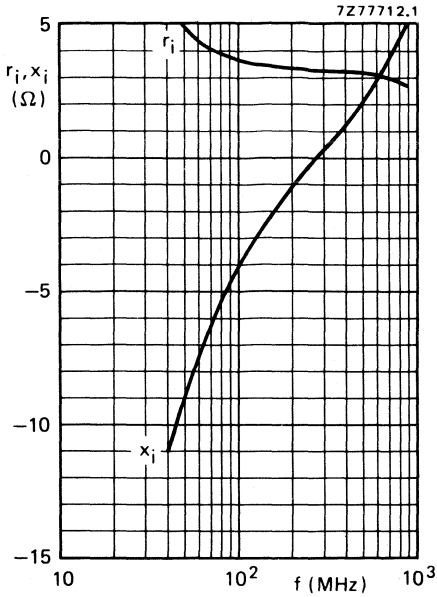


Fig. 12 Input impedance (series components).

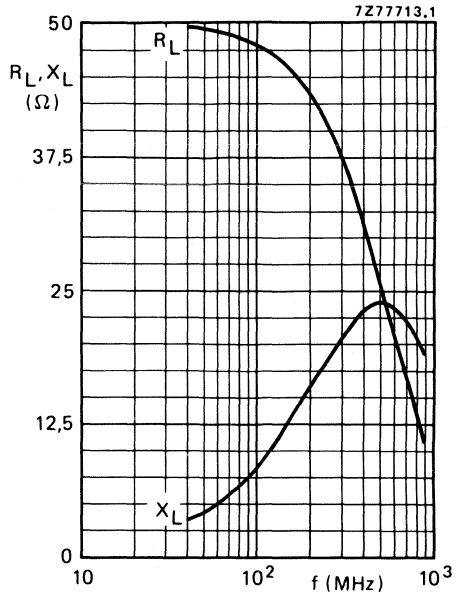


Fig. 13 Load impedance (series components).

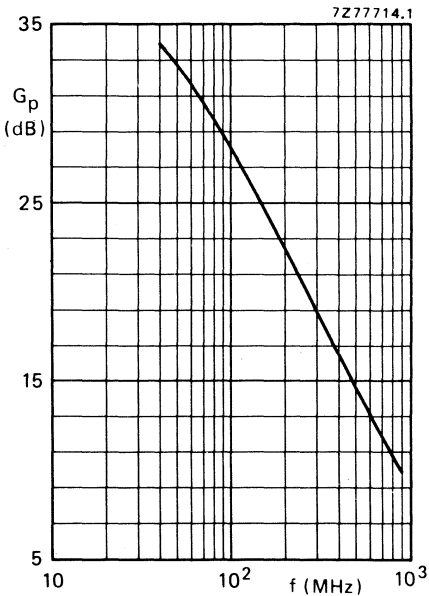


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 25$ V; $I_C = 300$ mA;
 $T_h = 70$ °C.

Ruggedness

The BLW33 is capable of withstanding a load mismatch (VSWR = 50 through all phases) under the following conditions:

$f = 860$ MHz; $V_{CE} = 25$ V; $I_C = 300$ mA;
 $T_h = 70$ °C and $P_L = 2$ W.

U.H.F. LINEAR 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

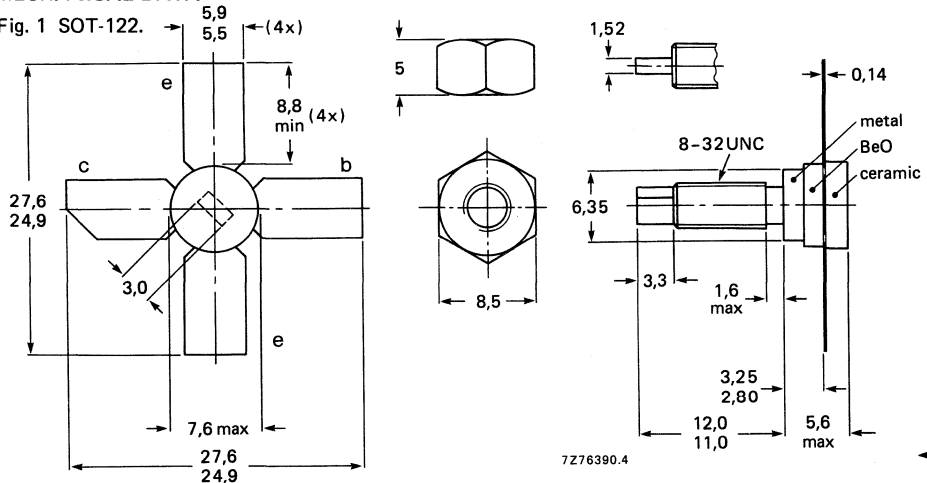
R.F. performance

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	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.

PRODUCT SAFETY 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

V_{CESM} max. 50 V

V_{CEO} max. 30 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

I_C max. 2,25 A

(peak value); $f > 1$ MHz

I_{CM} max. 3,5 A

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

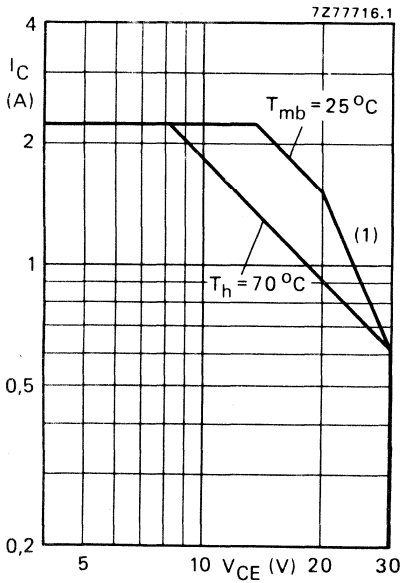
P_{tot} max. 31 W

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.

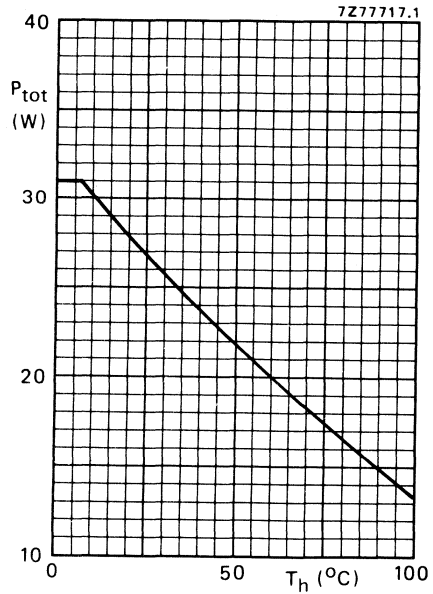


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base

(dissipation = 15 W; $T_{mb} = 79$ °C; i.e. $T_h = 70$ °C)

$R_{th\ j-mb}$ = 6,2 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,6 K/W

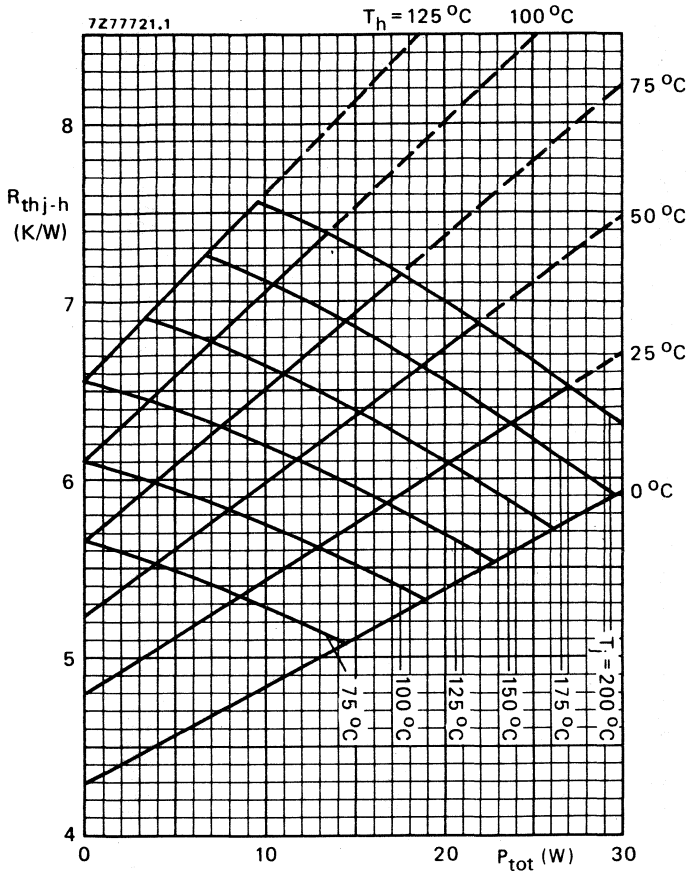


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{thmb-h} = 0,6$ K/W.)

Example

Nominal class-A operation: $V_{CE} = 25$ V; $I_C = 600$ mA; $T_h = 70^\circ\text{C}$.

Fig. 4 shows: R_{thj-h} max. 6,75 K/W
 T_j max. 170 $^\circ\text{C}$

Typical device: R_{thj-h} typ. 5,45 K/W
 T_j typ. 152 $^\circ\text{C}$

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. 1,2 pF

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

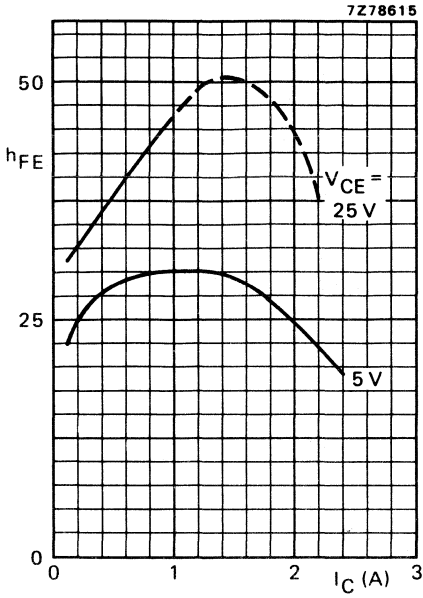


Fig. 5 Typical values; $T_j = 25^\circ\text{C}$.

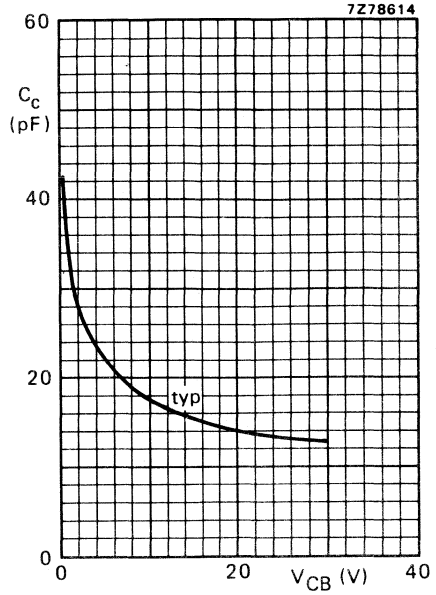


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

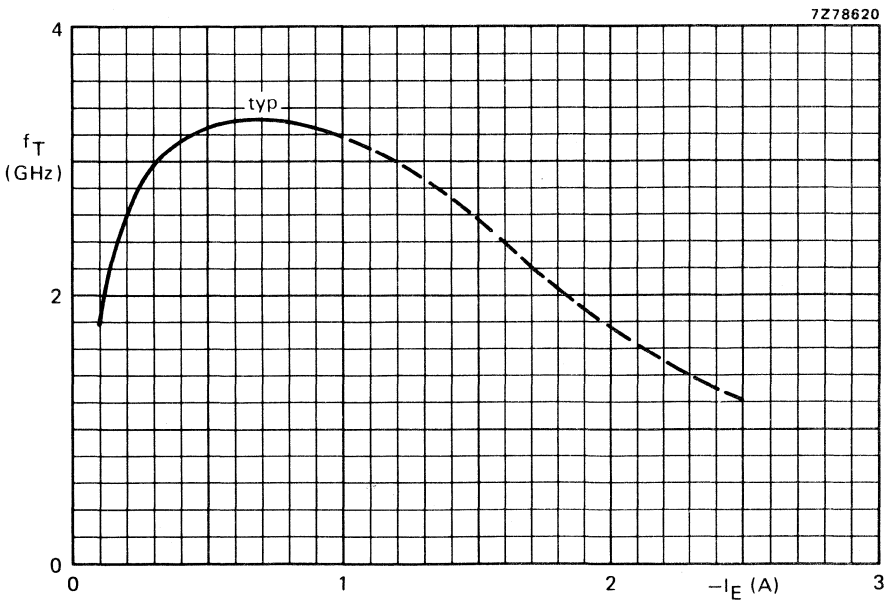


Fig. 7 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25^\circ\text{C}$

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	T_{h} ($^{\circ}\text{C}$)	d_{im} (dB) *	P_{Osync} (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.

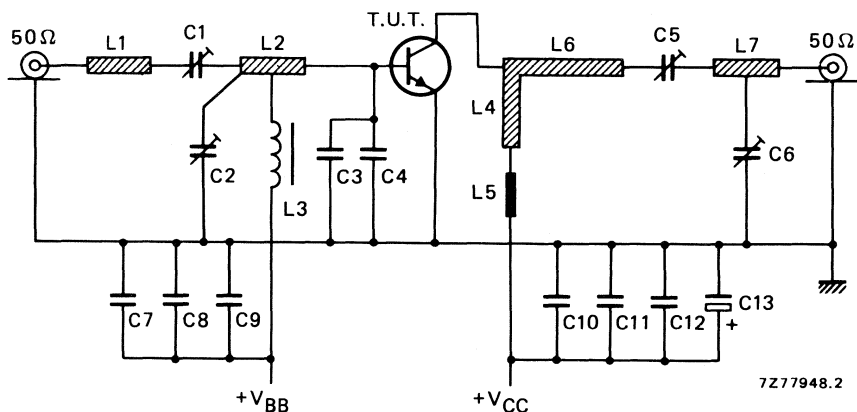


Fig. 8 Test circuit at $f_{\text{vision}} = 860$ MHz.

List of components:

C1 = C5 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)

C2 = C6 = 1 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001) placed 13,5 mm and 46 mm respectively from transistor edge

C3 = C4 = 2 pF multilayer chip capacitor (ATC 100A-2RO-C-PX-50)

C7 = C10 = 1 nF chip capacitor

C8 = 100 nF polyester capacitor

C9 = C12 = 470 nF polyester capacitor

C11 = 10 nF polyester capacitor

C13 = 3,3 $\mu\text{F}/40$ V solid aluminium electrolytic capacitor

L1 = stripline (9,2 mm x 7,0 mm)

L2 = stripline (14,2 mm x 7,0 mm)

L3 = micro choke 0,47 μH (cat. no. 4322 057 04770)

L4 = stripline (see Fig. 9 printed-circuit board layout)

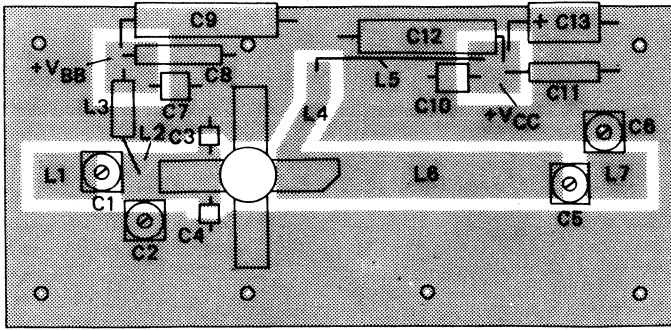
L5 = 34 mm straight Cu wire (1,0 mm); height above print 3,3 mm

L6 = stripline (41,0 mm x 7,0 mm)

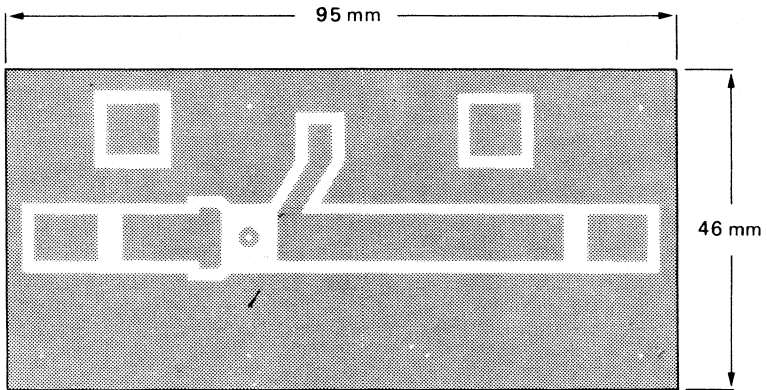
L7 = stripline (8,7 mm x 7,0 mm)

L1; L2; L4; L6 and L7 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".

Component layout and printed-circuit board for 860 MHz test circuit are shown in Fig. 9. For bias circuit see Fig. 10.



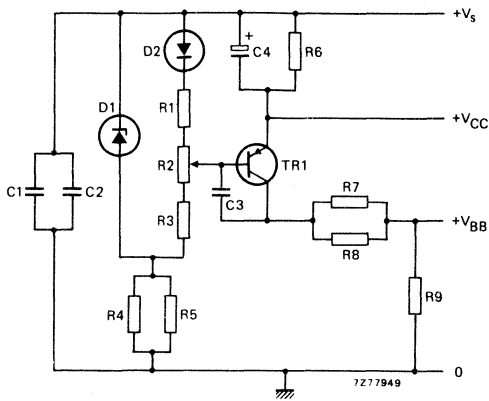
7278882



7278877

Fig. 9 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, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.



List of components:

- C1 = 100 pF ceramic capacitor
- 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 preset potentiometer (0,1 W)
- R3 = 82 Ω carbon resistor (0,25 W)
- R4 = R5 = 2,2 k Ω carbon resistor (0,25 W)
- R6 = 2,8 Ω ; parallel connection of 2 x 5,6 Ω carbon resistors (0,5 W each)
- R7 = R8 = 820 Ω carbon resistor (0,25 W)
- R9 = 33 Ω carbon resistor (0,25 W)
- D1 = BZY88-C3V3
- D2 = BY206
- TR1 = BD136

Fig. 10 Bias circuit for class-A linear amplifier at $f_{\text{vision}} = 860$ MHz.

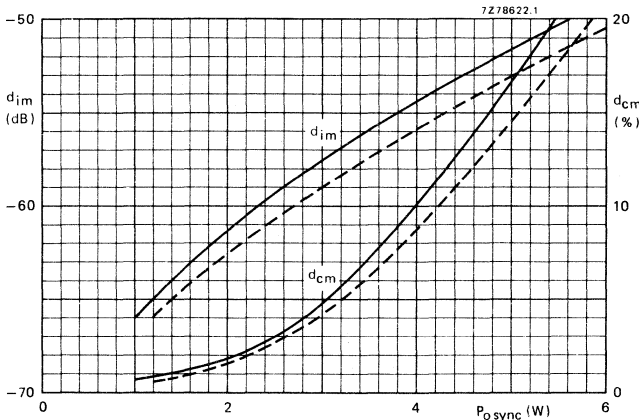


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; $V_{CE} = 25$ V; $I_C = 600$ mA; $f_{\text{vision}} = 860$ MHz; ---- $T_h = 25^\circ\text{C}$; — $T_h = 70^\circ\text{C}$.

Information for wideband application from 470 to 860 MHz 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 ≤ -75 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier -7 dB), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB.

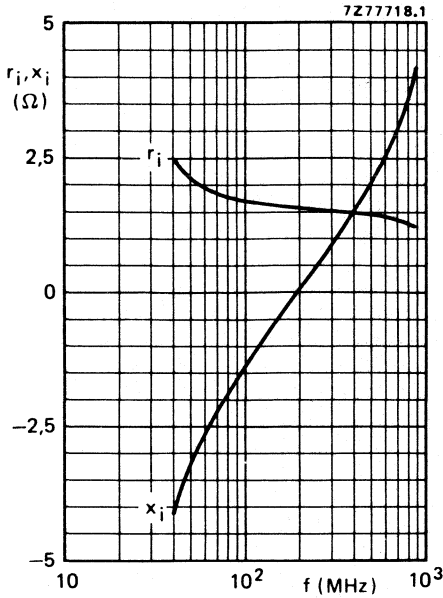


Fig. 12 Input impedance (series components).

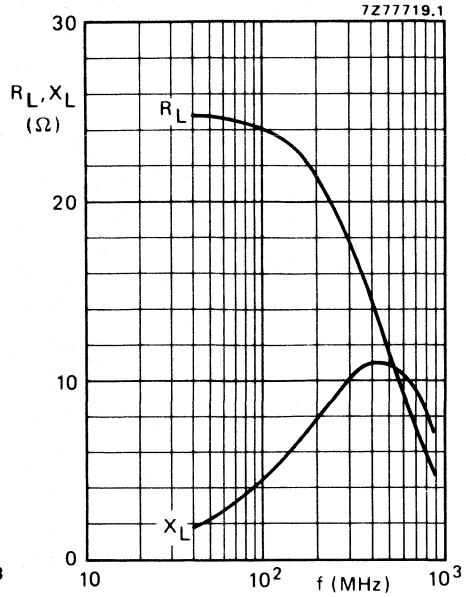


Fig. 13 Load impedance (series components).

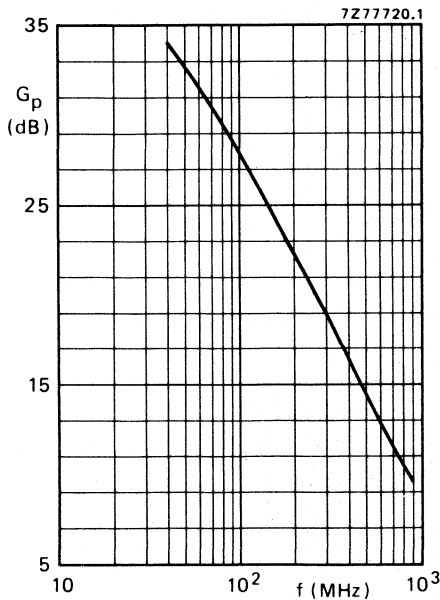


Fig. 14.

Conditions for Figs 12, 13 and 14:

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 through all phases) under the following conditions:

$f = 860$ MHz; $V_{CE} = 25$ V; $I_C = 600$ mA;
 $T_h = 70$ °C and $P_L = 4$ W.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in class-A, AB and B operated, industrial and military transmitters in the h.f. and v.h.f. band. Resistance stabilization provides protection against device damage at 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

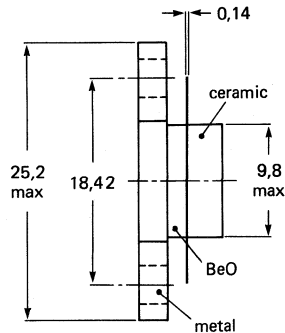
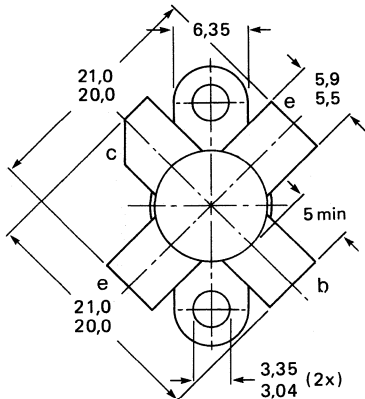
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_{dt} %	I_C A	$I_C(ZS)$ mA	d_3 dB	T_h °C
s.s.b. (class-A)	45	1,6 - 28	0 - 16 (P.E.P.)	> 19,5	—	1,2	—	< -40	70
s.s.b. (class-AB)	50	1,6 - 28	10 - 65 (P.E.P.)	typ. 18	typ. 45*	1,45	50	typ. -30	25

* At 65W P.E.P.

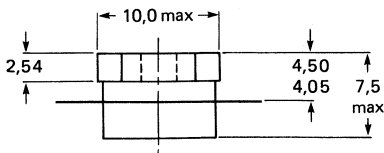
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



7277386.2



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

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

Heatsink compound must be applied sparingly
and evenly distributed.

PRODUCT SAFETY 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. 110 V

Collector-emitter voltage (open base)

V_{CEO} max. 55 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_C(AV)$ max. 2,5 A

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

I_{CM} max. 7,5 A

D.C. and r.f. ($f > 1$ MHz) power dissipation; $T_{mb} = 25$ °C

$P_{tot}; P_{rf}$ max. 94 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

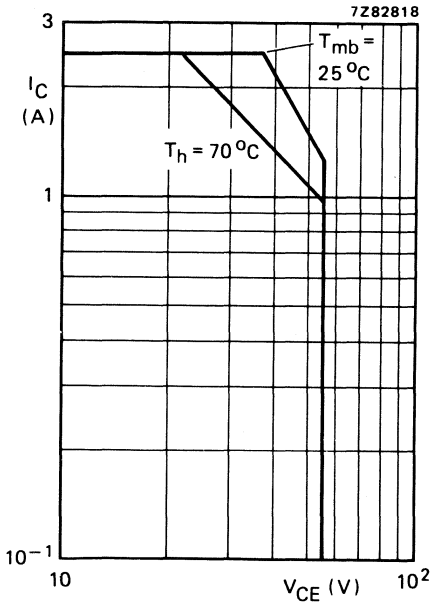


Fig. 2 D.C. SOAR.

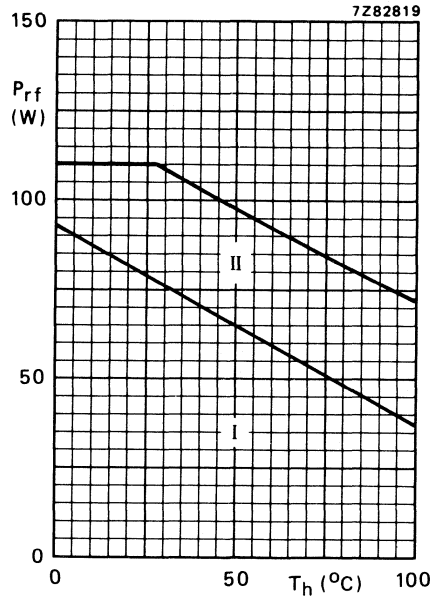


Fig. 3 Power derating curves vs. temperature.

I Continuous d.c. and r.f. operation

II Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 54 W; $T_{mb} = 86$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base
(d.c. and r.f. dissipation)

$R_{th j-mb} = 2,1$ K/W

From mounting base to heatsink

$R_{th mb-h} = 0,3$ K/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; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 55\text{ V}$

Emitter-base breakdown voltage

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

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 55\text{ V}$ $I_{CES} < 10\text{ mA}$ 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*

 $I_C = 1,2\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 25
15 to 100

D.C. current gain ratio of matched devices*

 $I_C = 1,2\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage*

 $I_C = 3,0\text{ A}; I_B = 0,6\text{ A}$ V_{CEsat} typ. 1,2 VTransition frequency at $f = 100\text{ MHz}$ * $-I_E = 1,2\text{ A}; V_{CB} = 45\text{ V}$ $-I_E = 4,0\text{ A}; V_{CB} = 45\text{ V}$ f_T typ. 490 MHz f_T typ. 540 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 45\text{ V}$ C_C typ. 53 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 45\text{ V}$ C_{re} typ. 35 pF

Collector-flange capacitance

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

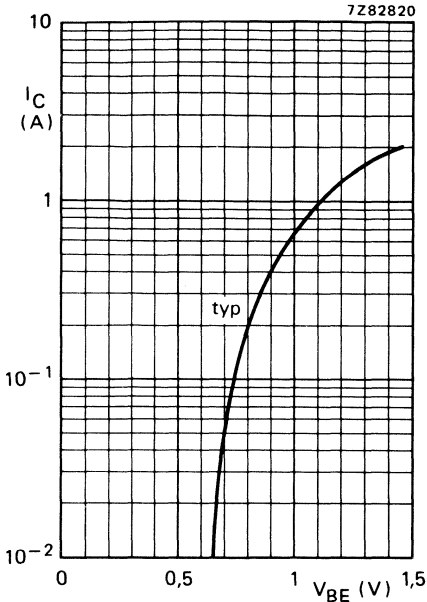


Fig. 4 $V_{CE} = 40\text{ V}$; $T_{mb} = 25\text{ }^\circ\text{C}$.

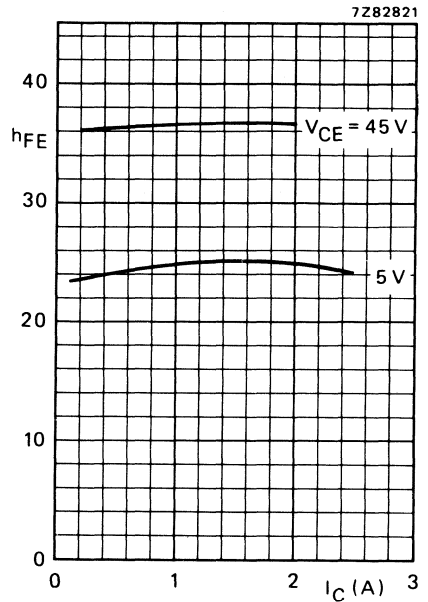


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

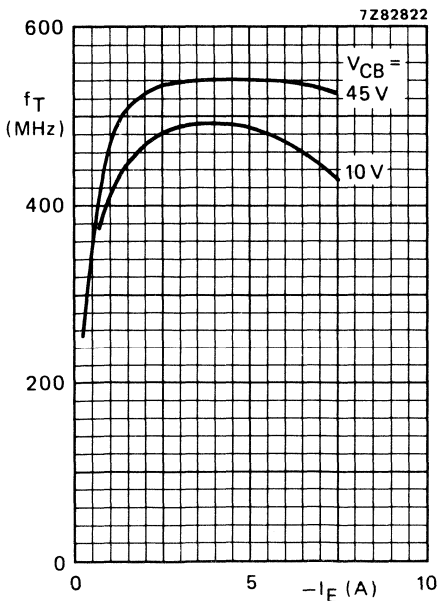


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

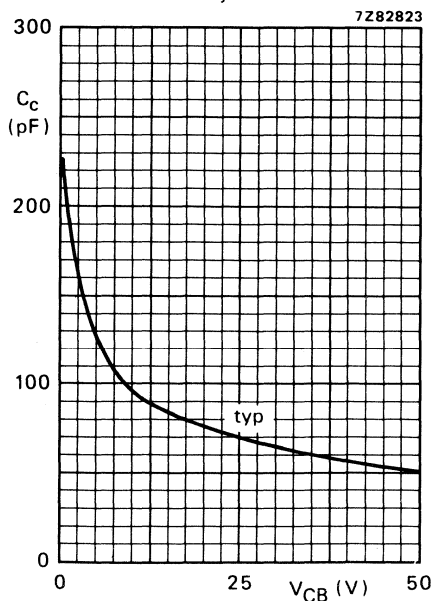


Fig. 7 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

 $V_{CE} = 45 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	I_C A	d_{3^*} dB	d_{5^*} dB	T_h $^{\circ}\text{C}$
> 16 (P.E.P.)	> 19,5	1,2	-40	< -40	70
typ. 17 (P.E.P.)	typ. 20,5	1,2	-40	< -40	70

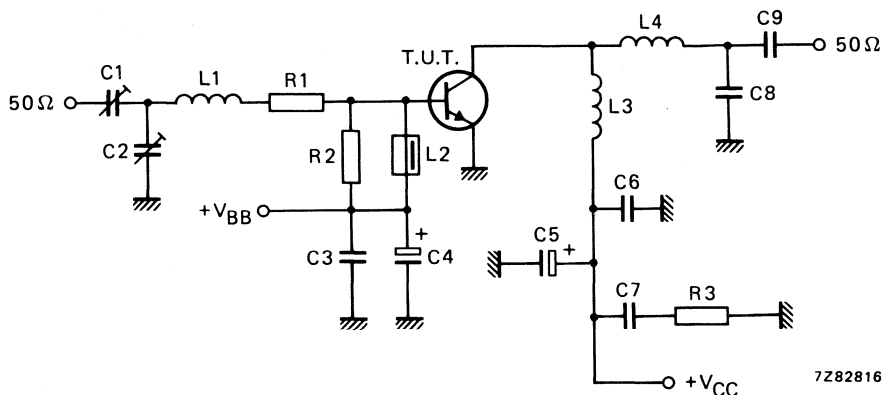


Fig. 8 Test circuit; s.s.b. class-A.

List of components in Fig. 8:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = 22 nF ceramic capacitor (63 V)

C4 = 4,7 μF /16 V electrolytic capacitorC5 = 1 μF /75 V solid tantalum capacitor

C6 = C7 = 47 nF polyester capacitor (100 V)

C8 = 68 pF ceramic capacitor (500 V)

C9 = 3,9 nF ceramic capacitor

L1 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm

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

L3 = 1,05 μH ; 15 turns enamelled Cu wire (1,0 mm); int. dia. 10,0 mm; length 17,4 mm; leads 2 x 5 mm

L4 = 162 nH; 6 turns enamelled Cu wire (1,0 mm); int. dia. 7,0 mm; length 11,6 mm; leads 2 x 5 mm

R1 = 1,6 Ω ; parallel connection of 3 x 4,7 Ω carbon resistors ($\pm 5\%$; 0,125 W)R2 = 47 Ω carbon resistor ($\pm 5\%$; 0,25 W)R3 = 4,7 Ω carbon resistor ($\pm 5\%$; 0,25 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.

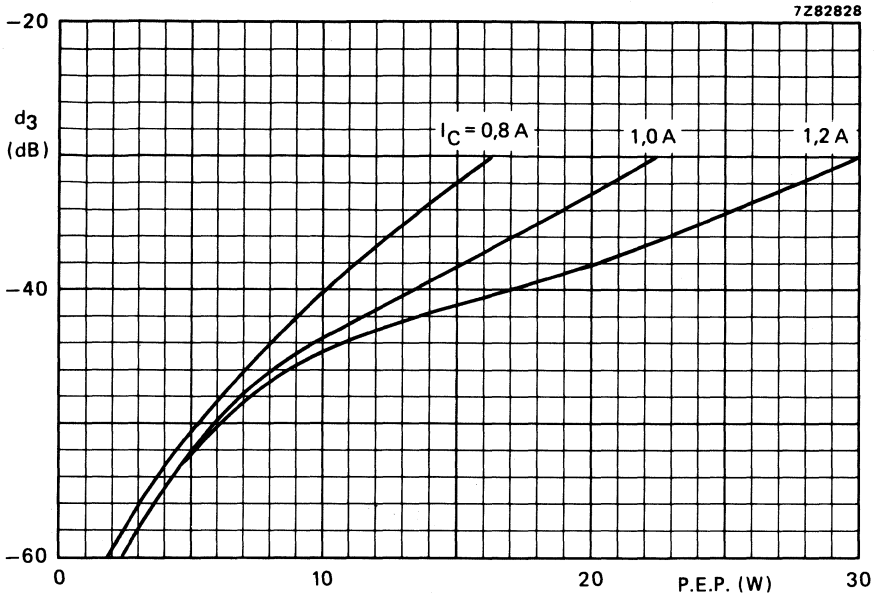


Fig. 9 Intermodulation distortion (see note on page 5) as a function of output power. Typical values; $V_{CE} = 45 V$; $f_1 = 28,000 MHz$; $f_2 = 28,001 MHz$; $T_h = 70 ^\circ C$.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

$V_{CE} = 50 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	η_{dt} (%) at 65 W P.E.P.	I_C (A)	d_3^* dB	d_5^* dB	$I_C(ZS)$ mA	T_h $^{\circ}\text{C}$
10 to 65 (P.E.P.)	typ. 18	typ. 45	typ. 1,45	typ. -30	< -30	50	25

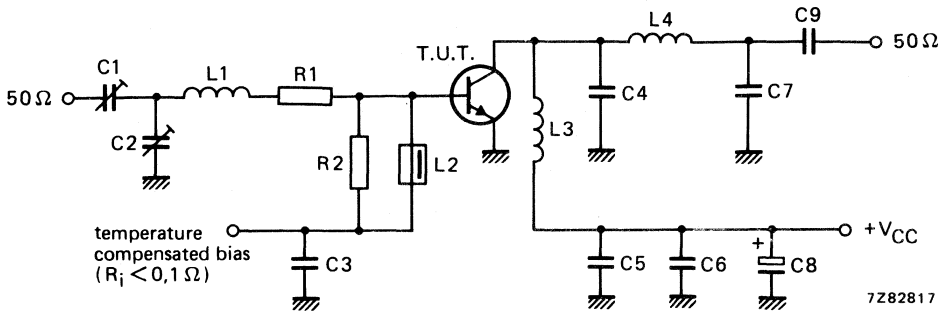


Fig. 10 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = C5 = C6 = 220 nF polyester capacitor

C4 = 120 pF ceramic capacitor (500 V)

C7 = 150 pF ceramic capacitor (500 V)

C8 = 47 $\mu\text{F}/63 \text{ V}$ electrolytic capacitor

C9 = 3,9 nF ceramic 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 = 9 turns enamelled Cu wire (1,0 mm); int. dia. 10 mm; length 14,5 mm; leads 2 x 5 mm

L4 = 6 turns enamelled Cu wire (1,0 mm); int. dia. 6,5 mm; length 11,0 mm; leads 2 x 5 mm

R1 = 2,4 Ω ; parallel connection of 2 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.

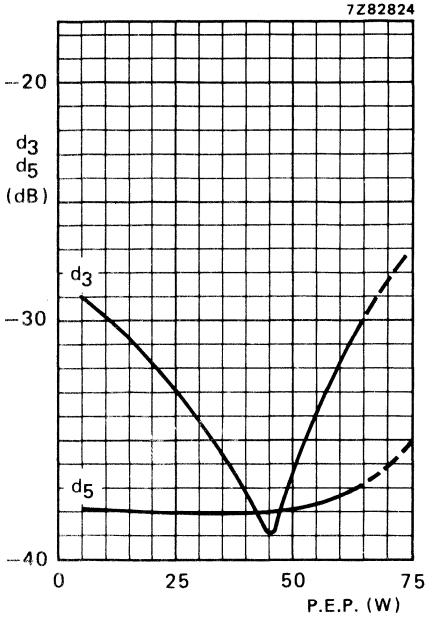


Fig. 11 Intermodulation distortion as a function of output power*.

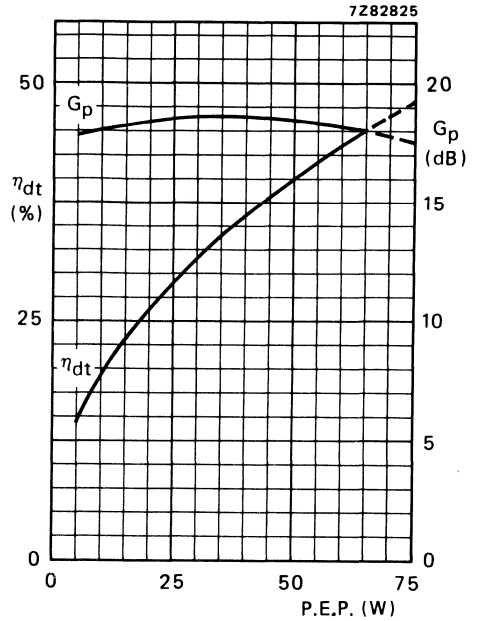


Fig. 12 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 11 and 12:

$V_{CE} = 50 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; typical values.

Ruggedness in s.s.b. operation

The BLW50F is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 45 W (P.E.P.) under the following conditions:

$V_{CE} = 50 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0,3 \text{ K/W}$.

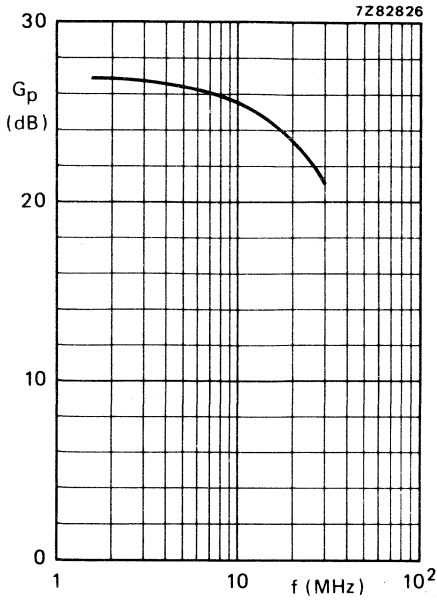


Fig. 13 Power gain as a function of frequency.

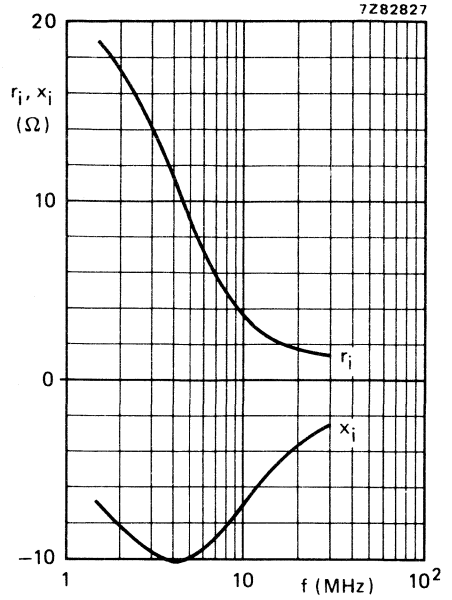


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions for Figs 13 and 14:

$V_{CE} = 50 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $P_L = 60 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 16 \text{ } \Omega$.

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

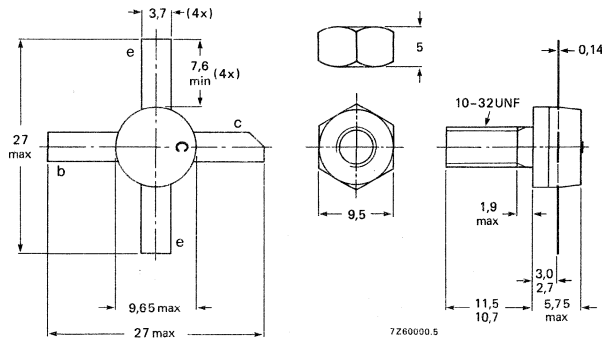
R.F. performance up to $T_H = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{Z}_i Ω	\bar{Z}_L Ω	d_3 dB
c.w. (class-B)	12,5	175	45	> 5,0	> 75	$1,2 + j1,4$	$2,6 - j1,2$	—
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.

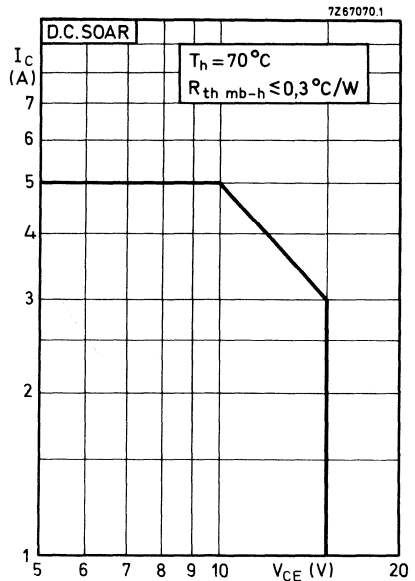
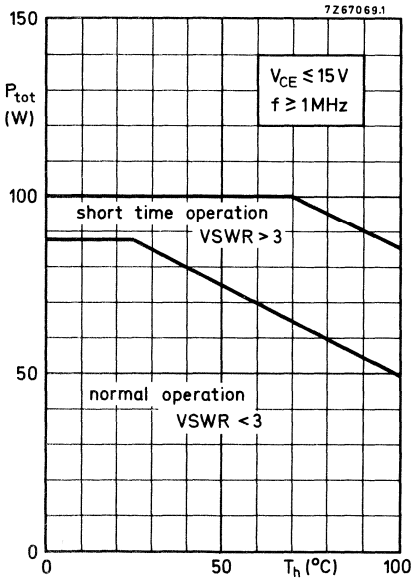
Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 4,9 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.

PRODUCT SAFETY 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)

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
Collector current (average)	$I_{C(AV)}$	max.	8 A
Collector current (peak value); $f \geq 1\text{MHz}$	I_{CM}	max.	20 A
Total power dissipation at $T_h = 70^\circ\text{C}$ $f \geq 1\text{MHz}$; $V_{CE} \leq 15\text{V}$; $R_{th\text{ mb-h}} \leq 0,3\text{K/W}$ Derate by 0,5 W/K for $50^\circ\text{C} \leq T_h \leq 100^\circ\text{C}$			
	P_{tot}	max.	65 W



Storage temperature

T_{stg} -65 to +200 $^\circ\text{C}$

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

Breakdown voltages

Collector-base voltage open emitter; $I_C = 100\text{ mA}$	$V_{(BR)CBO} >$	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 mH; f = 50 Hz

open base	E	>	8 ms
$-V_{BE} = 1,5\text{ V}; R_{BE} = 33\ \Omega$	E	>	8 ms

D.C. current gain

 $I_C = 1\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} 20 to 100

D.C. current gain ratio of matched devices

 $I_C = 1\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE1}/h_{FE2} <$ 1, 2

Transition frequency

 $I_C = 6\text{ A}; V_{CE} = 10\text{ V}$ f_T typ. 550 MHz

Collector capacitance at f = 1 MHz

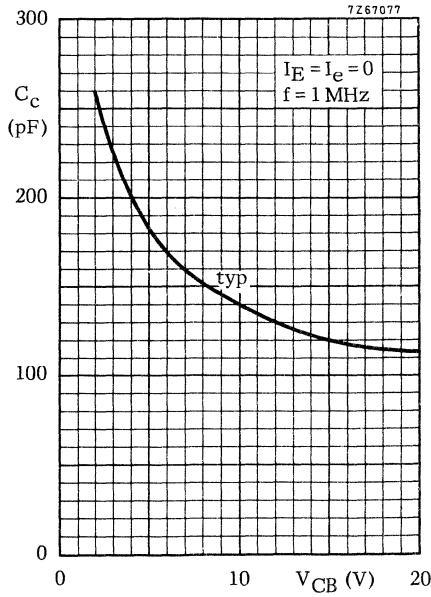
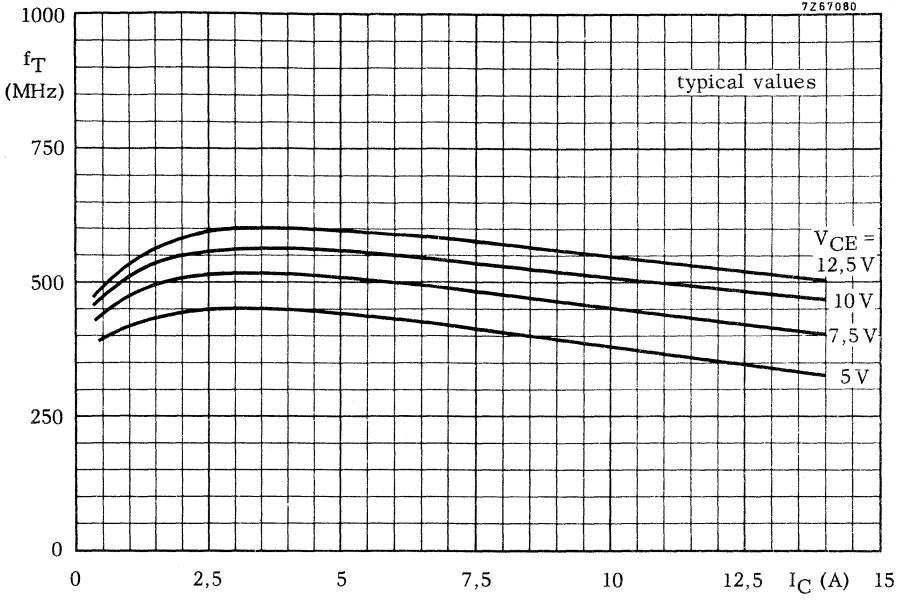
 $I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_C typ. 120 pF
< 160 pF

Feedback capacitance

 $I_C = 200\text{ mA}; V_{CE} = 15\text{ V}$ C_{re} typ. 80 pF

Collector-stud capacitance

 C_{cs} typ. 2 pF



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{Z}_L Ω
175	12,5	45	< 14,2	> 5,0	< 4,8	> 75	1,2 + j1,4	2,6 - j1,2

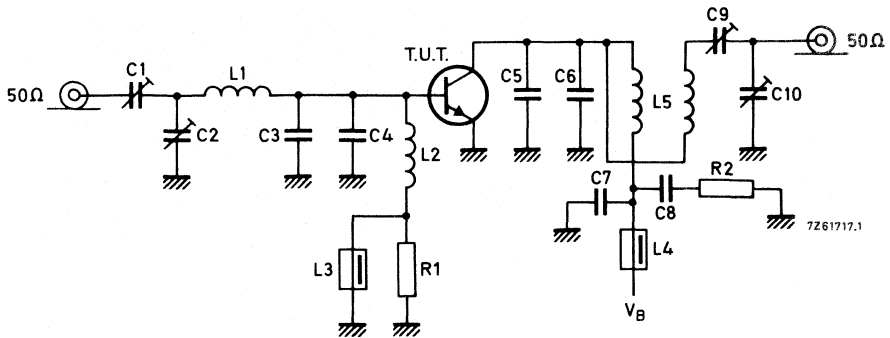


Fig. 6 Test circuit; c.w. class-B.

List of components:

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 = 1½ turns enamelled Cu wire (1,6 mm); int. dia. 6,0 mm; length 4 mm; leads 2 x 5 mm

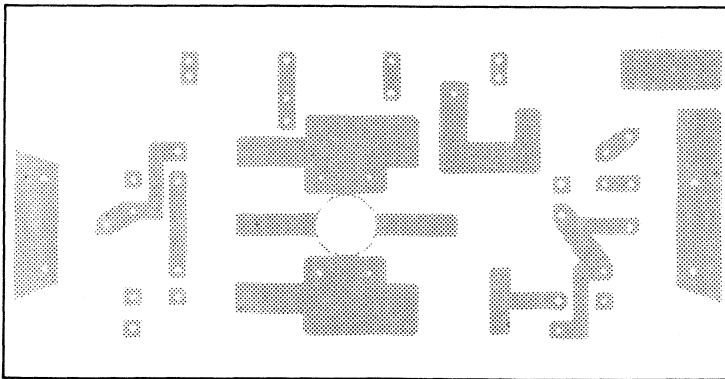
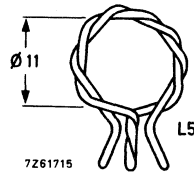
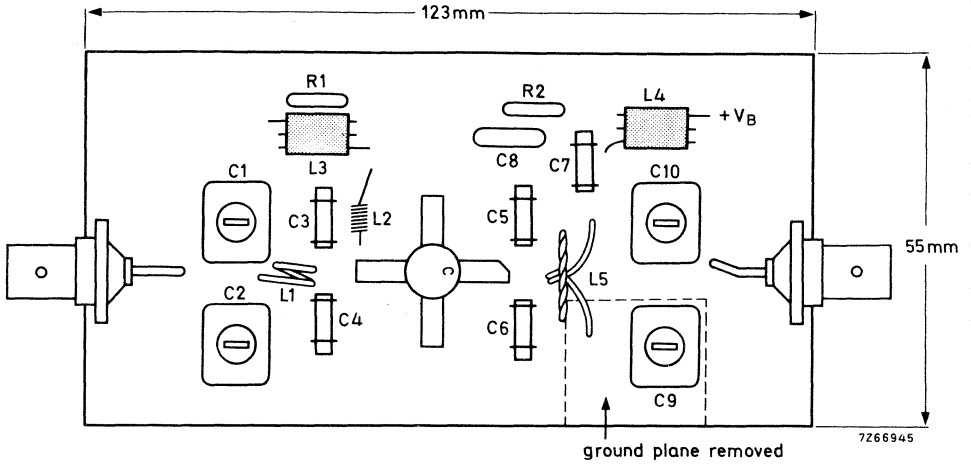
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3,0 mm; leads 2 x 5 mm

L3 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L5 = bifilar wound enamelled Cu wire (1,0 mm); see figure on

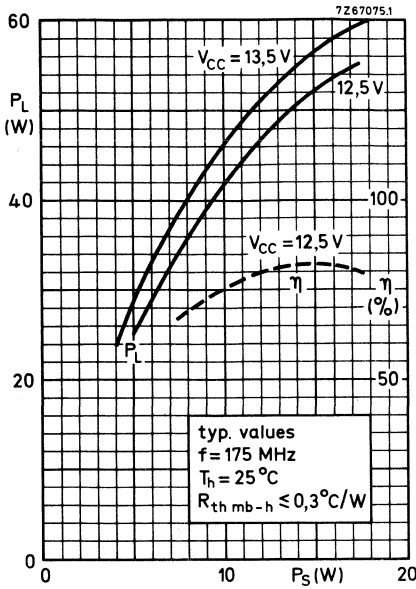
R1 = 10 Ω carbon resistorR2 = 4,7 Ω carbon resistor

APPLICATION INFORMATION (continued)

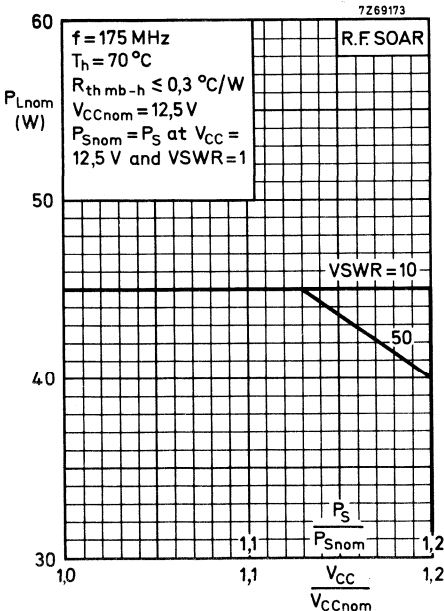


7Z66943

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 mW/K



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 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_{Snom}) increases linearly with supply overvoltage ratio (V_{CC}/V_{CCnom}).

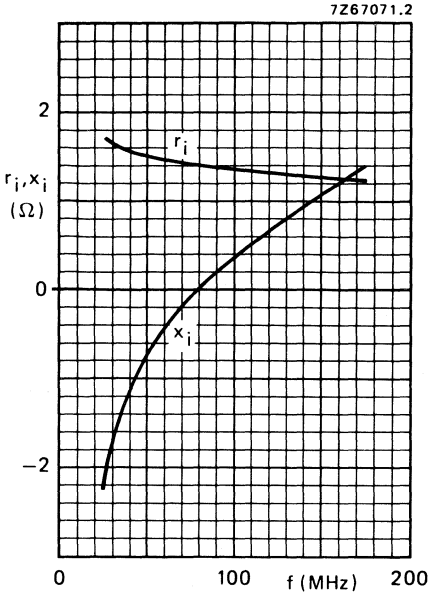


Fig. 10 Input impedance (series components).

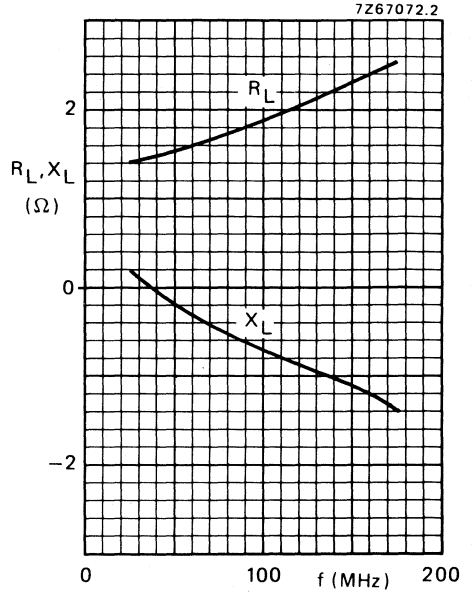


Fig. 11 Load impedance (series components).

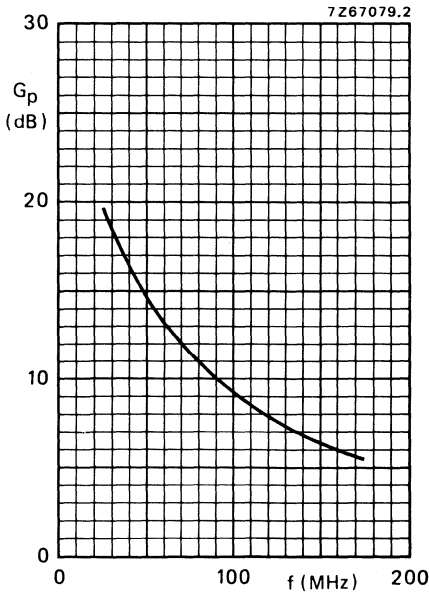


Fig. 12.

Conditions for Figs 10, 11 and 12:
 Typical values; $V_{CE} = 12,5 \text{ V}$; $P_L = 45 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

APPLICATION INFORMATION (continued)

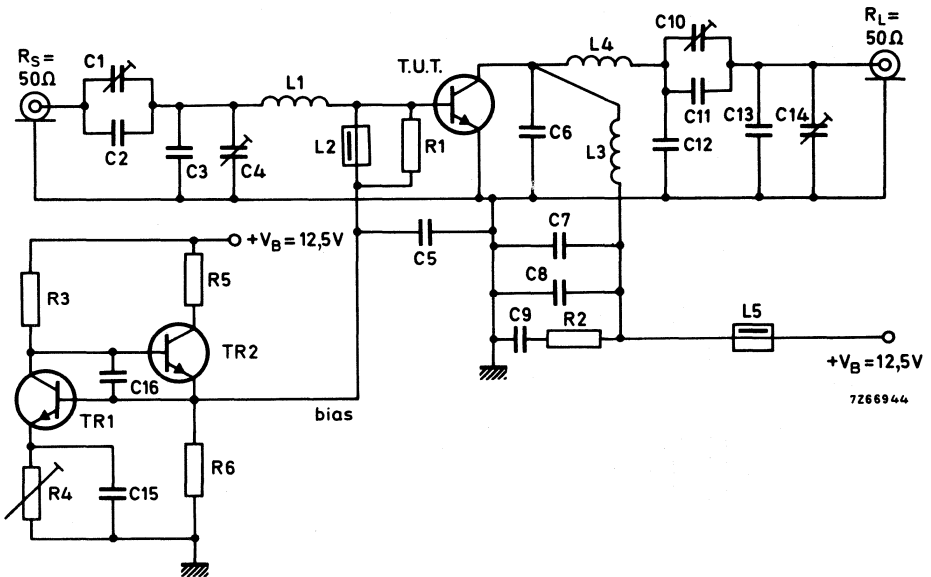
R.F. performance in s.s.b. class-AB operation

$V_{CE} = 12,5 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$

$f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

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 on

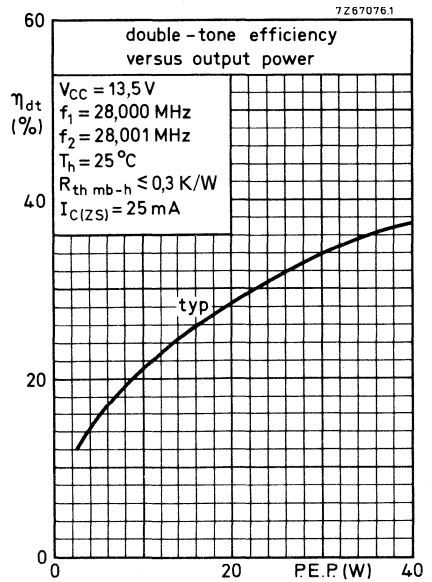
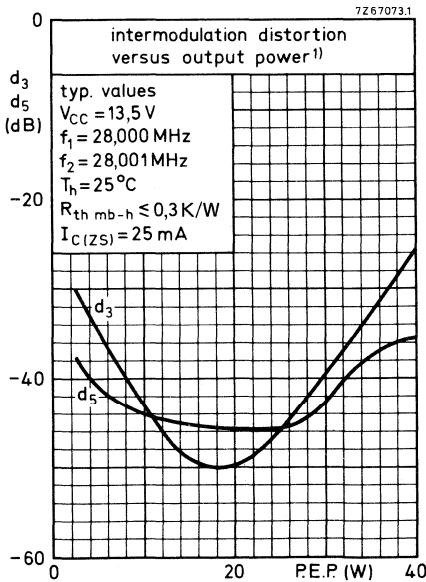
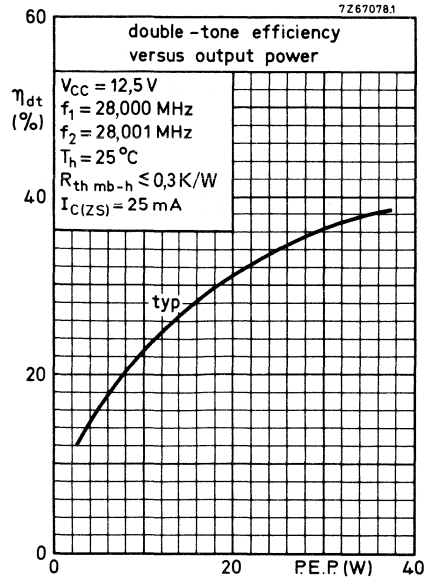
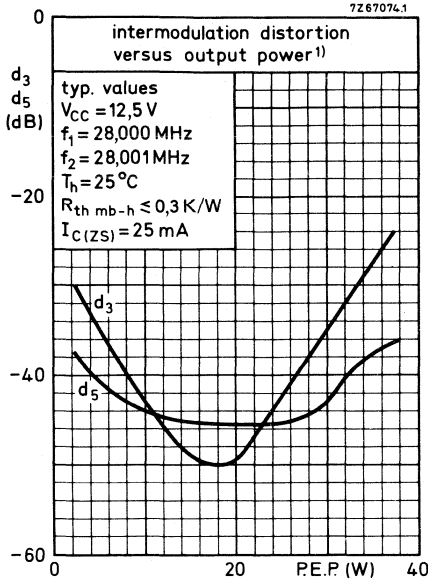
* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

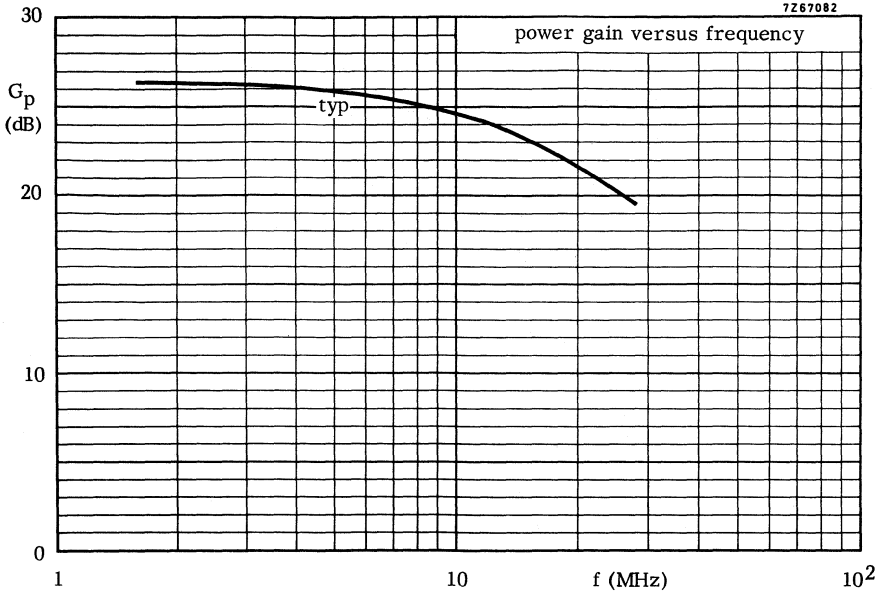
List of components:

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 = ferrocube 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.



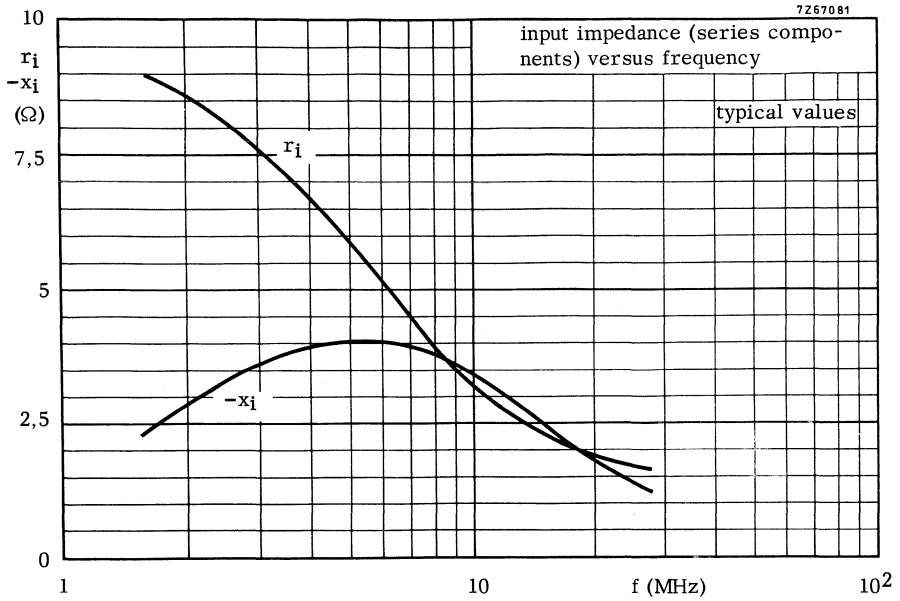
S.S.B. class AB operation

Conditions:

$P_L = 30 \text{ W (PEP)}$
 $V_{CC} = 12,5 \text{ V}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$
 $Z_L = 1,9 \Omega$

$P_L = 35 \text{ W (PEP)}$
 $V_{CC} = 13,5 \text{ V}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$
 $Z_L = 1,9 \Omega$

The curve (both conditions) holds for an unneutralized amplifier.



S.S.B. class AB operation

Conditions:

$P_L = 30 \text{ W (PEP)}$
 $V_{CC} = 12,5 \text{ V}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$
 $Z_L = 1,9 \text{ } \Omega$

$P_L = 35 \text{ W (PEP)}$
 $V_{CC} = 13,5 \text{ V}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$
 $Z_L = 1,9 \text{ } \Omega$

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

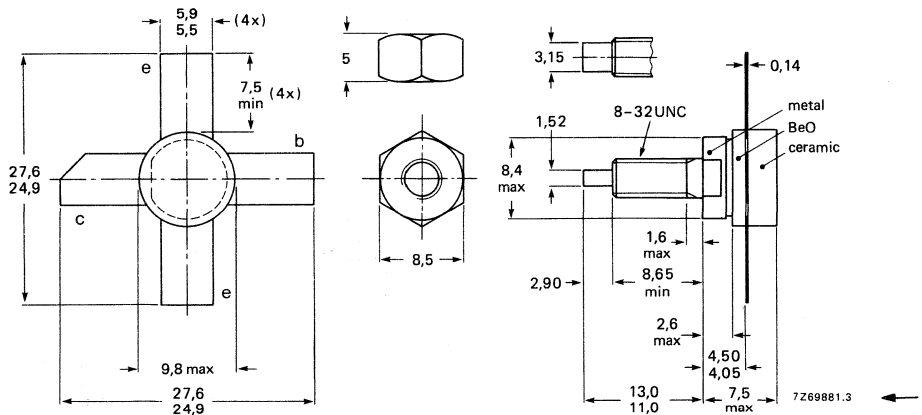
R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{z}_L Ω	d_3 dB
c.w. (class-B)	12,5	175	45	> 5,0	> 75	$1,2 + j1,4$	$2,6 - j1,2$	—
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-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.

PRODUCT SAFETY 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

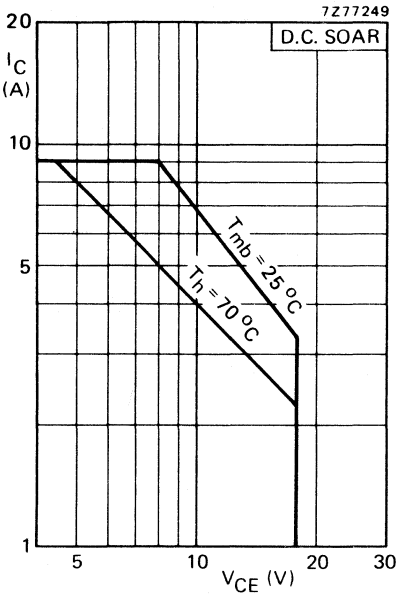


Fig. 2 D.C. SOAR.

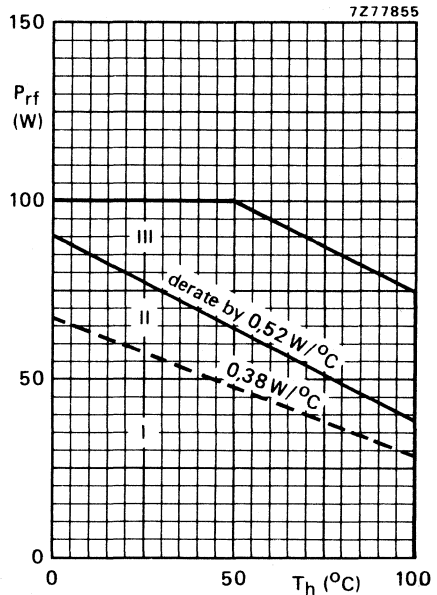


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	2,05 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,45 K/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 $> 8\text{ ms}$ E $> 8\text{ ms}$

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 *

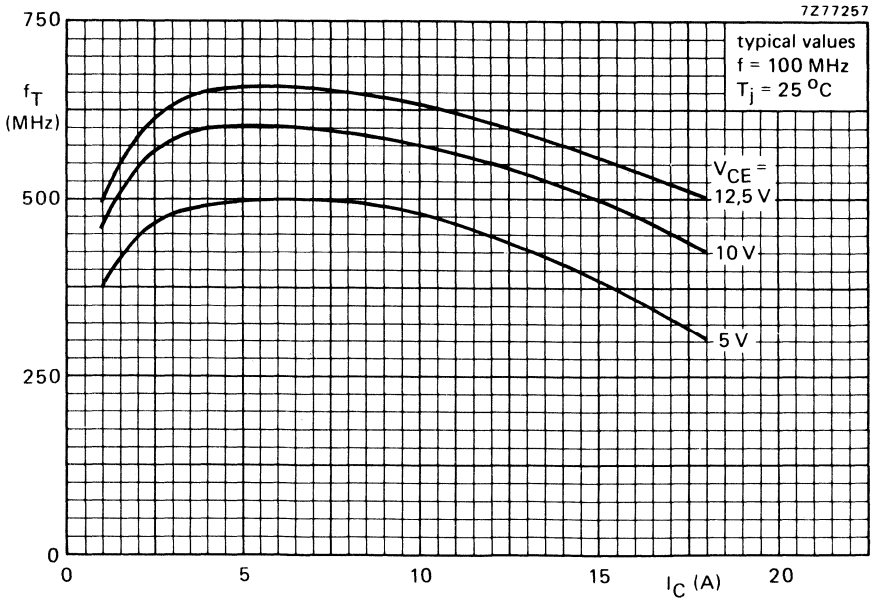
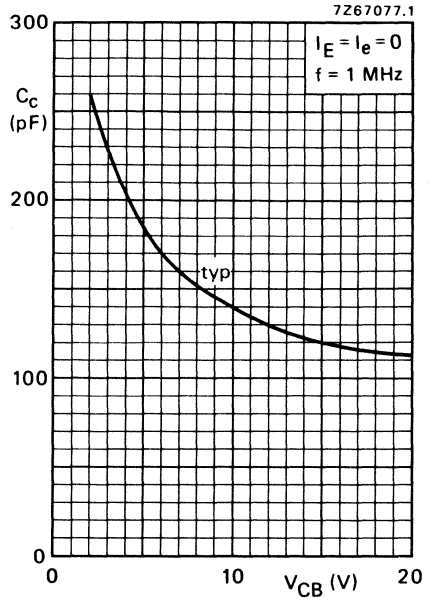
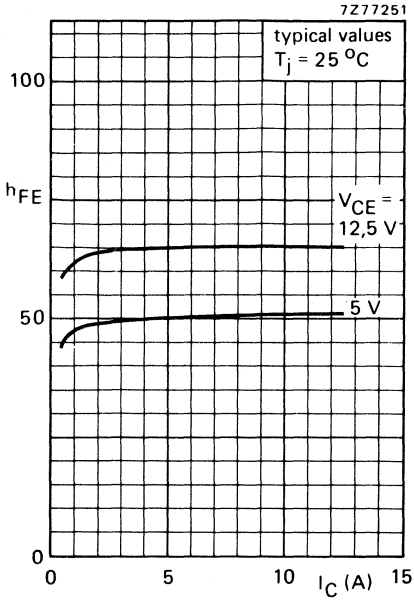
 $I_C = 4\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE1}/h_{FE2} < 1,2$

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{Z}_L (Ω)
175	12,5	45	< 14,2	> 5,0	< 4,8	> 75	1,2 + j1,4	2,6 - j1,2
175	13,5	45	—	typ. 6,0	—	typ. 75	—	—

Test circuit for 175 MHz

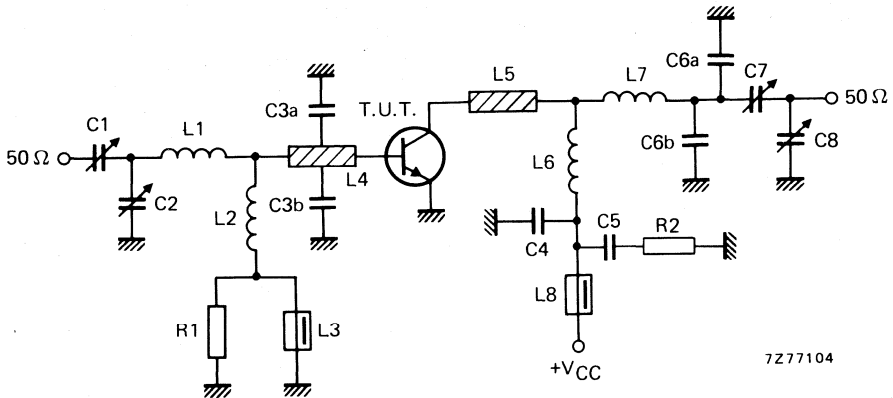


Fig. 7 Class-B test circuit at f = 175 MHz.

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 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

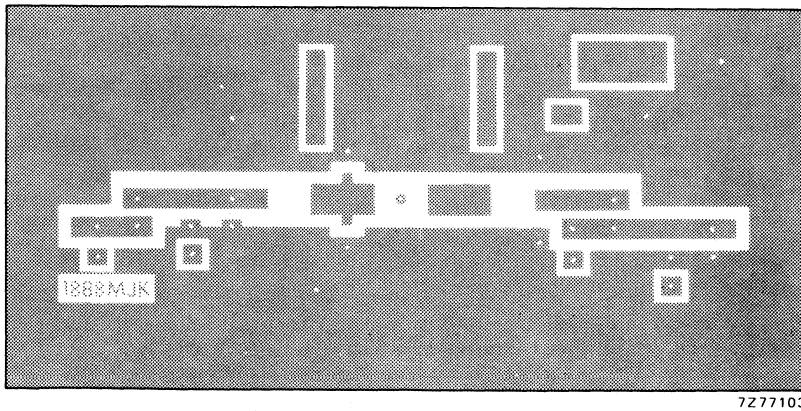
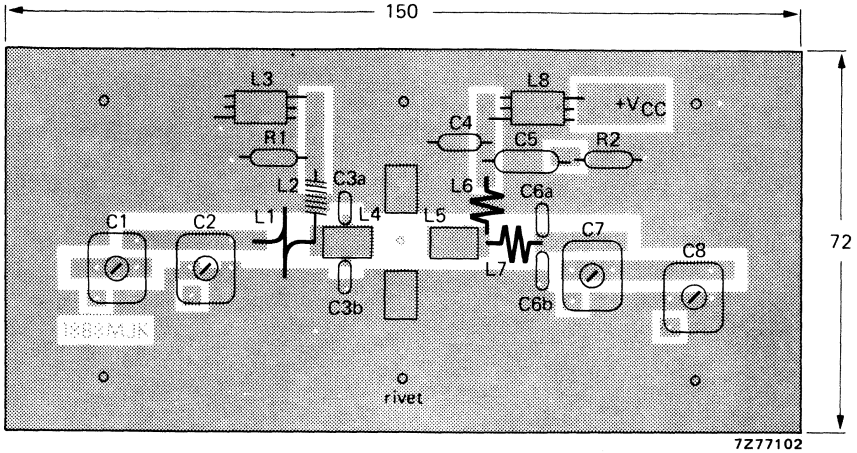
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω ($\pm 10\%$) carbon resistorR2 = 4,7 Ω ($\pm 5\%$) carbon resistor

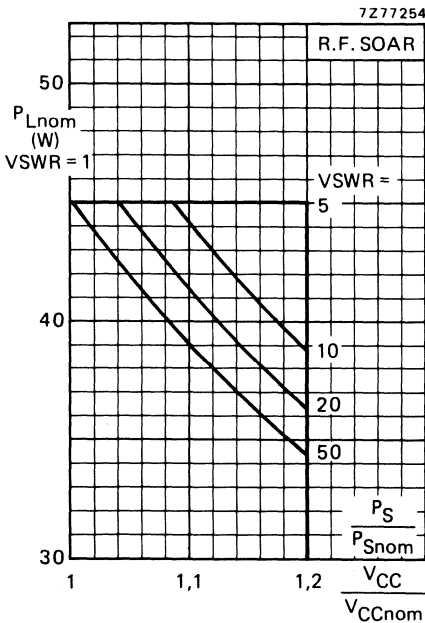
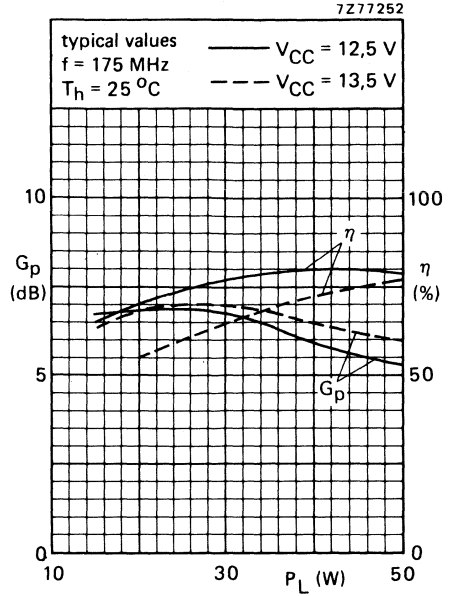
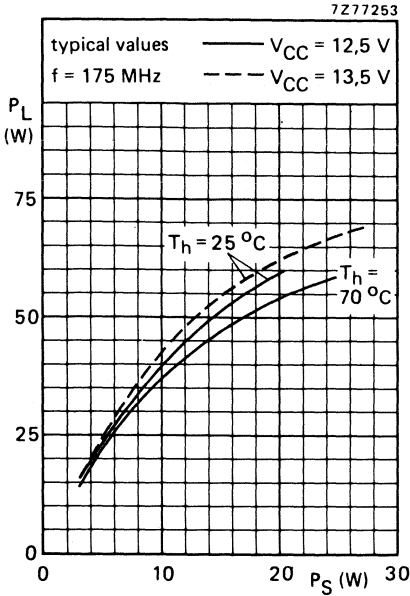
Component layout and printed-circuit board for 175 MHz test circuit on

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

$f = 175 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,45 \text{ K/W}$
 $V_{CCnom} = 12,5 \text{ V or } 13,5 \text{ V}$
 $P_S = P_{Snom}$ at V_{CCnom} and $VSWR = 1$
 see

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.

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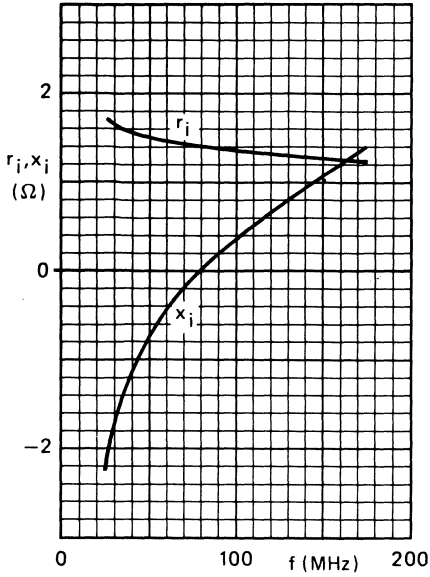


Fig. 12 Input impedance (series components).

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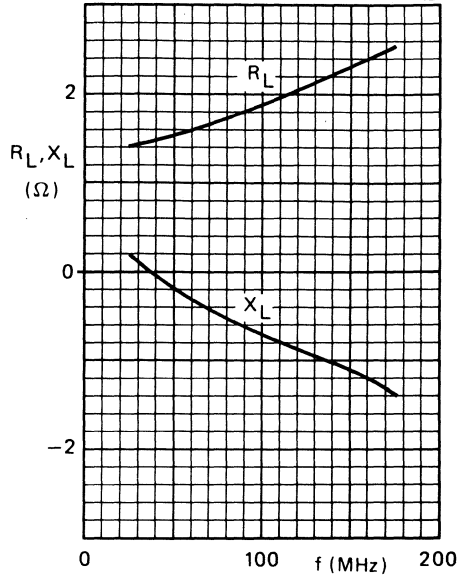


Fig. 13 Load impedance (series components).

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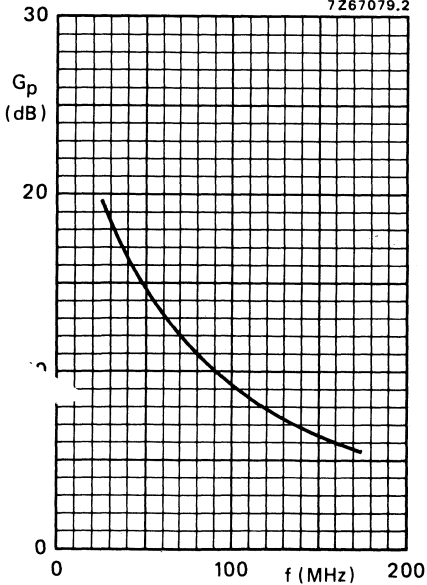


Fig. 14.

Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 12,5 \text{ V}$; $P_L = 45 \text{ W}$;
 class-B operation; $T_H = 25 \text{ }^\circ\text{C}$.

APPLICATION INFORMATION (continued)

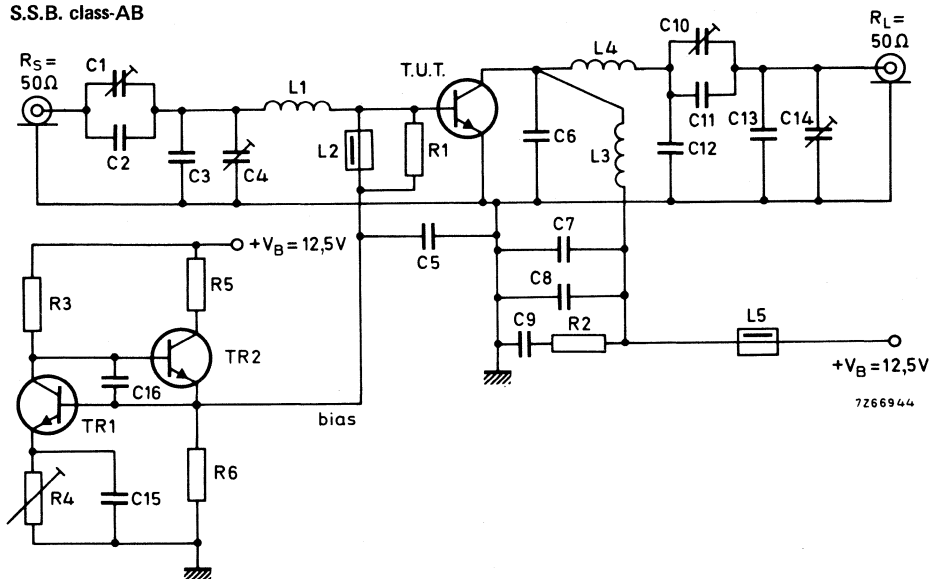
R.F. performance in s.s.b. class-AB operation

$V_{CE} = 12,5 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,45 \text{ K/W}$
 $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

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

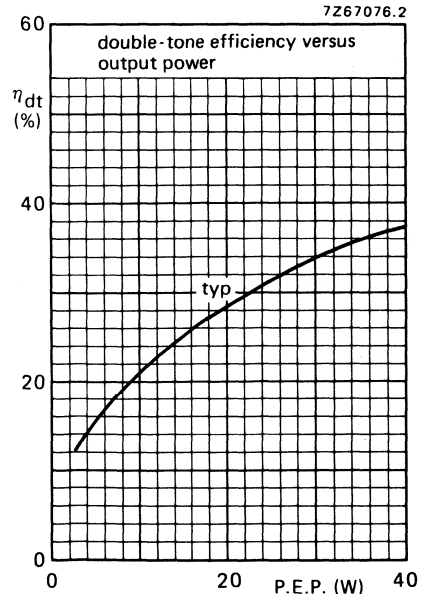
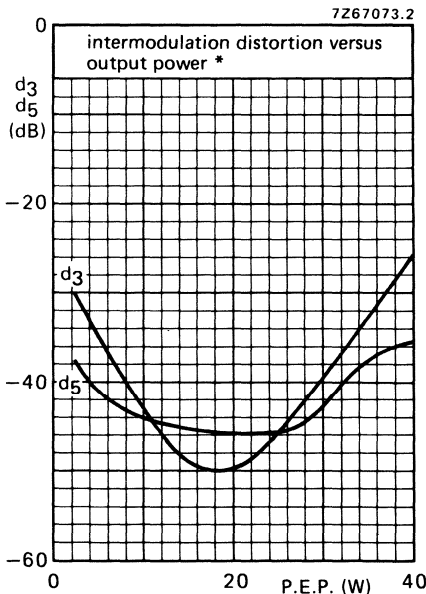
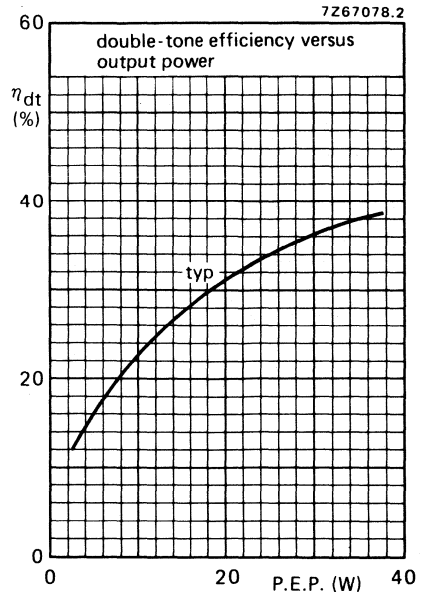
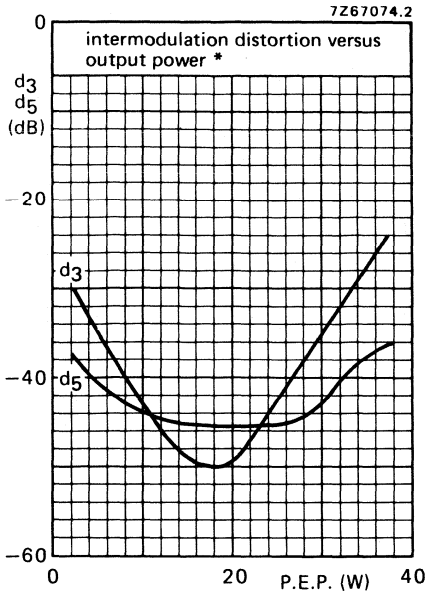
L4 = 96 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 7,6 mm; leads 2 x 5 mm

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** $V_{CC} = 12,5 \text{ V}$ $f_1 = 28,000 \text{ MHz}$ $f_2 = 28,001 \text{ MHz}$ $T_h = 25 \text{ }^\circ\text{C}$ $R_{th \text{ mb-h}} \leq 0,45 \text{ }^\circ\text{K/W}$ $I_{C(ZS)} = 25 \text{ mA}$

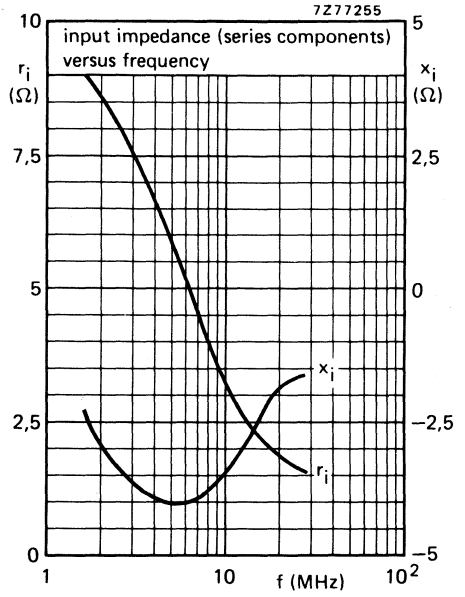
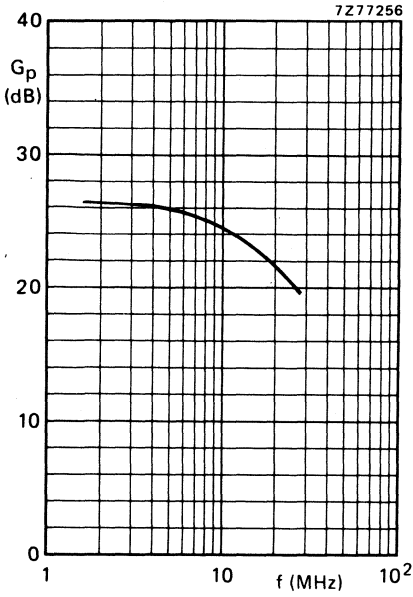
typical values

Measuring conditions for the lower graphs on page 11 $V_{CC} = 13,5 \text{ V}$ $f_1 = 28,000 \text{ MHz}$ $f_2 = 28,001 \text{ MHz}$ $T_h = 25 \text{ }^\circ\text{C}$ $R_{th \text{ mb-h}} \leq 0,45 \text{ }^\circ\text{K/W}$ $I_{C(ZS)} = 25 \text{ mA}$

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:

$V_{CC} = 12,5 \text{ V}$
 $P_L = 30 \text{ W (P.E.P.)}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,45 \text{ K/W}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $Z_L = 1,9 \text{ } \Omega$

$V_{CC} = 13,5 \text{ V}$
 $P_L = 35 \text{ W (P.E.P.)}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,45 \text{ K/W}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $Z_L = 1,9 \text{ } \Omega$

The typical curves (both conditions) hold for an unneutralized amplifier.

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

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

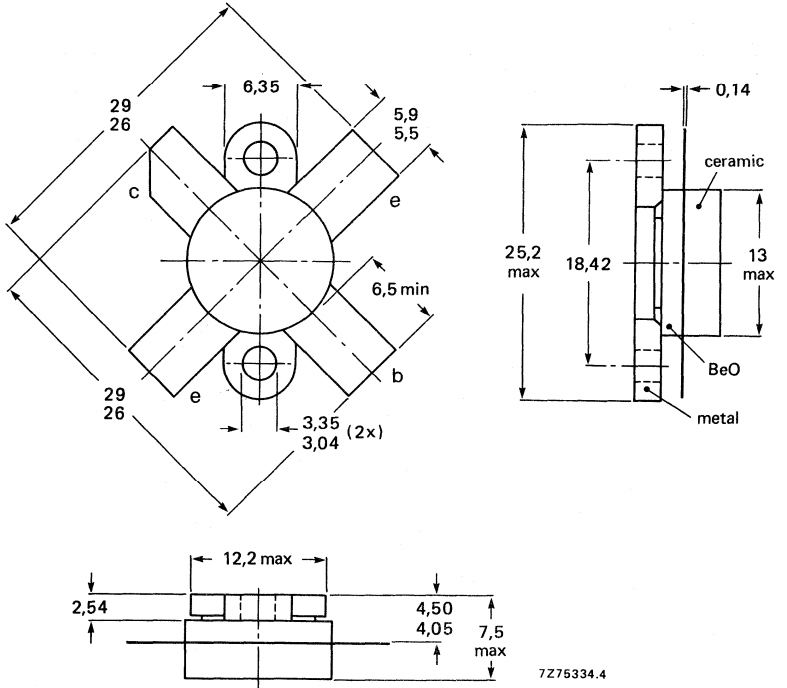
SOT-121 (see Fig.1).

PRODUCT SAFETY 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-121.

Dimensions in mm



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

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

Heatsink compound must be applied sparingly and evenly distributed.

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

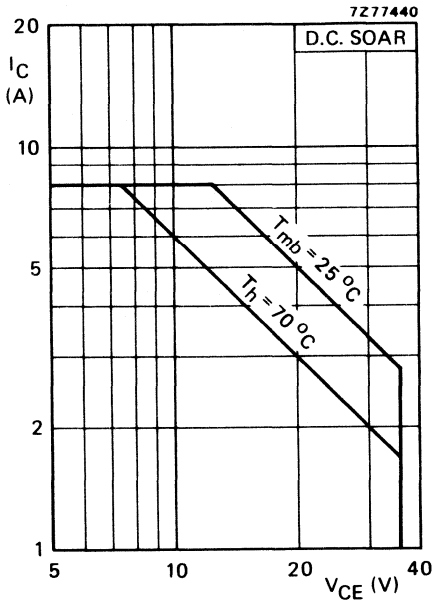


Fig. 2 D.C. SOAR.

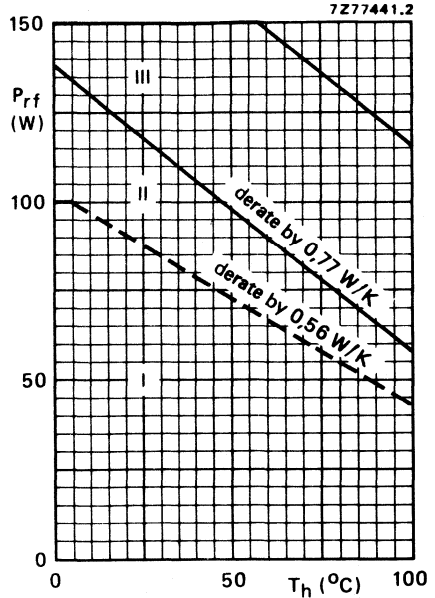


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- 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 K/W

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

$R_{th\ j-mb(rf)}$ = 1,33 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,2 K/W

CHARACTERISTICS

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

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

$C_{cf} \quad \text{typ. } 3\text{ pF}$

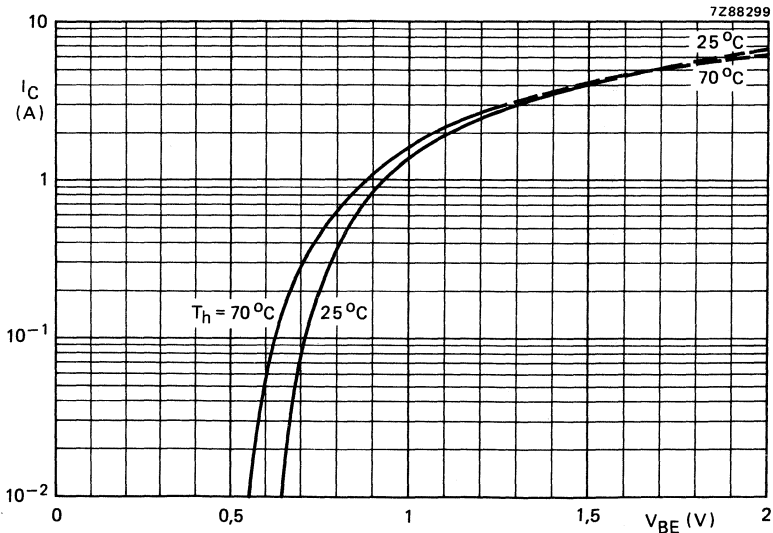


Fig. 4 Typical values; $V_{CE} = 20\text{ V}$.

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

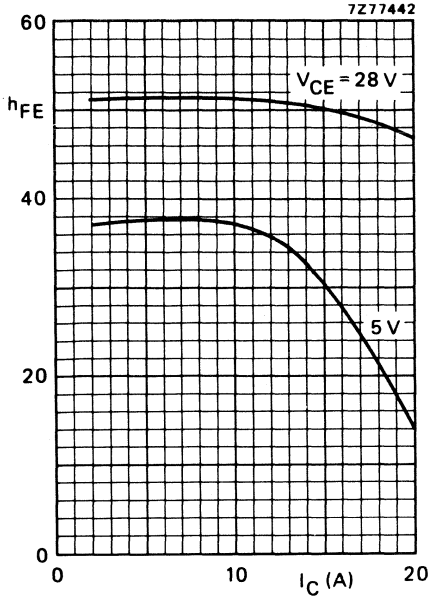


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

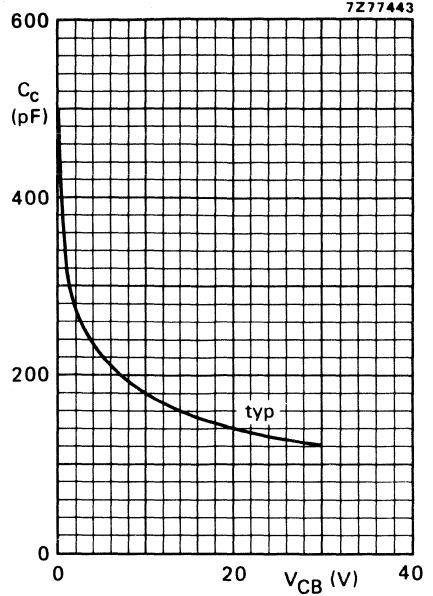


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

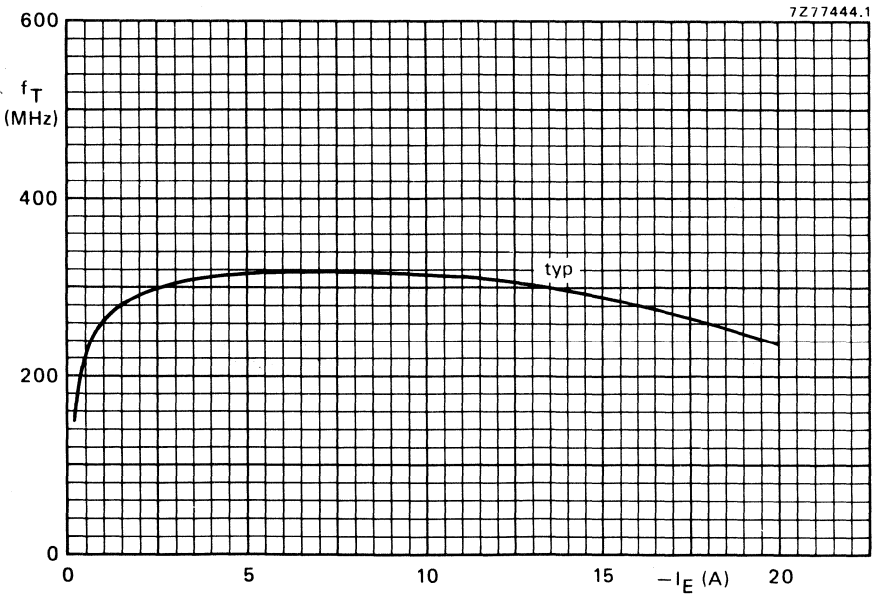


Fig. 7 $V_{CB} = 28\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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

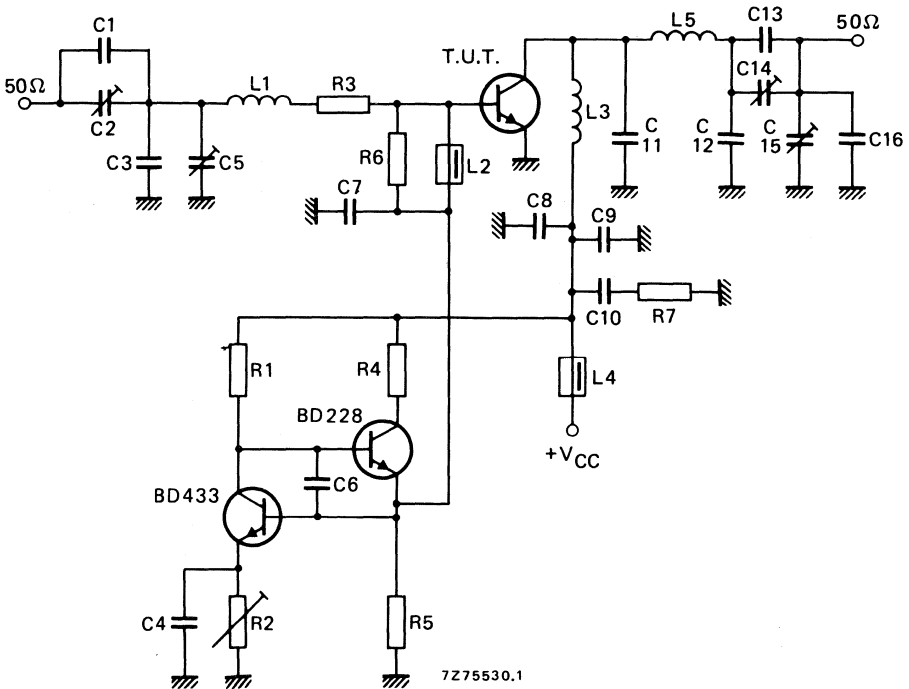


Fig. 8 Test circuit; s.s.b. class-AB.

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)

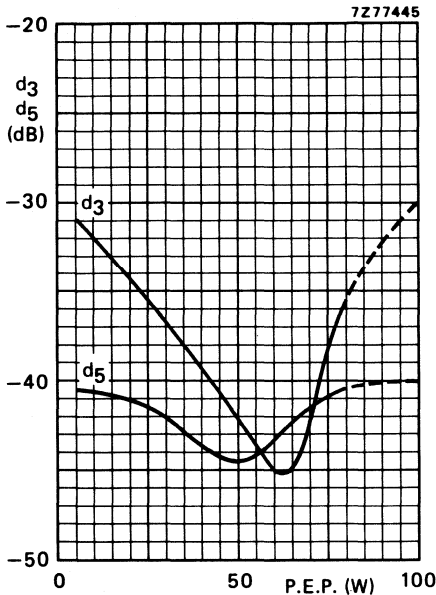


Fig. 9 Intermodulation distortion as a function of output power.*

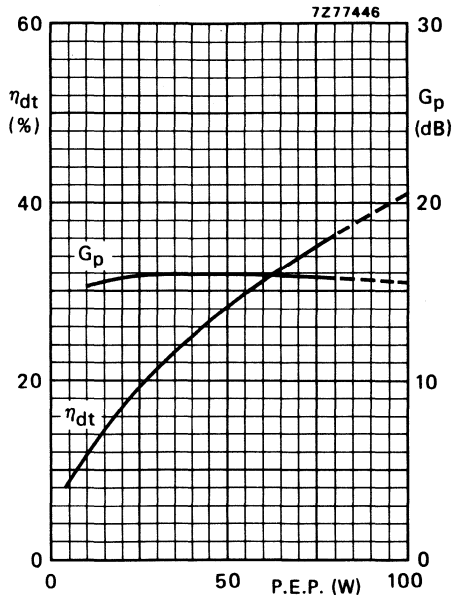


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

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)

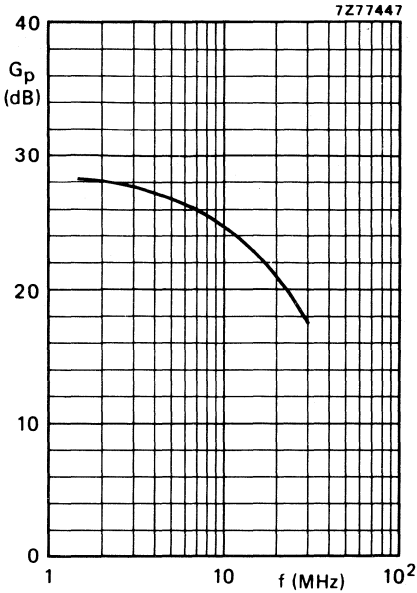


Fig. 11 Power gain as a function of frequency.

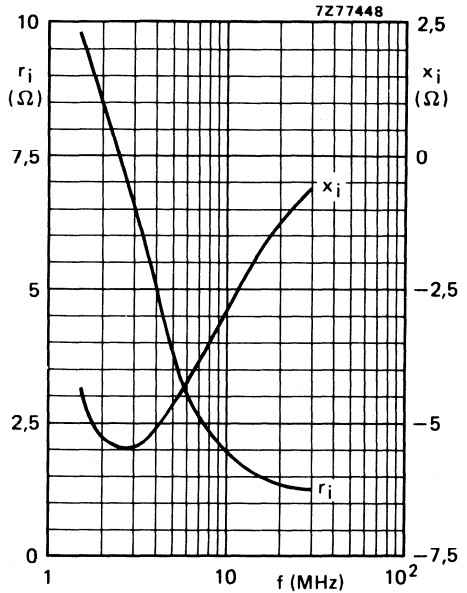


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $P_L = 80 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 3,9 \text{ } \Omega$.

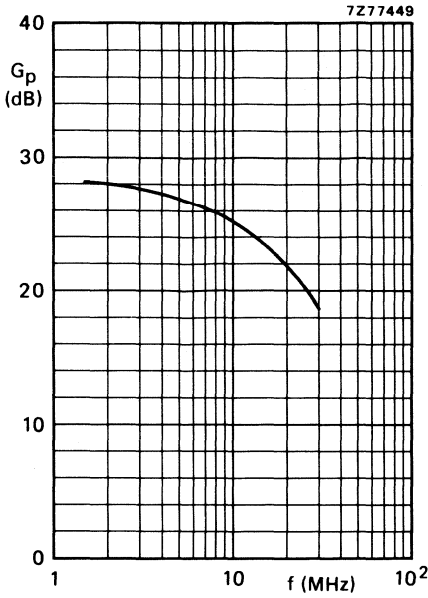


Fig. 13 Power gain as a function of frequency.

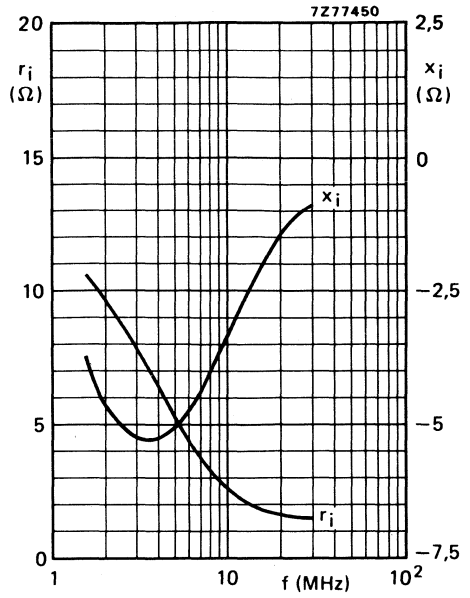


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for 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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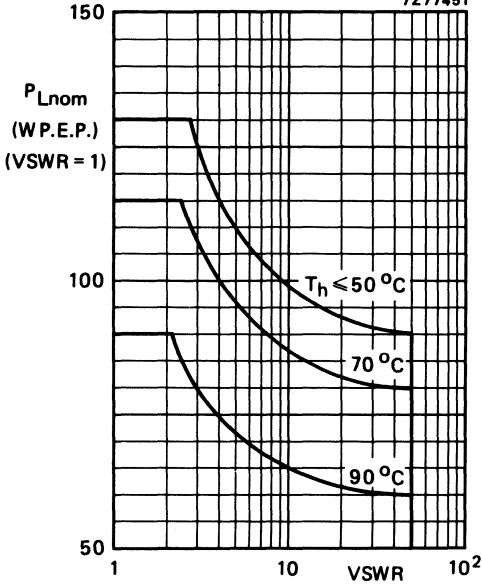


Fig. 15 R.F. SOAR; s.s.b. class-AB operation; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz; $V_{CE} = 28$ V; $R_{th\text{ mb-h}} = 0,2$ K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink 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 (mS)
108	28	80	typ. 13	typ. 7,9	typ. 4,1	typ. 70	$0,85 + j1,0$	$174 - j40$

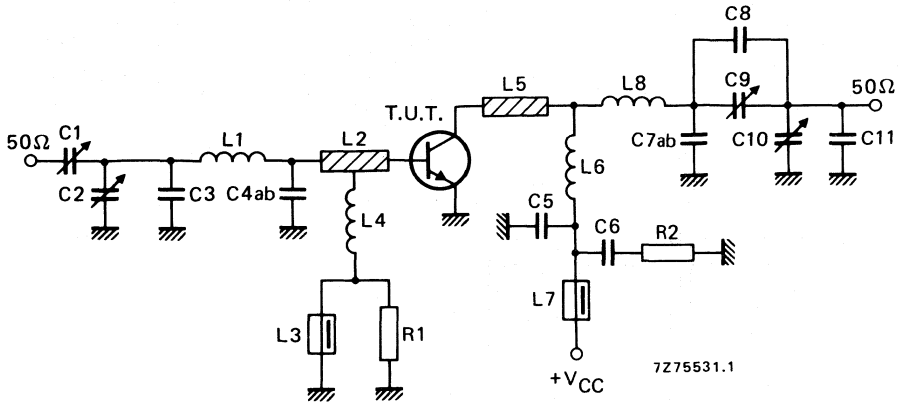


Fig. 16 Test circuit; c.w. class-B.

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. 17.

APPLICATION INFORMATION (continued)

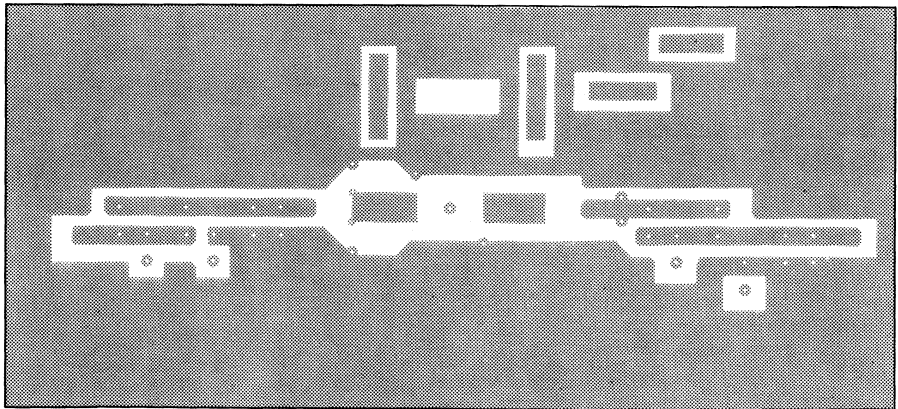
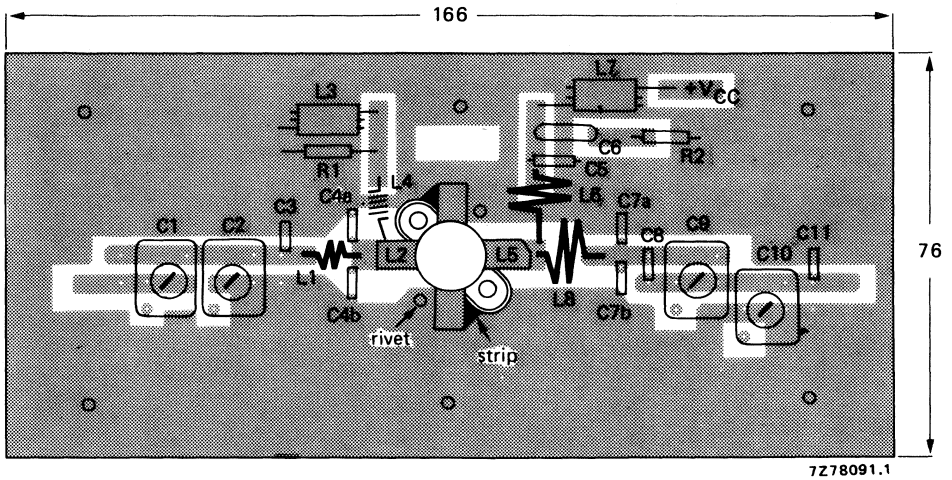


Fig. 17 Component layout and printed-circuit board for 108 MHz test circuit.

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.

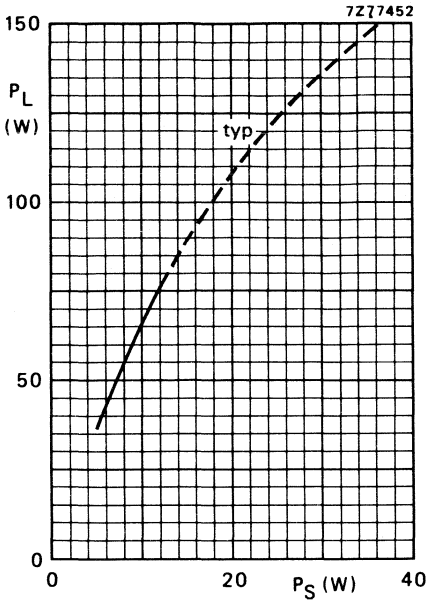


Fig. 18 $V_{CE} = 28$ V; $f = 108$ MHz; $T_h = 25$ °C.

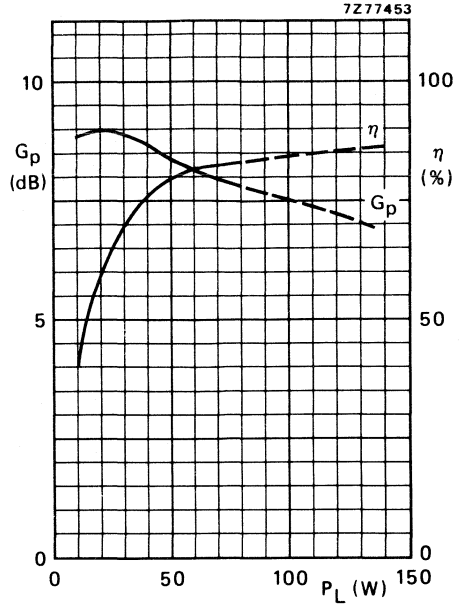


Fig. 19 $V_{CE} = 28$ V; $f = 108$ MHz; $T_h = 25$ °C; typical values.

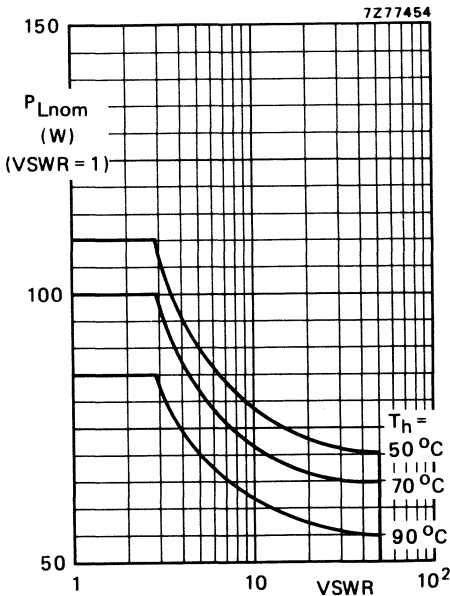


Fig. 20 R.F. SOAR; c.w. class-B operation; $f = 108$ MHz; $V_{CE} = 28$ V; $R_{th\ mb-h} = 0,2$ K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

APPLICATION INFORMATION (continued)

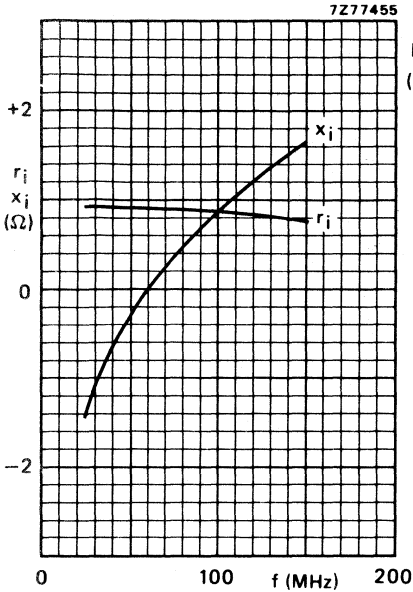


Fig. 21 $V_{CE} = 28$ V; $P_L = 80$ W; $T_h = 25$ °C typical values.

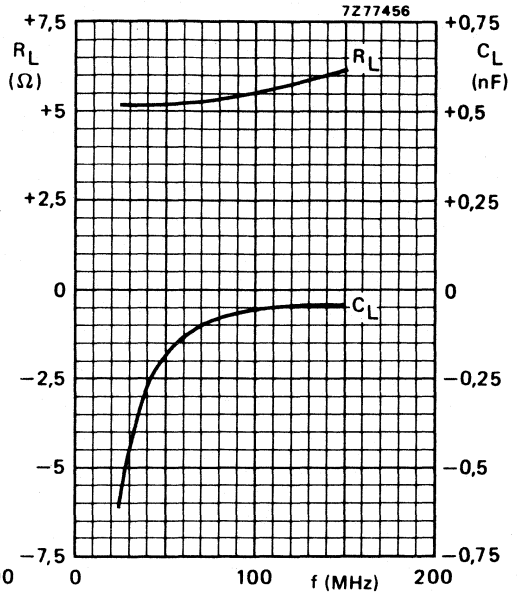


Fig. 22 $V_{CE} = 28$ V; $P_L = 80$ W; $T_h = 25$ °C; typical values.

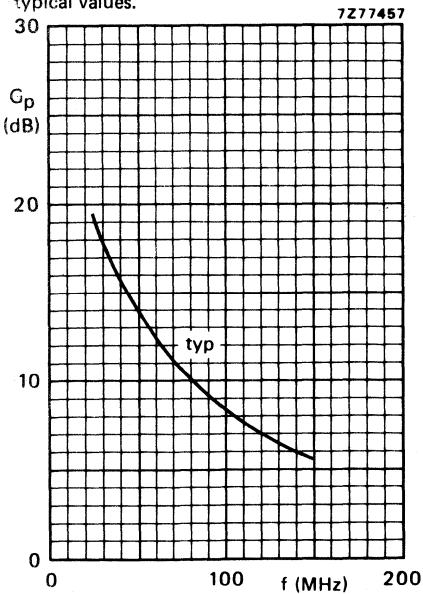


Fig. 23 $V_{CE} = 28$ V; $P_L = 80$ W; $T_h = 25$ °C.

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

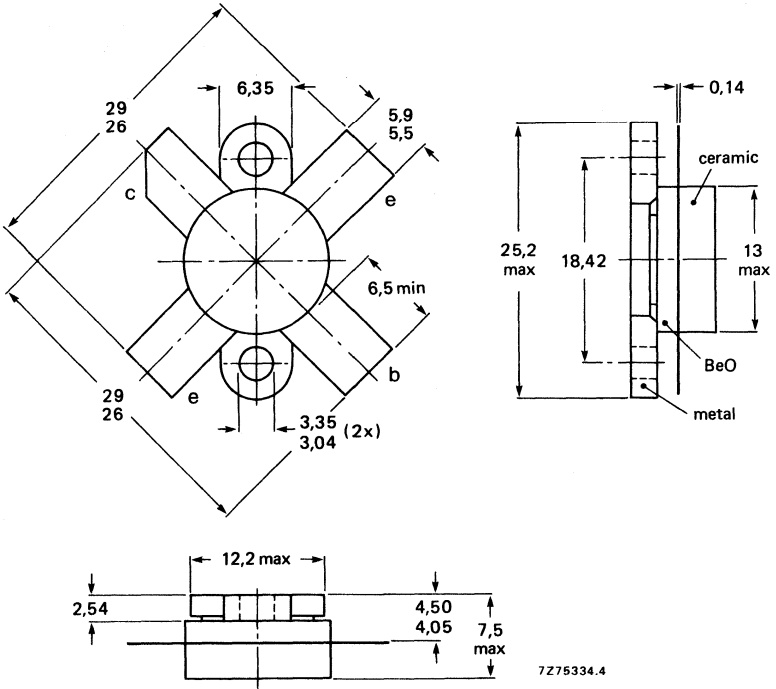
SOT-121 (see Fig. 1).

PRODUCT SAFETY 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-121.

Dimensions in mm



7Z75334.4

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

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

Heatsink compound must be applied sparingly and evenly distributed.

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); $T_{mb} = 25$ °C

P_{rf} max. 245 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

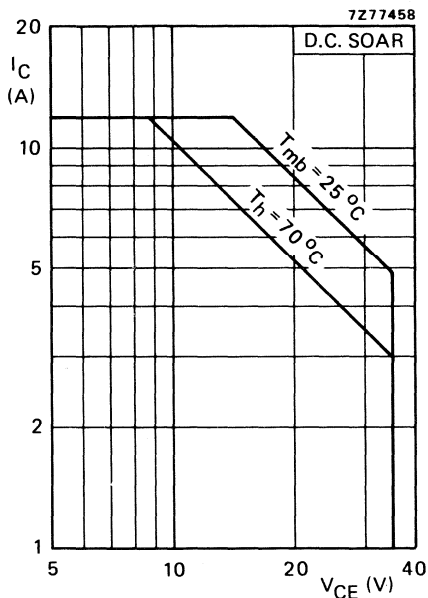


Fig. 2 D.C. SOAR.

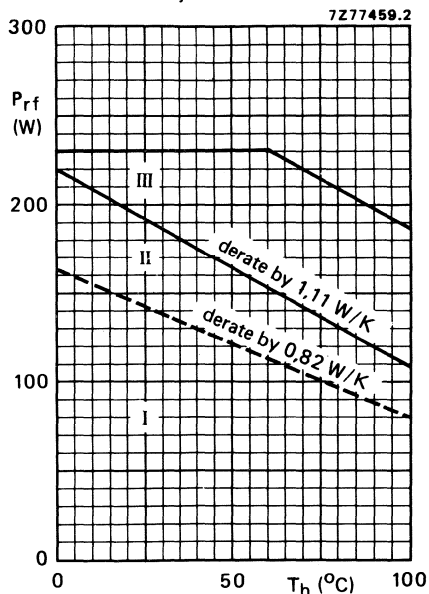


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

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

THERMAL RESISTANCE (dissipation = 100 W; $T_{mb} = 90$ °C, i.e. $T_h = 70$ °C)

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

$R_{th\ j-mb(dc)}$ = 1,03 K/W

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

$R_{th\ j-mb(rf)}$ = 0,71 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,2 K/W

CHARACTERISTICS

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

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*

$I_C = 20\text{ A}; I_B = 4\text{ A}$

$V_{CEsat} \quad \text{typ. } 2\text{ V}$

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

$-I_E = 7\text{ A}; V_{CB} = 28\text{ V}$

$f_T \quad \text{typ. } 320\text{ MHz}$

$-I_E = 20\text{ A}; V_{CB} = 28\text{ V}$

$f_T \quad \text{typ. } 300\text{ MHz}$

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

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

$C_C \quad \text{typ. } 255\text{ pF}$

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

$I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$

$C_{re} \quad \text{typ. } 175\text{ pF}$

Collector-flange capacitance

$C_{cf} \quad \text{typ. } 3\text{ pF}$

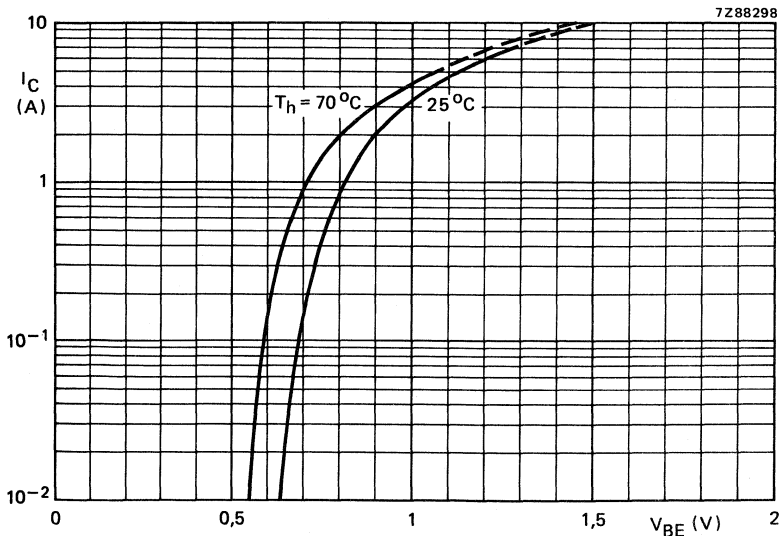


Fig. 4 Typical values; $V_{CE} = 20\text{ V}$.

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

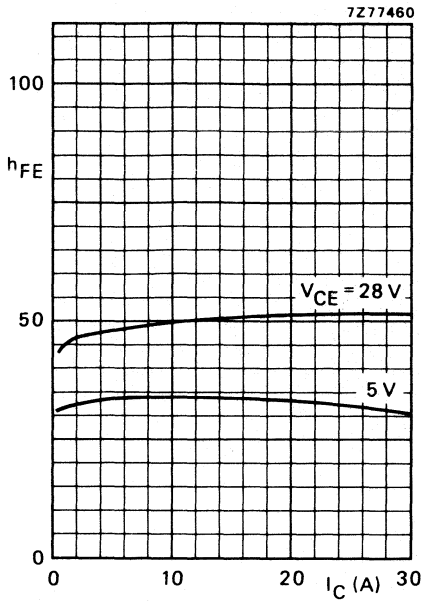


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

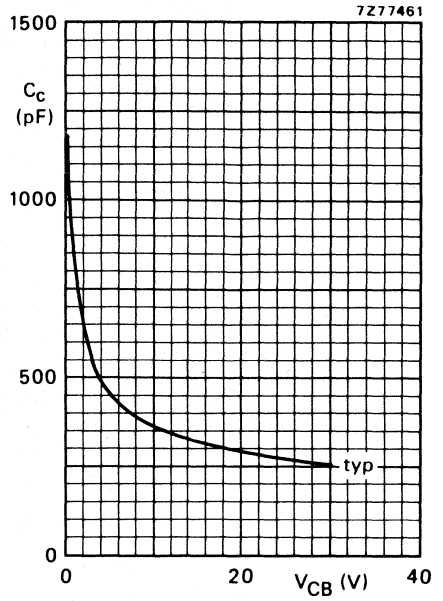


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

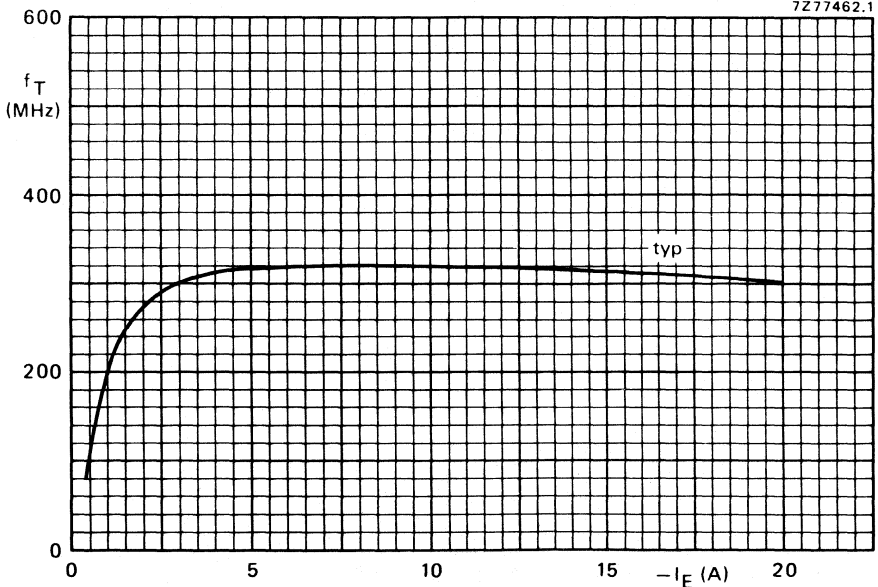


Fig. 7 $V_{CB} = 28\text{ V}$; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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 130 W P.E.P.	I_C (A)	d_3 dB	d_5 dB	$I_{C(2S)}$ A
15 to 130 (P.E.P.)	> 12	> 37,5	< 6,2	< -30	< -30	0,1

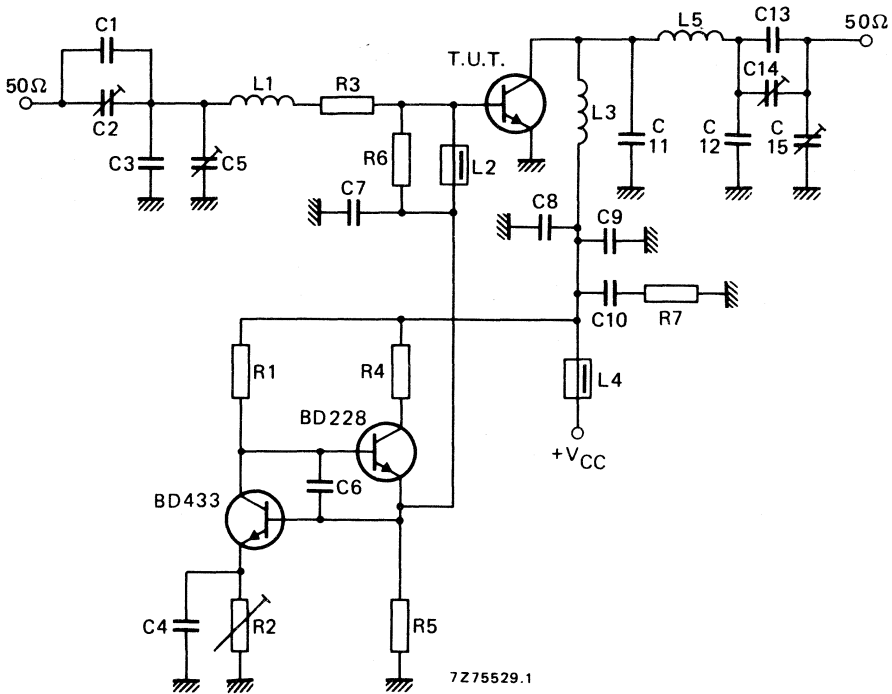


Fig. 8 Test circuit; s.s.b. class-AB.

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 μ F moulded metallized polyester capacitor
- C11 = 2 x 180 pF polysterene 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)

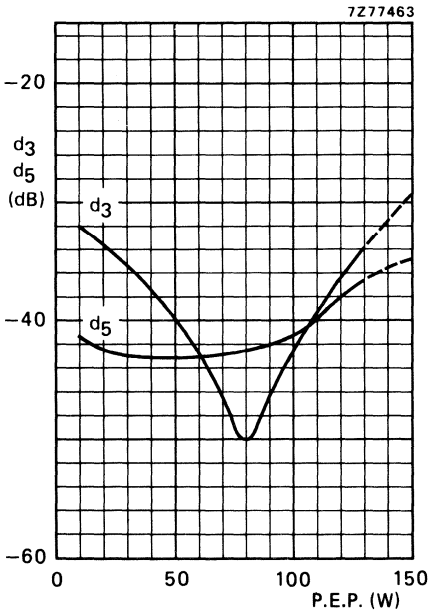


Fig. 9 Intermodulation distortion as a function of output power.*

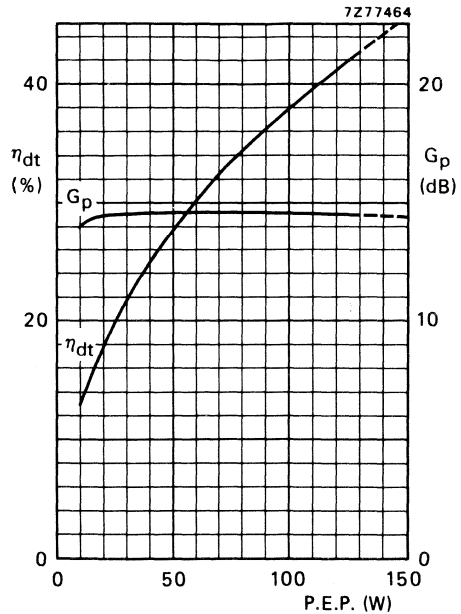


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 28 V; I_{C(ZS)} = 100 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)

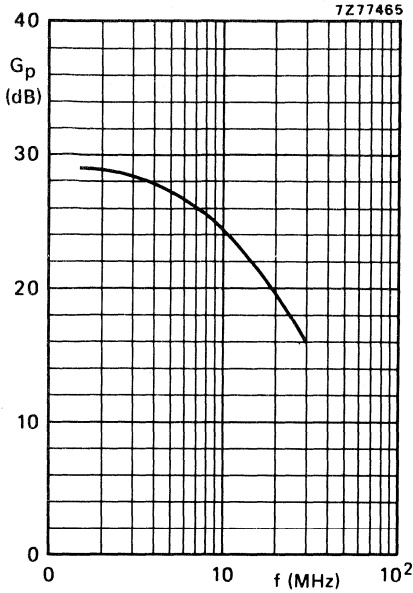


Fig. 11 Power gain as a function of frequency.

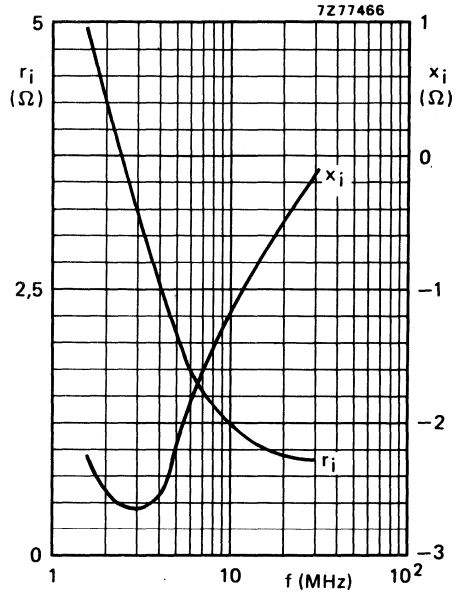


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.
 Conditions:
 $V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 100 \text{ mA}$; $P_L = 130 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; $Z_L = 2,5 \text{ } \Omega$.

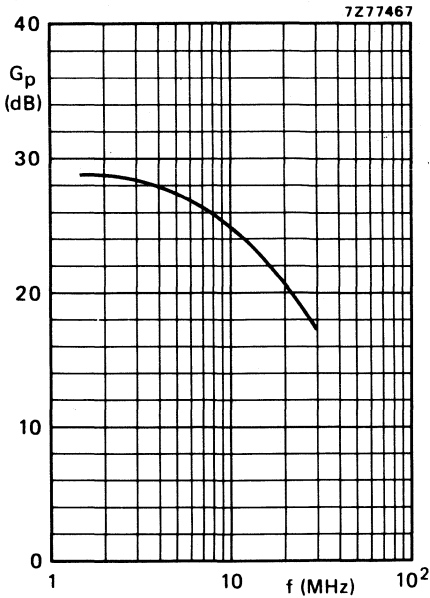


Fig. 13 Power gain as a function of frequency.

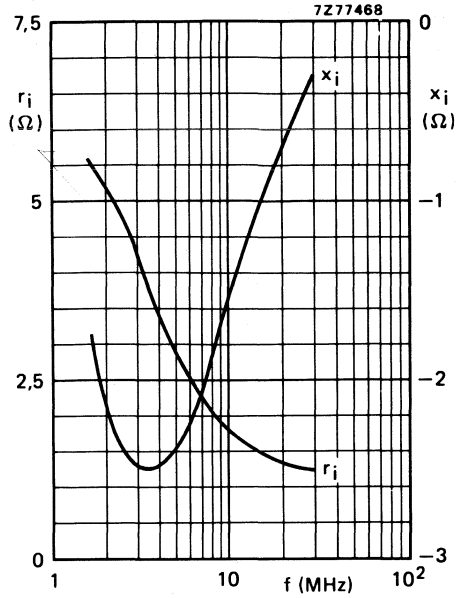


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for 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)

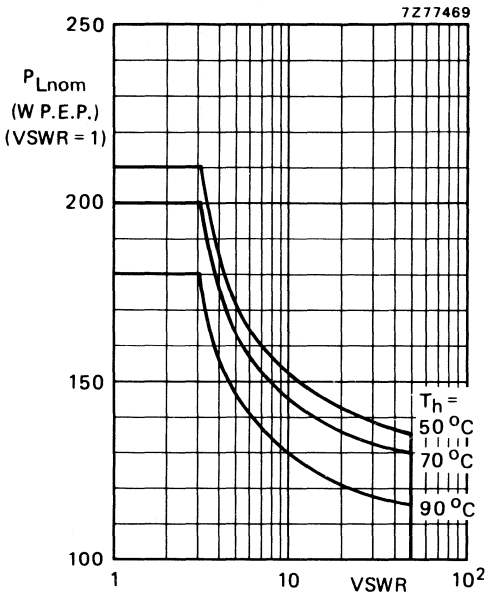


Fig. 15 R.F. SOAR; s.s.b. class-AB operation; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz; $V_{CE} = 28$ V; $R_{th\ mb-h} = 0,2$ K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

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

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

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 (mS)
87,5	28	130	typ. 23,2	typ. 7,5	typ. 6,2	typ. 75	$0,62 + j0,73$	$273 - j42$

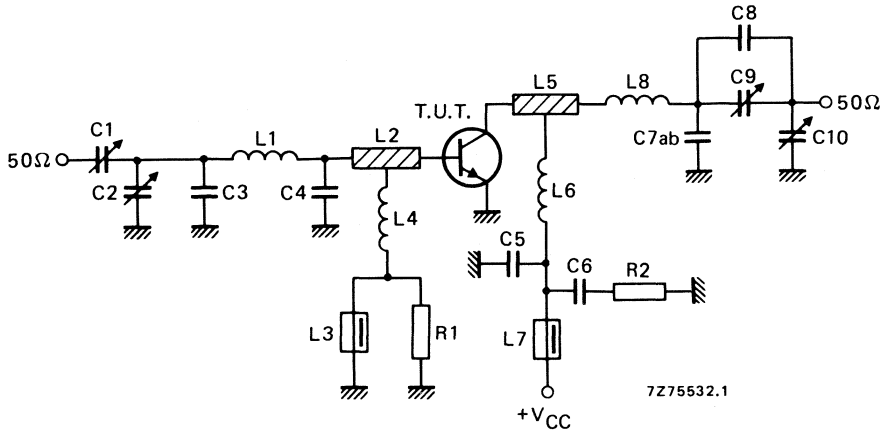


Fig. 16 Test circuit; c.w. class-B.

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. 17.

APPLICATION INFORMATION (continued)

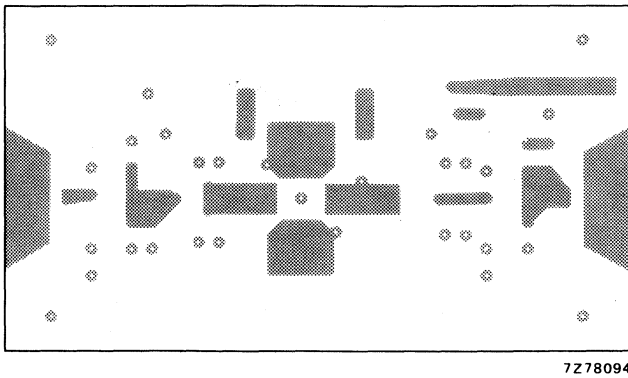
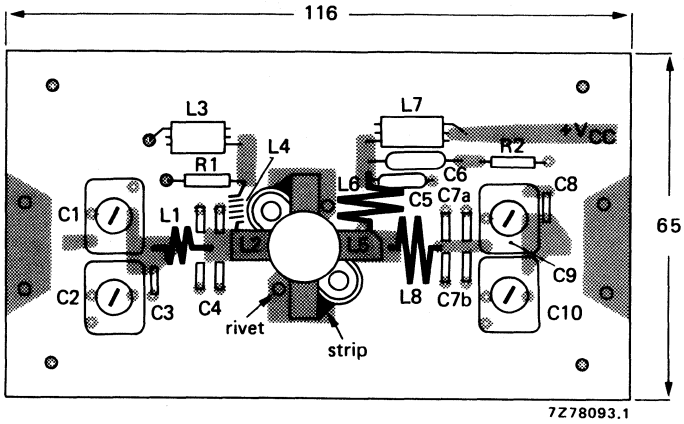


Fig. 17 Component layout and printed-circuit board for 87,5 MHz test circuit.

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 strips are used for a direct contact between upper and lower sheets.

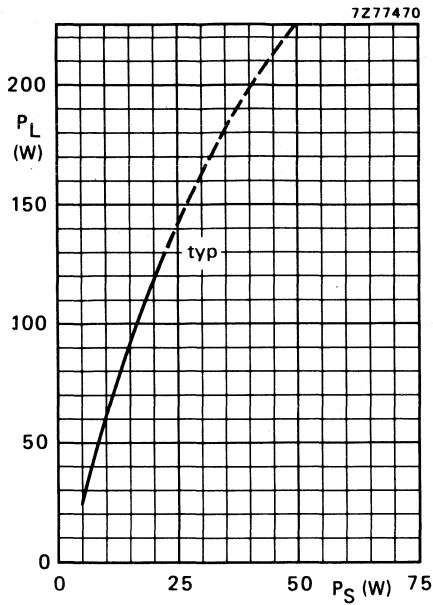


Fig. 18 $V_{CE} = 28 \text{ V}$; $f = 87,5 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$.

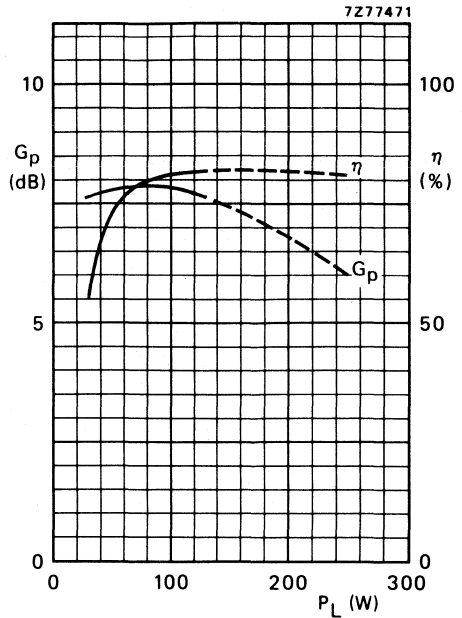


Fig. 19 $V_{CE} = 28 \text{ V}$; $f = 87,5 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; typical values.

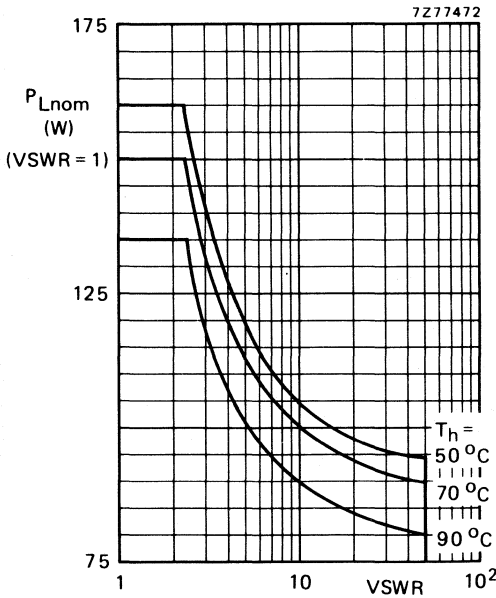


Fig. 20 R.F. SOAR; c.w. class-B operation; $f = 87,5 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$. The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

APPLICATION INFORMATION (continued)

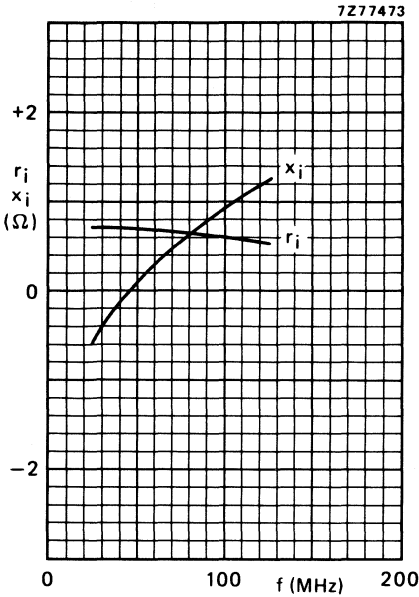


Fig. 21 $V_{CE} = 28 \text{ V}$; $P_L = 130 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; typical values.

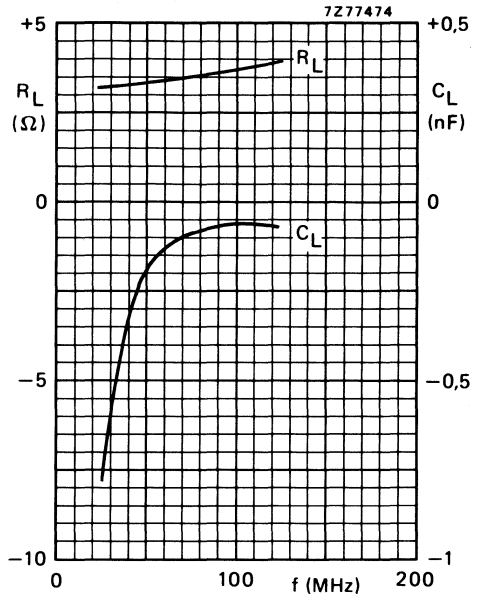


Fig. 22 $V_{CE} = 28 \text{ V}$; $P_L = 130 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$; typical values.

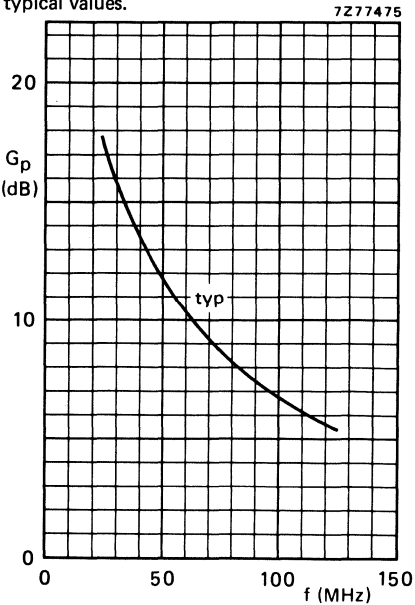


Fig. 23 $V_{CE} = 28 \text{ V}$; $P_L = 130 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-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 ½" 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	I_C $I_{C(ZS)}$ A	f MHz	P_L W	G_p dB	η %	d_3^* dB
c.w. (class-B)	28	—	150	100	> 6	> 70	—
s.s.b. (class-A)	26	3	28	35 (P.E.P.)	typ. 19,5	—	typ. -40
s.s.b. (class-AB)	28	0,05	28	100 (P.E.P.)	typ. 19,0	typ. 42	typ. -30

* 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.

MECHANICAL DATA

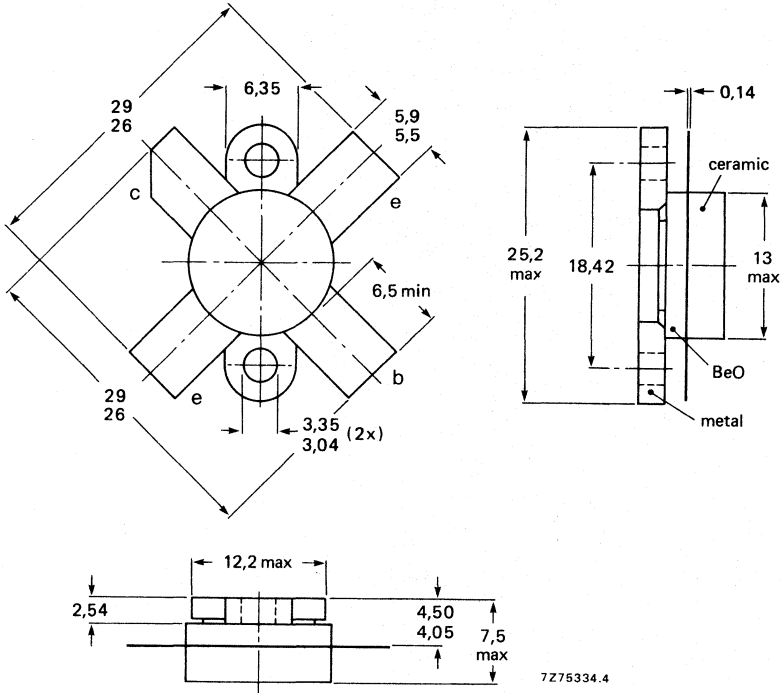
SOT-121 (see Fig. 1).

PRODUCT SAFETY 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-121.

Dimensions in mm



7Z75334.4

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

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

Heatsink compound must be applied sparingly and evenly distributed.

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

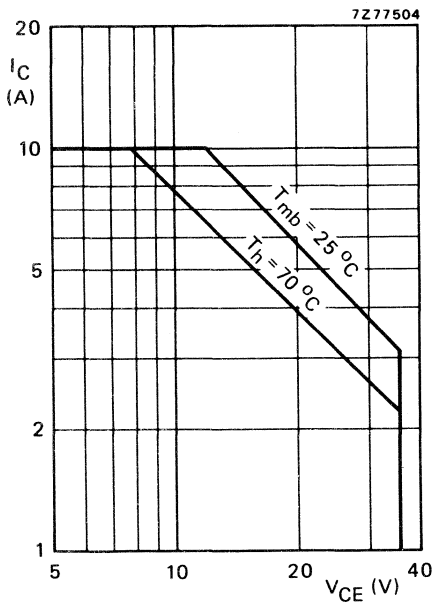


Fig. 2 D.C. SOAR.

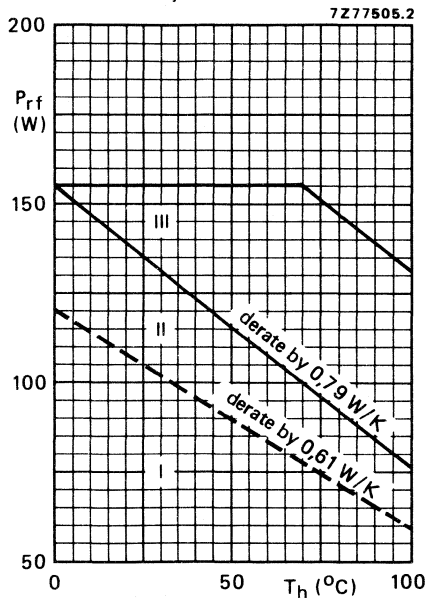


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- 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 K/W

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

$R_{th j-mb(rf)}$ = 1,06 K/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,2 K/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*

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

$h_{FE} 20\text{ to }85$

Collector-emitter saturation voltage

$I_C = 15\text{ A}; I_B = 3\text{ A}$

$V_{CEsat} \text{ typ. } 2\text{ V}$

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

$-I_E = 5\text{ A}; V_{CB} = 28\text{ V}$

$f_T \text{ typ. } 370\text{ MHz}$

$-I_E = 15\text{ A}; V_{CB} = 28\text{ V}$

$f_T \text{ typ. } 350\text{ MHz}$

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

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

$C_C \text{ typ. } 155\text{ pF}$

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

$I_C = 100\text{ mA}; V_{CE} = 28\text{ V}$

$C_{re} \text{ typ. } 102\text{ pF}$

Collector-flange capacitance

$C_{cf} \text{ typ. } 3\text{ pF}$

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

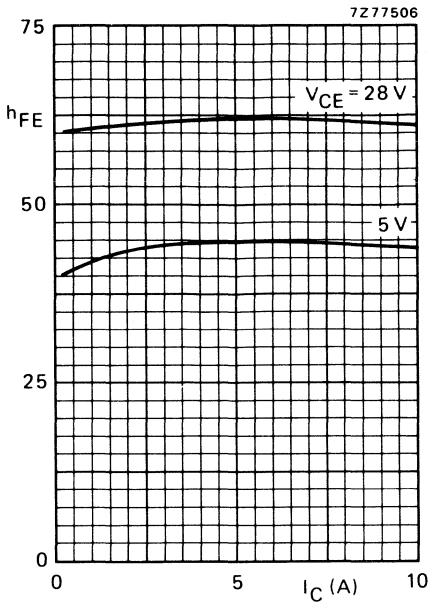


Fig. 4 Typical values; $T_j = 25^\circ C$.

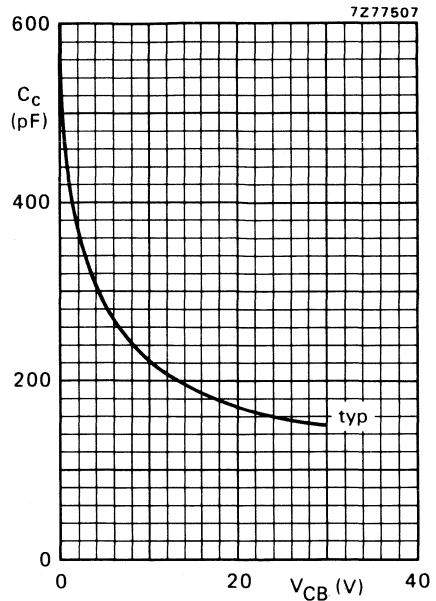


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

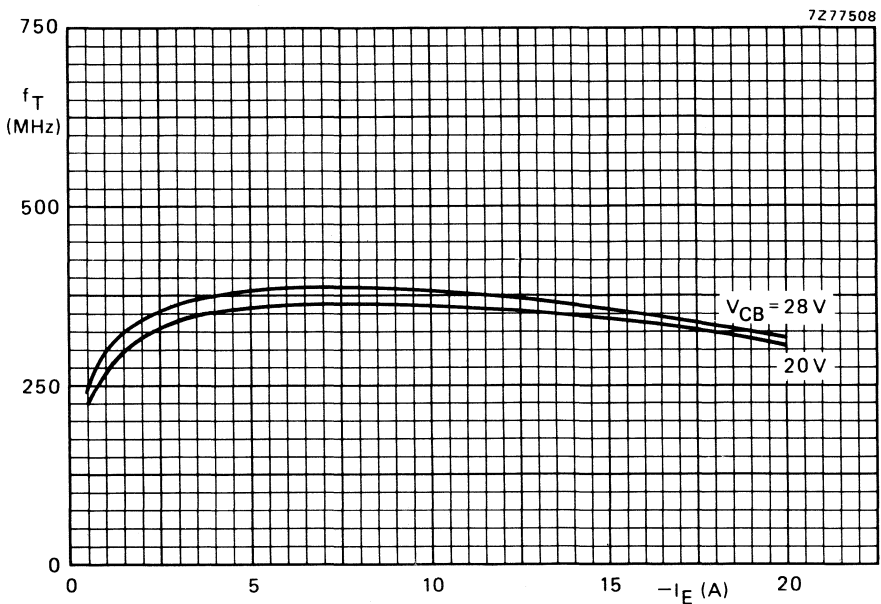
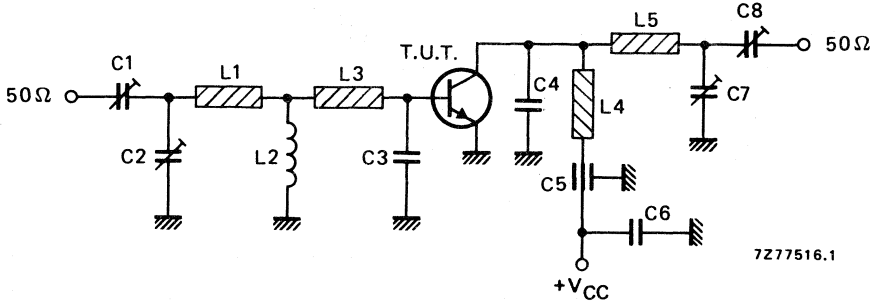


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ C$.

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_D (W)	η (%)	\bar{z}_i (Ω)	\bar{Z}_L (Ω)
150	28	100	≤ 25	≥ 70	$0,74 + j1,35$	$4,30 + j0,60$

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 multilayer ceramic chip capacitors (500 V, ATC[▲]) in parallelC4 = 39 pF multilayer ceramic chip capacitor (500 V, ATC[▲])


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 , 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

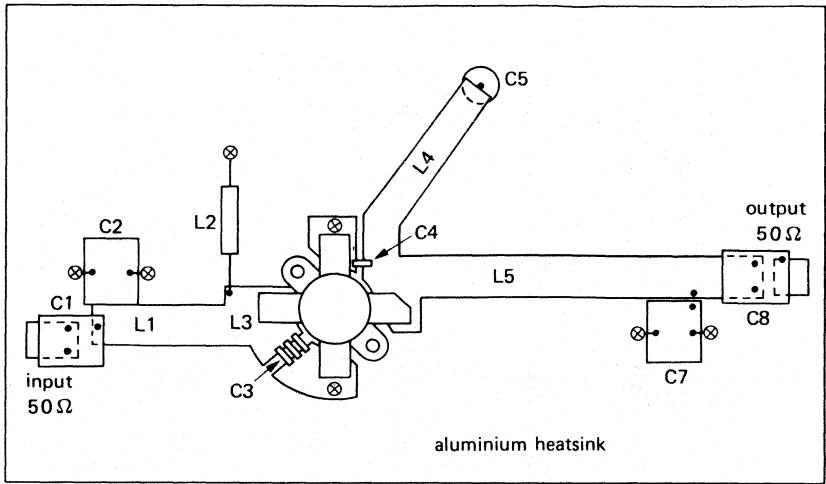
L1, L3, L4, and L5 are copper strips with a thickness of 0,6 mm.

Heatsink: aluminium; 0,9 K/W

At $P_L = 100\text{ W}$ and $V_{CE} = 28\text{ V}$, 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. 0,12 W/K.

Component layout on an aluminium heatsink for 150 MHz test circuit is shown in Fig. 8.

[▲] ATC means American Technical Ceramics.



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Fig. 8 Component layout on an aluminium heatsink for 150 MHz test circuit. ⊗ Earthing bolts.

APPLICATION INFORMATION (continued)

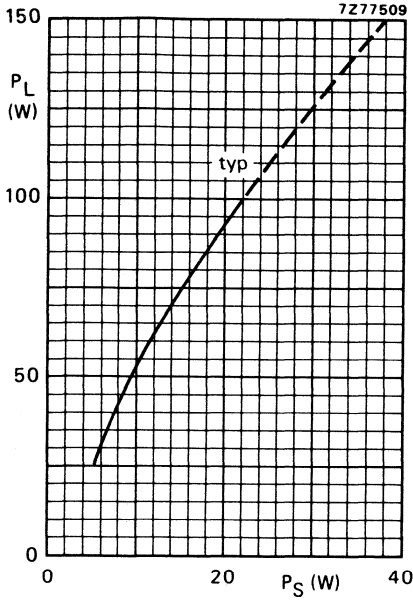


Fig. 9 $V_{CE} = 28$ V; $f = 150$ MHz; $T_h = 25$ °C.

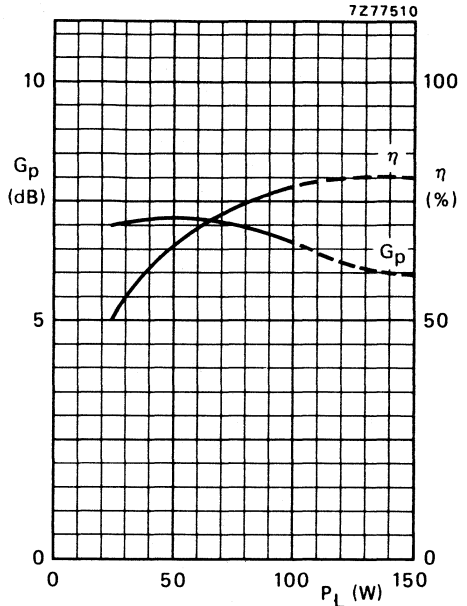


Fig. 10 $V_{CE} = 28$ V; $f = 150$ MHz; $T_h = 25$ °C; typical values.

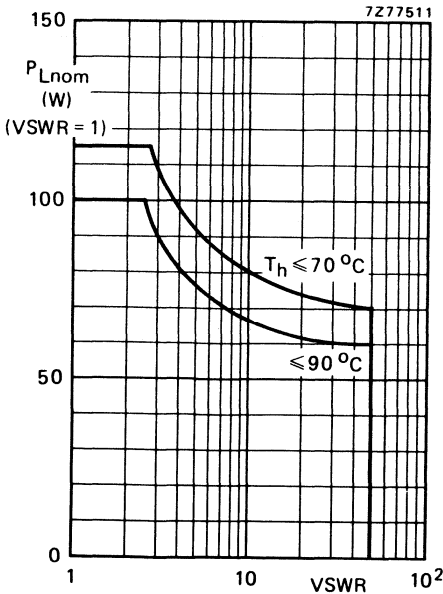


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 150$ MHz; $V_{CE} = 28$ V; $R_{th\ mb-h} = 0,2$ K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 4,7 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

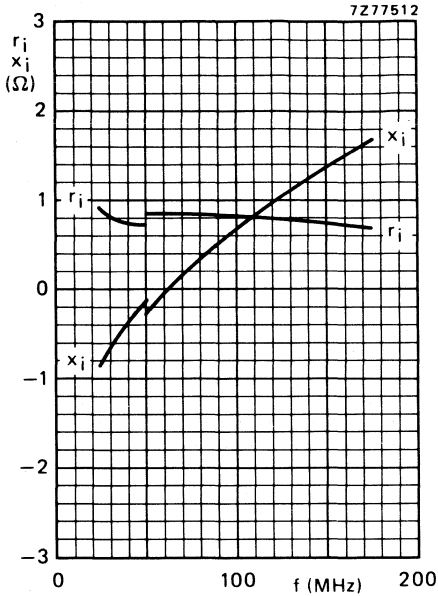


Fig. 12 Input impedance (series components).

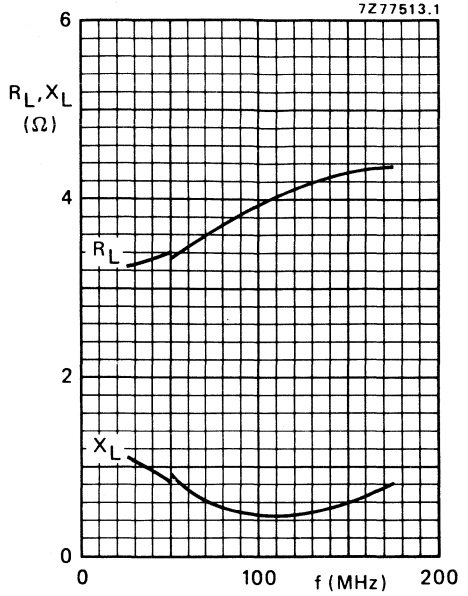


Fig. 13 Load impedance (series components).

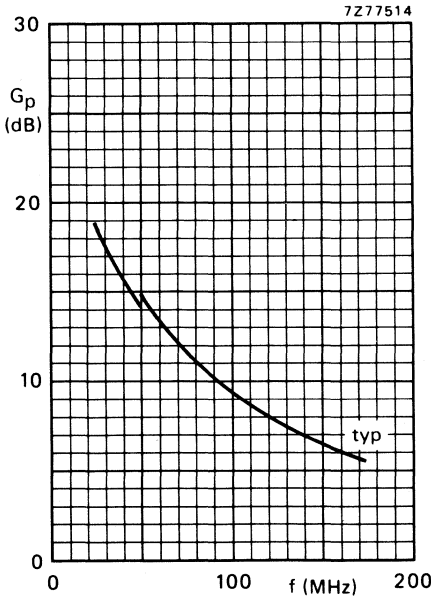


Fig. 14.

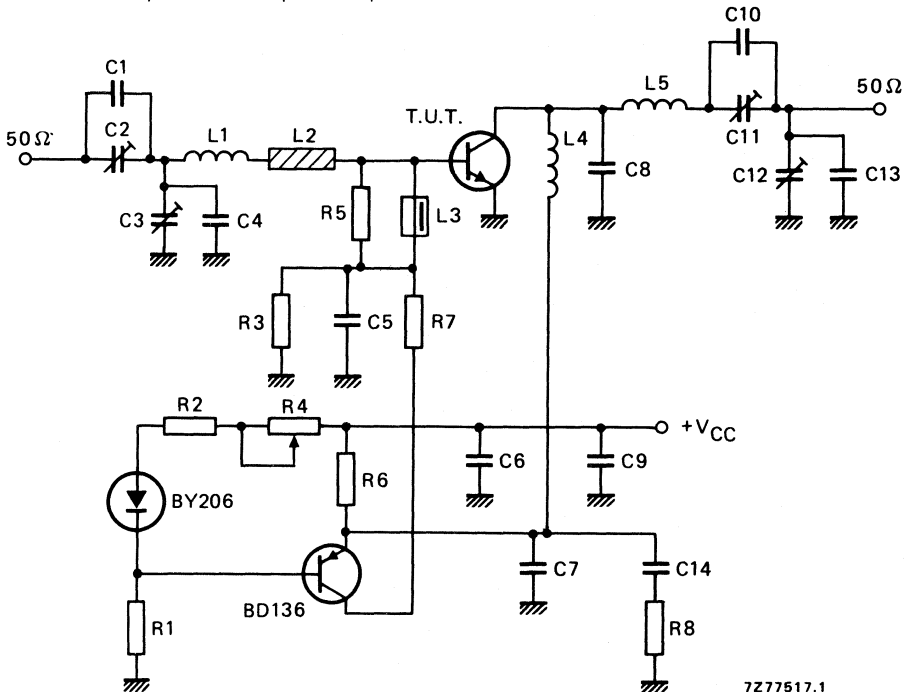
Conditions for Figs 12, 13 and 14:
 $V_{CE} = 28 \text{ V}$; $P_L = 100 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$;
 typical values; class-B operation.

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



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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 = 300 nH; 6 turns Cu wire (1,5 mm); int. dia. 12 mm; length 16 mm; leads 2 x 5 mm

L5 = 330 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

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)

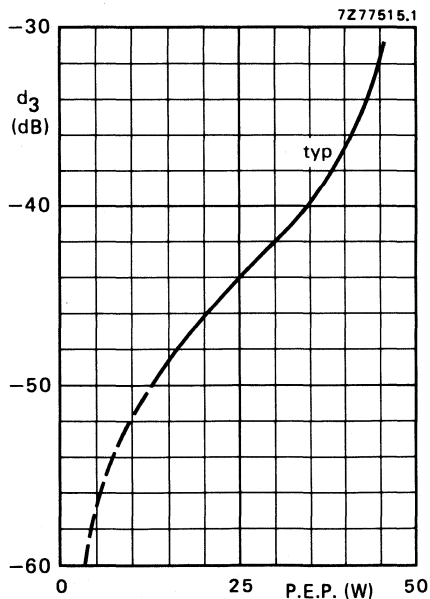


Fig. 16 Intermodulation distortion as a function of output power; $V_{CE} = 26$ V; $I_C = 3$ A; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz; $T_H = 40$ °C.

APPLICATION INFORMATION (continued)

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} %	I_C A	d_3^* dB	d_5^* dB	$I_{C(ZS)}$ mA
100 (P.E.P.)	typ. 19	typ. 42	typ. 4,3	typ. -30	typ. -37	50

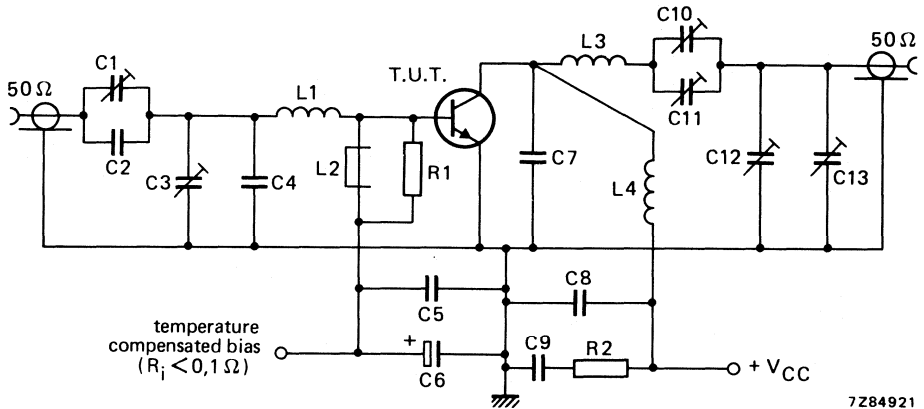


Fig. 17 Test circuit; s.s.b. class-AB; $f = 28 \text{ MHz}$.

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List of components:

- C1 = C11 = 150 pF air dielectric trimmer (single insulated rotor type)
- C2 = 27 pF ceramic capacitor (500 V)
- C3 = C12 = 150 pF air dielectric trimmer (single non-insulated rotor type)
- C4 = 180 pF ceramic capacitor (500 V)
- C5 = C8 = 3,9 nF ceramic capacitor
- C6 = 150 $\mu\text{F}/6 \text{ V}$ solid tantalum capacitor
- C7 = 150 pF ceramic capacitor (500 V)
- C9 = 100 nF polyester capacitor
- C10 = 750 pF mica dielectric trimmer (single insulated rotor type)
- C13 = 750 pF mica dielectric trimmer (single non-insulated rotor type)
- L1 = 3 turns enamelled Cu wire (1,0 mm); int. dia. 12 mm; length 12 mm
- L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
- L3 = 3 turns enamelled Cu wire (2,0 mm); int. dia. 12 mm; length 12 mm
- L4 = 2 turns enamelled Cu wire (2,0 mm); int. dia. 12 mm; length 8 mm
- R1 = 27 Ω ($\pm 10\%$) carbon resistor (0,5 W)
- R2 = 4,7 Ω ($\pm 10\%$) carbon resistor (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.

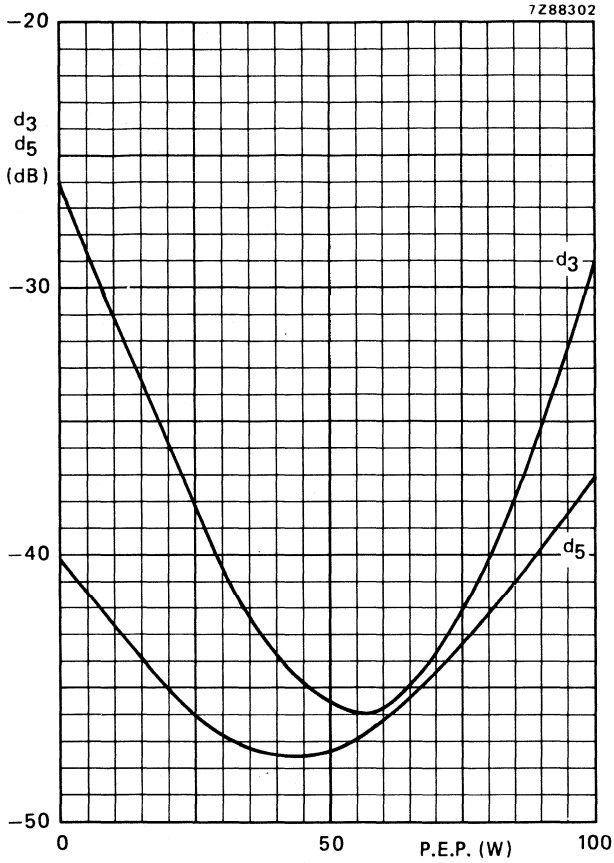


Fig. 18 Intermodulation distortion* as a function of output power.
Typical values; $V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 50 \text{ mA}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$.

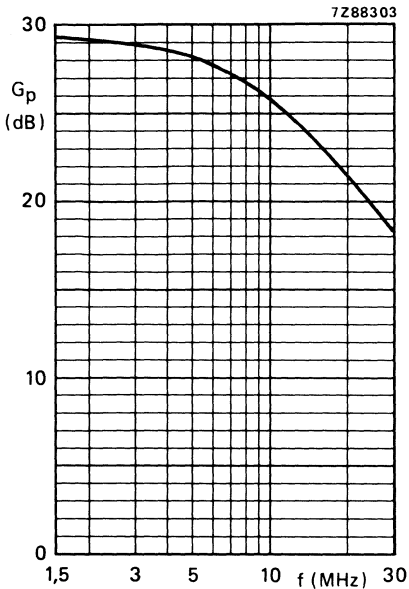


Fig. 19 Power gain as a function of frequency.

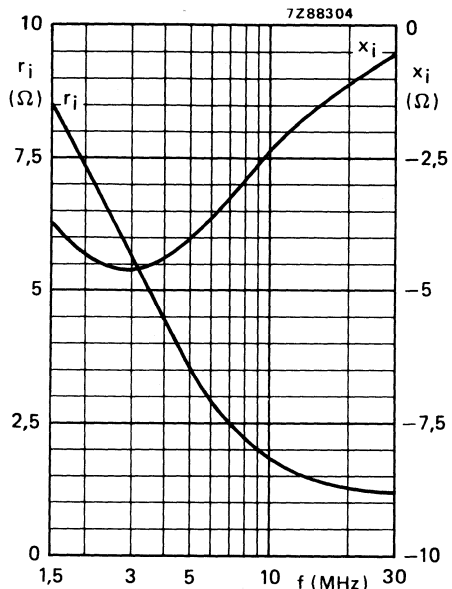


Fig. 20 Input impedance (series components).

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.
 Conditions:

$V_{CE} = 28 \text{ V}; I_{C(ZS)} = 50 \text{ mA}; P_L = 100 \text{ W (P.E.P.)}; T_H = 25 \text{ }^\circ\text{C}; Z_L = 2,7 \text{ } \Omega.$

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

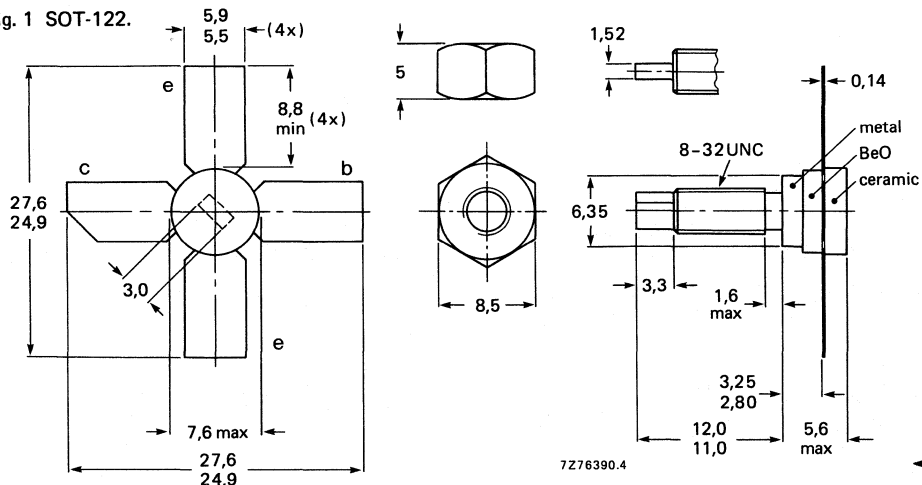
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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

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.

PRODUCT SAFETY 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)

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 (d.c.)

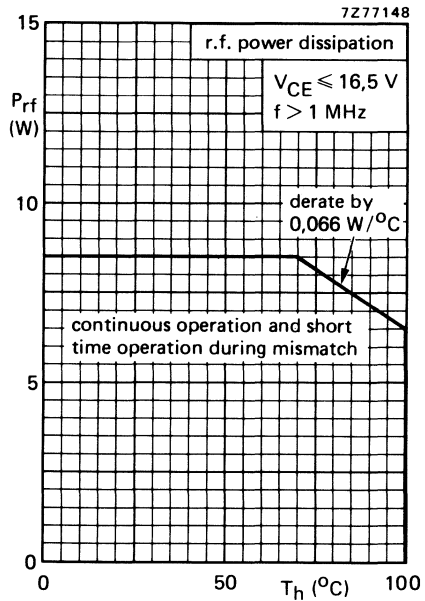
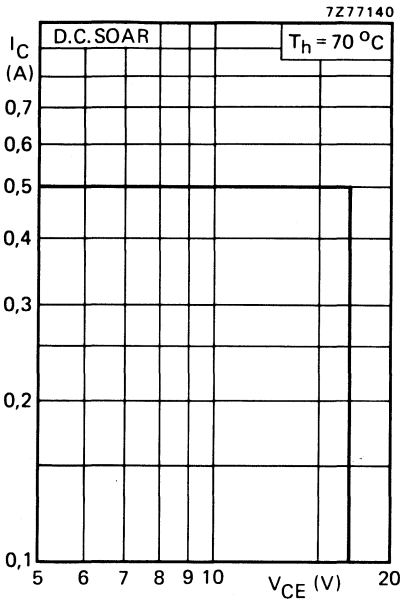
I_C max 0,5 A

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

I_{CM} max 1,5 A

Total power dissipation (d.c. and r.f.) up to $T_h = 70$ °C

P_{tot} max 8,5 W



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 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,6 K/W

CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ **Breakdown voltages**

Collector-emitter voltage

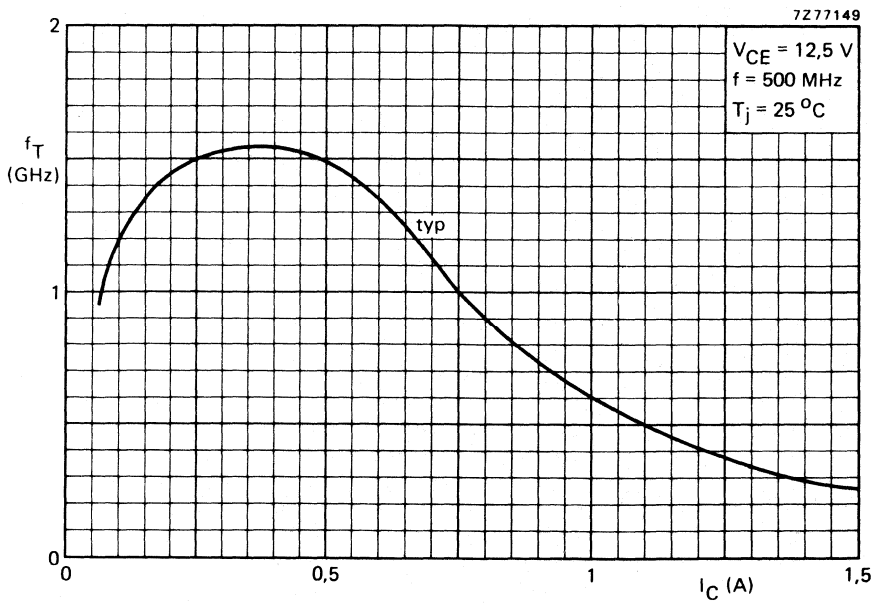
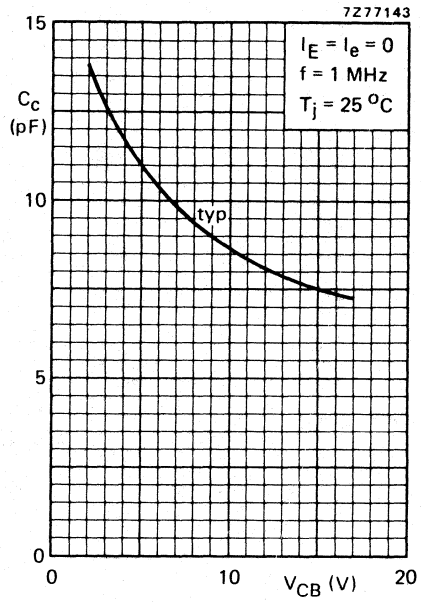
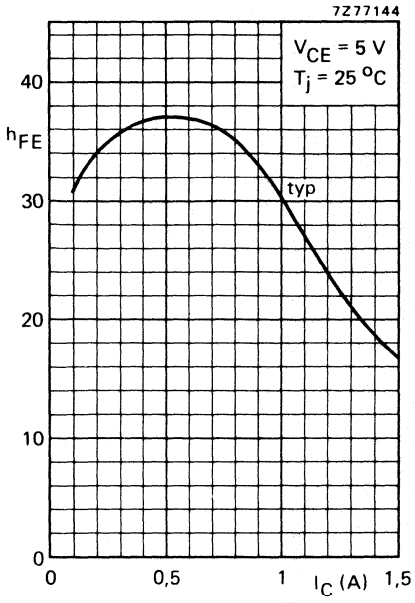
 $V_{BE} = 0; I_C = 5\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

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 *** $I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$ $h_{FE} > 10$
typ 35**Collector-emitter saturation voltage *** $I_C = 750\text{ mA}; I_B = 150\text{ mA}$ V_{CEsat} typ 0,6 V**Transition frequency at $f = 500\text{ MHz}$ *** $I_C = 250\text{ mA}; V_{CE} = 12,5\text{ V}$ f_T typ 1,5 GHz $I_C = 750\text{ mA}; V_{CE} = 12,5\text{ V}$ f_T typ 1,0 GHz**Collector capacitance at $f = 1\text{ MHz}$** $I_E = I_e = 0; V_{CB} = 12,5\text{ V}$ C_c typ 8 pF**Feedback capacitance at $f = 1\text{ MHz}$** $I_C = 20\text{ mA}; V_{CE} = 12,5\text{ V}$ C_{re} typ 3,6 pF**Collector-stud capacitance** C_{cs} typ 1,2 pF ←* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



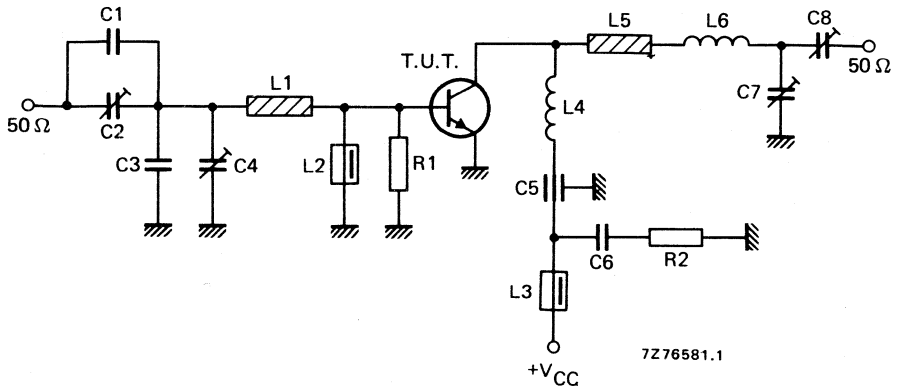
APPLICATION INFORMATION

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

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

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 (mS)
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

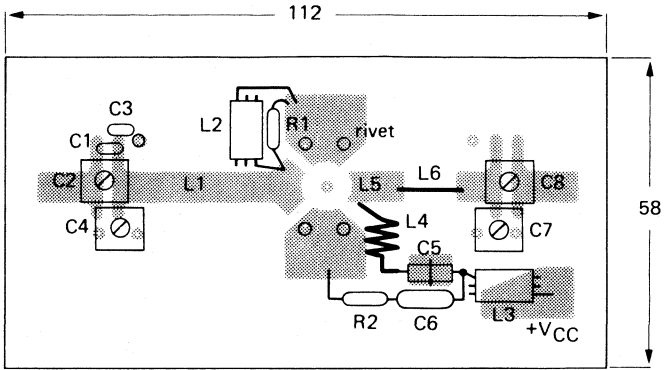
L5 = stripline (10,0 mm x 6,0 mm)

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

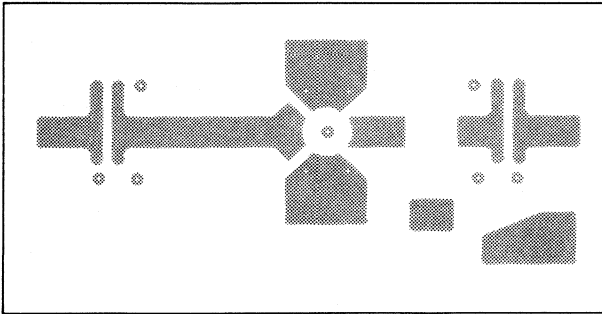
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.

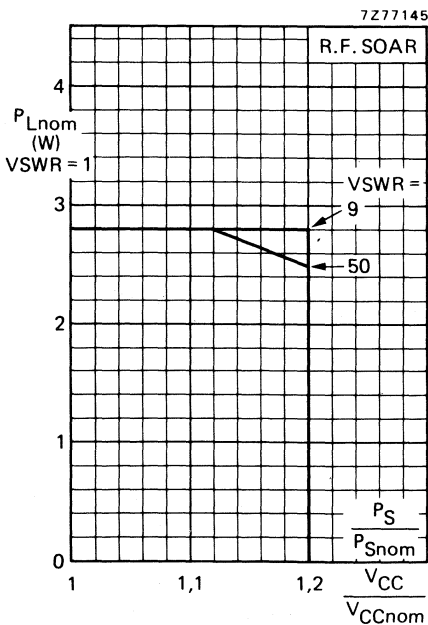
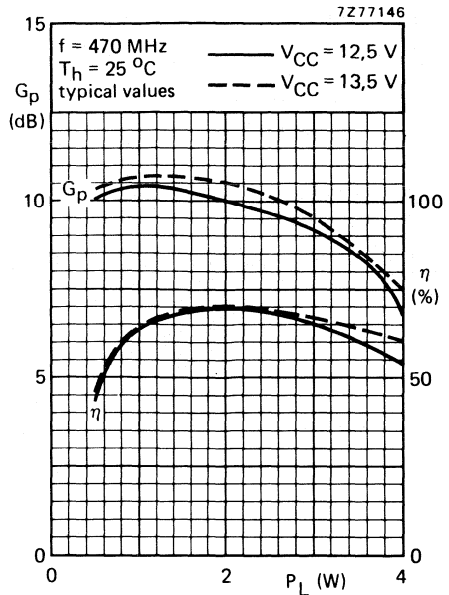
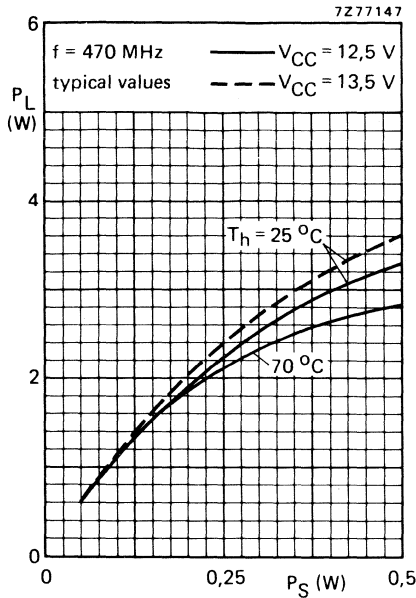


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The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



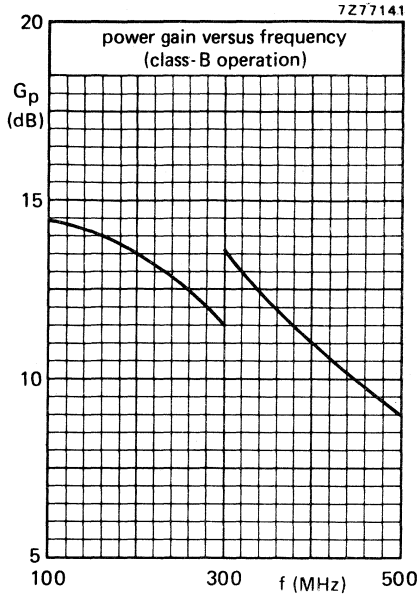
Conditions for R.F. SOAR

$f = 470 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,6 \text{ K/W}$
 $V_{CCnom} = 12,5 \text{ V or } 13,5 \text{ V}$
 $P_S = P_{Snom} \text{ at } V_{CCnom} \text{ and } V_{SWR} = 1$
 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.

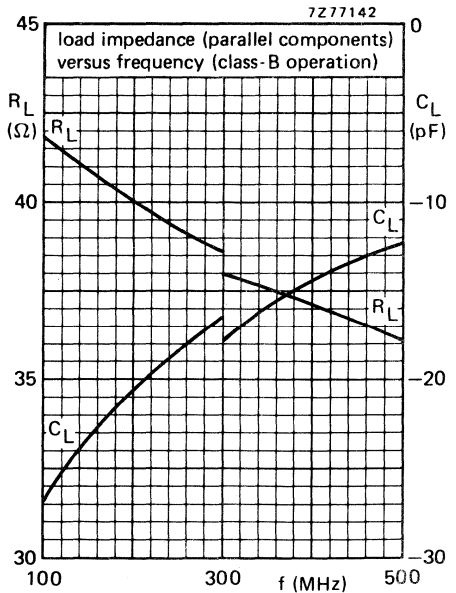
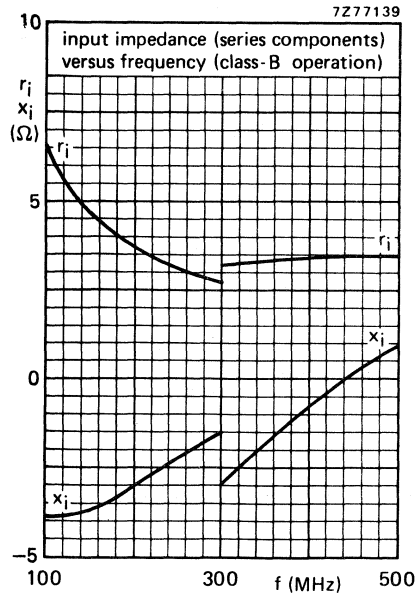
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

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

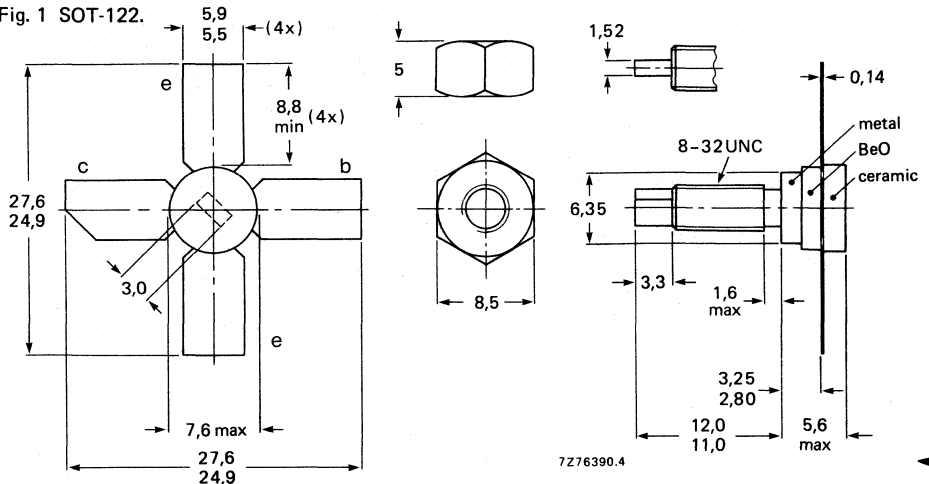
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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

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.

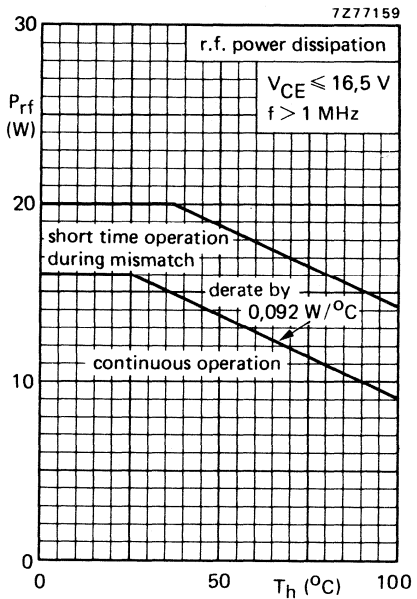
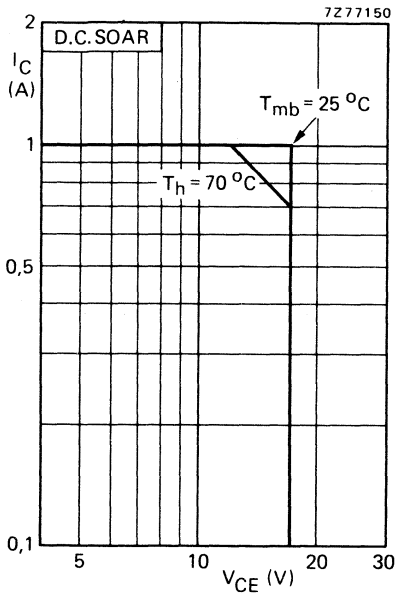
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY 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)

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 (d.c.)	I_C	max	1 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max	3 A
Total power dissipation (d.c. and r.f.) up to $T_{mb} = 25$ °C	P_{tot}	max	17 W



Storage temperature	T_{stg}	-65 to +150 °C
Operating junction temperature	T_j	max 200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	10,3 °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

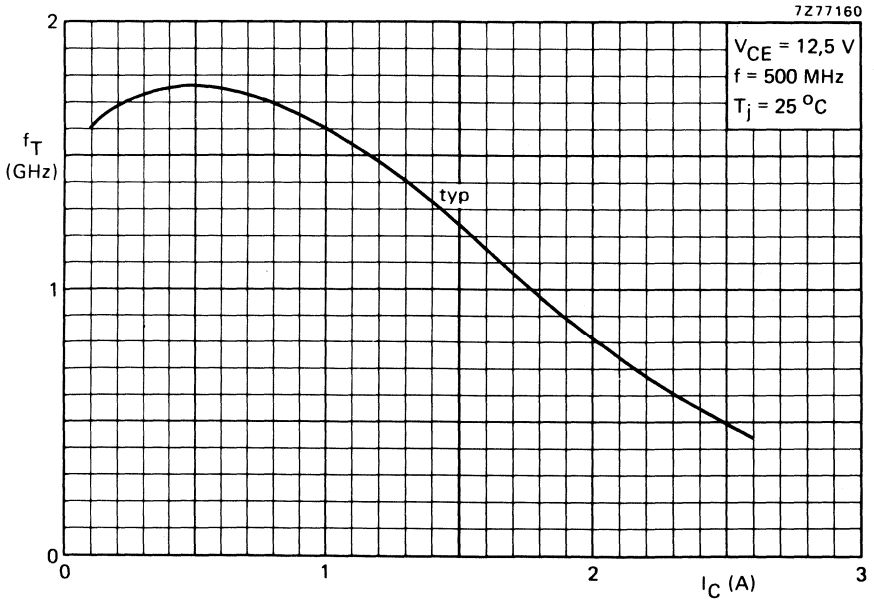
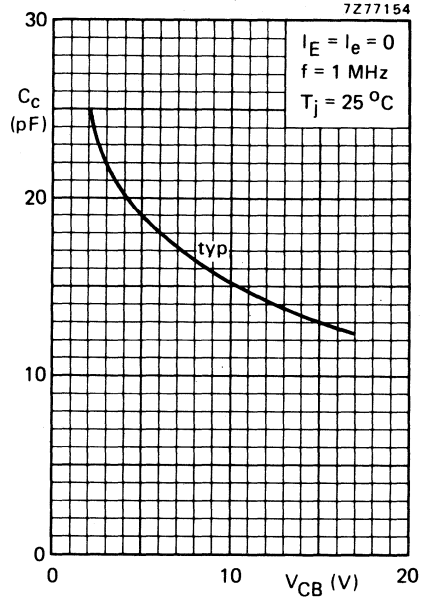
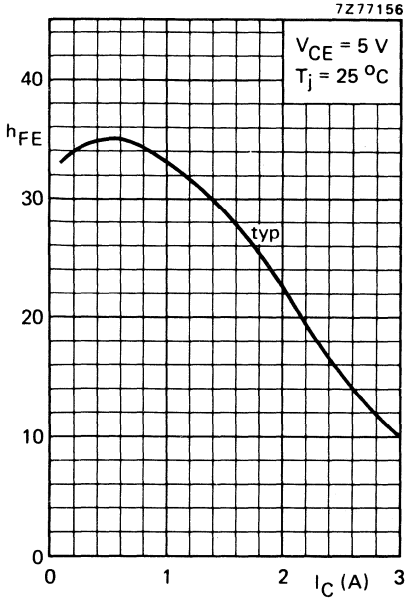
 $V_{BE} = 0; I_C = 10\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

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 *** $I_C = 0,5\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE} > 10$
typ 35**Collector-emitter saturation voltage *** $I_C = 1,5\text{ A}; I_B = 0,3\text{ A}$ V_{CEsat} typ 0,75 V**Transition frequency at $f = 500\text{ MHz}$ *** $I_C = 0,5\text{ A}; V_{CE} = 12,5\text{ V}$ f_T typ 1,75 GHz $I_C = 1,5\text{ A}; V_{CE} = 12,5\text{ V}$ f_T typ 1,25 GHz**Collector capacitance at $f = 1\text{ MHz}$** $I_E = I_e = 0; V_{CB} = 12,5\text{ V}$ C_c typ 14 pF**Feedback capacitance at $f = 1\text{ MHz}$** $I_C = 40\text{ mA}; V_{CE} = 12,5\text{ V}$ C_{re} typ 7,1 pF**Collector-stud capacitance** C_{cs} typ 1,2 pF ←* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



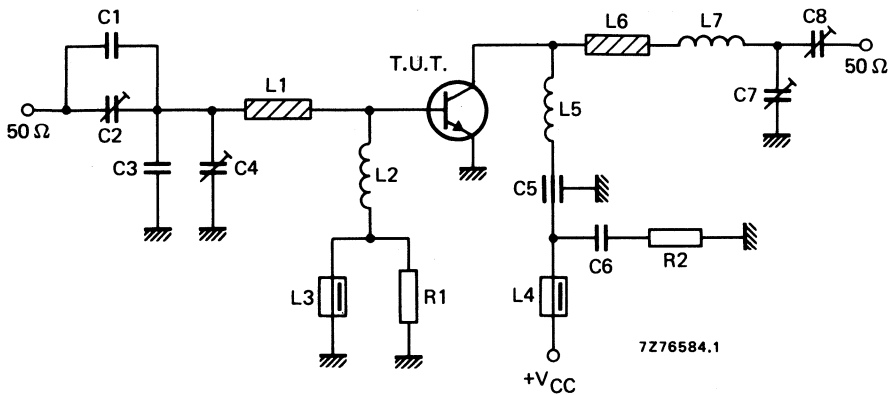
APPLICATION INFORMATION

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

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

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mS)
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 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 = 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 x 5 mm

L6 = stripline (10,0 mm x 6,0 mm)

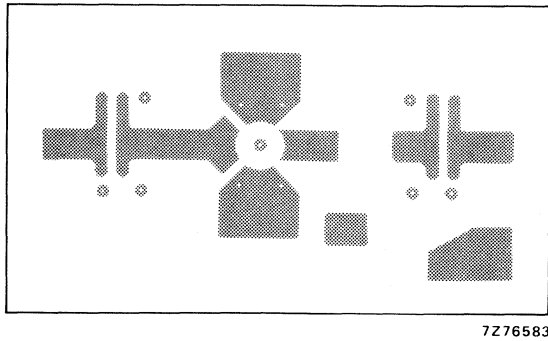
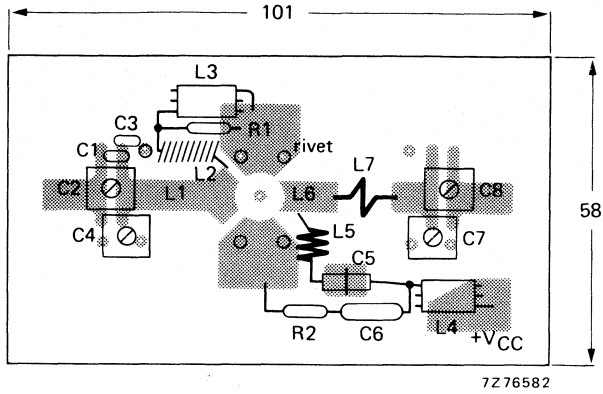
L7 = 15 nH; 1 turn Cu wire (1 mm); int. dia. 5 mm; leads 2 x 5 mm

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 ($\pm 5\%$) carbon resistor

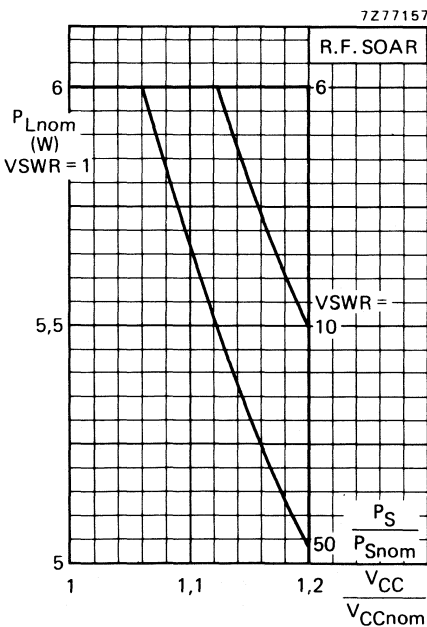
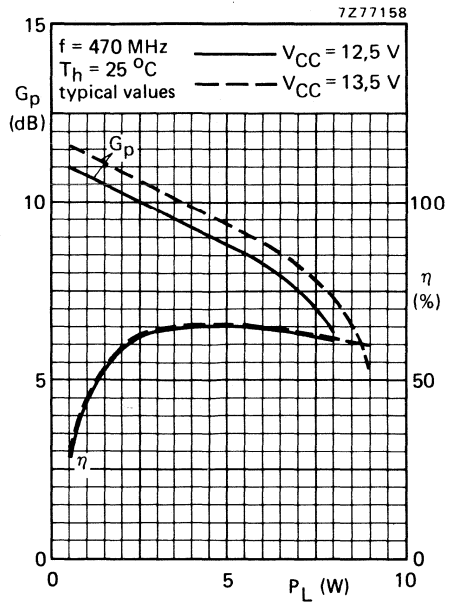
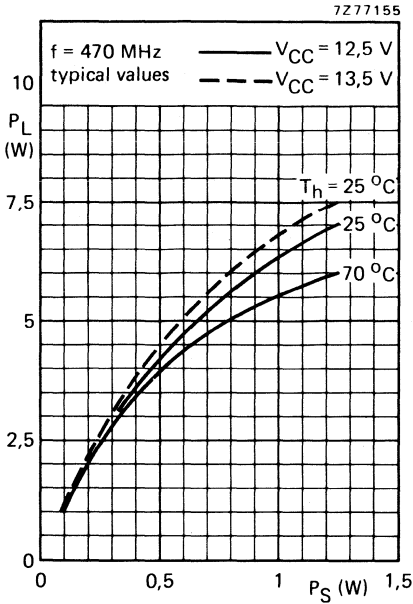
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

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.



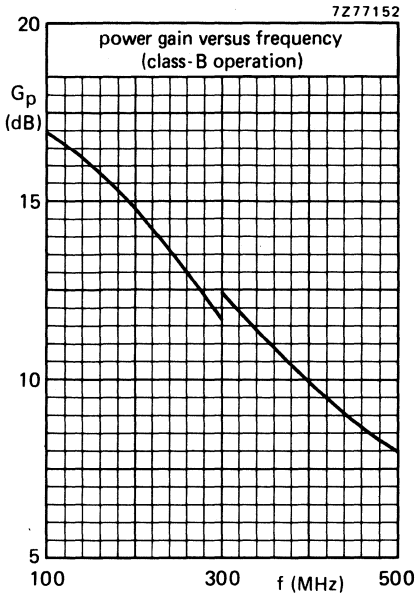
Conditions for R.F. SOAR

$f = 470 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,6 \text{ K/W}$
 $V_{CCnom} = 12,5 \text{ V or } 13,5 \text{ V}$
 $P_S = P_{Snom}$ 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.



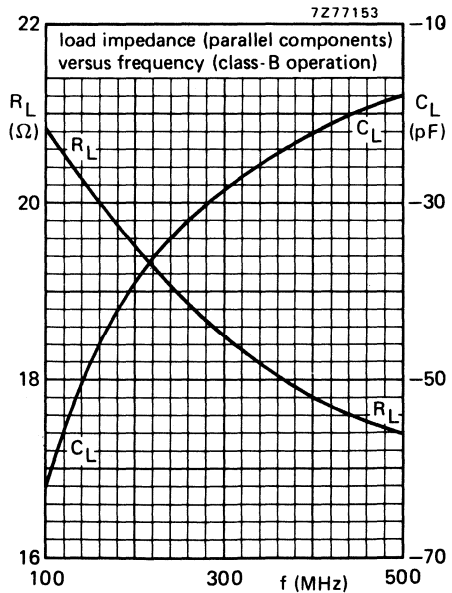
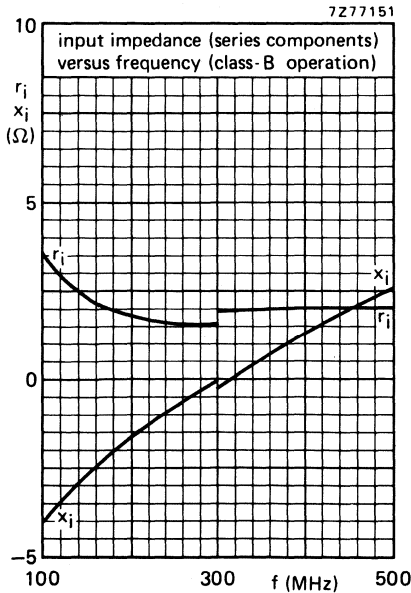
Measuring conditions for the graphs on this page

$V_{CC} = 12,5\ V$

$P_L = 4\ W$

$T_h = 25\ ^\circ C$

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

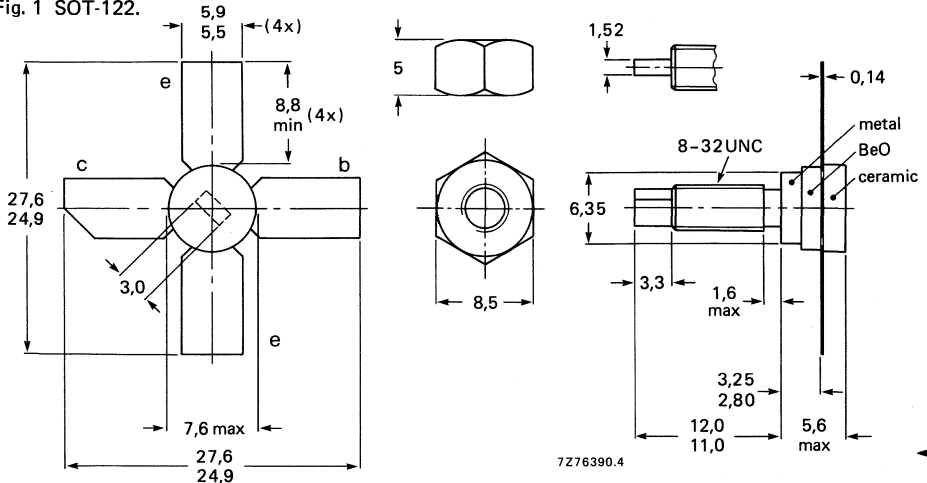
R.F. performance up to $T_H = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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

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.

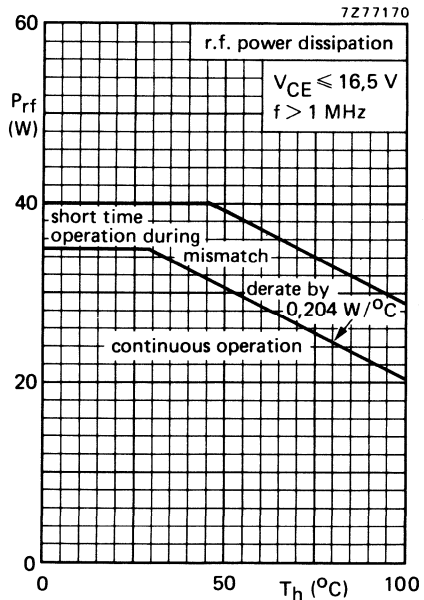
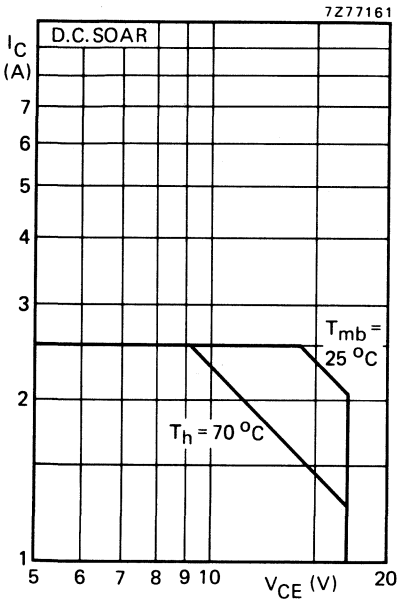
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY 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)

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 (d.c. or average)	I_C	max	2,5 A
Collector current (peak value); $f > 1$ MHz	I_{CM}	max	7,5 A
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{tot}	max	40 W



Storage temperature
Operating junction temperature

T_{stg}	-65 to +150 °C
T_j	max 200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	4,3 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6 K/W

CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ **Breakdown voltages**

Collector-emitter voltage

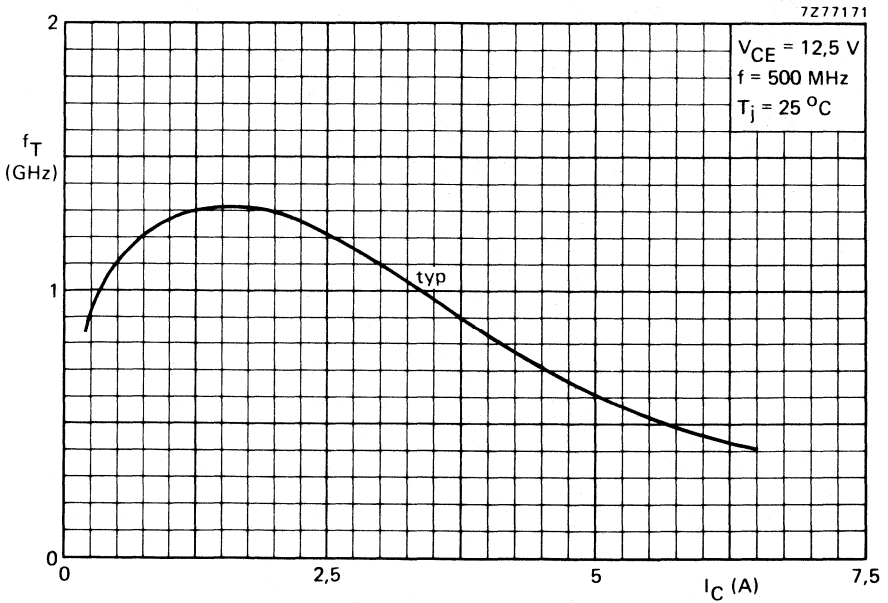
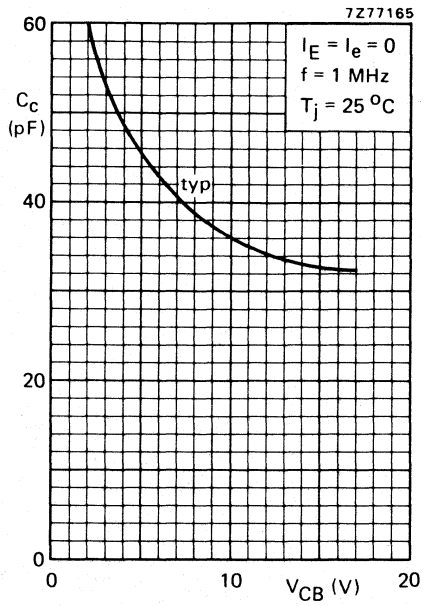
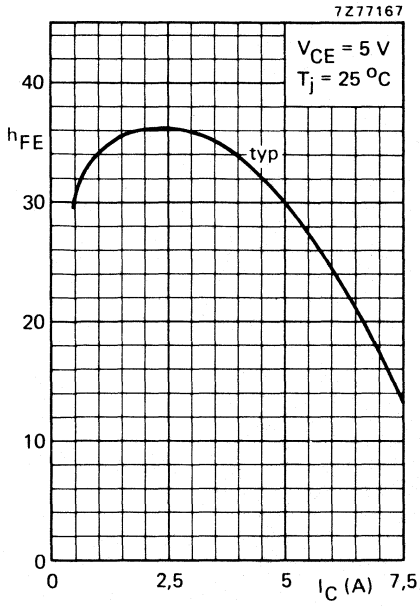
 $V_{BE} = 0; I_C = 25\text{ mA}$ $V_{(BR)CES} > 36\text{ V}$

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 *** $I_C = 1,25\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE} > 10$
typ 35**Collector-emitter saturation voltage *** $I_C = 3,75\text{ A}; I_B = 0,75\text{ A}$ V_{CEsat} typ 0,75 V**Transition frequency at $f = 500\text{ MHz}$ *** $I_C = 1,25\text{ A}; V_{CE} = 12,5\text{ V}$ f_T typ 1,3 GHz $I_C = 3,75\text{ A}; V_{CE} = 12,5\text{ V}$ f_T typ 0,9 GHz**Collector capacitance at $f = 1\text{ MHz}$** $I_E = I_e = 0; V_{CB} = 12,5\text{ V}$ C_c typ 34 pF**Feedback capacitance at $f = 1\text{ MHz}$** $I_C = 100\text{ mA}; V_{CE} = 12,5\text{ V}$ C_{re} typ 18 pF**Collector-stud capacitance** C_{CS} typ 1,2 pF ←* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



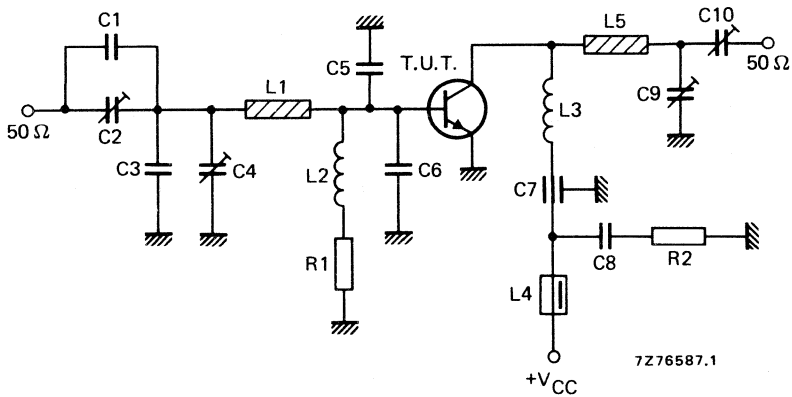
APPLICATION INFORMATION

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

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

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{V}_L (mS)
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)

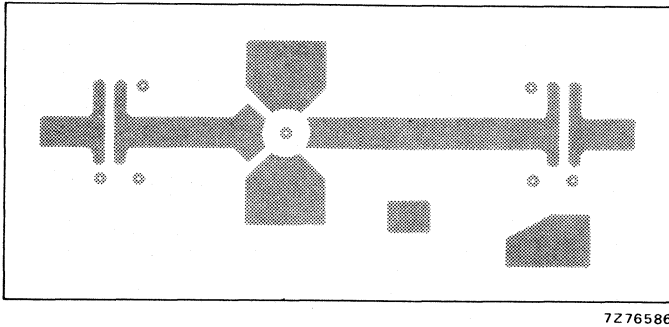
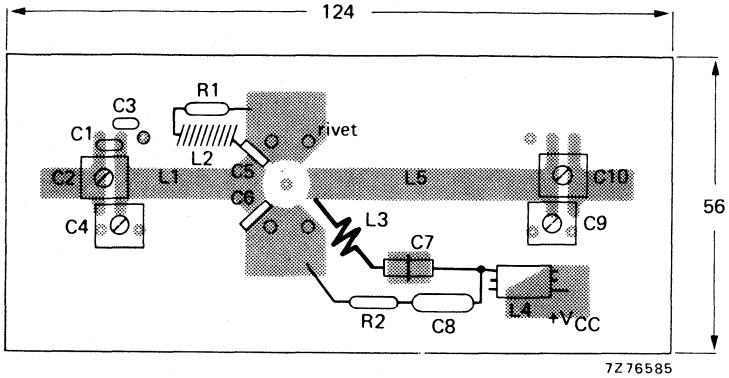
L5 = stripline (45,8 mm x 6,0 mm)

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

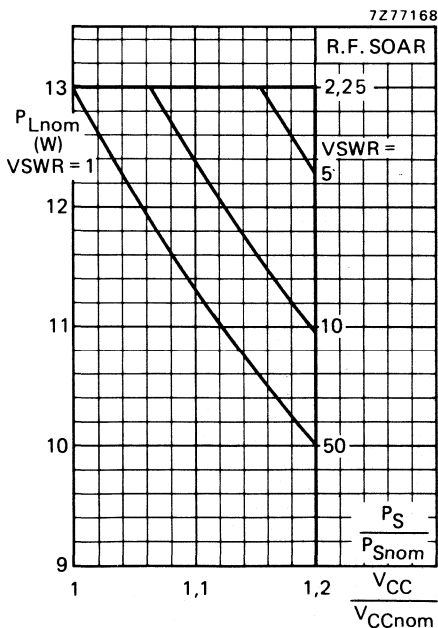
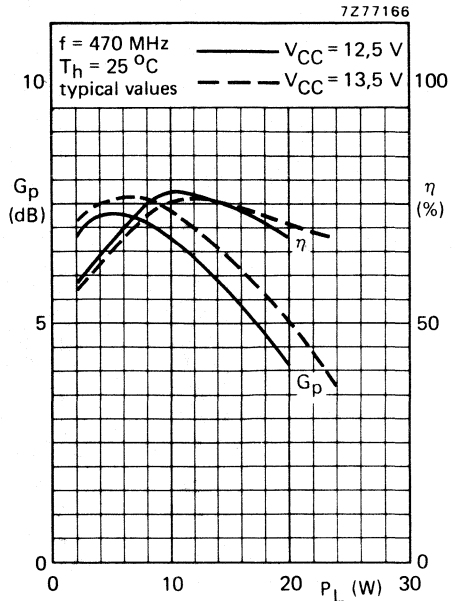
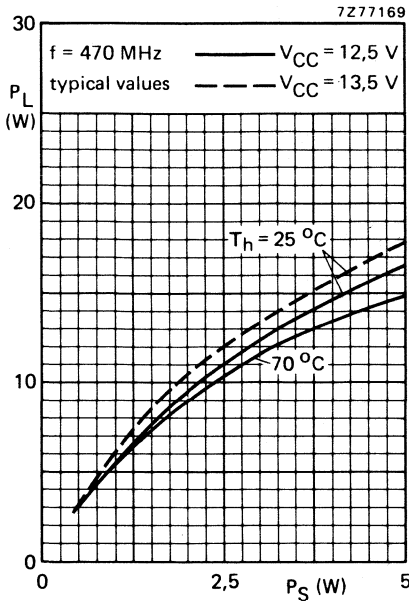
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.



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.



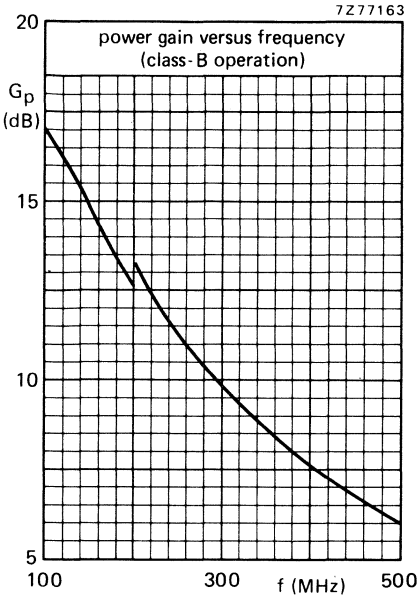
Measuring conditions for R.F. SOAR

$f = 470 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,6 \text{ K/W}$
 $V_{CCnom} = 12,5 \text{ V or } 13,5 \text{ V}$
 $P_S = P_{Snom}$ 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 200 MHz a base-emitter resistor of $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.



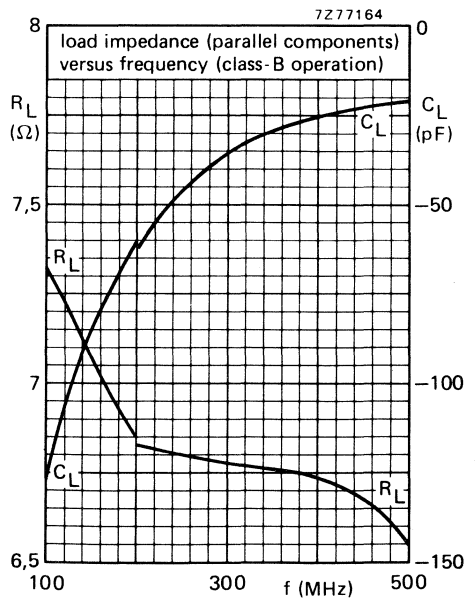
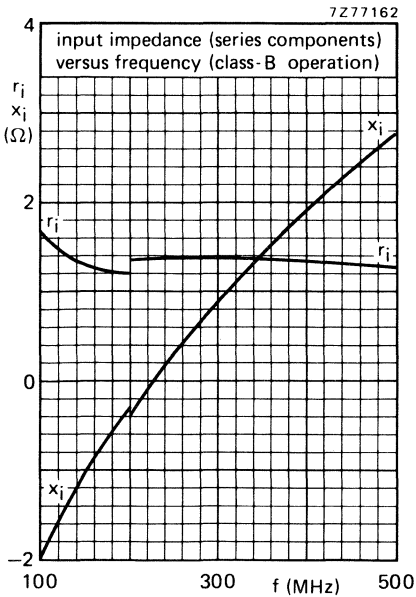
Measuring conditions for the graphs on this page

$V_{CC} = 12,5\ V$

$P_L = 10\ W$

$T_h = 25\ ^\circ C$

typical values



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

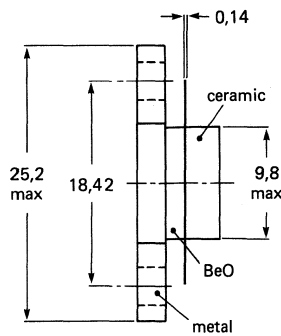
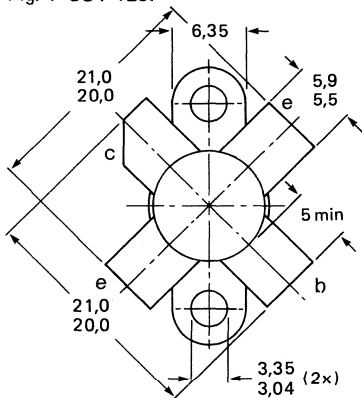
R.F. performance

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

Dimensions in mm

Fig. 1 SOT-123.

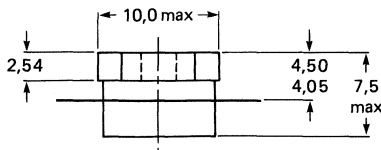


7277386.2

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

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

Heatsink compound must be applied sparingly and evenly distributed.



PRODUCT SAFETY 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

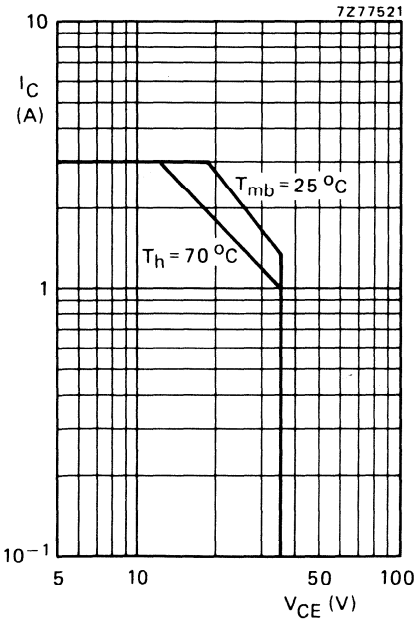


Fig. 2 D.C. SOAR.

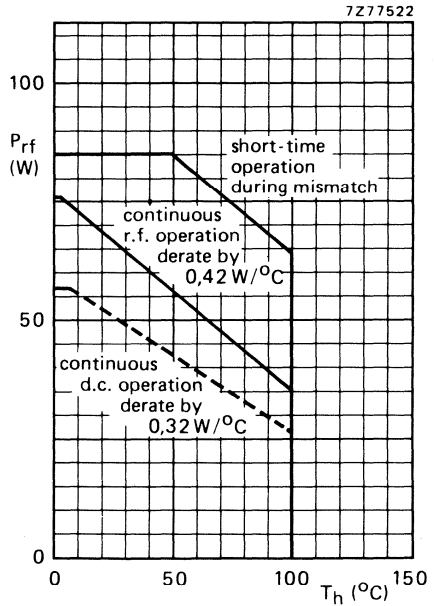


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	2,35 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,3 K/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

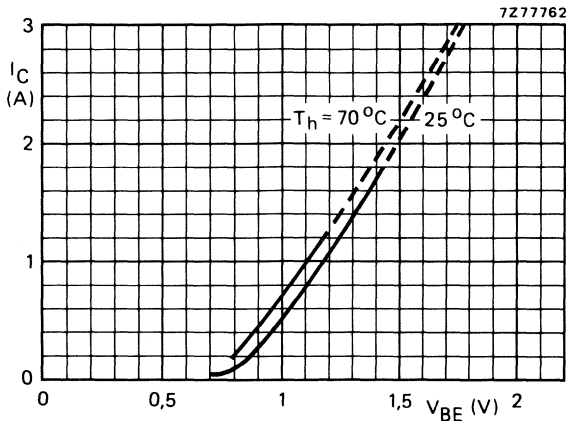


Fig. 4 Typical values; $V_{CE} = 28\text{ V}$.

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

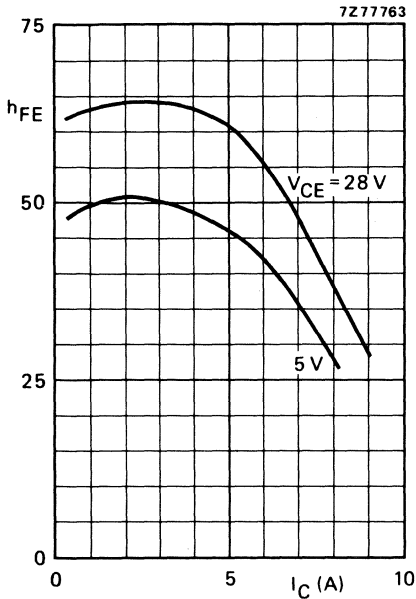


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

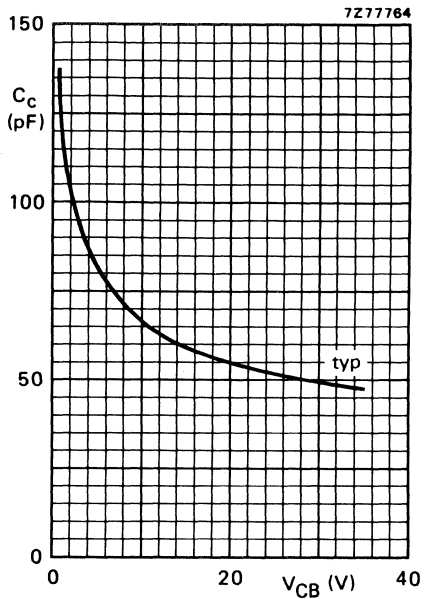


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

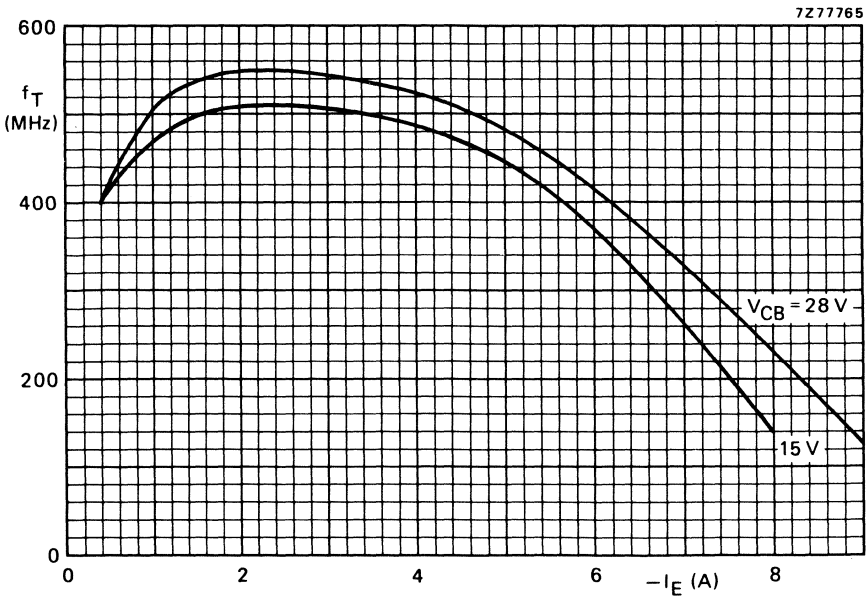


Fig. 7 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in 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
> 10 (P.E.P.) typ. 11 (P.E.P.)	> 20	1,35	-40	< -40	70
typ. 12 (P.E.P.)	typ. 24	1,35	-40	< -40	25

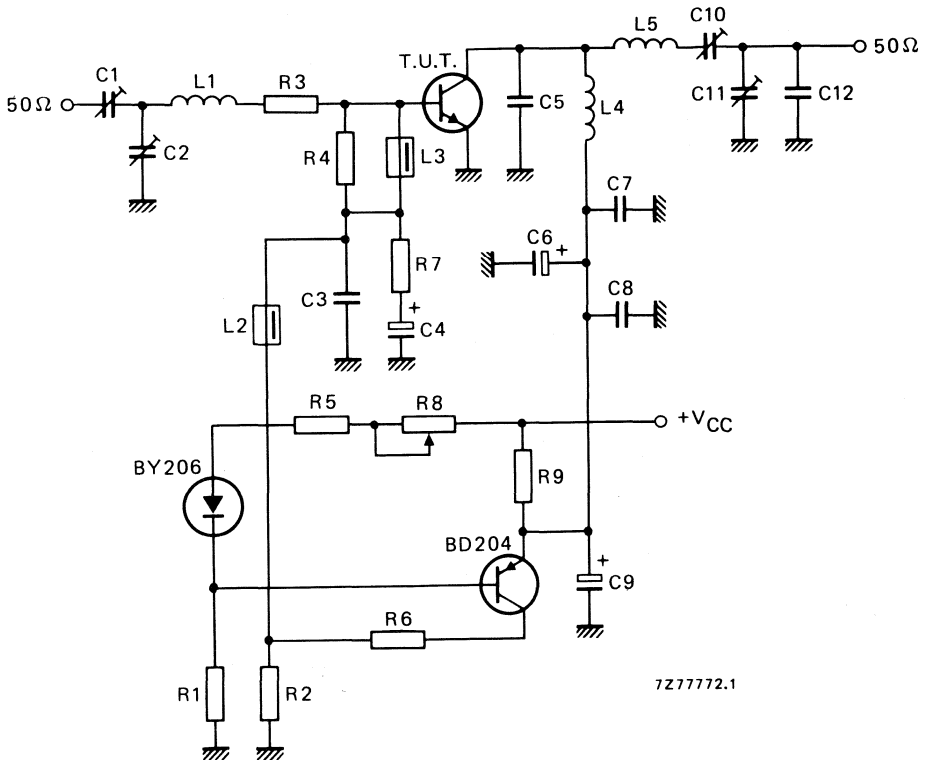


Fig. 8 Test circuit; s.s.b. class-A.

* 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. 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)

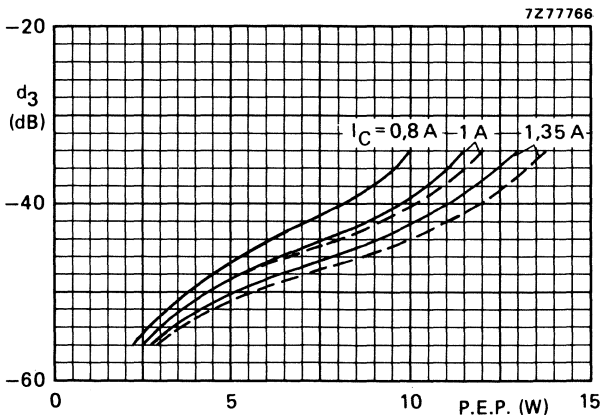


Fig. 9 Intermodulation distortion as a function of output power. Typical values; $V_{CE} = 26$ V; — $T_h = 70$ °C; - - - $T_h = 25$ °C.

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

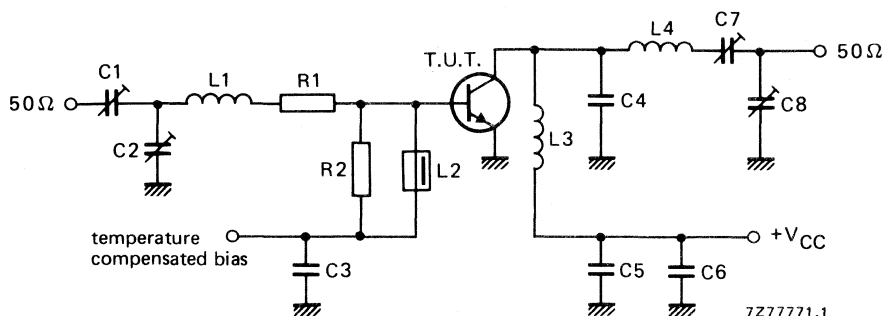


Fig. 10 Test circuit; s.s.b. class-AB.

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.

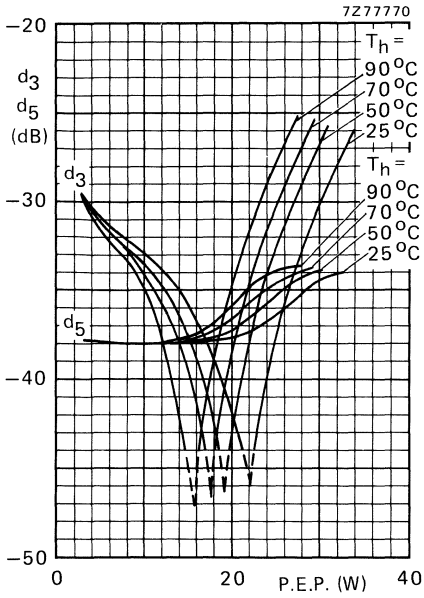


Fig. 11 Intermodulation distortion as a function of output power.*

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.

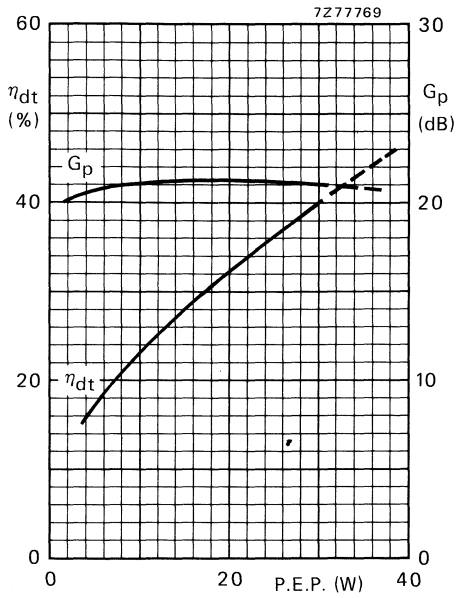


Fig. 12 Double-tone efficiency and power gain as a function of output power.

* See note on previous page.

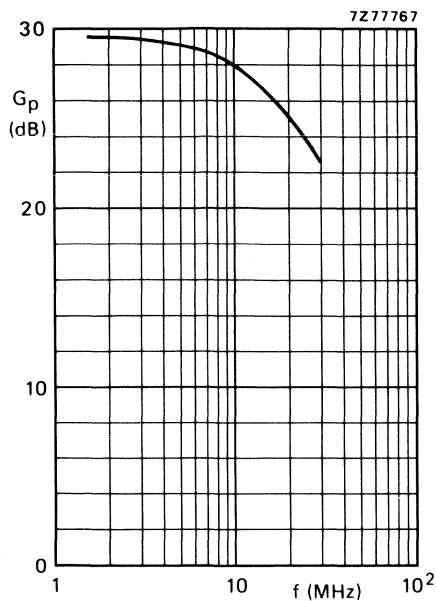


Fig. 13 Power gain as a function of frequency.

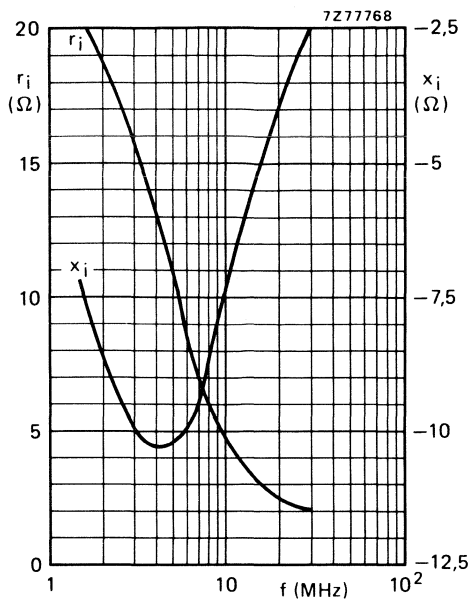


Fig. 14 Input impedance (series components) as a function of frequency.

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

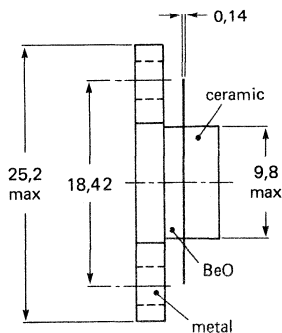
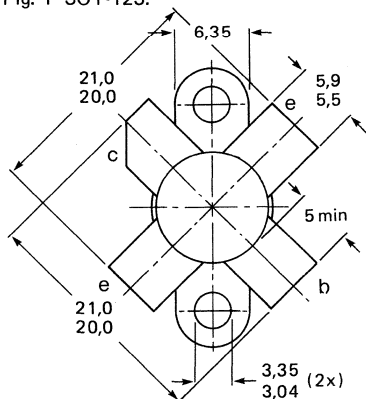
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{Z}_1 Ω	\bar{Y}_L mS
c.w.	28	175	25	> 9	> 60	$1,0 + j1,2$	$59 - j54$

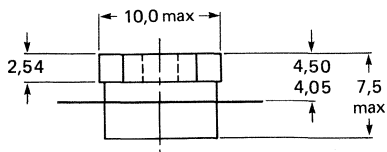
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



7Z77386.2



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

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

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY 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

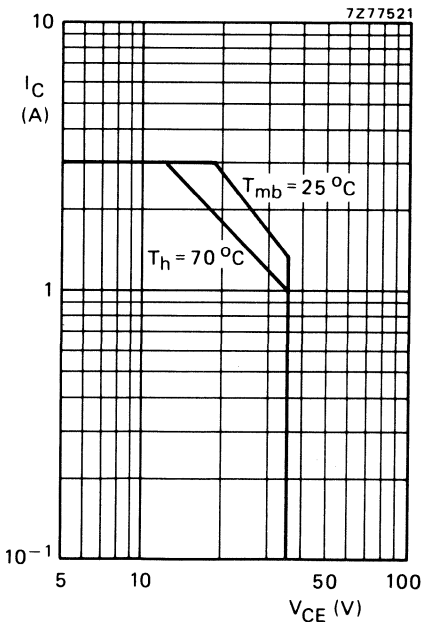


Fig. 2 D.C. SOAR.

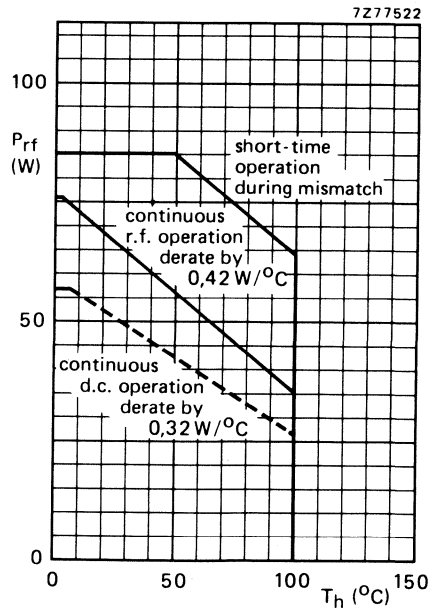


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

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 K/W

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

$R_{th\ j-mb\ (rf)}$ = 2,25 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 K/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

 $ESBO > 8\text{ mJ}$ $R_{BE} = 10\text{ }\Omega$ $ESBR > 8\text{ mJ}$

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 $f = 100\text{ MHz}$ * $-I_E = 1,25\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 650 MHz $-I_E = 3,75\text{ A}; V_{CB} = 28\text{ V}$ 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: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

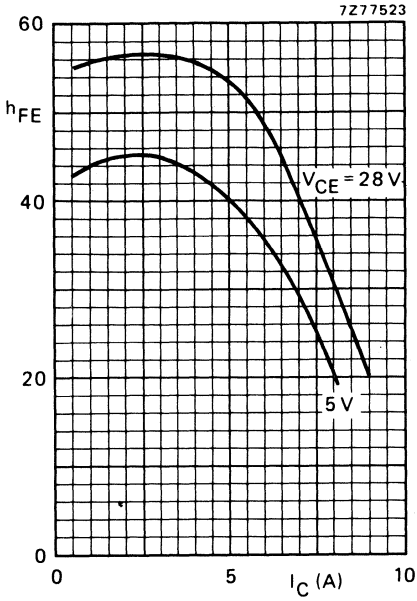


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

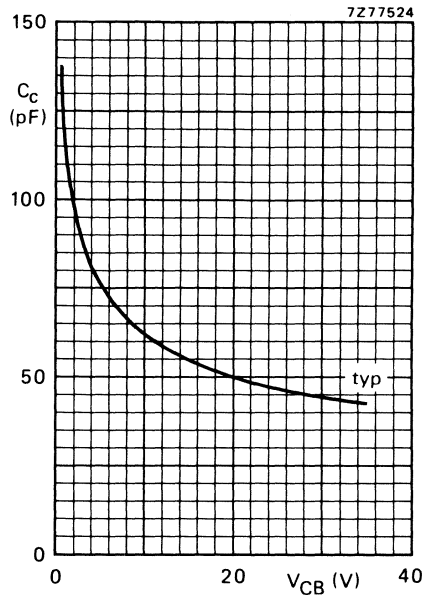


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

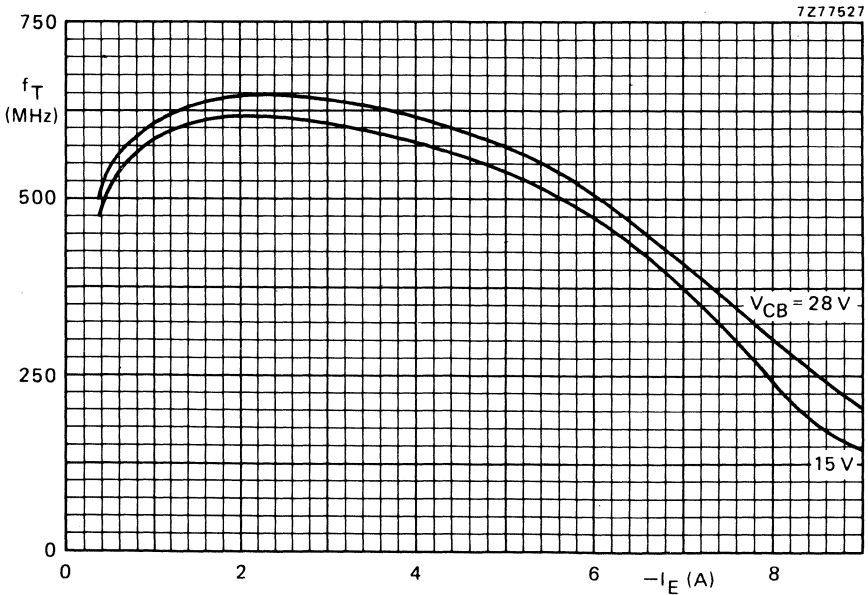


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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 (mS)
175	28	25	< 3,15	> 9	< 1,49	> 60	$1,0 + j1,2$	59–j54

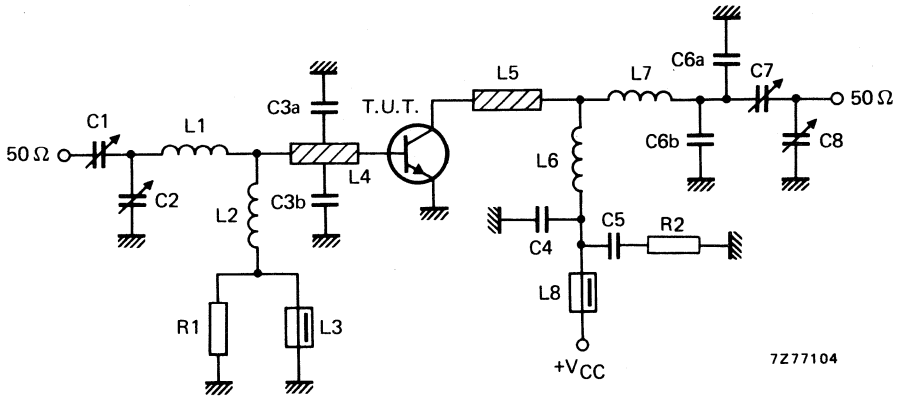


Fig. 7 Test circuit; c.w. class-B.

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

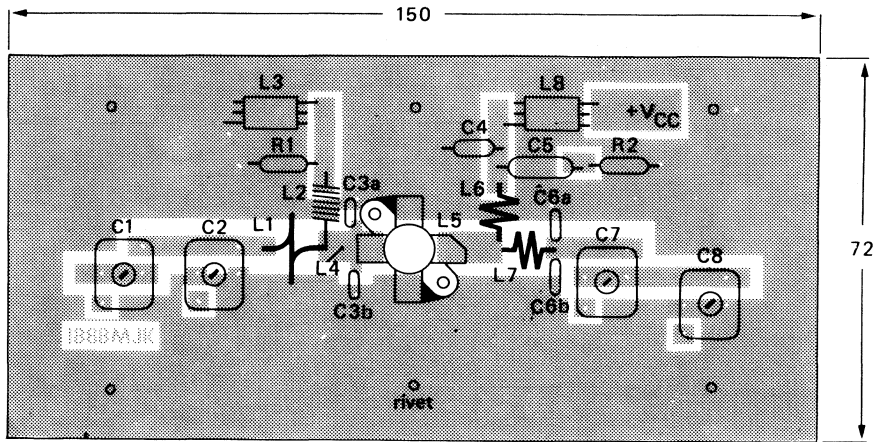
L7 = 62 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

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

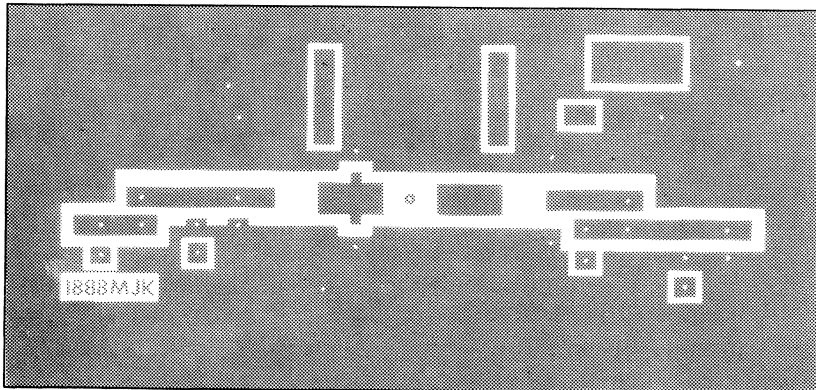
R1 = R2 = 10 Ω ($\pm 10\%$) carbon resistor (0,25 W)

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

APPLICATION INFORMATION (continued)



7Z77549.1



7Z77548

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.

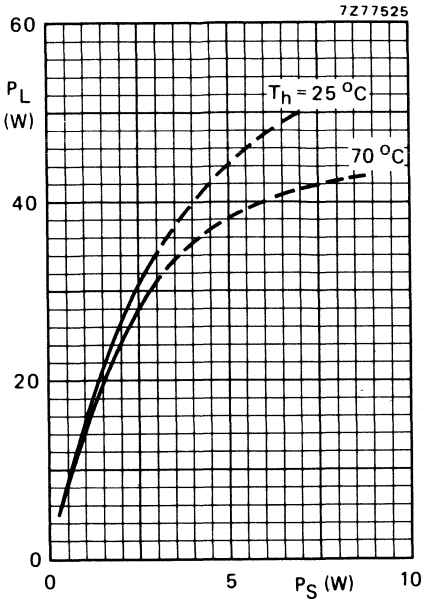


Fig. 9 $V_{CE} = 28$ V; $f = 175$ MHz; typical values.

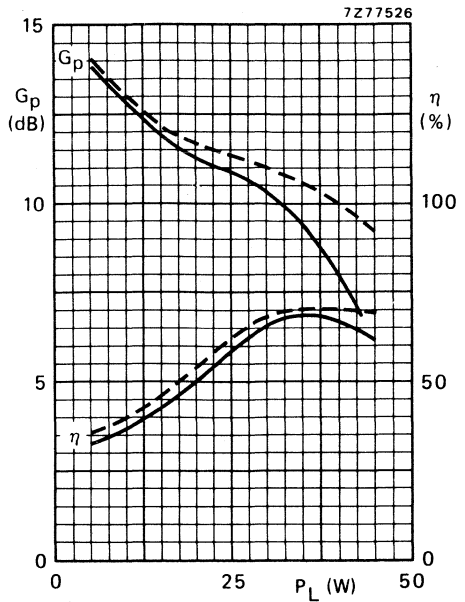


Fig. 10 $V_{CE} = 28$ V; $f = 175$ MHz; typical values; --- $T_h = 25^\circ\text{C}$; — $T_h = 70^\circ\text{C}$.

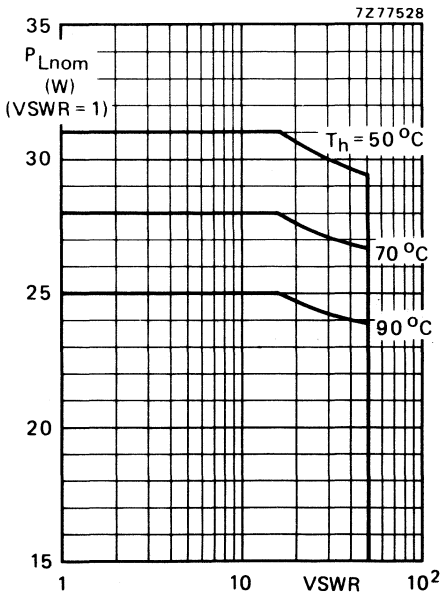
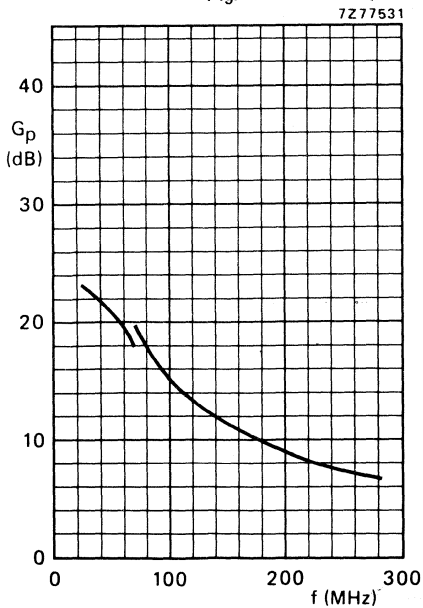
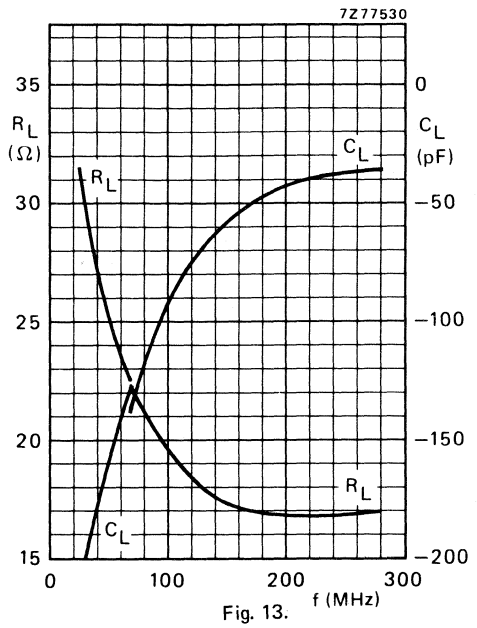
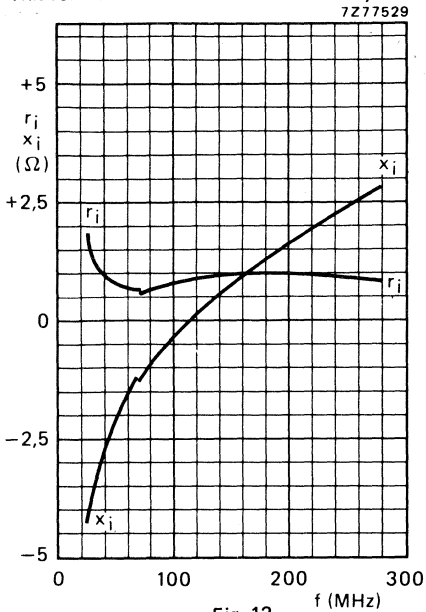


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175$ MHz; $V_{CE} = 28$ V; $R_{th\text{ mb-h}} = 0,3$ K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

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



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

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-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

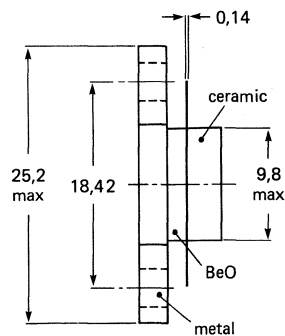
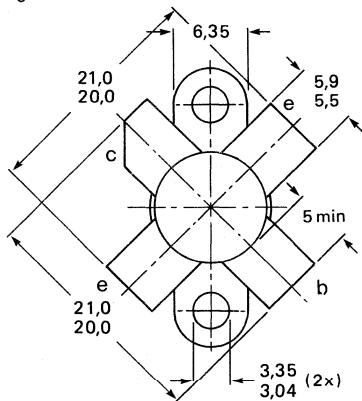
R.F. performance up to $T_H = 25\text{ }^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{Z}_i Ω	\bar{Z}_L Ω	d_3 dB
c.w. (class-B)	12,5	175	45	> 4,5	> 75	$1,4 + j1,5$	$2,7 - j1,3$	—
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-123.

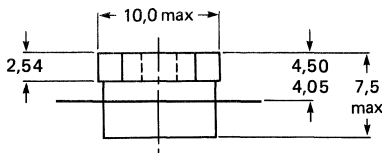


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Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

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

Heatsink compound must be applied sparingly and evenly distributed.



PRODUCT SAFETY 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

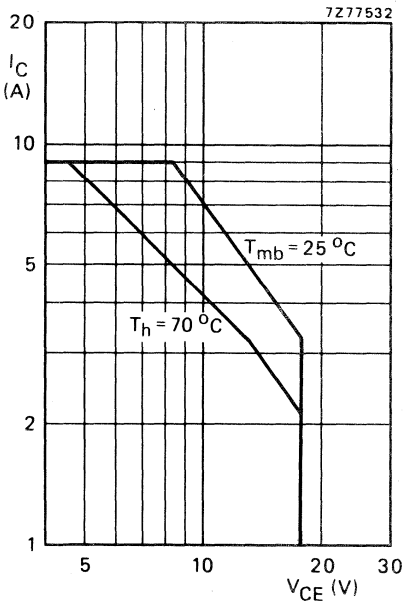


Fig. 2 D.C. SOAR.

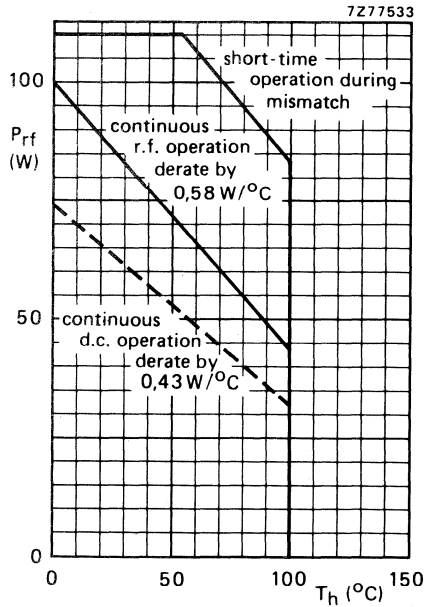


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f \geq 1$ MHz.

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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	1,8 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,3 K/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: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

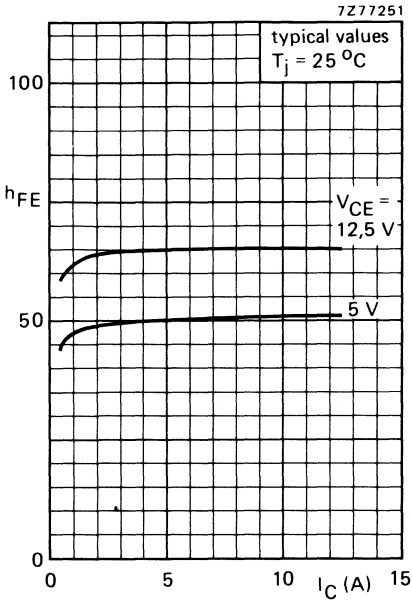


Fig. 4.

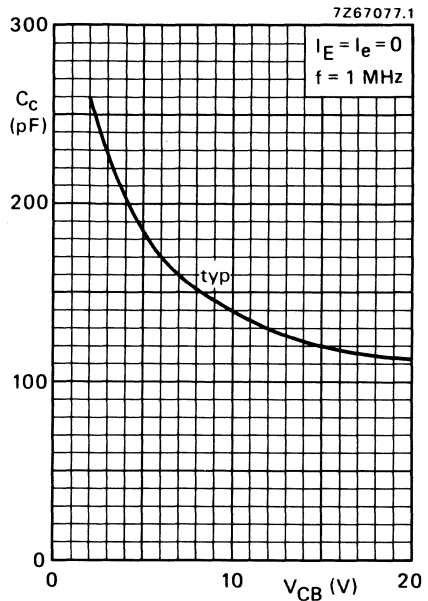


Fig. 5 $T_j = 25^\circ\text{C}$.

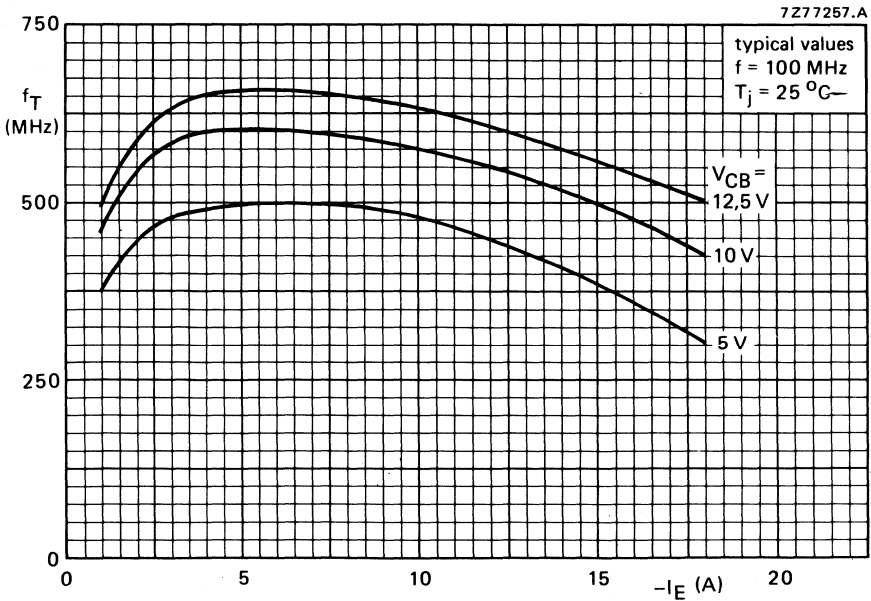


Fig. 6.

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{Z}_L (Ω)
175	12,5	45	< 16	> 4,5	< 4,8	> 75	$1,4 + j1,5$	$2,7 - j1,3$
175	13,5	45	—	typ. 6,0	—	typ. 75	—	—

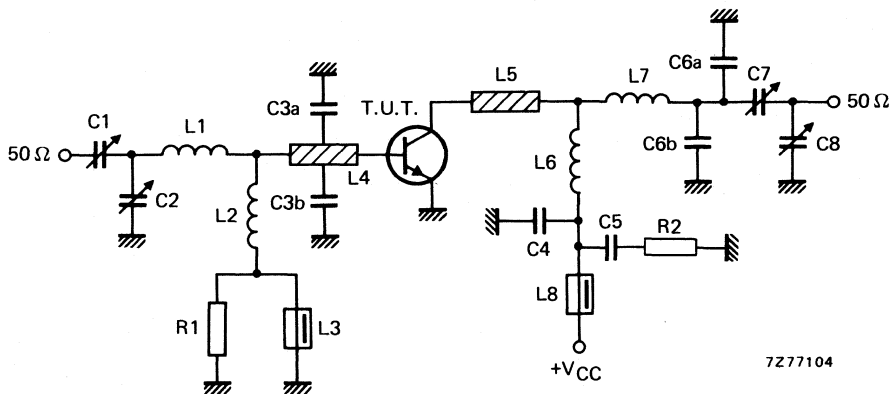


Fig. 7 Test circuit; c.w. class-B.

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

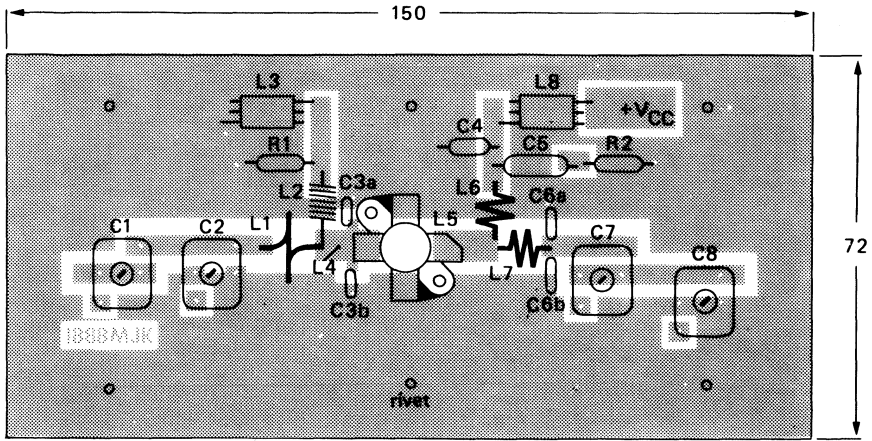
L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

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

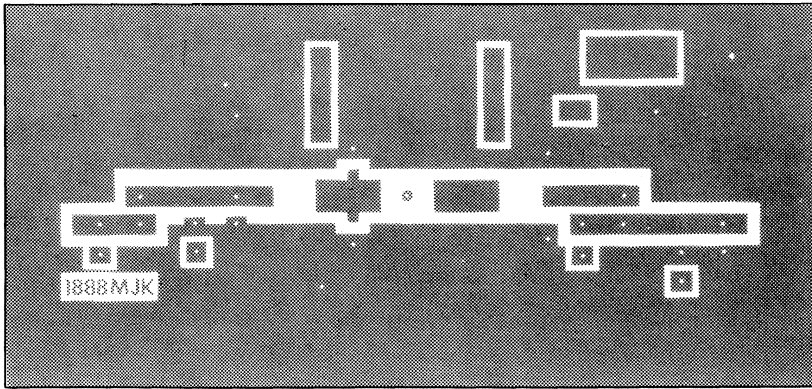
R1 = 10 Ω ($\pm 10\%$) carbon resistor (0,25 W)R2 = 4,7 Ω ($\pm 5\%$) carbon resistor (0,25 W)

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.

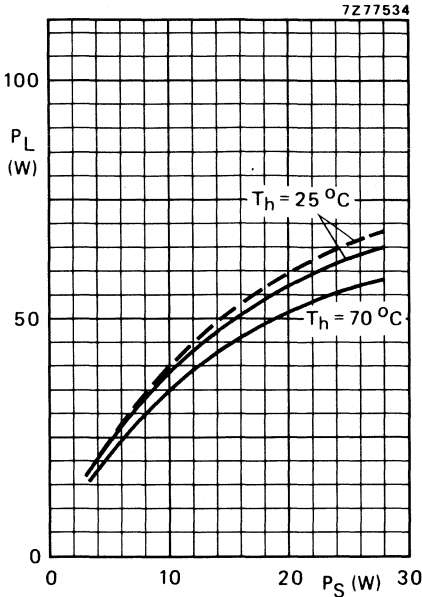


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 12,5 \text{ V}$; - - - $V_{CE} = 13,5 \text{ V}$.

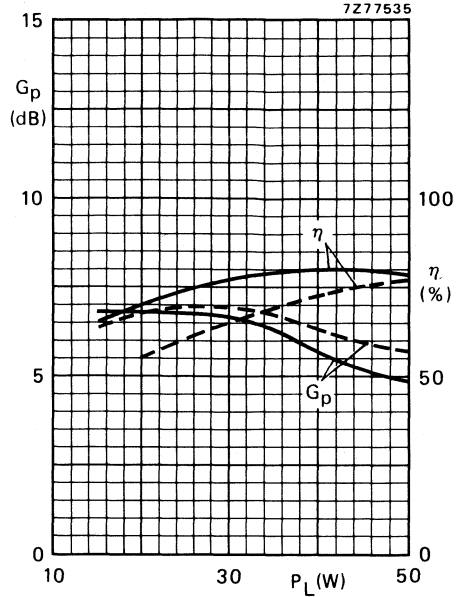


Fig. 10 Typical values; $f = 175 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$;
 — $V_{CE} = 12,5 \text{ V}$; - - - $V_{CE} = 13,5 \text{ V}$.

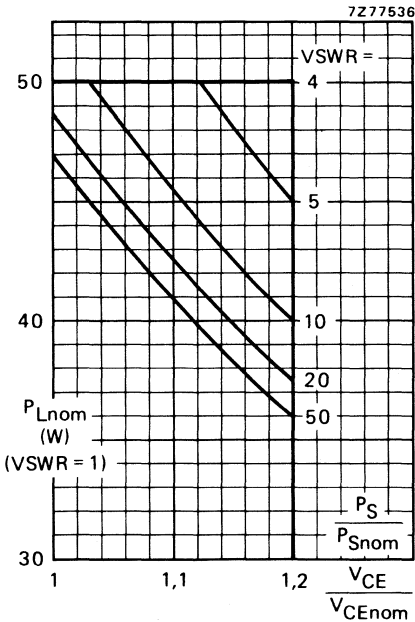


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,3 \text{ K/W}$; $V_{CE \text{ nom}} = 12,5 \text{ V}$ or $13,5 \text{ V}$;
 $P_S = P_{S \text{ nom}}$ at $V_{CE \text{ nom}}$ and $V_{SWR} = 1$

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.

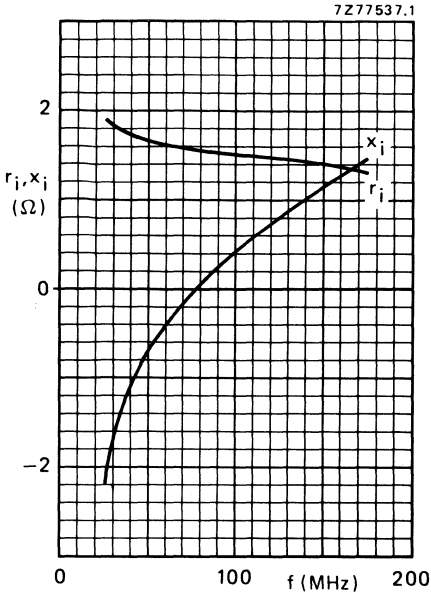


Fig. 12 Input impedance (series components).

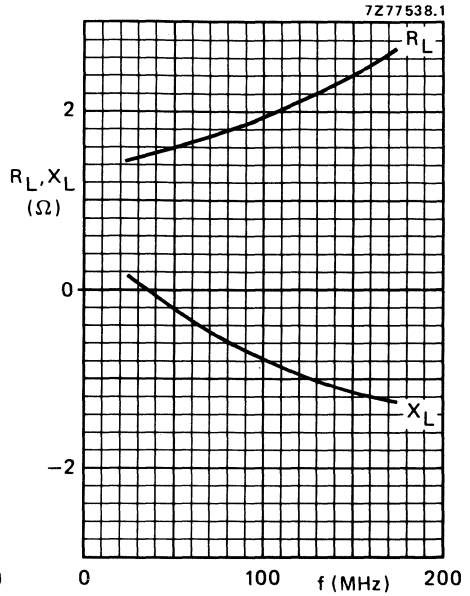


Fig. 13 Load impedance (series components).

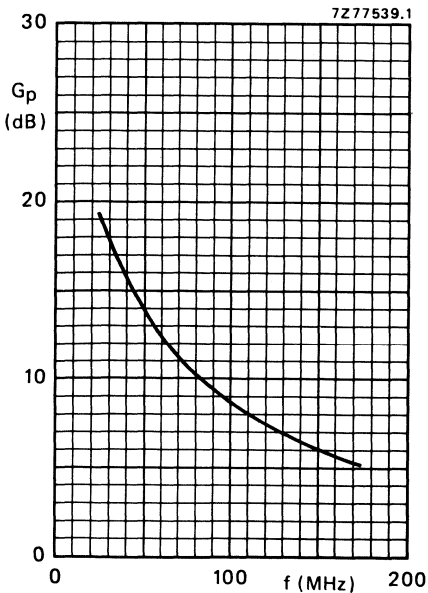


Fig. 14.

Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 12,5 \text{ V}$; $P_L = 45 \text{ W}$;
 class-B operation; $T_h = 25 \text{ }^\circ\text{C}$.

R.F. performance in s.s.b. class-AB operation

$V_{CE} = 12,5 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$
 $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

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

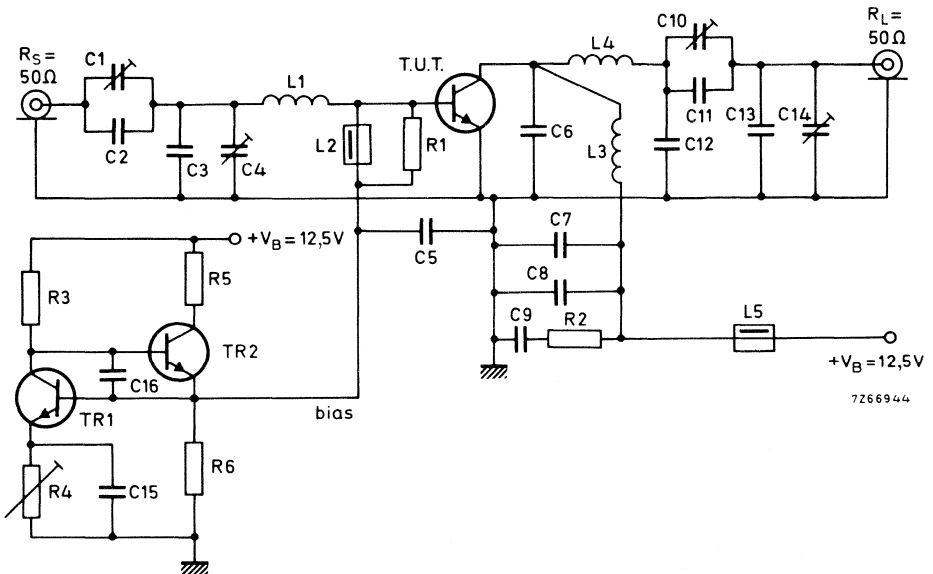


Fig. 15 Test circuit; s.s.b. class-AB.

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 = 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 (±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)

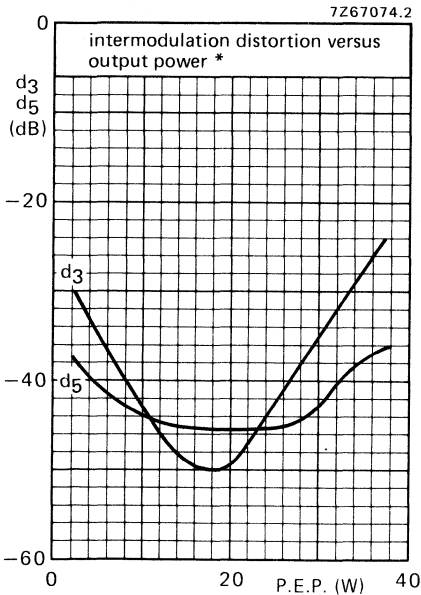


Fig. 16.

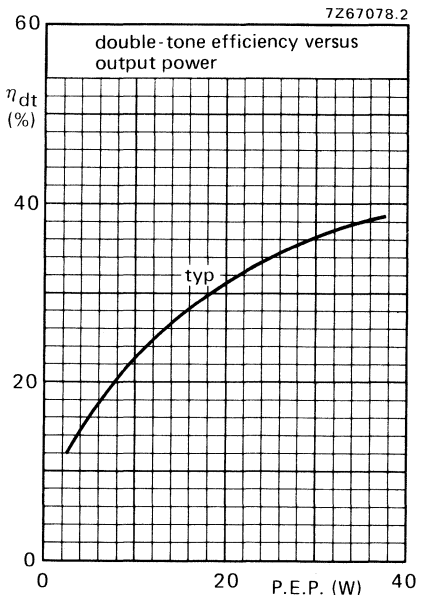


Fig. 17.

Conditions for Figs 16 and 17:

$V_{CE} = 12,5 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,3 \text{ }^\circ\text{K/W}$; $I_{C(ZS)} = 25 \text{ mA}$; typical values.

* See next page.

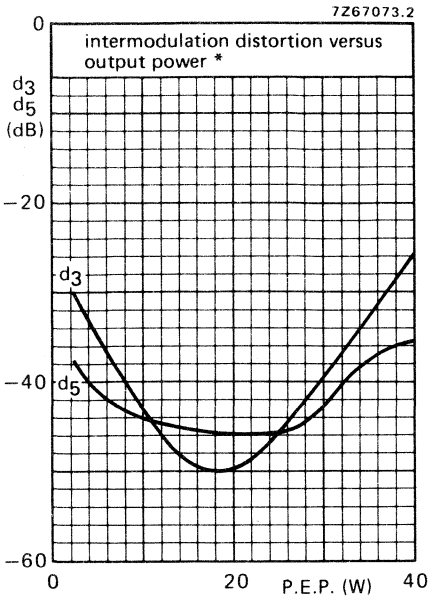


Fig. 18.

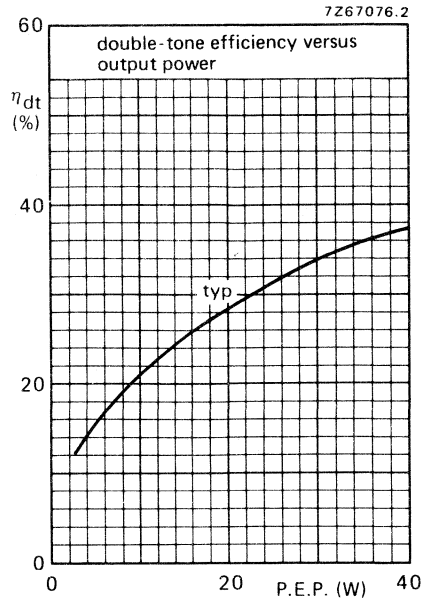


Fig. 19.

Conditions for Figs 18 and 19:

$V_{CE} = 13,5 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$; $I_{C(ZS)} = 25 \text{ mA}$; 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)

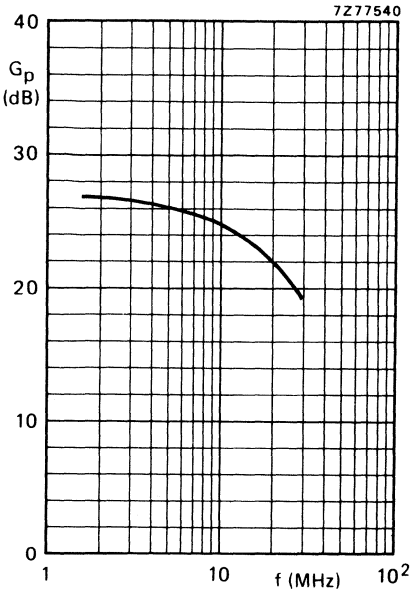


Fig. 20 Power gain as a function of frequency.

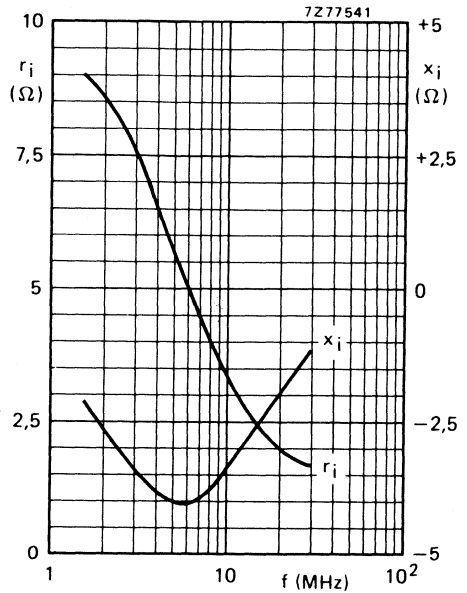


Fig. 21 Input impedance (series components) as a function of frequency.

Fig. 20 and 21 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 12,5 \text{ V}$
 $P_L = 30 \text{ W (P.E.P.)}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $Z_L = 1,8 \text{ } \Omega$

$V_{CE} = 13,5 \text{ V}$
 $P_L = 35 \text{ W (P.E.P.)}$
 $T_h = 25 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} \leq 0,3 \text{ K/W}$
 $I_{C(ZS)} = 25 \text{ mA}$
 $Z_L = 1,8 \text{ } \Omega$

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

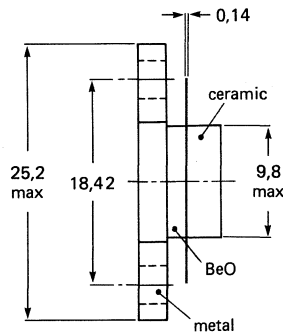
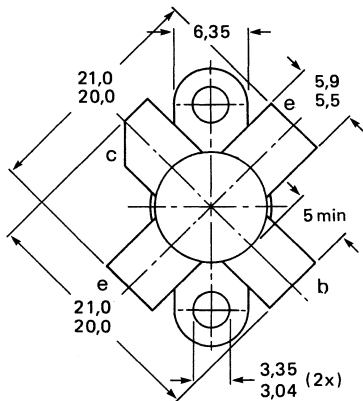
R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_D dB	η %	\bar{z}_i Ω	\bar{Y}_L mS	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

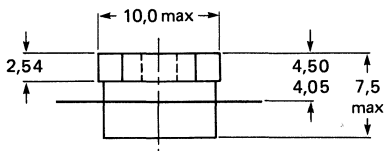
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



7Z77386.2



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

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

Heatsink compound must be applied sparingly
and evenly distributed.

PRODUCT SAFETY 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_{rff} max. 105 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

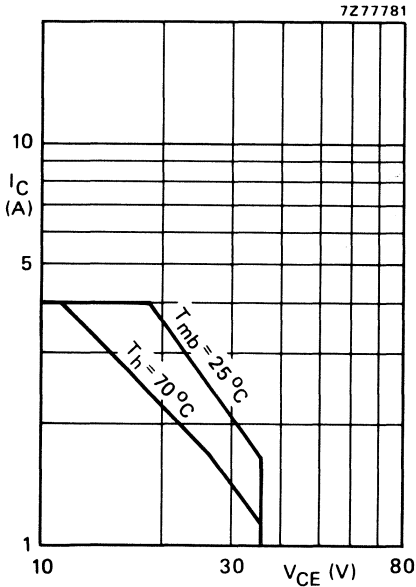


Fig. 2 D.C. SOAR.

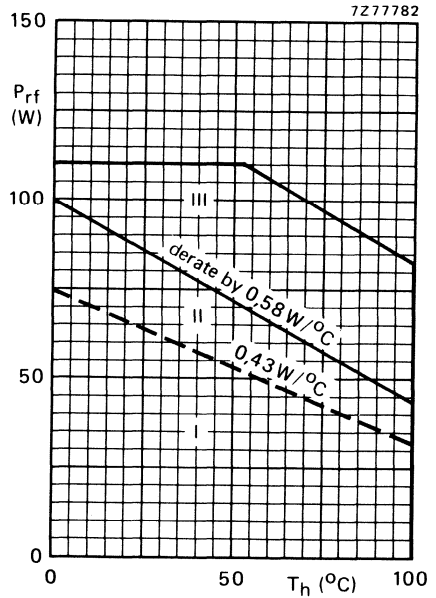


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- 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 K/W

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

$R_{th j-mb(rf)}$ = 1,95 K/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,3 K/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 $f = 1\text{ MHz}$

$I_E = I_B = 0; V_{CB} = 28\text{ V}$

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

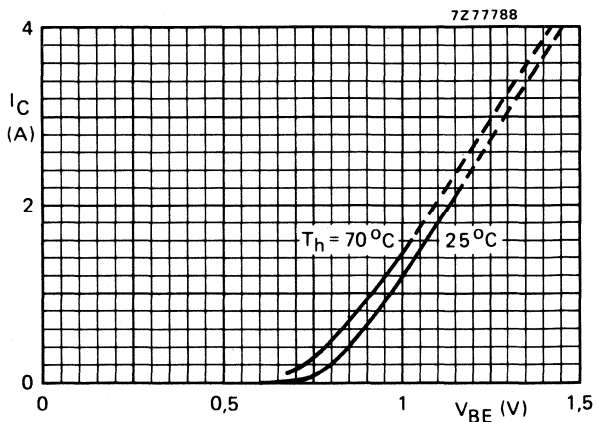


Fig. 4 Typical values; $V_{CE} = 28\text{ V}$.

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

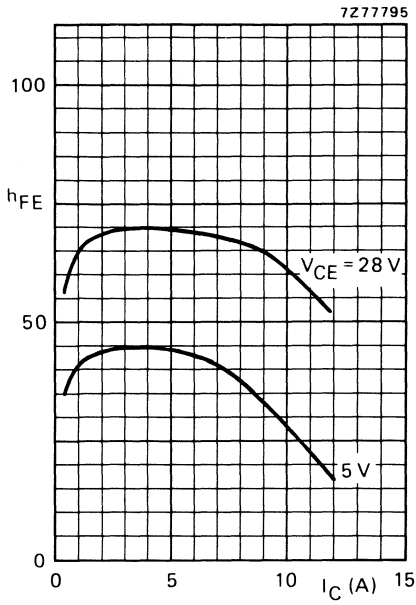


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

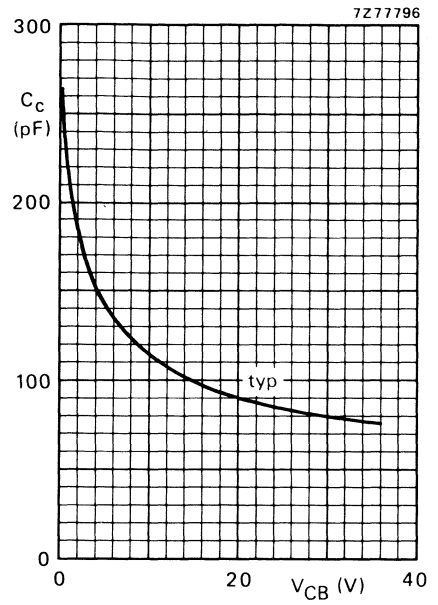


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

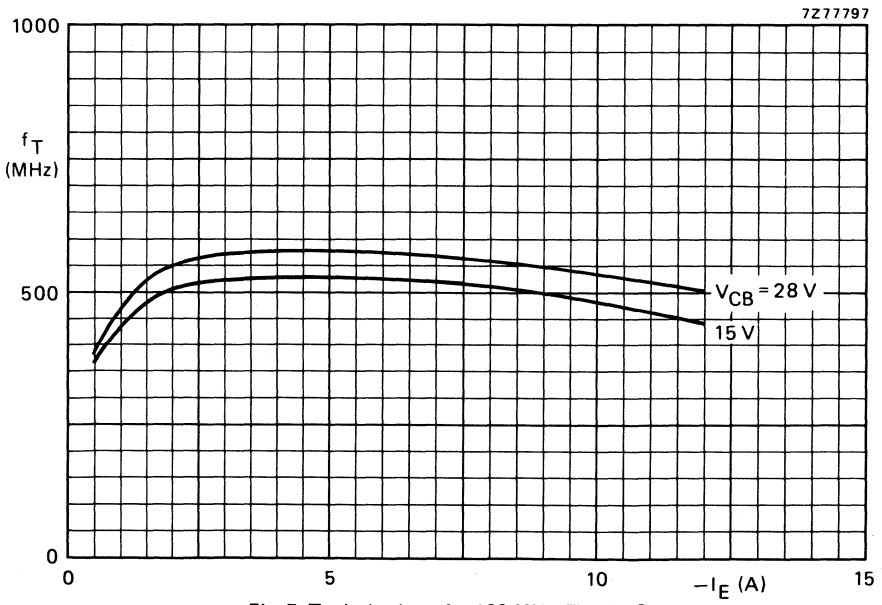


Fig. 7 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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 (mS)
175	28	45	< 8	> 7,5	< 2,47	> 70	$0,7 + j1,3$	$110 - j62$

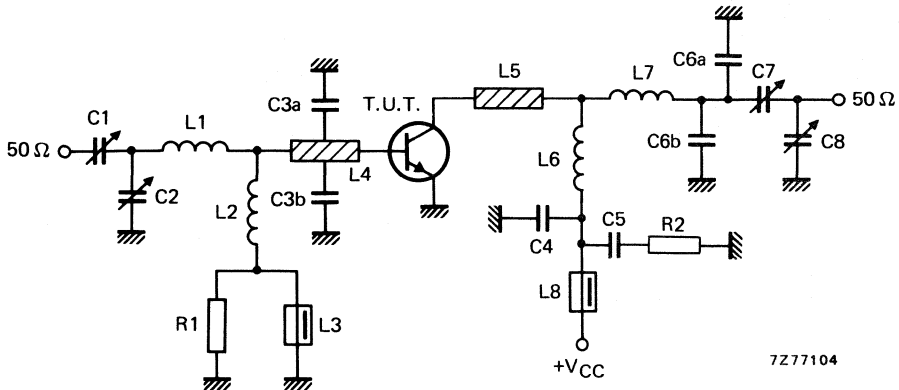


Fig. 8 Test circuit; c.w. class-B.

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

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.

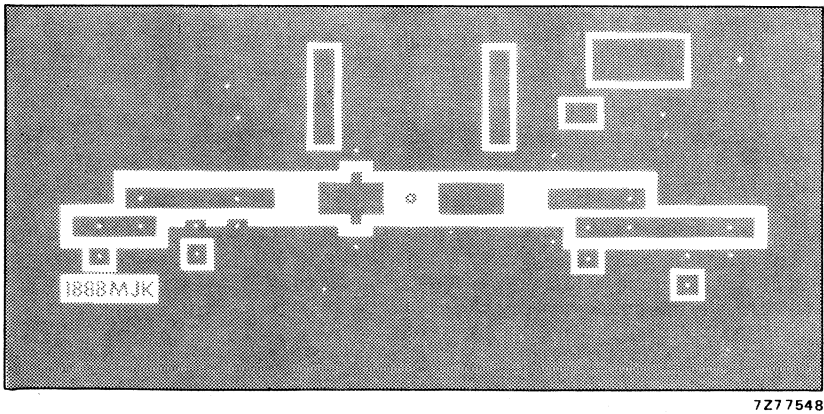
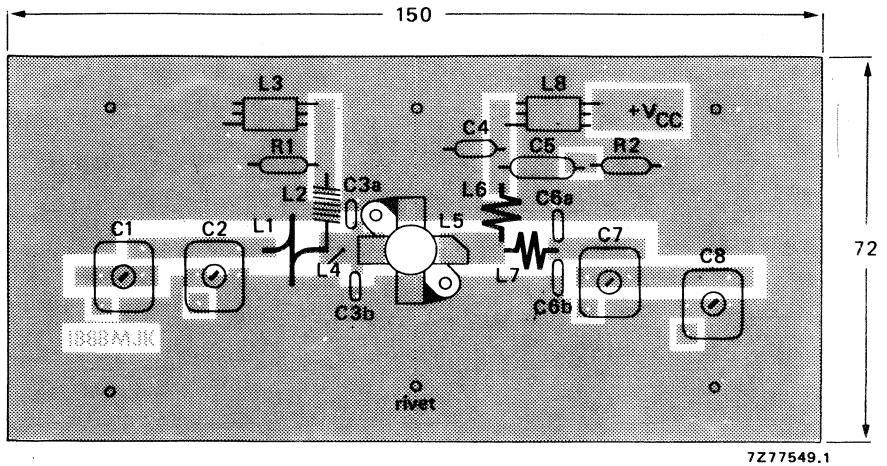


Fig. 9 Component layout and printed-circuit board for 175 MHz test circuit.

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.

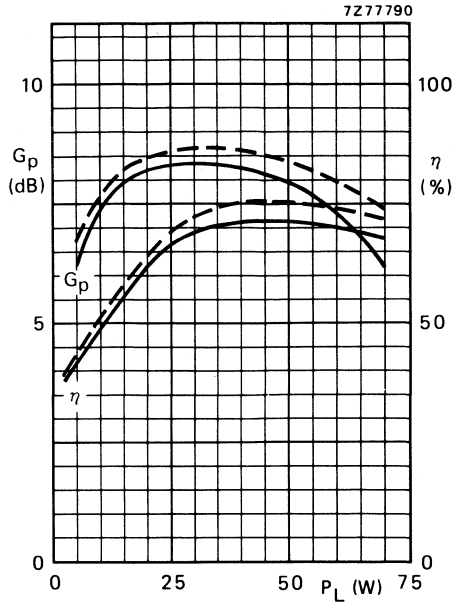
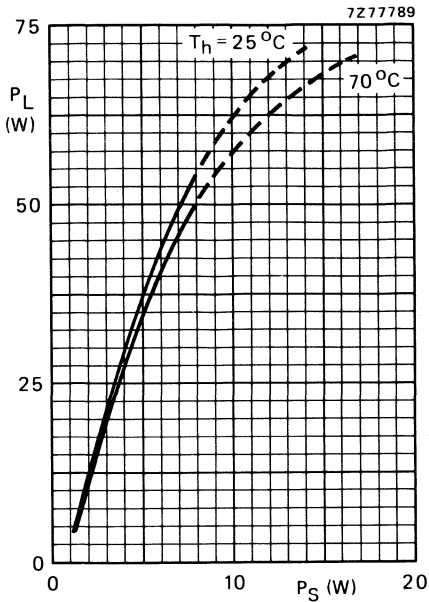


Fig. 10 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

Fig. 11 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$; --- $T_h = 25^\circ\text{C}$; — $T_h = 70^\circ\text{C}$.

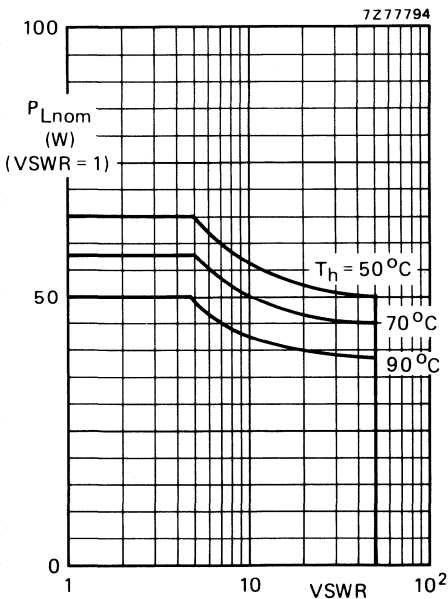


Fig. 12 R.F. SOAR; c.w. class-B operation; $f = 175\text{ MHz}$; $V_{CE} = 28\text{ V}$; $R_{th\text{ mb-h}} = 0,3\text{ K/W}$. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

7Z77791

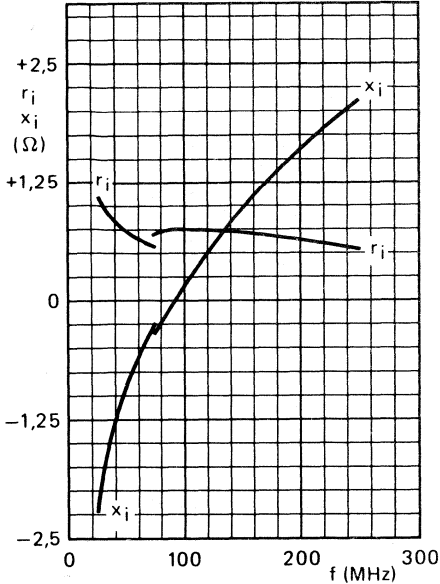


Fig. 13 Input impedance (series components).

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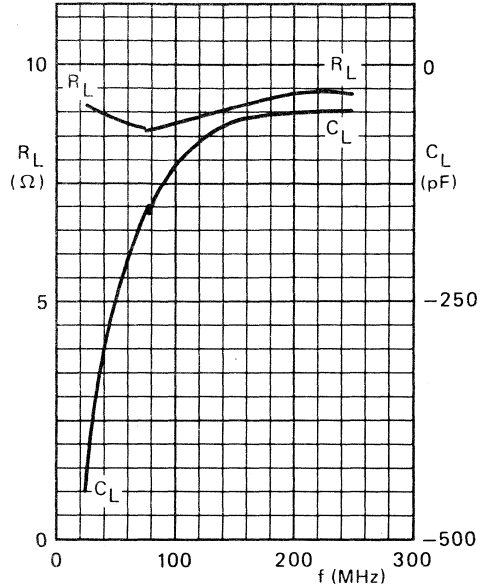


Fig. 14 Load impedance (parallel components).

7Z77793

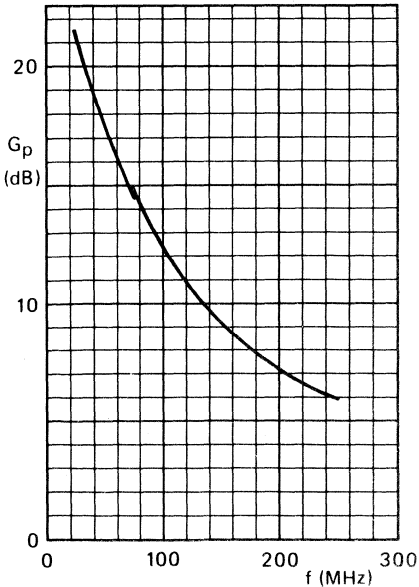


Fig. 15 Power gain versus frequency.

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; $V_{CE} = 28$ V; $P_L = 45$ W; $T_h = 25$ $^{\circ}$ 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) typ. 1,9	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

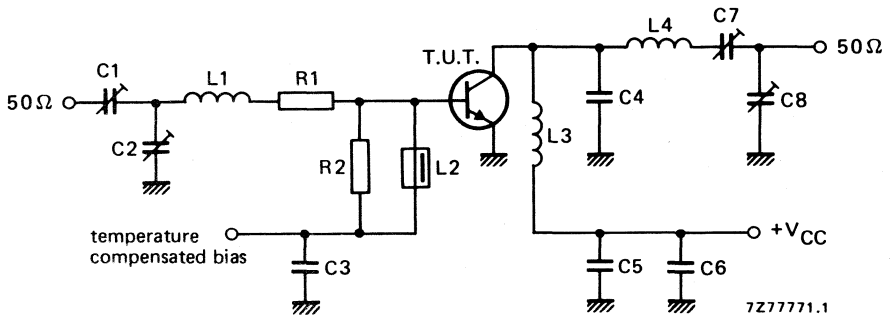


Fig. 16 Test circuit; s.s.b. class-AB.

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 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.

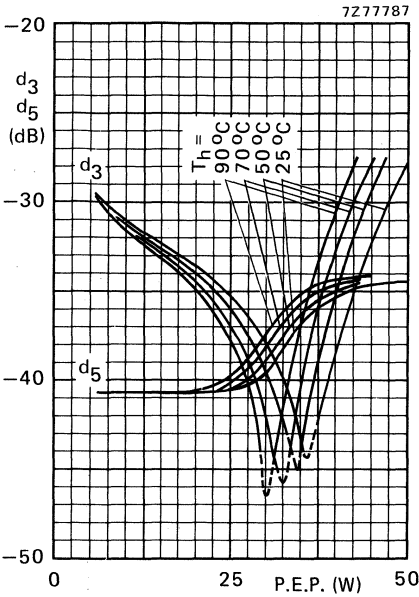


Fig. 17 Intermodulation distortion as a function of output power.*

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:

$V_{CE} = 28\text{ V}$; $I_{C(ZS)} = 50\text{ mA}$; $f_1 = 28,000\text{ MHz}$; $f_2 = 28,001\text{ MHz}$; $T_h = 25^\circ\text{C}$; typical values.

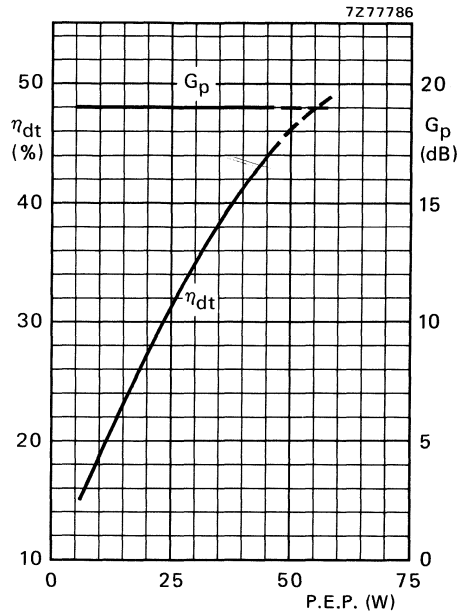


Fig. 18 Double-tone efficiency and power gain as a function of output power.

* See note on previous page.

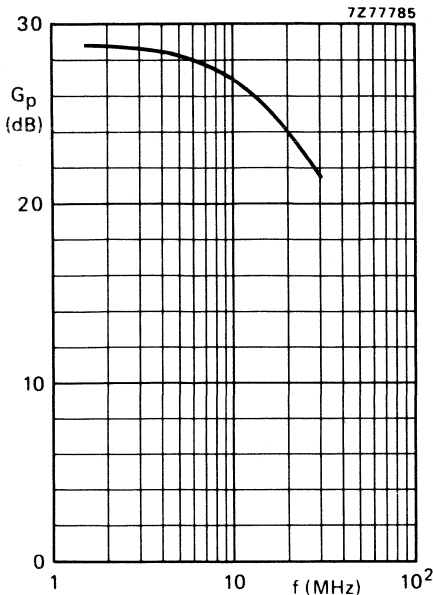


Fig. 19 Power gain as a function of frequency.

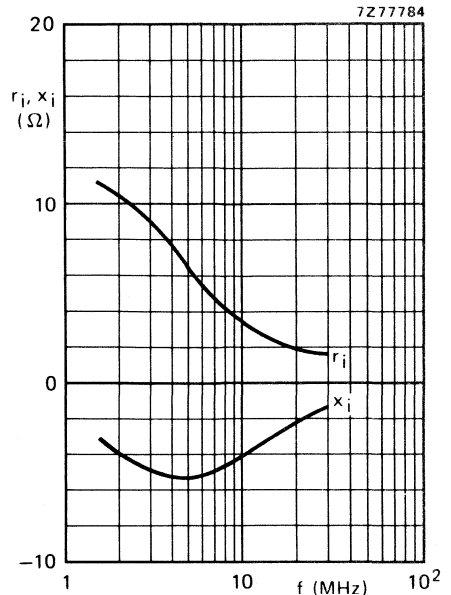


Fig. 20 Input impedance (series components) as a function of frequency.

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

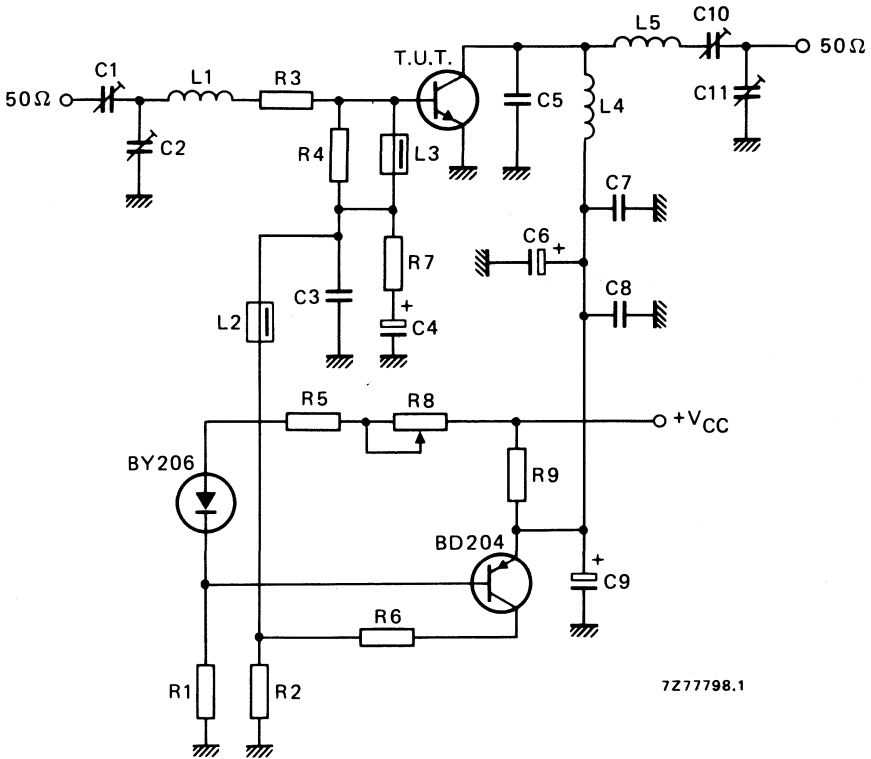


Fig. 21 Test circuit; s.s.b. class-A.

* 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)

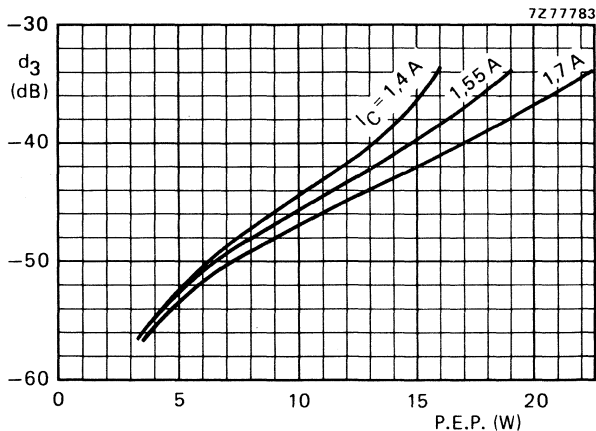


Fig. 22 Intermodulation distortion as a function of output power.

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

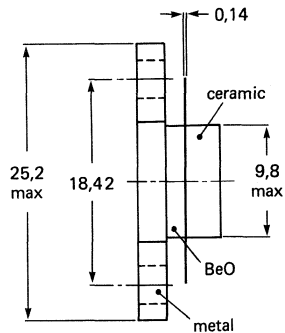
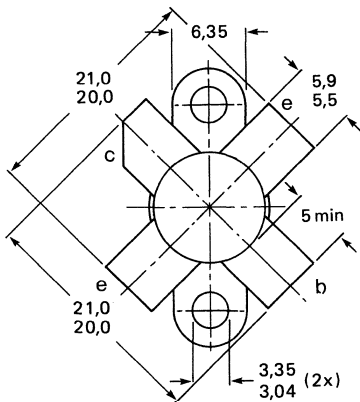
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
c.w.	13,5	175	25	> 6	> 70	$1,6 + j1,4$	$210 + j5,5$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.

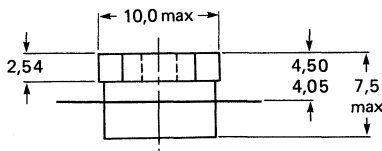


7Z77386.2

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

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

Heatsink compound must be applied sparingly
and evenly distributed.



PRODUCT SAFETY 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

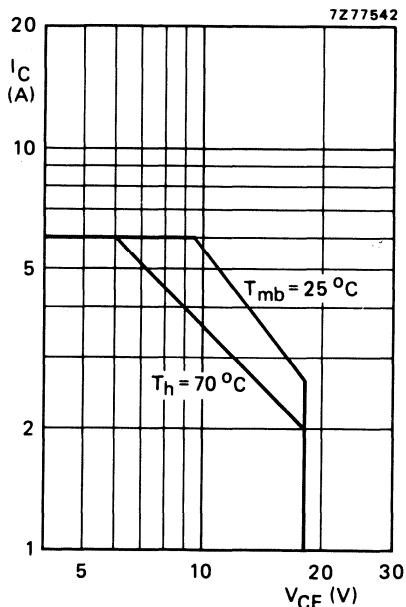


Fig. 2 D.C. SOAR.

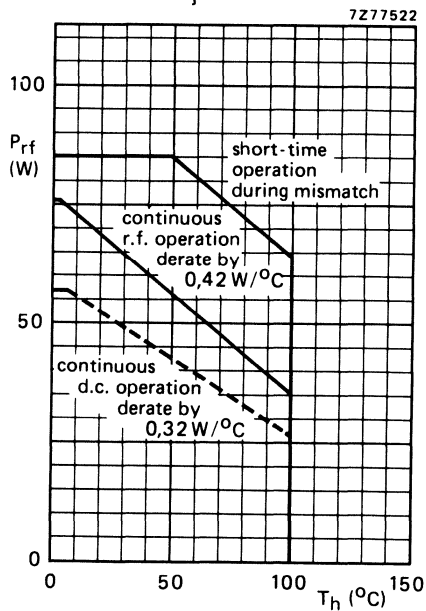


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f \geq 1$ MHz.

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 K/W

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

$R_{th\ j-mb(rf)}$ = 2,25 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 K/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

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

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: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

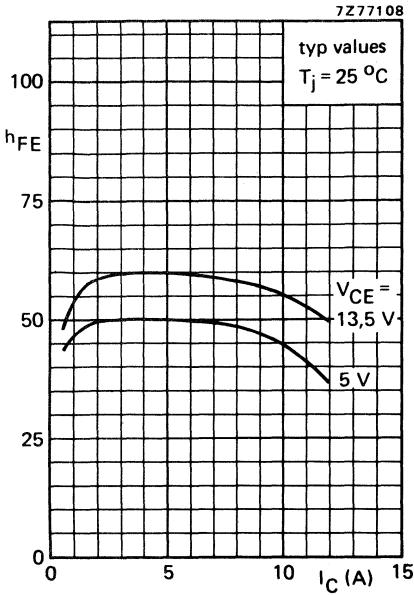


Fig. 4.

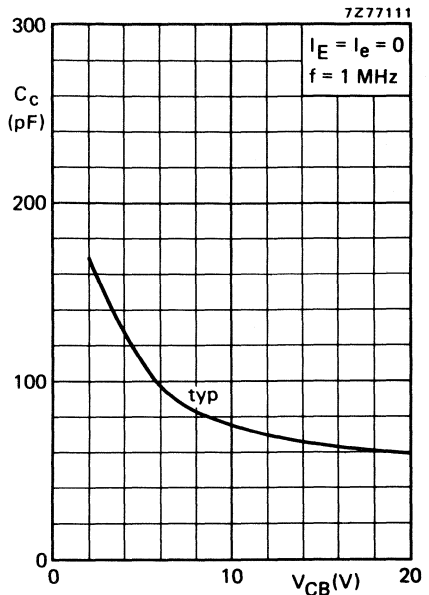


Fig. 5 $T_j = 25^\circ\text{C}$.

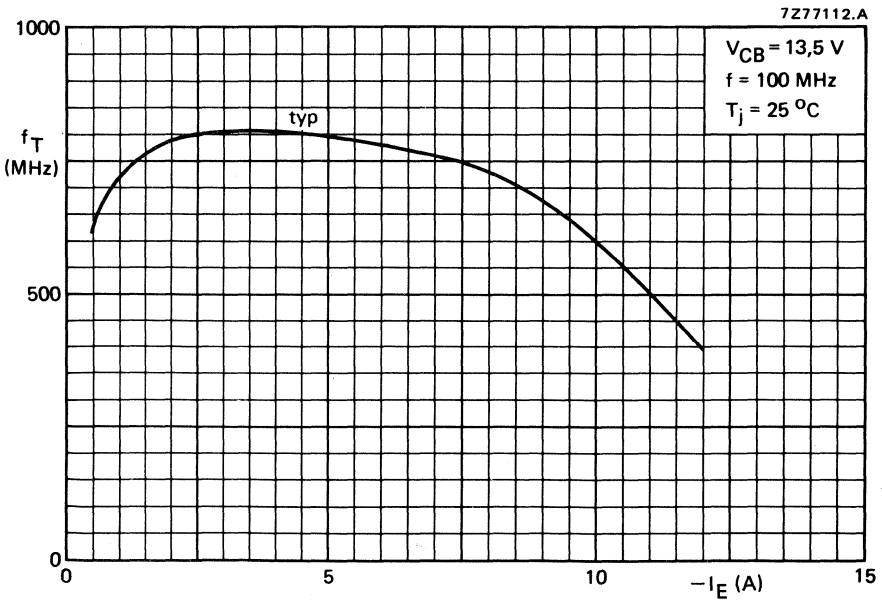


Fig. 6.

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 (mS)
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	—	—

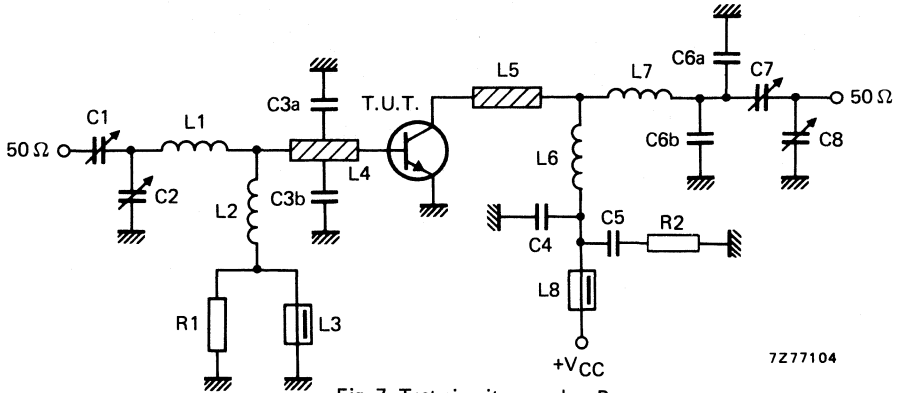


Fig. 7 Test circuit; c.w. class-B.

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)

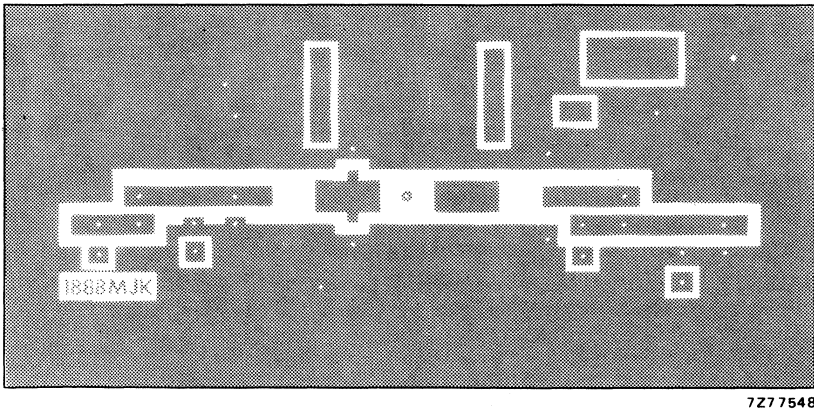
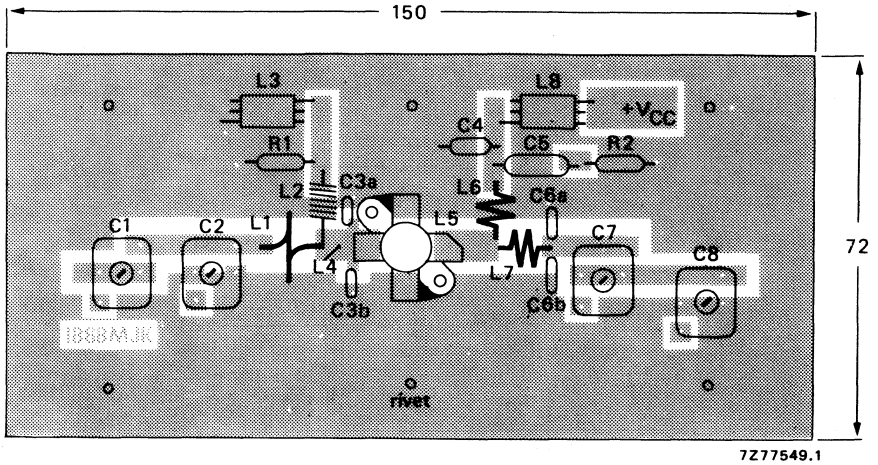


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

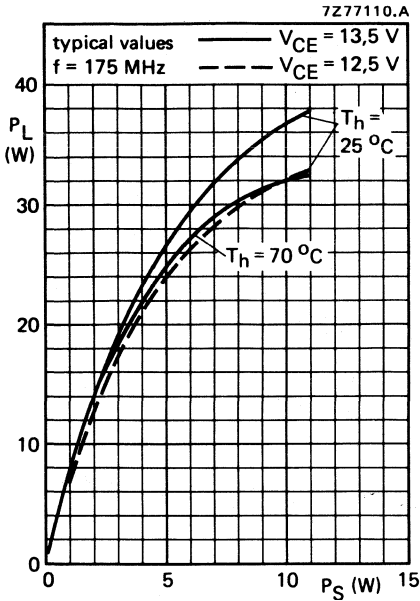


Fig. 9.

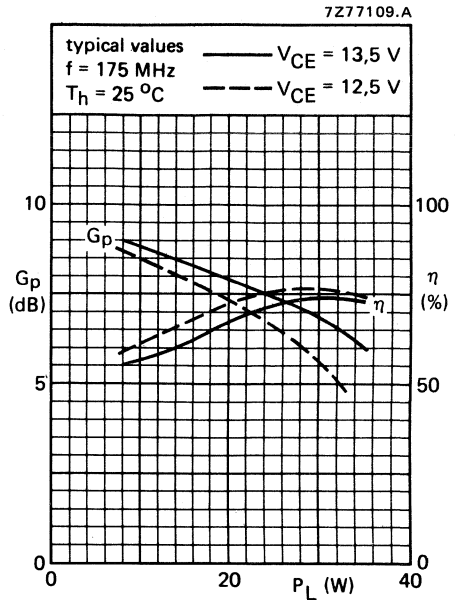


Fig. 10.

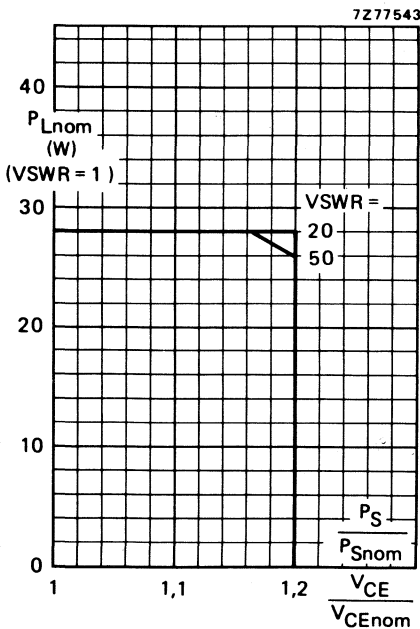


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0,3 \text{ K/W}$; $V_{CEnom} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{Snom}$ at V_{CEnom} and $V_{SWR} = 1$

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 ($V_{SWR} = 1$), 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 $10\ \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

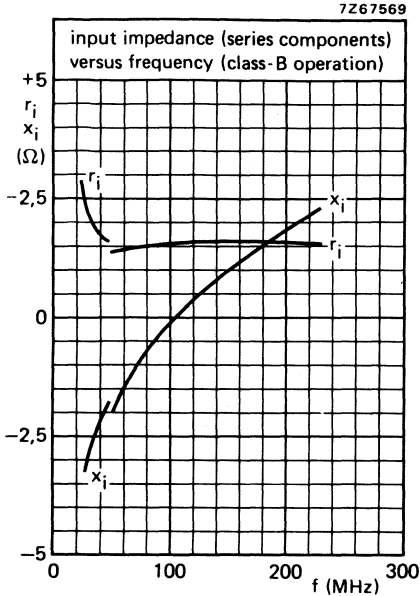


Fig. 12.

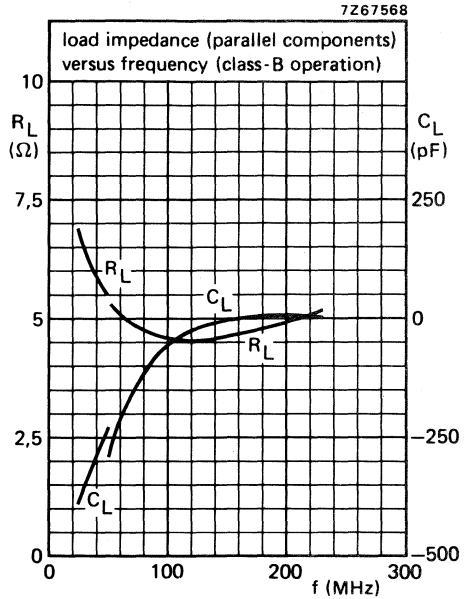
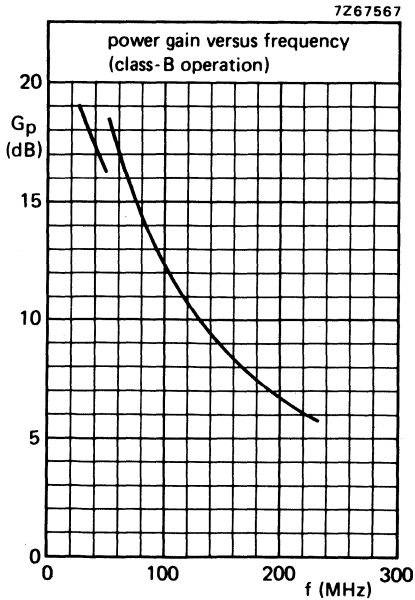


Fig. 13.



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

Fig. 14.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor suitable for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand infinite VSWR at rated output power. High reliability is ensured by a **gold sandwich metallization**.

The transistor is housed in a ¼" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

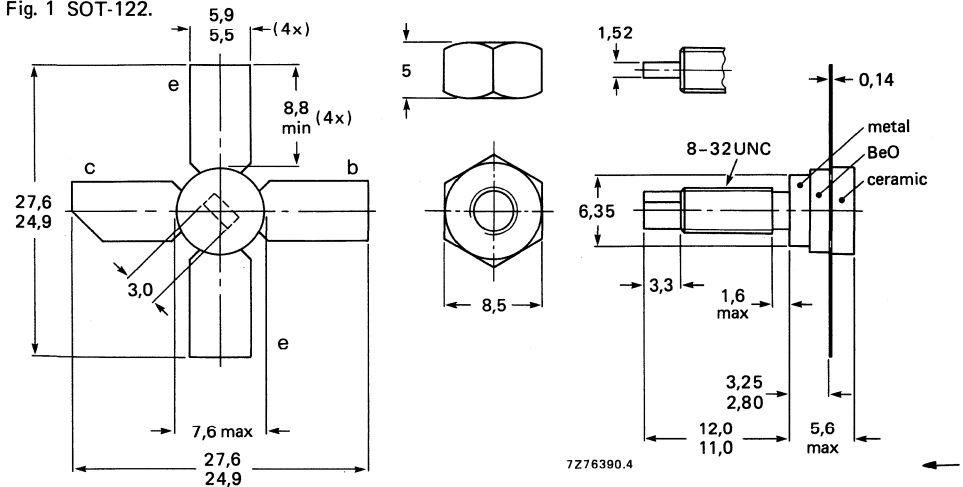
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %
c.w.	28	470	2	> 12	> 50

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.

PRODUCT SAFETY 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

V_{CESM} max. 60 V

V_{CEO} max. 30 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

$I_C; I_{C(AV)}$ max. 0,32 A

(peak value); $f > 1$ MHz

I_{CM} max. 1,0 A

Total power dissipation (d.c. and r.f.) up to $T_{mb} = 50$ °C

P_{tot} max. 9,6 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

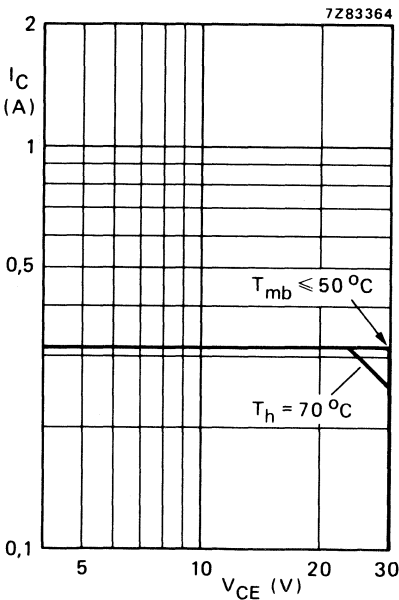


Fig. 2 D.C. SOAR.

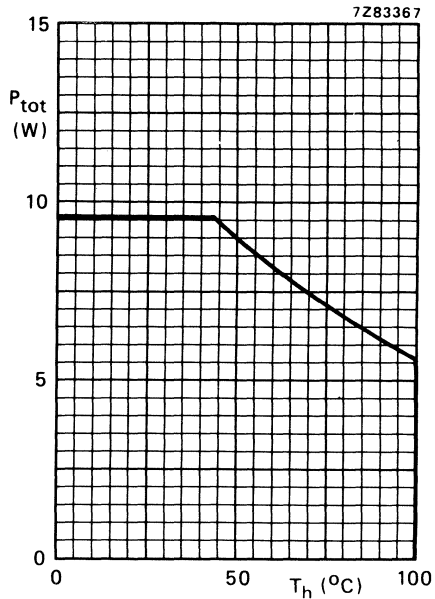


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (dissipation = 3,5 W; $T_{mb} = 72$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base
(d.c. and r.f. dissipation)

$R_{th\ j-mb} = 13,0$ K/W

From mounting base to heatsink

$R_{th\ mb-h} = 0,6$ K/W

CHARACTERISTICS

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

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 2\text{ mA}$ $V_{(BR)CES} > 60\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 10\text{ mA}$ $V_{(BR)CEO} > 30\text{ V}$

Emitter-base breakdown voltage

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

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 30\text{ V}$ $I_{CES} < 1\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $R_{BE} = 10\text{ }\Omega$ $ES_{BO} > 0,5\text{ mJ}$ $ES_{BR} > 0,5\text{ mJ}$

D.C. current gain *

 $I_C = 0,15\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 100

Collector-emitter saturation voltage *

 $I_C = 0,5\text{ A}; I_B = 0,1\text{ A}$ V_{CEsat} typ. 0,9 VTransition frequency at $f = 500\text{ MHz}$ * $-I_E = 0,15\text{ A}; V_{CB} = 28\text{ V}$ $-I_E = 0,50\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 1,20 GHz f_T typ. 0,85 GHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ C_c typ. 5,5 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 10\text{ mA}; V_{CE} = 28\text{ V}$ C_{re} typ. 2 pF

Collector-stud capacitance

 C_{cs} typ. 1,2 pF ←* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

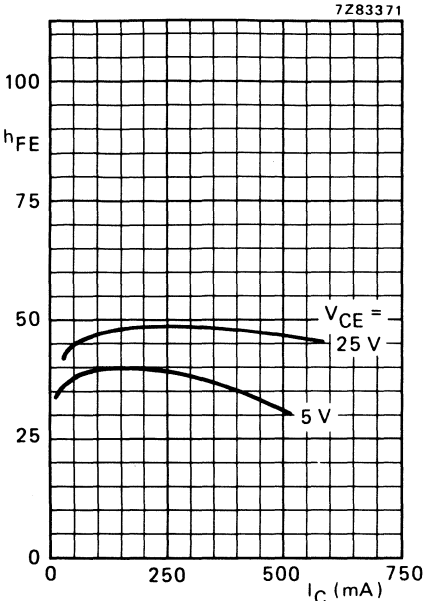


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

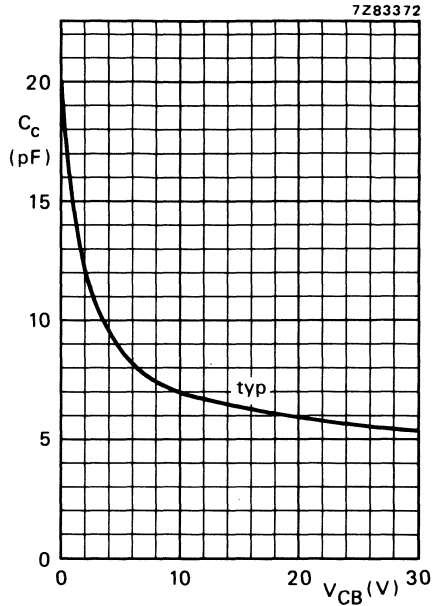


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

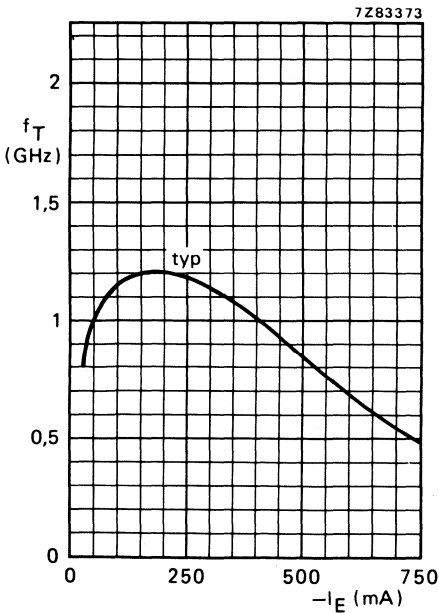


Fig. 6 $V_{CB} = 28\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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{Z}_L (Ω)
470	28	2	< 0,13 > 12	< 0,145 > 50	< 0,145 > 50	3,0 - j0,4	12 + j45	
470	28	2	typ. 0,09	typ. 13,5	typ. 0,135	typ. 53	-	-

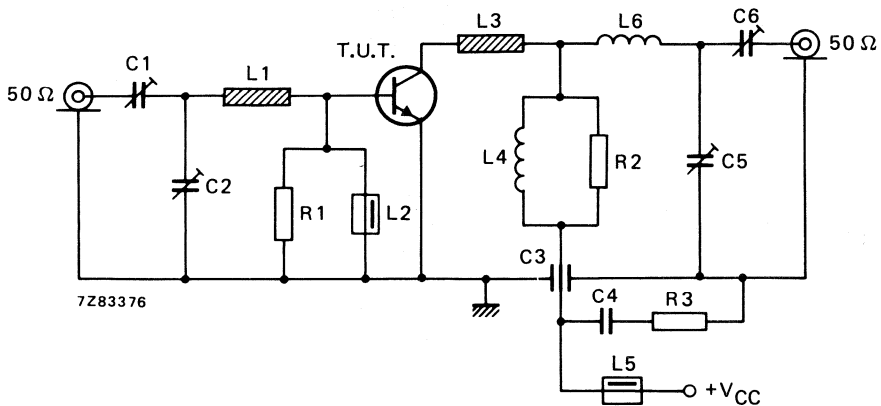


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C5 = C6 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = 100 pF ceramic feed-through capacitor

C4 = 100 nF polyester capacitor

L1 = stripline (34,8 mm x 6,0 mm)

L2 = L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = stripline (12,0 mm x 6,0 mm)

L4 = 220 nH; 10 turns enamelled Cu wire (0,35 mm) closely wound around R2

L6 = 29 nH; 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 3,5 mm; leads 2 x 4 mm

L1 and L3 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 carbon resistorR2 = 10 k Ω carbon resistor (style CR37)R3 = 10 Ω carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit are shown in Fig. 8.

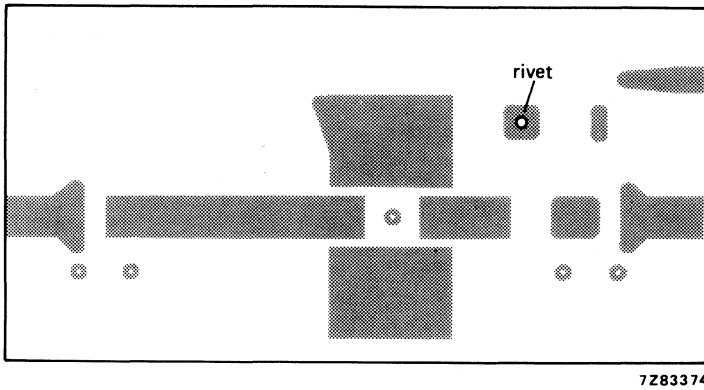
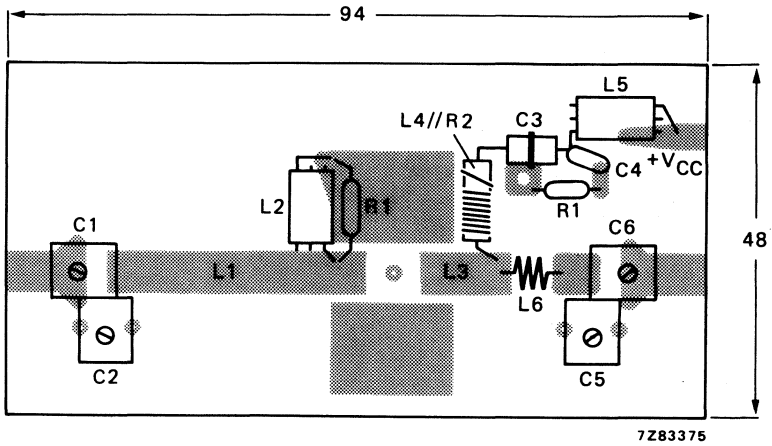


Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

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.

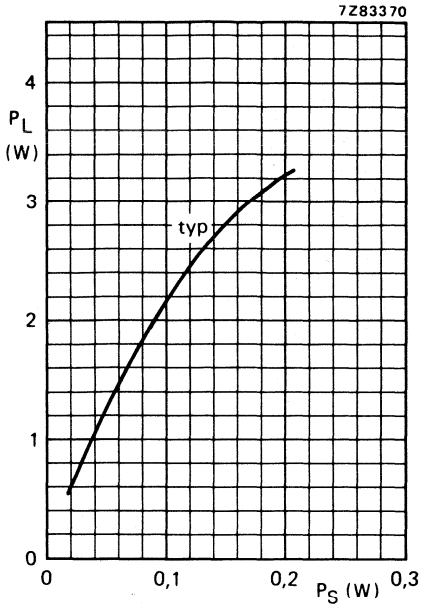


Fig. 9 $V_{CE} = 28$ V; $f = 470$ MHz; $T_h = 25$ °C.

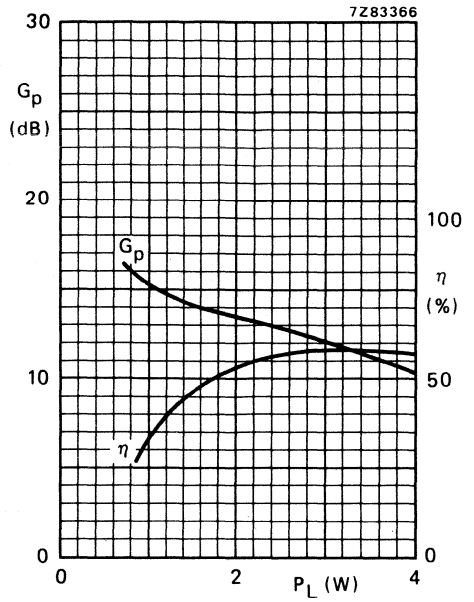


Fig. 10 Typical values; $V_{CE} = 28$ V; $f = 470$ MHz; $T_h = 25$ °C.

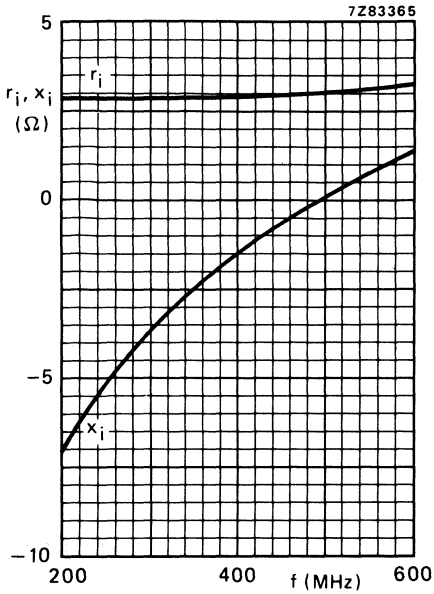


Fig. 11 Input impedance (series components).

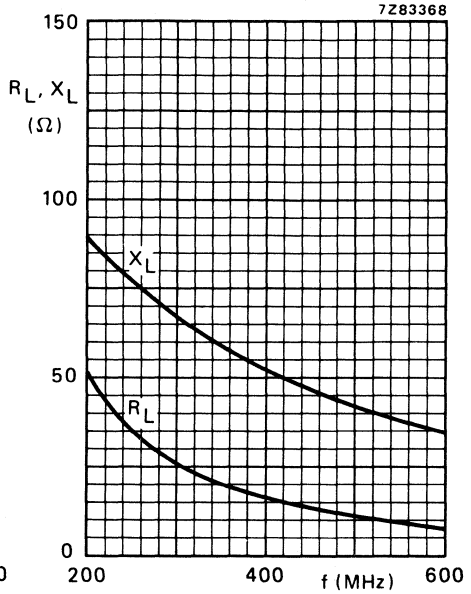


Fig. 12 Load impedance (series components).

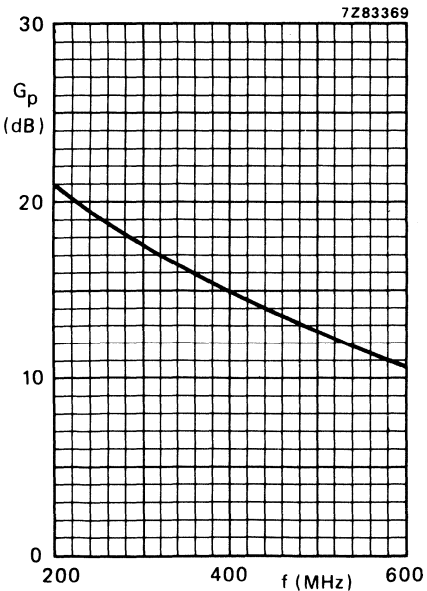


Fig. 13.

Conditions for Figs 11, 12 and 13:
 Typical values; $V_{CE} = 28$ V; $P_L = 2$ W;
 $T_h = 25$ °C.

Ruggedness

The BLW89 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 2 W under the following conditions:

$V_{CE} = 28$ V; $f = 470$ MHz; $T_h = 70$ °C;
 $R_{th\ mb-h} = 0,6$ K/W.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor suitable for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand infinite VSWR at rated output power. High reliability is ensured by a gold sandwich metallization.

The transistor is housed in a ¼" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

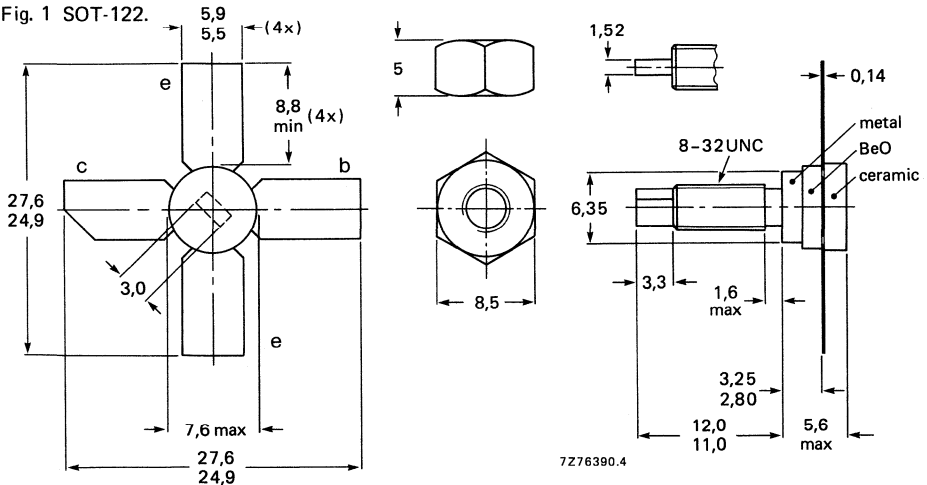
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %
c.w.	28	470	4	> 11	> 55

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.

PRODUCT SAFETY 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	V_{CESM}	max.	60 V
Emitter-base voltage (open collector)	V_{CEO}	max.	30 V
Collector current d.c. or average (peak value); $f > 1$ MHz	V_{EBO}	max.	4 V
Total power dissipation (d.c. and r.f.) up to $T_{mb} = 25$ °C	$I_C; I_C(AV)$	max.	0,62 A
	I_{CM}	max.	2,0 A
Storage temperature	P_{tot}	max.	18,6 W
Operating junction temperature	T_{stg}		-65 to + 150 °C
	T_j	max.	200 °C

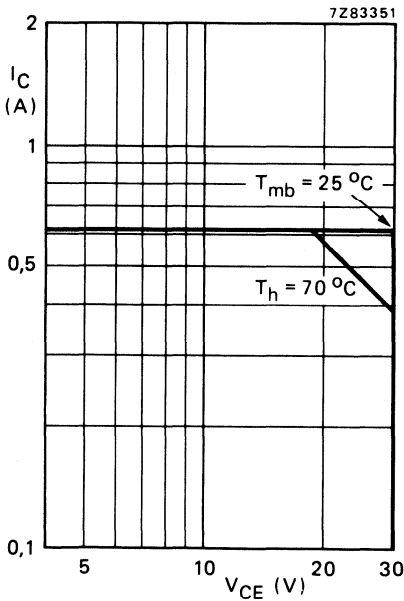


Fig. 2 D.C. SOAR.

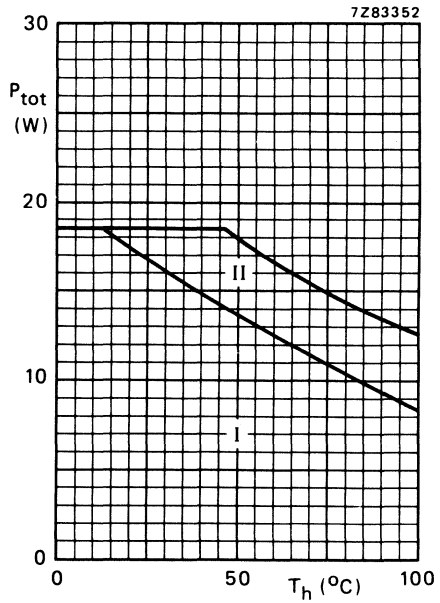


Fig. 3 Power derating curves vs. temperature.
I Continuous d.c. and r.f. operation
II Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 6 W; $T_{mb} = 73,6$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base
(d.c. and r.f. dissipation)

$R_{th\ j-mb} = 9,0$ K/W

From mounting base to heatsink

$R_{th\ mb-h} = 0,6$ K/W

CHARACTERISTICS

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

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 4\text{ mA}$ $V_{(BR)CES} > 60\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 20\text{ mA}$ $V_{(BR)CEO} > 30\text{ V}$

Emitter-base breakdown voltage

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

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 30\text{ V}$ $I_{CES} < 2\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

 $E_{SBO} > 1\text{ mJ}$ $R_{BE} = 10\text{ }\Omega$ $E_{SBR} > 1\text{ mJ}$

D.C. current gain *

 $I_C = 0,3\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 40
10 to 100

Collector-emitter saturation voltage *

 $I_C = 1,0\text{ A}; I_B = 0,2\text{ A}$ V_{CEsat} typ. 0,9 VTransition frequency at $f = 500\text{ MHz}$ * $-I_E = 0,3\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 1,2 GHz $-I_E = 1,0\text{ A}; V_{CB} = 28\text{ V}$ f_T typ. 0,9 GHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 28\text{ V}$ C_C typ. 8,4 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 20\text{ mA}; V_{CE} = 28\text{ V}$ C_{re} typ. 3,6 pF

Collector-stud capacitance

 C_{cs} typ. 1,2 pF ←* Measured under pulse conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

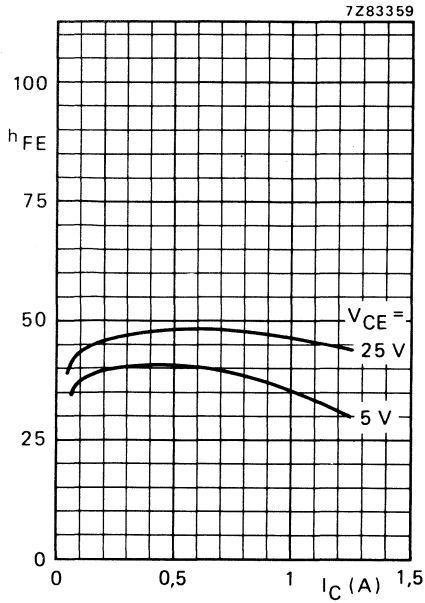


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

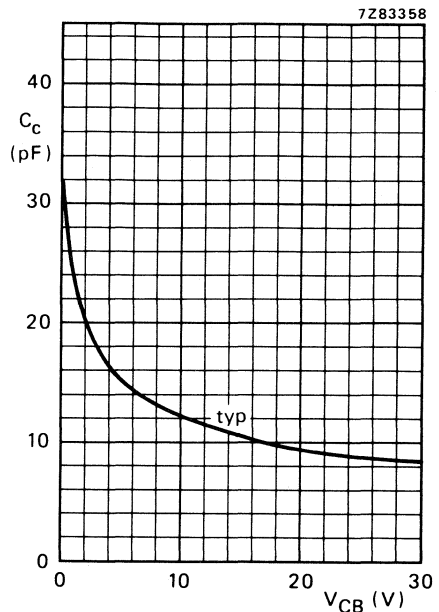


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

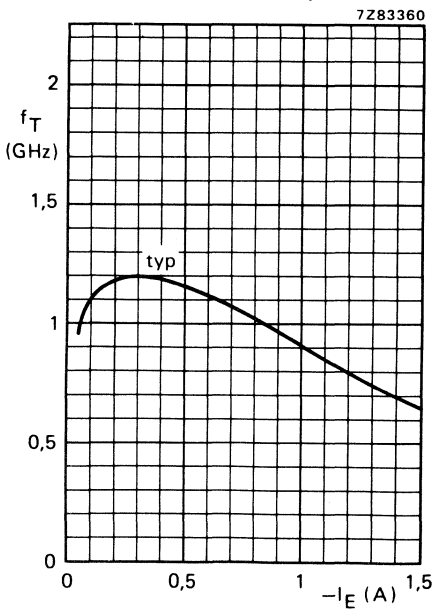


Fig. 6 $V_{CB} = 28\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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{Z}_L (Ω)
470	28	4	< 0,32	> 11	< 0,26	> 55	1,7 + j1,8	8 + j26
470	28	4	typ. 0,23	typ. 12,5	typ. 0,25	typ. 58	—	—

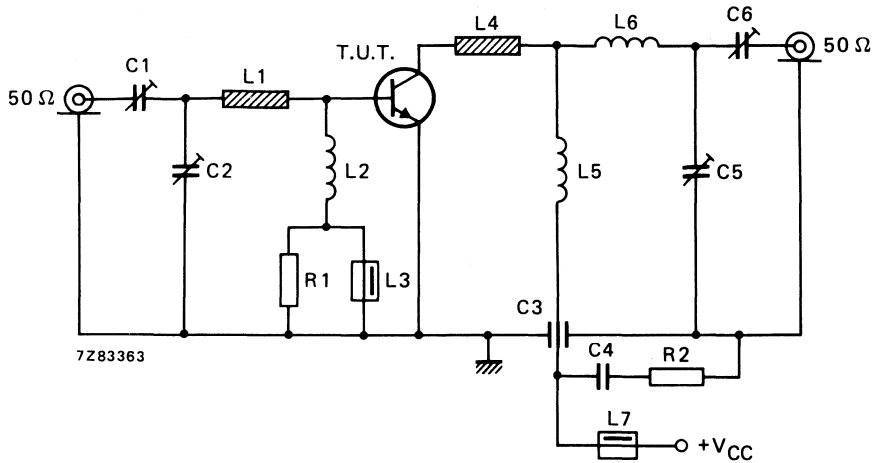


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C5 = C6 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = 100 pF feed-through capacitor

C4 = 100 nF polyester capacitor

L1 = stripline (34,8 mm x 6,0 mm)

L2 = 320 nH; 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; leads 2 x 4 mm

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

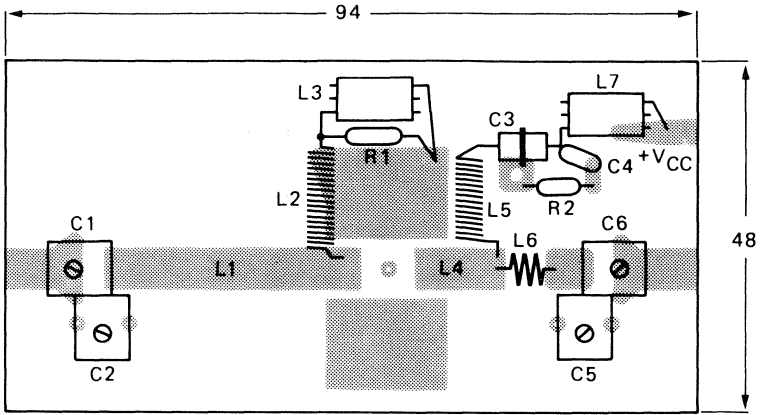
L4 = stripline (12,0 mm x 6,0 mm)

L5 = 265 nH; 13 turns closely wound enamelled Cu wire (0,35 mm); int. dia. 3,5 mm; leads 2 x 4 mm

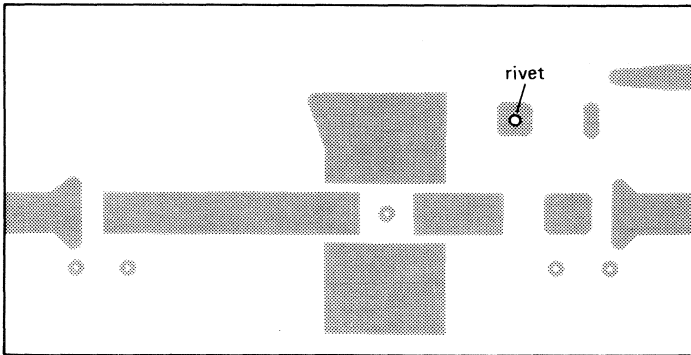
L6 = 29 nH; 3 turns closely wound enamelled Cu wire (1 mm); int. dia. 3,5 mm; leads 2 x 4 mm

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".R1 = 100 Ω carbon resistorR2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit are shown in Fig. 8.



7Z83361



7Z83362

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.

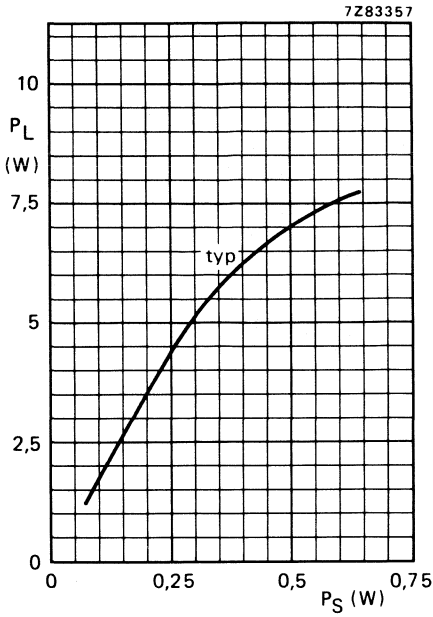


Fig. 9 $V_{CE} = 28$ V; $f = 470$ MHz; $T_h = 25$ °C.

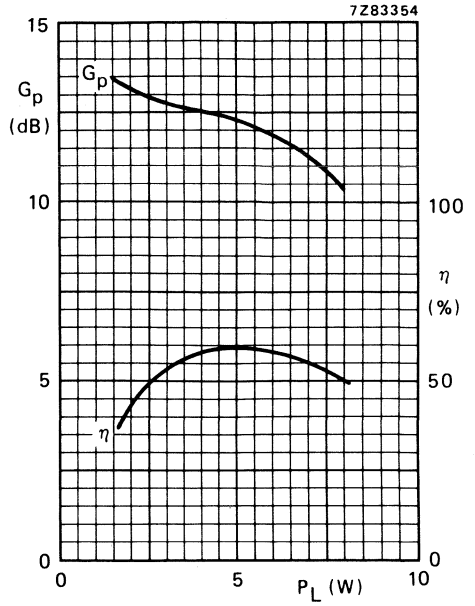


Fig. 10 Typical values; $V_{CE} = 28$ V; $f = 470$ MHz; $T_h = 25$ °C.

7Z83356

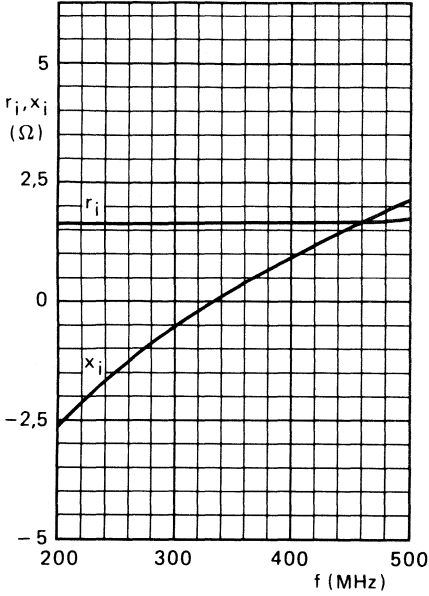


Fig. 11 Input impedance (series components).

7Z83355

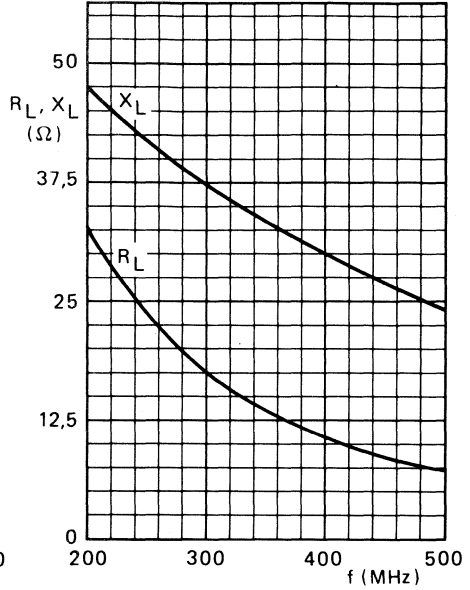


Fig. 12 Load impedance (series components).

7Z83353

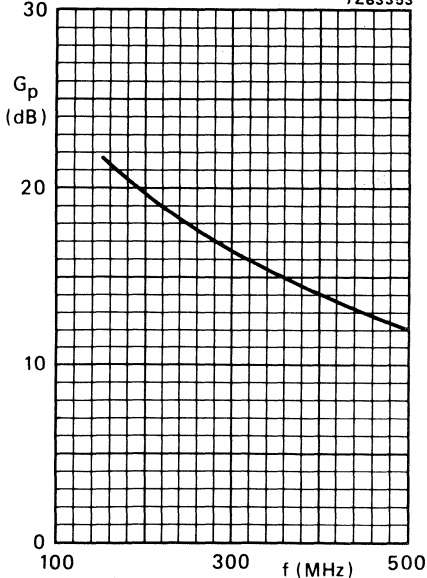


Fig. 13.

Conditions for Figs 11, 12 and 13:

Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 4 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

Ruggedness

The BLW90 is capable of withstanding full load mismatch ($V_{SWR} = 50$ through all phases) up to 4 W under the following conditions:

$V_{CE} = 28 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,6 \text{ K/W}$.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor suitable for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand infinite VSWR at rated output power. High reliability is ensured by a **gold sandwich metallization**.

The transistor is housed in a ¼" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

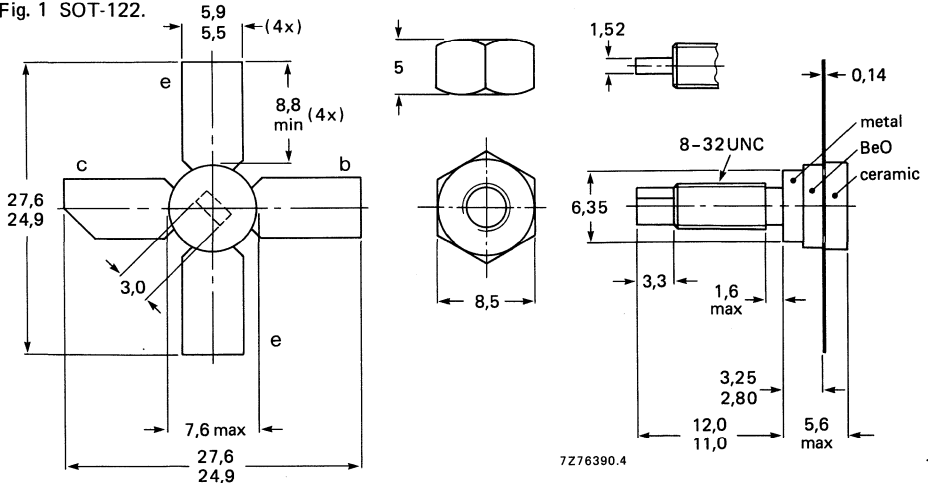
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %
c.w.	28	470	10	>9	>60

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.

PRODUCT SAFETY 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. 60 V

open base

V_{CEO} max. 30 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

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

(peak value); $f > 1$ MHz

I_{CM} max. 3,5 A

Total power dissipation up to $T_{mb} = 35$ °C

P_{tot} max. 30 W

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

P_{rf} max. 32,5 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

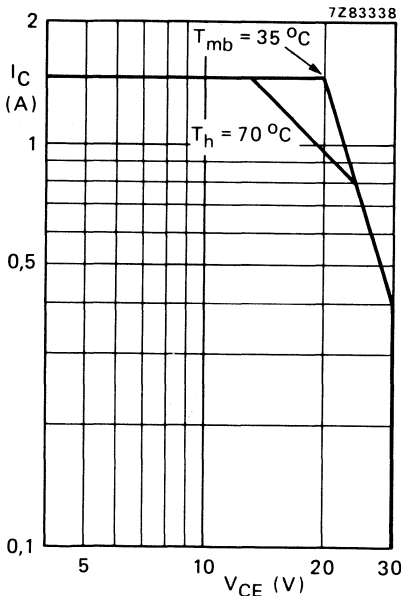


Fig. 2 D.C. SOAR.

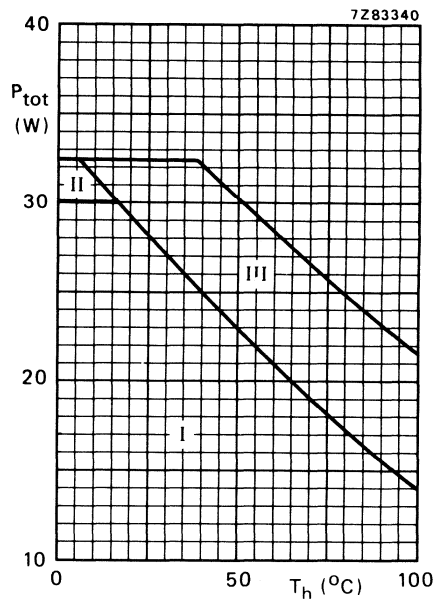


Fig. 3 Power derating curves vs. temperature.

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

THERMAL RESISTANCE (dissipation = 10 W; $T_{mb} = 76$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. and r.f. dissipation)

$R_{th\ j-mb}$ = 6,2 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,6 K/W

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$$V_{BE} = 0; I_C = 10\text{ mA}$$

$$V_{(BR)CES} > 60\text{ V}$$

Collector-emitter breakdown voltage

$$\text{open base; } I_C = 50\text{ mA}$$

$$V_{(BR)CEO} > 30\text{ V}$$

Emitter-base breakdown voltage

$$\text{open collector; } I_E = 4\text{ mA}$$

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

Collector cut-off current

$$V_{BE} = 0; V_{CE} = 30\text{ V}$$

$$I_{CES} < 4\text{ mA}$$

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

open base

$$R_{BE} = 10\text{ }\Omega$$

$$ESBO > 2\text{ mJ}$$

$$ESBR > 2\text{ mJ}$$

D.C. current gain *

$$I_C = 0,6\text{ A; } V_{CE} = 5\text{ V}$$

$$h_{FE} \text{ typ. } 40$$

10 to 100

Collector-emitter saturation voltage *

$$I_C = 2,0\text{ A; } I_B = 0,4\text{ A}$$

$$V_{CEsat} \text{ typ. } 1,0\text{ V}$$

Transition frequency at $f = 500\text{ MHz}$ *

$$-I_E = 0,6\text{ A; } V_{CB} = 28\text{ V}$$

$$-I_E = 2,0\text{ A; } V_{CB} = 28\text{ V}$$

$$f_T \text{ typ. } 1,2\text{ GHz}$$

$$f_T \text{ typ. } 1,0\text{ GHz}$$

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

$$I_E = I_e = 0; V_{CB} = 28\text{ V}$$

$$C_C \text{ typ. } 17\text{ pF}$$

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

$$I_C = 20\text{ mA; } V_{CE} = 28\text{ V}$$

$$C_{re} \text{ typ. } 8,5\text{ pF}$$

Collector-stud capacitance

$$C_{cs} \text{ typ. } 1,2\text{ pF} \leftarrow$$

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

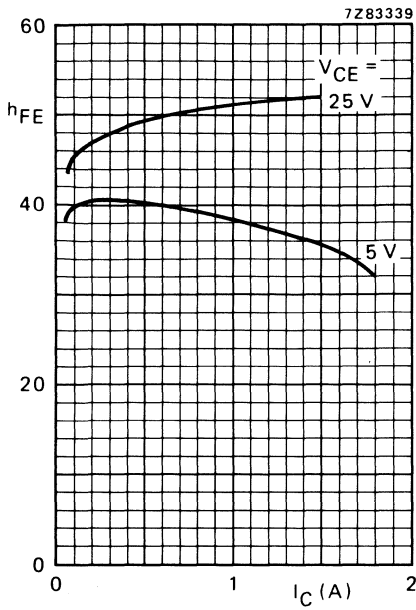


Fig. 4 Typical values; $T_j = 25^\circ\text{C}$.

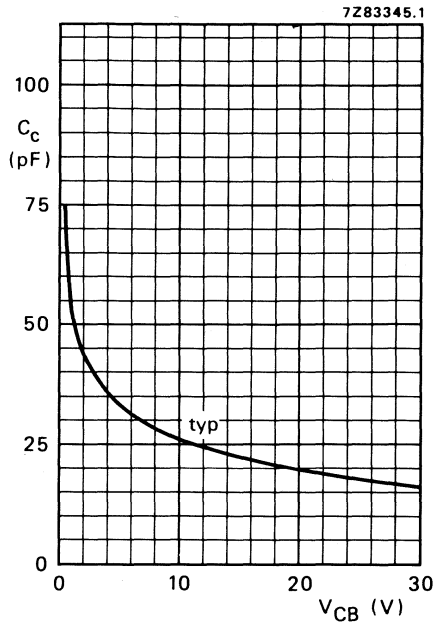


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ\text{C}$.

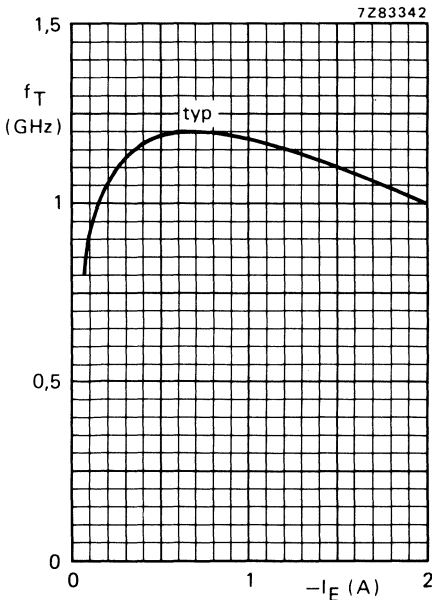


Fig. 6 $V_{CB} = 28$ V; $f = 500$ MHz; $T_j = 25^\circ\text{C}$.

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{z}_L (Ω)
470	28	10	< 1,26 >	9	< 0,6 >	> 60	$1,0 + j2,1$	$4,9 + j11$
470	28	10	typ. 0,9	typ. 10,5	typ. 0,56	typ. 63	—	—

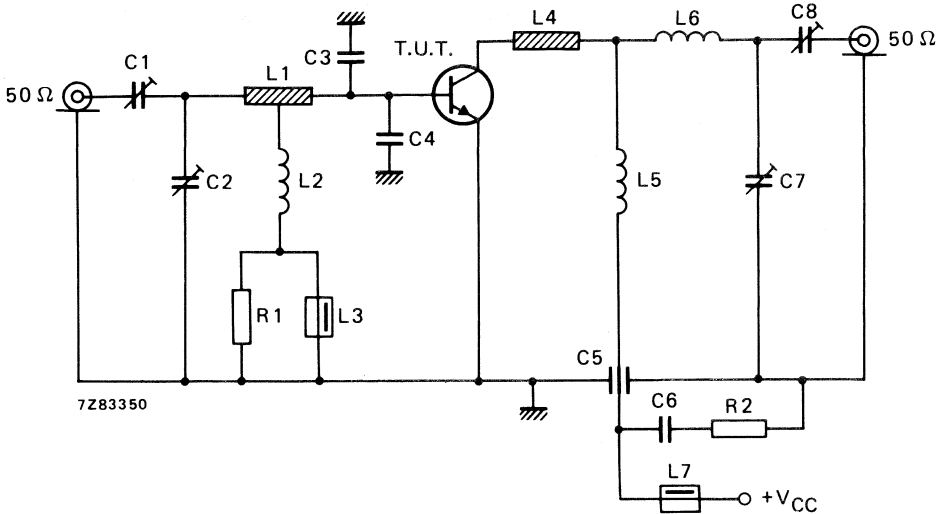


Fig. 7 Test circuit; c.w. class-B. For component layout and p.c.b. see Fig. 8.

List of components:

C1 = C7 = C8 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = C4 = 15 pF multilayer ceramic chip capacitor (cat. no. 2222 851 13159), middle of capacitor 3 mm from transistor edge

C5 = 100 pF feed-through capacitor

C6 = 100 nF polyester capacitor

L1 = stripline (30,4 mm x 6,0 mm); tap for L2 placed 11 mm from transistor edge

L2 = 320 nH; 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; leads 2 x 4 mm

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

L4 = stripline (12,0 mm x 6,0 mm)

L5 = 78 nH; 5 turns enamelled Cu wire (1,0 mm); int. dia. 5 mm; length 9,3 mm; leads 2 x 5 mm

L6 = 22 nH; 2 turns enamelled Cu wire (1,0 mm); int. dia. 4 mm; length 3,2 mm; leads 2 x 5 mm

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1/16".R1 = R2 = 10 Ω carbon resistor

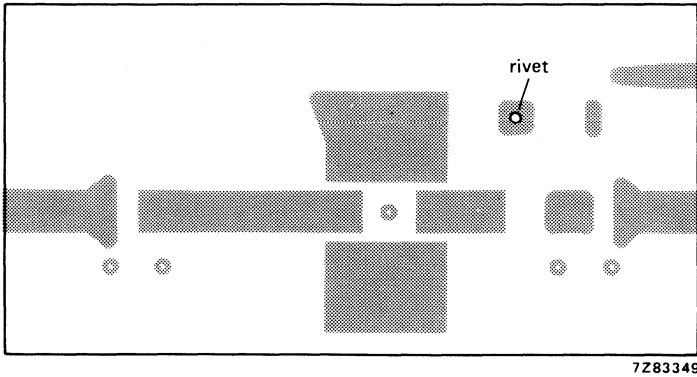
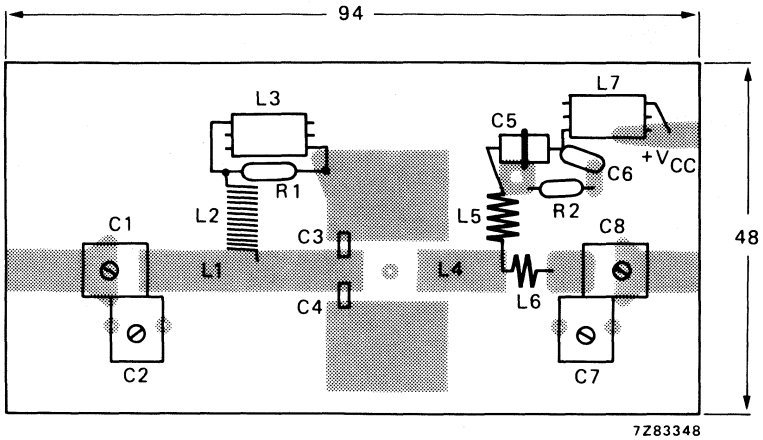


Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

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.

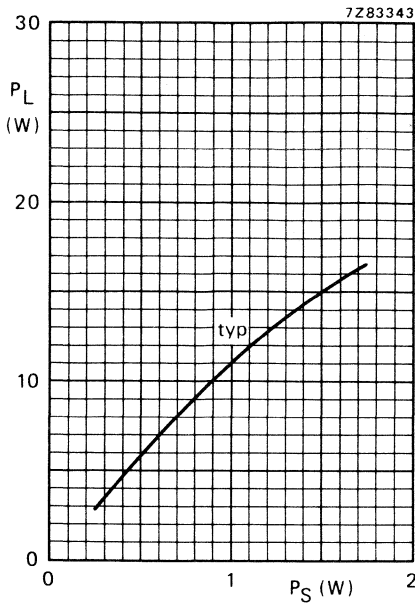


Fig. 9 $V_{CE} = 28$ V; $f = 470$ MHz; $T_h = 25$ °C.

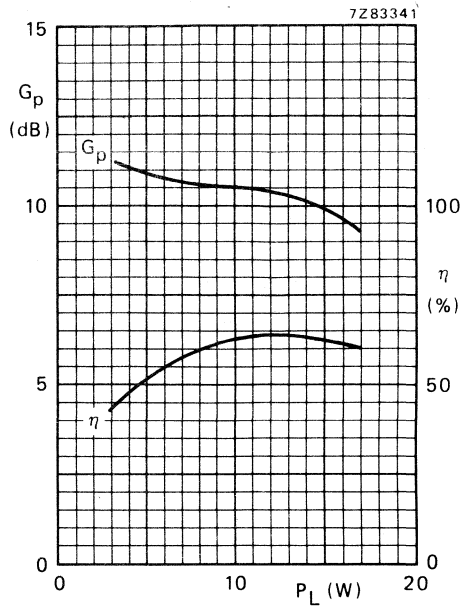


Fig. 10 Typical values; $V_{CE} = 28$ V; $f = 470$ MHz; $T_h = 25$ °C.

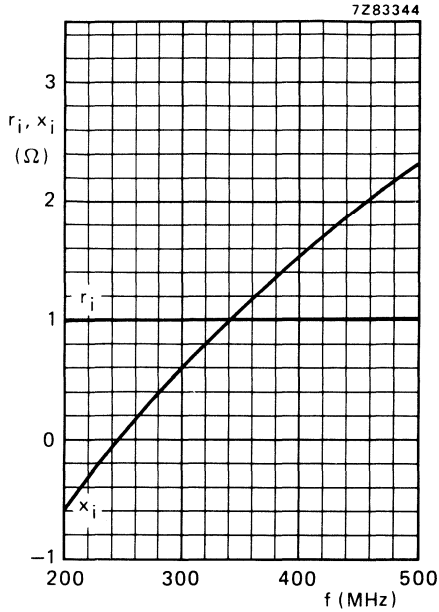


Fig. 11 Input impedance (series components).

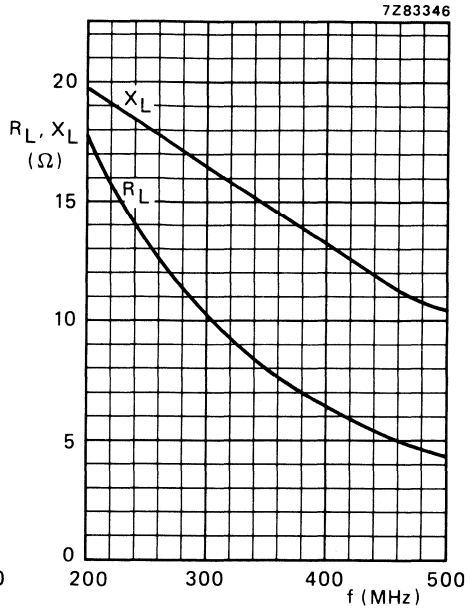
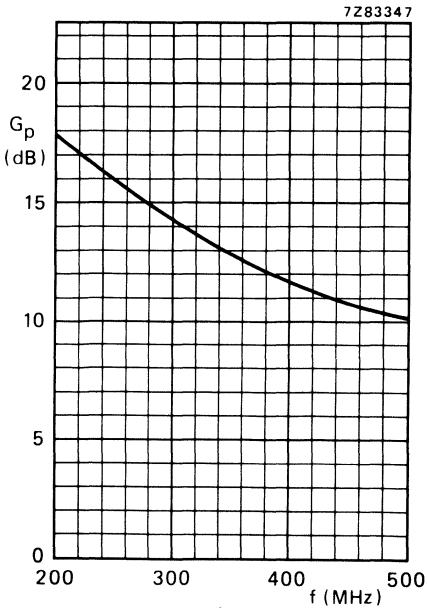


Fig. 12 Load impedance (series components).



Conditions for Figs 11, 12 and 13:

Typical values; $V_{CE} = 28 \text{ V}$; $P_L = 10 \text{ W}$;
 $T_h = 25 \text{ }^\circ\text{C}$.

Ruggedness

The BLW91 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 10 W under the following conditions:

$V_{CE} = 28 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,6 \text{ K/W}$.

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 $\frac{1}{2}$ " 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_{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

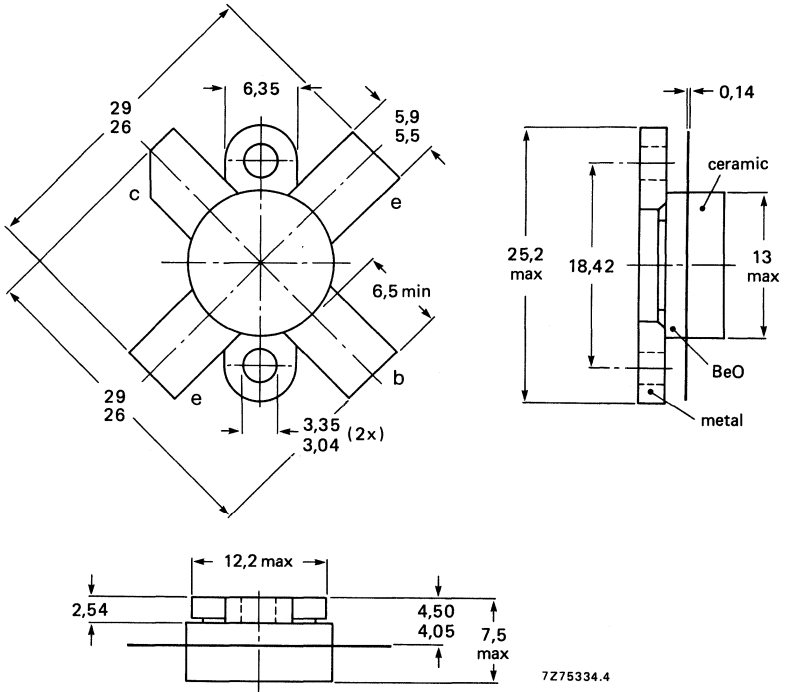
SOT-121A (see Fig. 1).

PRODUCT SAFETY 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-121.

Dimensions in mm



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

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

Heatsink compound must be applied sparingly and evenly distributed.

7275334.4

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

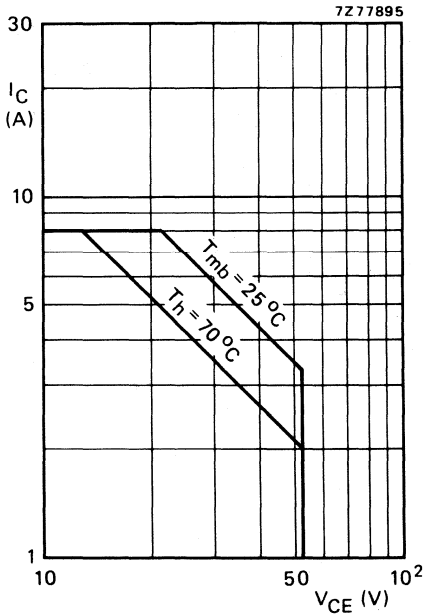


Fig. 2 D.C. SOAR.

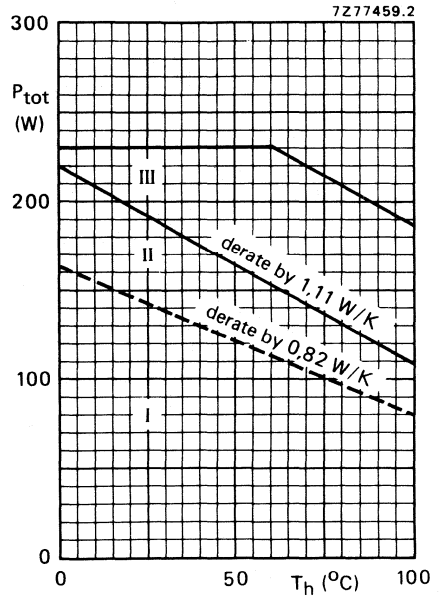


Fig. 3 R.F. power dissipation; $V_{CE} \leq 50$ V; $f \geq 1$ MHz.

- 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 K/W

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

$R_{th\ j-mb(rf)}$ = 0,7 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,2 K/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

$R_{BE} = 10\text{ }\Omega$

$E_{SBO} > 12,5\text{ mJ}$

$E_{SBR} > 12,5\text{ mJ}$

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: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

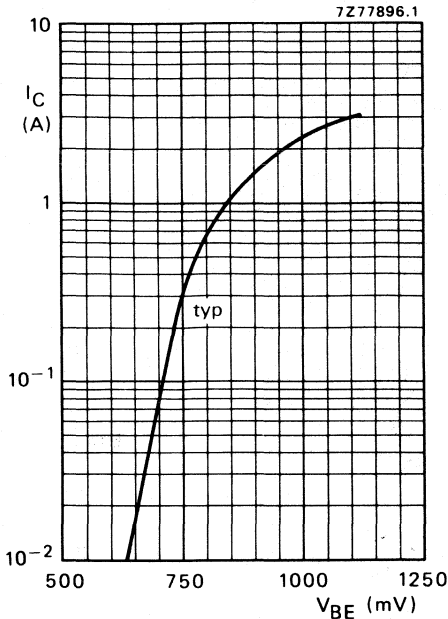


Fig. 4 $V_{CE} = 40\text{ V}$; $T_h = 25\text{ }^\circ\text{C}$.

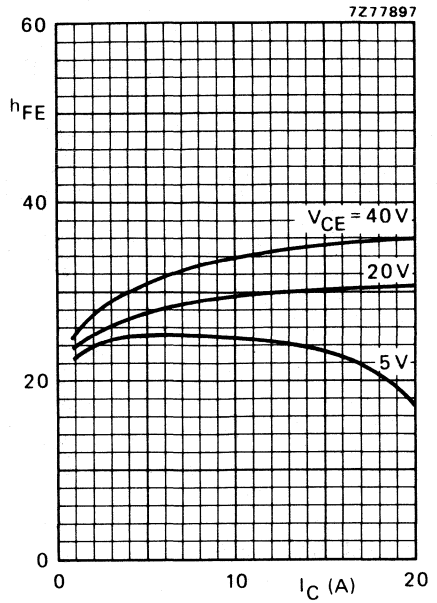


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

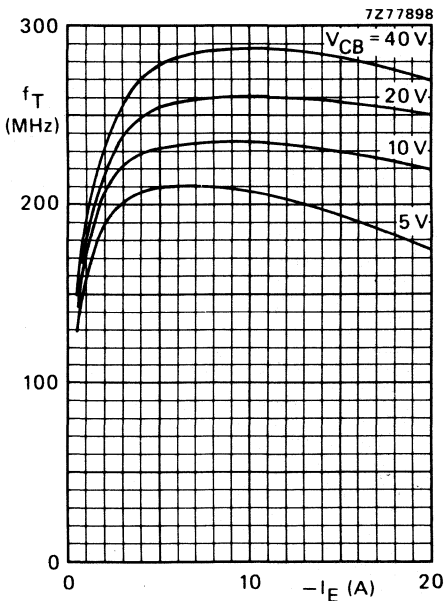


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

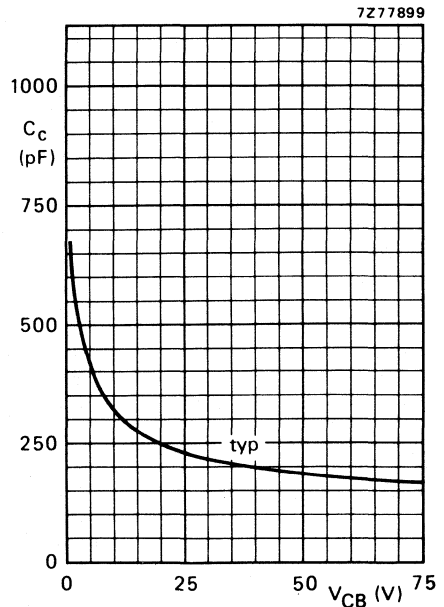


Fig. 7 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

$V_{CE} = 50 \text{ V}$; $T_h = 25 \text{ }^\circ\text{C}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

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

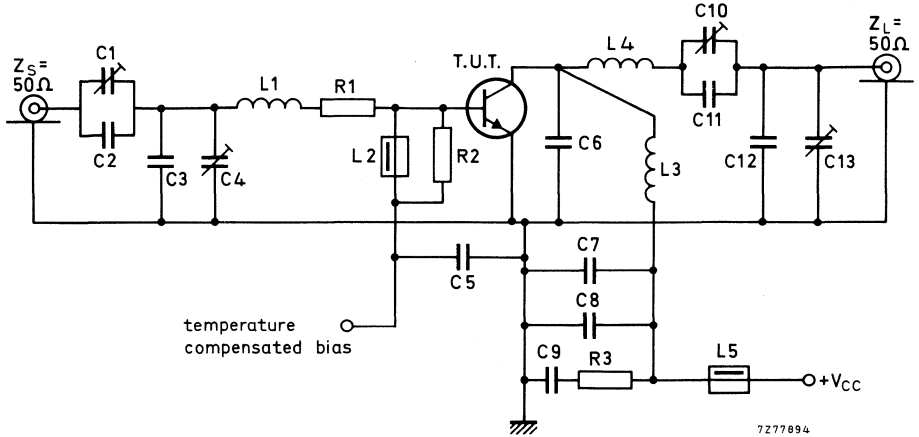


Fig. 8 Test circuit; s.s.b. class-AB.

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 (± 5%; 0,5 W each)

R2 = 27 Ω carbon resistor (± 5%; 0,5 W)

R3 = 4,7 Ω carbon resistor (± 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.

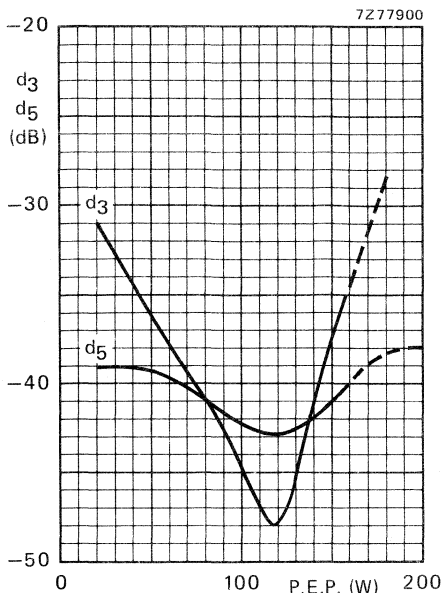


Fig. 9 Intermodulation distortion as a function of output power.*

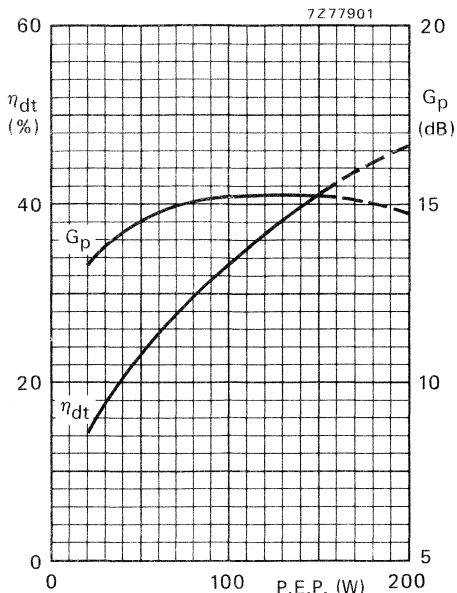


Fig. 10 Double-tone efficiency and power gain as a function of output power.

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:

$V_{CE} = 45\text{V}$; $f = 28 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$.

* See note on previous page.

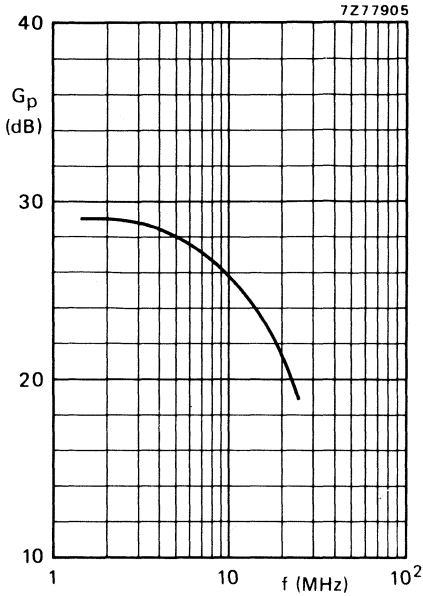


Fig. 11 Power gain as a function of frequency.

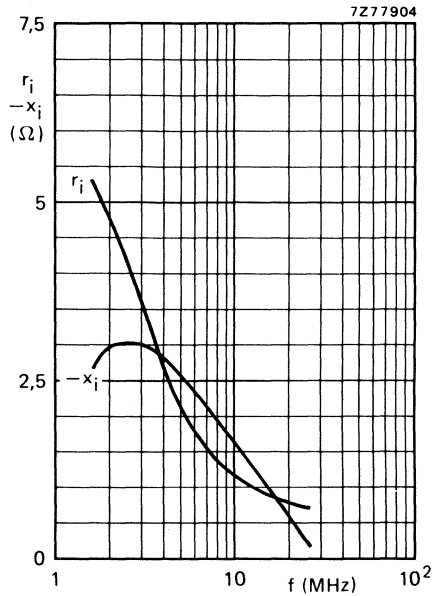


Fig. 12 Input impedance (series components) as a function of frequency.

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).

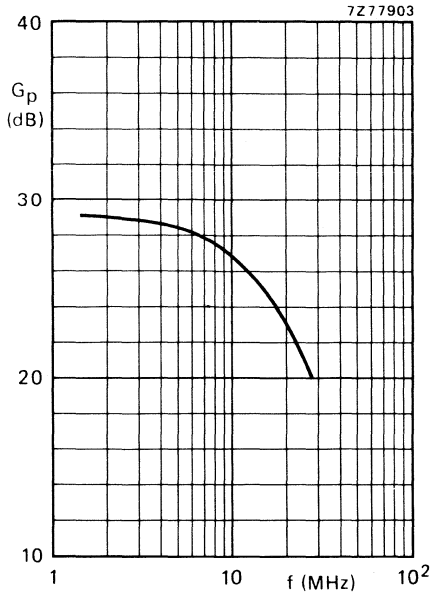


Fig. 13 Power gain as a function of frequency.

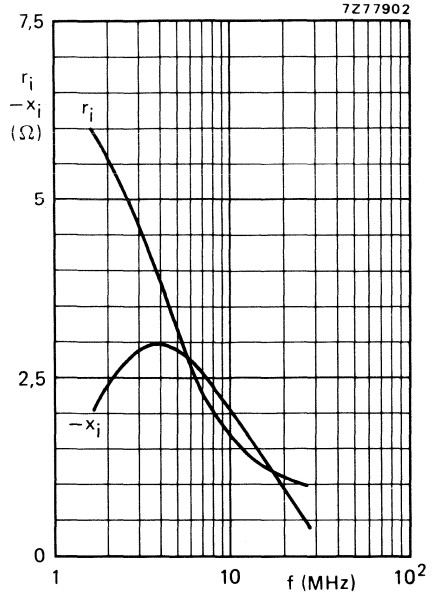


Fig. 14 Input impedance (series components) as a function of frequency.

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 .

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, AB and B operated high power industrial and military transmitting equipment in the h.f. and v.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. Transistors are supplied 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	f MHz	P_L W	G_p dB	η %	d_3 dB	d_5 dB	$I_{C(ZS)}$ (I_C) A
s.s.b. (class-AB)	50	1,6 – 28	25 – 200 (P.E.P.)	> 13,5	> 40*	< -30	< -30	0,1
c.w. (class-B)	50	108	200	typ. 6,5	typ. 67	–	–	(6)
s.s.b. (class-A)	40	28	50 (P.E.P.)	typ. 19	–	typ. -40	< -40	(4)

* η_{dt} at 200 W P.E.P.

MECHANICAL DATA

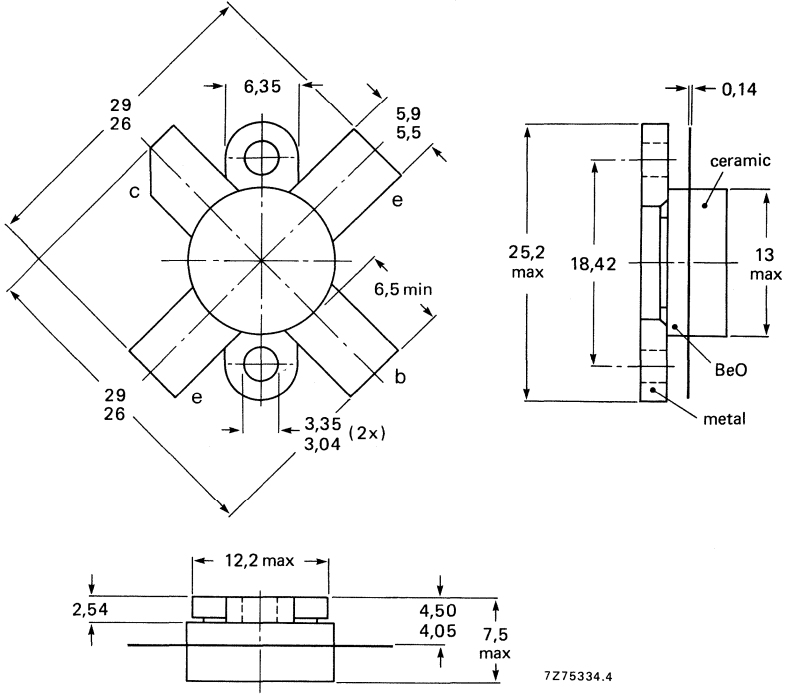
SOT-121 (see Fig. 1).

PRODUCT SAFETY 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-121.

Dimensions in mm



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

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

Heatsink compound must be applied sparingly and evenly distributed.

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. 55 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. 40 A

R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 45$ °C

P_{rf} max. 340 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C

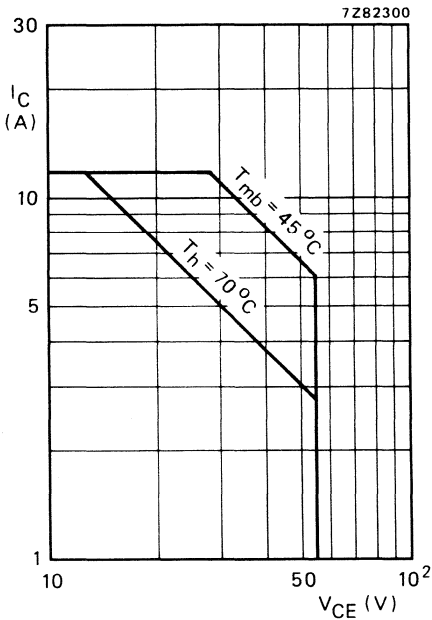


Fig. 2 D.C. SOAR.

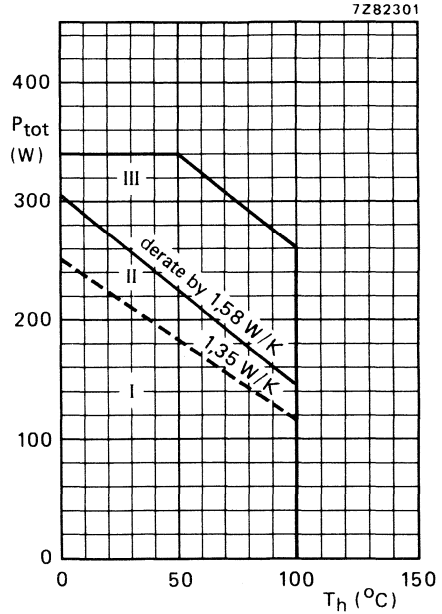


Fig. 3 Power/temperature derating curves.

- I Continuous d.c. operation
- II Continuous r.f. operation; $f > 1$ MHz
- III Short-time operation during mismatch; $f > 1$ MHz

THERMAL RESISTANCE (dissipation = 150 W; $T_{mb} = 100$ °C, i.e. $T_h = 70$ °C)

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

$R_{th j-mb(dc)}$ = 0,63 K/W

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

$R_{th j-mb(rf)}$ = 0,45 K/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,2 K/W

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 50\text{ mA}$

$V_{(BR)CES} > 110\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 200\text{ mA}$

$V_{(BR)CEO} > 55\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 20\text{ mA}$

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

Collector cut-off current

$V_{BE} = 0; V_{CE} = 55\text{ V}$

$I_{CES} < 10\text{ mA}$

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

open base

$R_{BE} = 10\text{ }\Omega$

$ES_{BO} > 20\text{ mJ}$

$ES_{BR} > 20\text{ mJ}$

D.C. current gain*

$I_C = 7\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 30
15 to 50

D.C. current gain ratio of matched devices*

$I_C = 7\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} \leq 1,2$

Collector-emitter saturation voltage*

$I_C = 20\text{ A}; I_B = 4\text{ A}$

V_{CEsat} typ. 1,9 V

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

$-I_E = 7\text{ A}; V_{CB} = 45\text{ V}$

$-I_E = 20\text{ A}; V_{CB} = 45\text{ V}$

f_T typ. 235 MHz

f_T typ. 245 MHz

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

$I_E = I_e = 0; V_{CB} = 50\text{ V}$

C_C typ. 280 pF

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

$I_C = 150\text{ mA}; V_{CE} = 50\text{ V}$

C_{re} typ. 170 pF

Collector-flange capacitance

C_{cf} typ. 4,4 pF

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

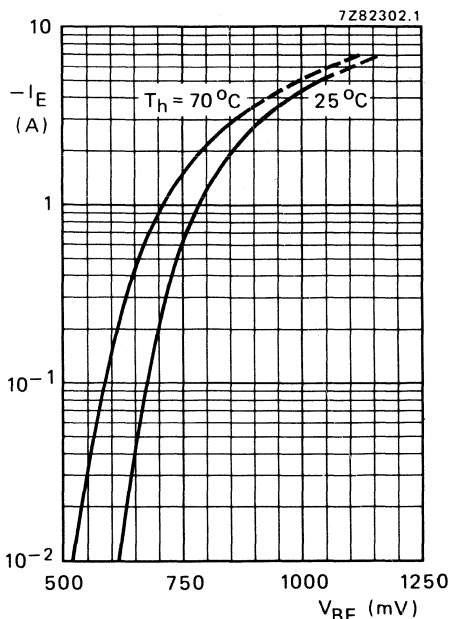


Fig. 4 Typical values; $V_{CE} = 40$ V.

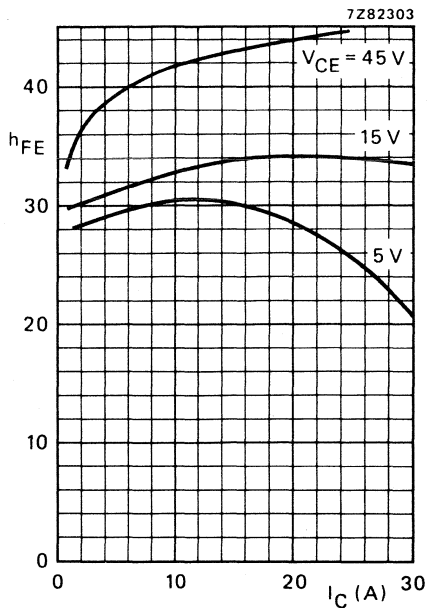


Fig. 5 Typical values; $T_j = 25^\circ\text{C}$.

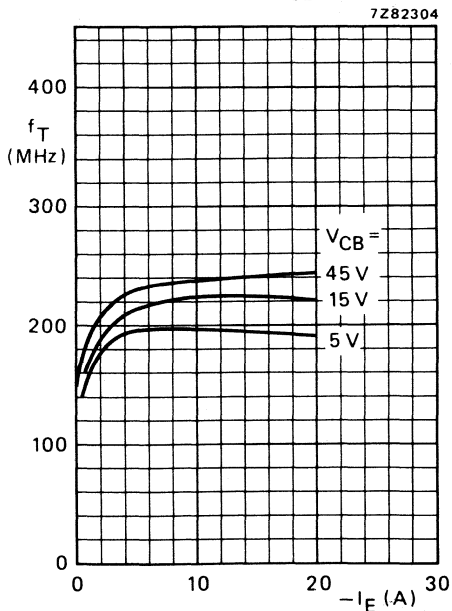


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ\text{C}$.

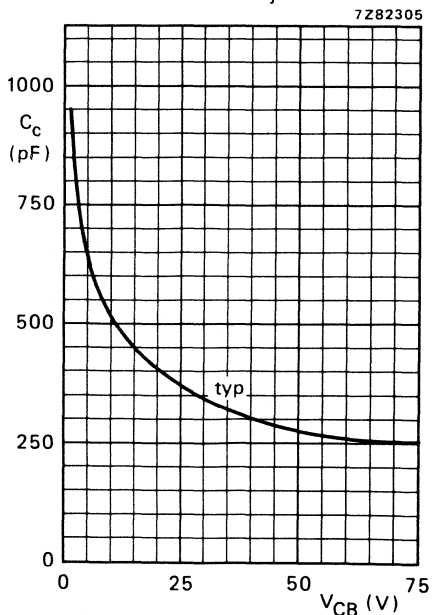


Fig. 7 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ\text{C}$.

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	$\eta_{dt}(\%)$ at 200 W (P.E.P.)	I_C (A) at 200 W (P.E.P.)	d_3^* dB	d_5^* dB	$I_{C(ZS)}$ A
25 to 200 (P.E.P.)	> 13,5	> 40	< 5,0	< -30	< -30	0,1

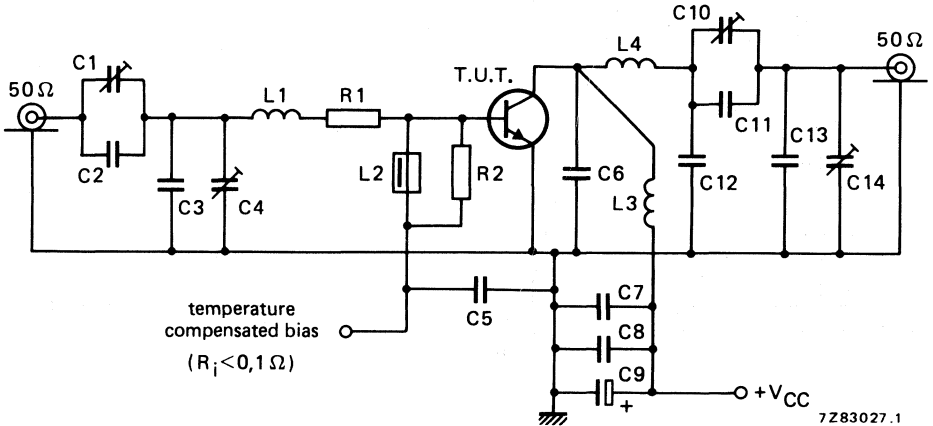


Fig. 8 Test circuit; s.s.b. class-AB.

List of components:

C1 = C4 = C10 = C14 = 100 pF film dielectric trimmer

C2 = 27 pF ceramic capacitor (500 V)

C3 = 270 pF polysterene capacitor (630 V)

C5 = C7 = C8 = 220 nF multilayer ceramic chip capacitor

C6 = 27 pF multilayer ceramic chip capacitor (500 V; ATC▲)

C9 = 47 μF /63 V electrolytic capacitor

C11 = 2 x 36 pF multilayer ceramic chip capacitors (500 V; ATC▲) in parallel

C12 = 2 x 43 pF multilayer ceramic chip capacitors (500 V; ATC▲) in parallel

C13 = 43 pF multilayer ceramic chip capacitor (500 V; ATC▲)

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

L3 = 150 nH; 5 turns Cu wire (2,0 mm); int. dia. 10,0 mm; length 18,7 mm; leads 2 x 5 mm

L4 = 197 nH; 5 turns Cu wire (2,0 mm); int. dia. 12,0 mm; length 18,6 mm; leads 2 x 5 mm

R1 = 0,66 Ω ; parallel connection of 5 x 3,3 Ω metal film resistors (PR37; $\pm 5\%$; 1,6 W each)R2 = 27 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.

▲ ATC means American Technical Ceramics.

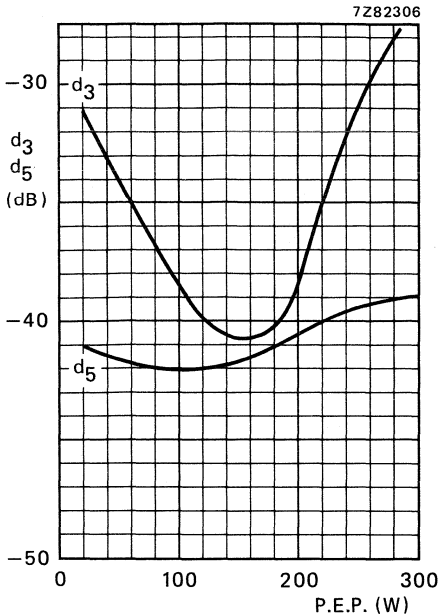


Fig. 9 Intermodulation distortion as a function of output power.*

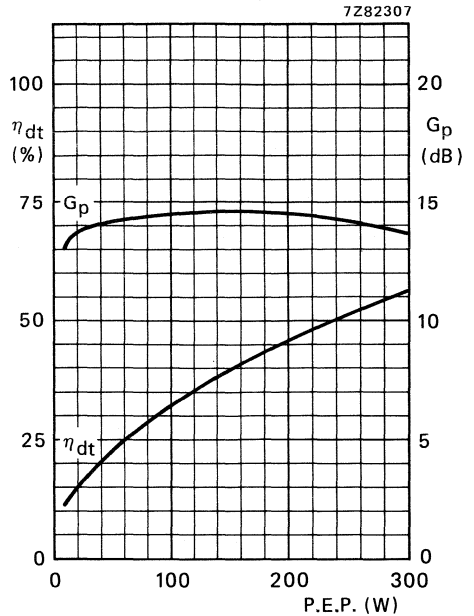


Fig. 10 Double-tone efficiency and power gain as a function of output power.

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 BLW96 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 150 W (P.E.P.) or a load mismatch (VSWR = 5 through all phases) up to 200 W (P.E.P.) under the following conditions:

$V_{CE} = 45 \text{ V}$; $f = 28 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$.

* See note on previous page.

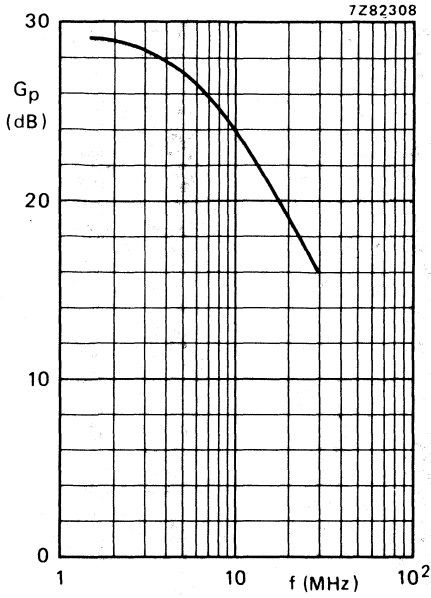


Fig. 11 Power gain as a function of frequency.

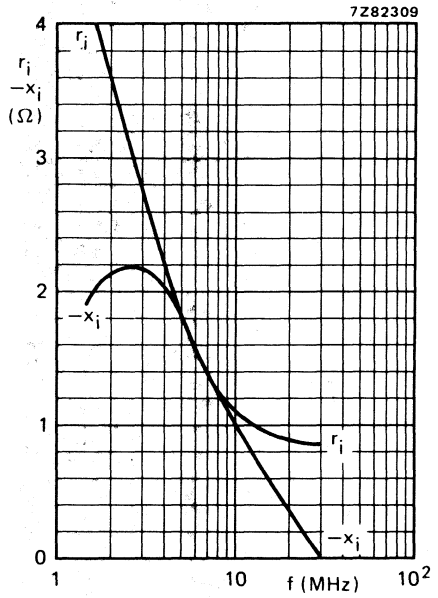


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for one transistor of a push-pull amplifier with cross-neutralization in s.s.b. class-AB operation.

Conditions:

$V_{CE} = 50$ V; $I_{C(ZS)} = 0,1$ A; $P_L = 200$ W (P.E.P.); $T_h = 25$ °C; $Z_L = 5$ Ω ; neutralizing capacitor: 47 pF.

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 (%)
108	50	200	typ. 45	typ. 6,5	typ. 6	typ. 67

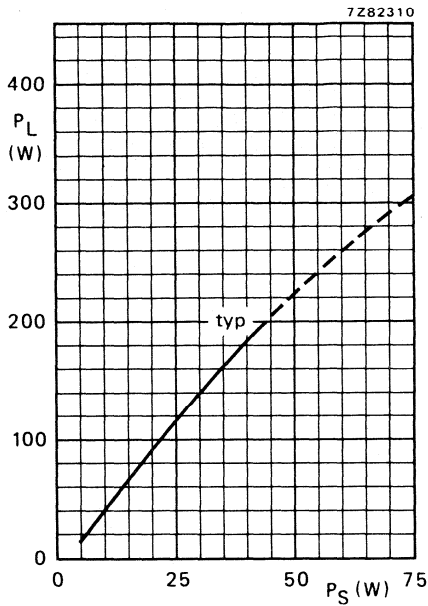


Fig. 13 $V_{CE} = 50\text{ V}$; $f = 108\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$.

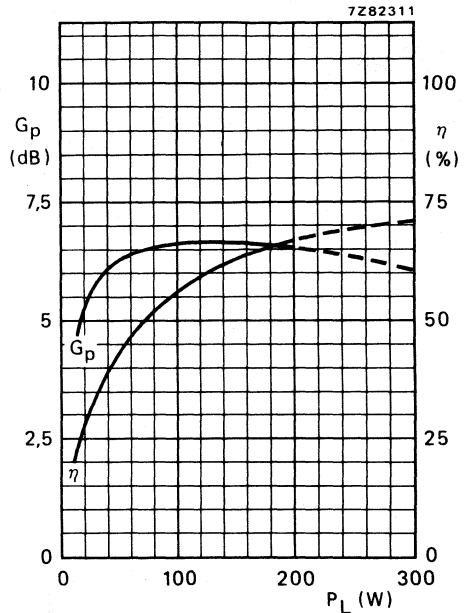


Fig. 14 $V_{CE} = 50\text{ V}$; $f = 108\text{ MHz}$; $T_h = 25\text{ }^\circ\text{C}$; typical values.

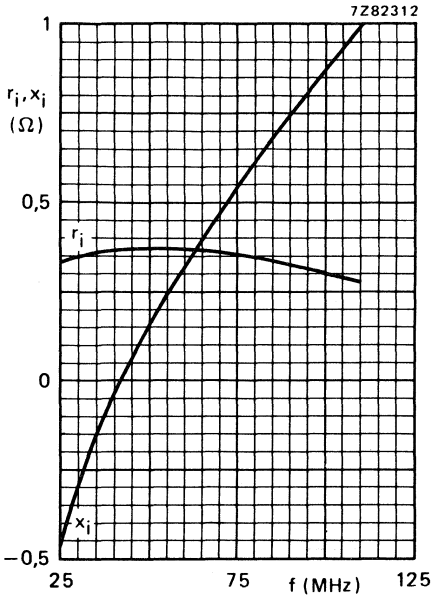


Fig. 15 Input impedance (series components).

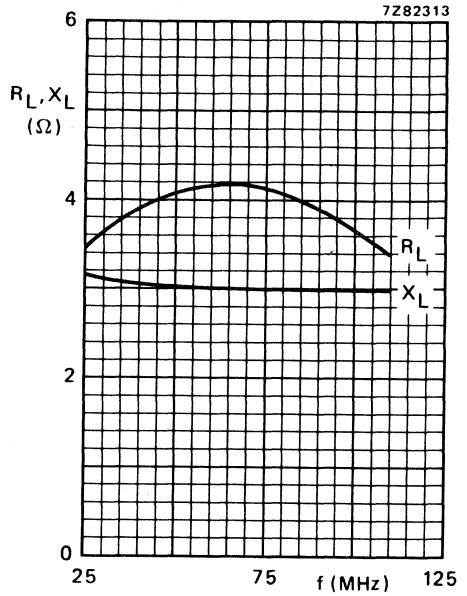


Fig. 16 Load impedance (series components).

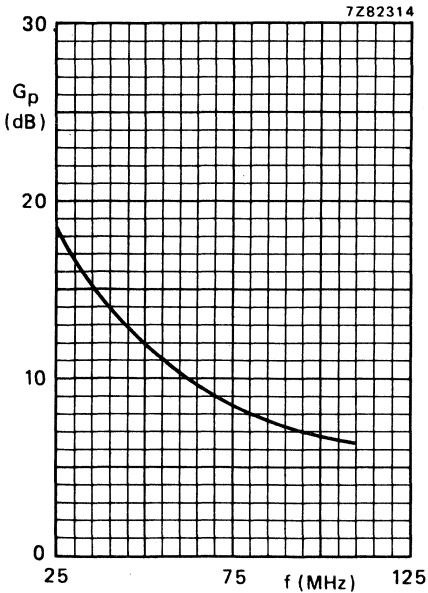


Fig. 17.

Conditions for Figs 15, 16 and 17:
 Typical values; $V_{CE} = 50$ V; $P_L = 200$ W;
 $T_h = 25$ °C; class-B operation.

R.F. performance in s.s.b. class-A operation (linear power amplifier)

$V_{CE} = 40 \text{ V}$; $T_h = 25 \text{ }^\circ\text{C}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	I_C A	d_3^* dB	d_5^* dB
typ. 50 (P.E.P.)	typ. 19	4	typ. -40	< -40

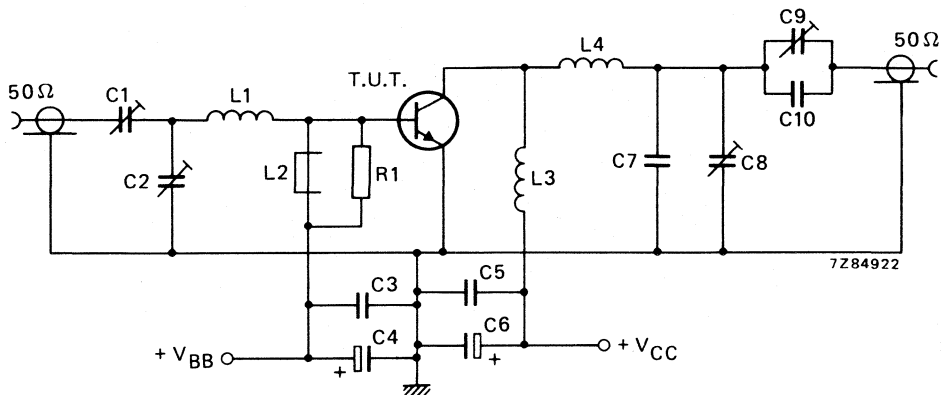


Fig. 18 Test circuit; s.s.b. class-A.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer

C3 = 220 nF polyester capacitor (100 V)

C4 = 100 μF /4 V electrolytic capacitor

C5 = 2 x 330 nF polyester capacitors (100 V) in parallel

C6 = 47 μF /63 V electrolytic capacitor

C7 = C10 = 2 x 82 pF ceramic capacitors (500 V) in parallel

C8 = C9 = 10 to 150 pF air dielectric trimmer

L1 = 45 nH; 2 turns enamelled Cu wire (1,6 mm); int. dia. 8,0 mm; length 4,0 mm; leads 2 x 3 mm

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

L3 = 110 nH; 4 turns enamelled Cu wire (2,0 mm); int. dia. 10,0 mm; length 8,0 mm; leads 2 x 2 mm

L4 = 210 nH; 5 turns enamelled Cu wire (2,0 mm); int. dia. 12,0 mm; length 10,0 mm; leads 2 x 2 mm

R1 = 27 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.

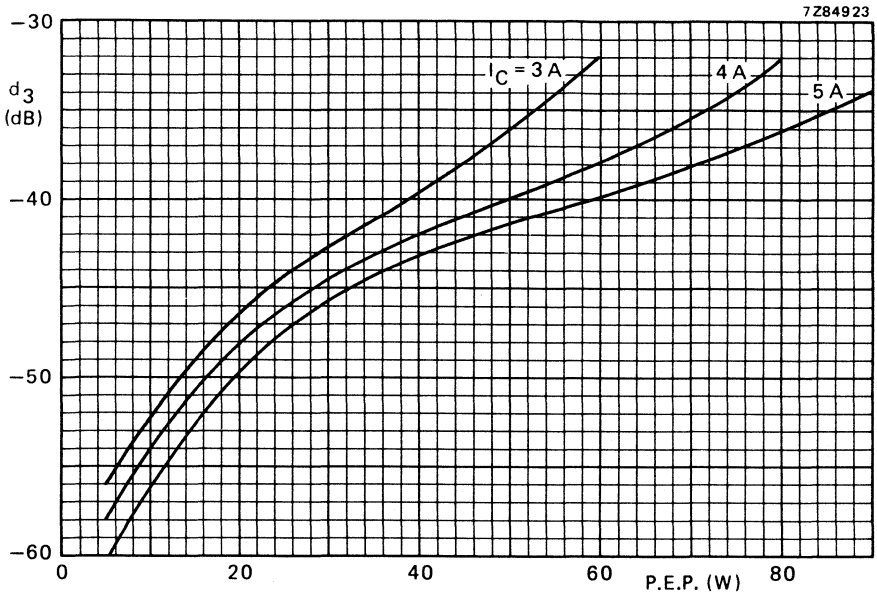


Fig. 19 Third order intermodulation distortion as a function of output power.*
Typical values; $V_{CE} = 40\text{ V}$; $T_h = 25\text{ }^\circ\text{C}$; $f_1 = 28,000\text{ MHz}$; $f_2 = 28,001\text{ MHz}$.

* 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.

H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in class-A, AB and B operated high-power industrial and military transmitting equipment in the h.f. band.

The transistor offers excellent performance as a linear amplifier in s.s.b. applications. It is resistance stabilized and is made to withstand severe load-mismatch conditions. All leads are isolated from the flange.

The transistors are supplied in matched h_{FE} groups.

QUICK REFERENCE DATA

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

mode of operation	V_{CE} V	$I_C(ZS)$ A	f MHz	P_L W	G_p dB	η_{dt} %	d_3 dB	d_5 dB
s.s.b. (class-AB)	28	0,1	1,6 – 28	175 (PEP)	>11,5	>40	<-30	<-30

MECHANICAL DATA

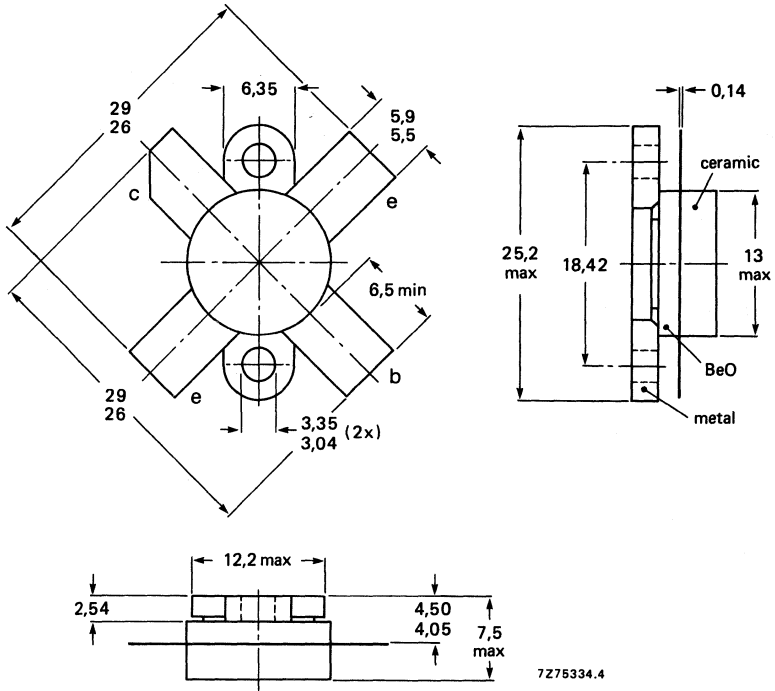
SOT-121 (see Fig. 1).

PRODUCT SAFETY 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-121.

Dimensions in mm



7Z75334.4

Torque on screw: min. 0,60 Nm (6,0 kg cm)
 max. 0,75 Nm (7,5 kg cm)

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

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

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

Collector-emitter voltage (peak value)

$V_{BE} = 0$

open base

V_{CESM} max. 65 V

V_{CEO} max. 33 V

V_{EBO} max. 4 V

Emitter-base voltage (open collector)

Collector current

average

$I_C(AV)$ max. 15 A

peak value; $f > 1$ MHz

I_{CM} max. 50 A

Total d.c. power dissipation at $T_h = 25^\circ C$

$P_{tot(d.c.)}$ max. 190 W

R.F. power dissipation

$f > 1$ MHz; $T_h = 25^\circ C$

$P_{tot(rf)}$ max. 230 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

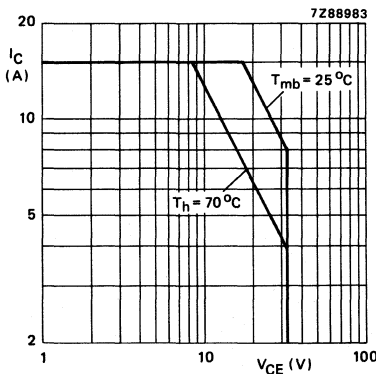


Fig. 2 D.C. SOAR.

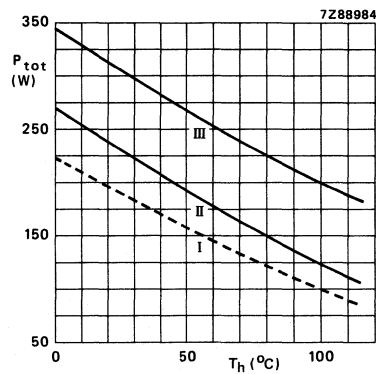


Fig. 3 Power/temperature derating curves.

- I Continuous d.c. operation
- II Continuous r.f. operation ($f > 1$ MHz).
- III Short-time operation during mismatch; ($f > 1$ MHz).

THERMAL RESISTANCE (dissipation = 120 W; $T_h = 25^\circ C$ i.e. $T_{mb} = 49^\circ C$)

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

$R_{th\ j-mb(dc)}$ = 0,63 K/W

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

$R_{th\ j-mb(dc)}$ = 0,48 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,20 K/W

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 50\text{ mA}$

$I_C = 100\text{ mA}$; open base

$V_{(BR)CES} > 65\text{ V}$

$V_{(BR)CEO} > 33\text{ V}$

Emitter-base breakdown voltage

$I_E = 20\text{ mA}$; open collector

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

Collector cut-off current

$V_{CE} = 33\text{ V}; V_{BE} = 0$

$I_{CES} < 20\text{ mA}$

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

open base

$E_{SBO} > 20\text{ mJ}$

$E_{SBR} > 20\text{ mJ}$

$R_{BE} = 10\ \Omega$

D.C. current gain*

$I_C = 10\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 30
15 to 50

D.C. current gain ratio of matched devices*

$I_C = 10\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage*

$I_C = 25\text{ A}; I_B = 5\text{ A}$

V_{CEsat} typ. 2,4 V

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

$-I_E = 10\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 230 MHz

$-I_E = 20\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 235 MHz

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

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

C_C typ. 380 pF

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

$I_C = 0; V_{CE} = 28\text{ V}$

C_{re} typ. 235 pF

Collector-flange capacitance

C_{cf} typ. 4,5 pF

* Measured under pulse conditions: $t_p = 500\ \mu\text{s}$.

** Measured under pulse conditions: $t_p = 300\ \mu\text{s}; \delta = 0,02$.

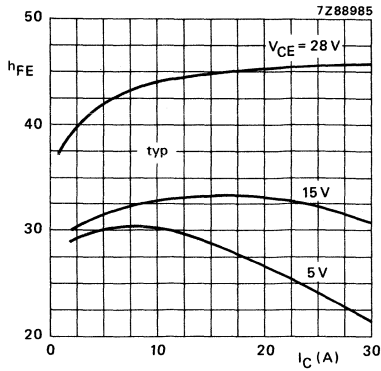


Fig. 4 $T_j = 25^\circ\text{C}$.

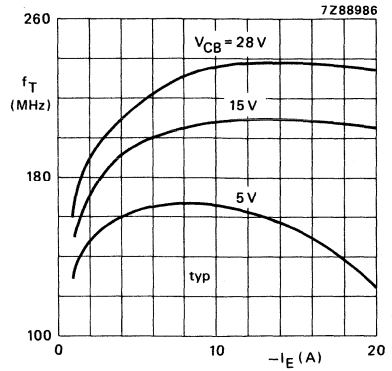


Fig. 5 $T_j = 25^\circ\text{C}$; $f = 100\text{ MHz}$;
 $t_p = 300\ \mu\text{s}$.

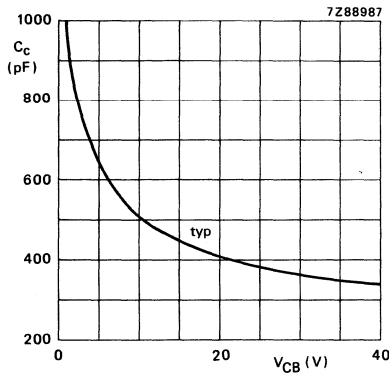


Fig. 6 $I_E = i_e = 0$; $f = 1\text{ MHz}$;
 $T_j = 25^\circ\text{C}$.

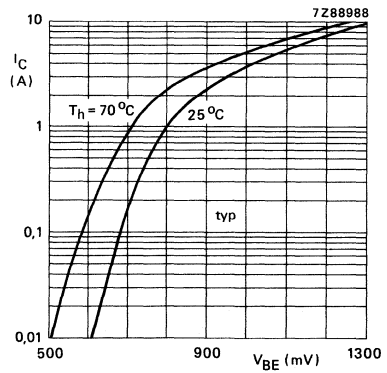


Fig. 7 $V_{CE} = 28\text{ V}$.

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	Gp dB	η_{dt} %	I_C A	d_3^* dB	d_5^* dB	$I_{C(ZS)}$ A
175 (PEP)	> 11,5 typ. 13,0	> 40 typ. 50	< 7,8 typ. 6,3	< -30 typ. -34	< -30 typ. -38	0,1

* The stated intermodulation distortion levels 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.

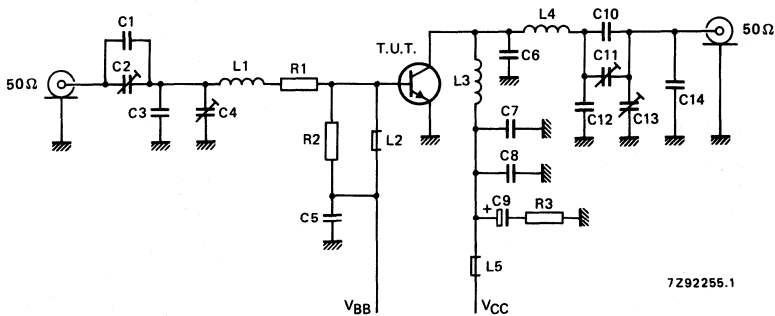


Fig. 8 Class-AB (s.s.b.) test circuit.

List of components:

- C1 = 47 pF (500 V) multilayer ceramic chip capacitor*
- C2 = 100 pF film dielectric trimmer
- C3 = 2 x 130 pF (300 V) multilayer ceramic chip capacitors in parallel*
- C4 = 280 pF film dielectric trimmer
- C5 = 10 nF (50 V) multilayer ceramic chip capacitor 2222 856 13103
- C6 = 2 x 180 pF (300 V) multilayer ceramic chip capacitors in parallel*
- C7 = 100 nF (50 V) multilayer ceramic chip capacitor 2222 856 48104
- C8 = 10 nF (50 V) multilayer ceramic chip capacitor 2222 856 13103
- C9 = 2,2 μF - 63 V solid aluminium electrolytic capacitor
- C10 = 5 x 82 pF (500 V) multilayer ceramic chip capacitors in parallel*
- C11 = 250 pF air dielectric trimmer
- C12 = 5 x 33 pF ceramic feed-through capacitors mounted in parallel on a brass plate
- C13 = 100 pF air dielectric trimmer
- C14 = 3 x 91 pF (500 V) multilayer ceramic chip capacitors in parallel*
- R1 = 0,7 Ω - 7 W (7 x 4,7 Ω - 1 W carbon resistors in parallel)
- R2 = 27 Ω - 0,25 W carbon resistor
- R3 = 4,7 Ω - 0,25 W carbon resistor

* American Technical Ceramics capacitor or capacitor of same quality.

- L1 = 73 nH; 4 turns Cu wire (1,5 mm); int. dia. 7 mm; length 9,4 mm; leads 2 x 5 mm
- L2 = Ferroxcube wide-band h.f. choke grade 3B (cat. no. 4312 020 36640); 6 leads in parallel
- L3 = 70,4 nH; 4 turns Cu wire (2 mm); int. dia. 7 mm; length 14,8 mm; leads 2 x 5 mm
- L4 = 83,5 nH; 4 turns Cu wire (2 mm); int. dia. 8 mm; length 15 mm; leads 2 x 5 mm
- L5 = Ferroxcube wide-band h.f. choke grade 3 B (cat. no. 4312 020 36640) with 6 leads in parallel

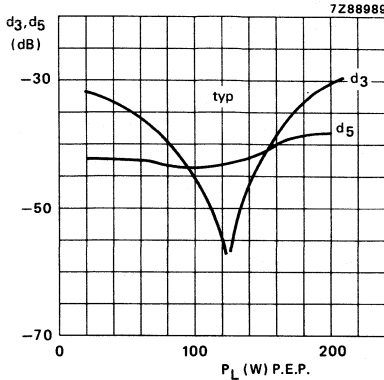


Fig. 9 Intermodulation distortion (see note on preceding page).

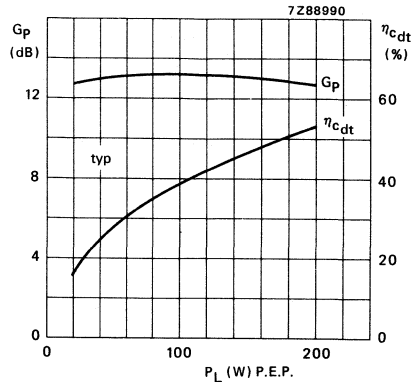


Fig. 10 Power gain and double-tone efficiency.

Conditions for Figs 9 and 10:

$V_{CE} = 28 \text{ V}$; $I_{C(ZS)} = 0,1 \text{ A}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$.

RUGGEDNESS

The BLW97 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 150 W (P.E.P.) or a load mismatch (VSWR = 5 through all phases) up to 175 W (P.E.P.) under the following conditions:

$V_{CE} = 28 \text{ V}$; $f = 28 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$.

Figures 11 and 12 on the next page present typical curves which are valid for one transistor of a push-pull amplifier in s.s.b. class-AB operation.

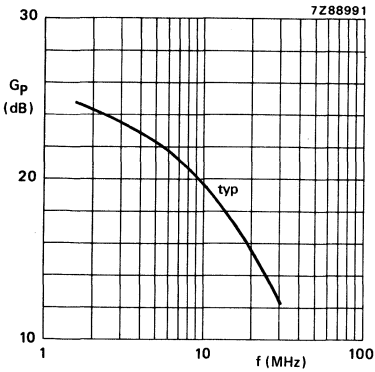


Fig. 11 Power gain.

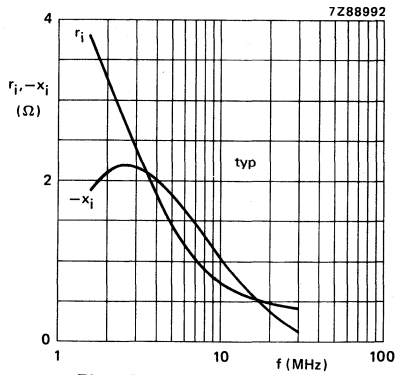


Fig. 12 Input impedance (series components).

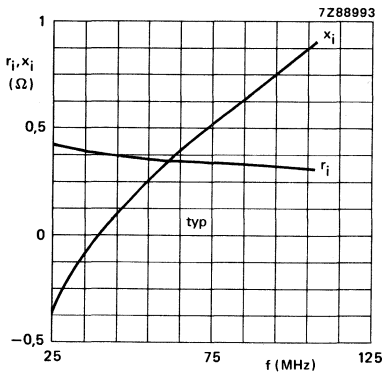


Fig. 13 Input impedance (series components).

Conditions for Figs 11 and 12:
 $V_{CE} = 28 \text{ V}$; $I_C(Z_S) = 0,1 \text{ A}$;
 $P_L = 175 \text{ W(PEP)}$; $T_h = 25 \text{ }^\circ\text{C}$;
 $Z_L = 1,55 \text{ } \Omega$

Conditions for Figs 13, 14 and 15:
 $V_{CE} = 28 \text{ V}$; $P_L = 175 \text{ W}$; $T_h = 25 \text{ }^\circ\text{C}$;
 class-B operation.

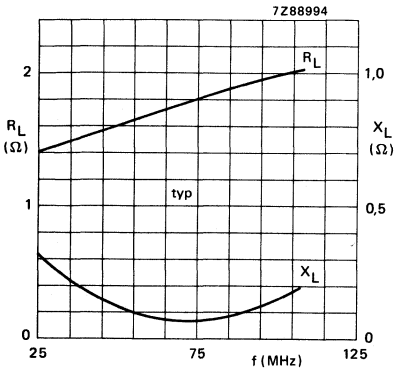


Fig. 14 Load impedance (series components).

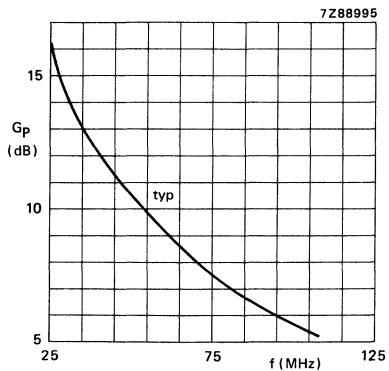


Fig. 15 Power gain.

U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear u.h.f. amplifiers of TV transposers and transmitters in band IV-V, as well as for driver stages in tube systems.

Features:

- diffused emitter ballasting resistors for an optimum temperature profile;
- gold sandwich metallization ensures excellent reliability.

The transistor has a $\frac{1}{4}$ " capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

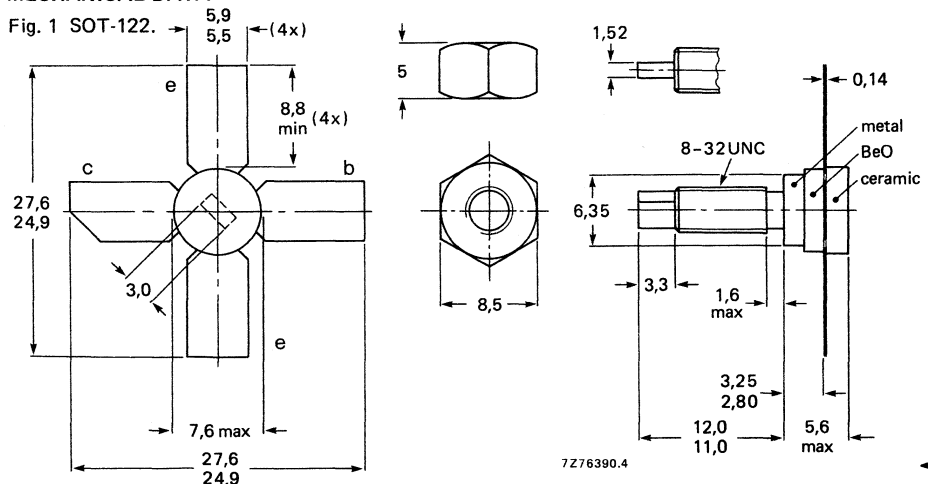
R.F. performance in linear amplifier

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	860	25	850	70	-60	> 3,5	> 6,5
class-A	860	25	850	25	-60	typ. 4,4	typ. 7,0

* 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.

PRODUCT SAFETY 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

V_{CESM} max. 50 V

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

(peak value); $f > 1$ MHz

I_{CM} max. 4 A

Total power dissipation at $T_h = 70$ °C

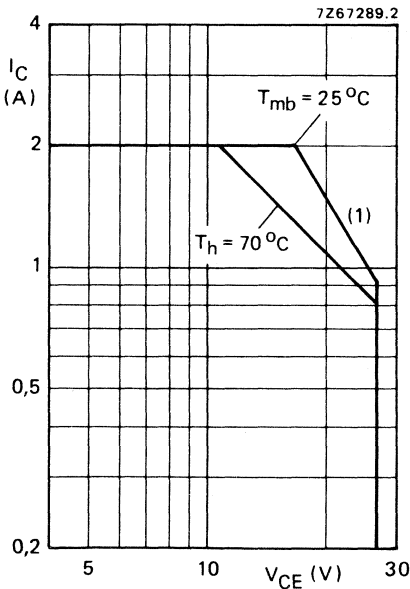
P_{tot} max. 21,5 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

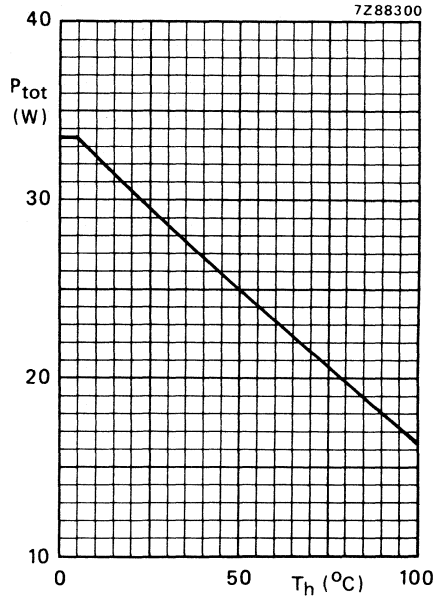


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (dissipation = 21,25 W; $T_{mb} = 82,75$ °C, $T_h = 70$ °C)

From junction to mounting base

$R_{th\ j-mb}$ = 5,45 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,6 K/W

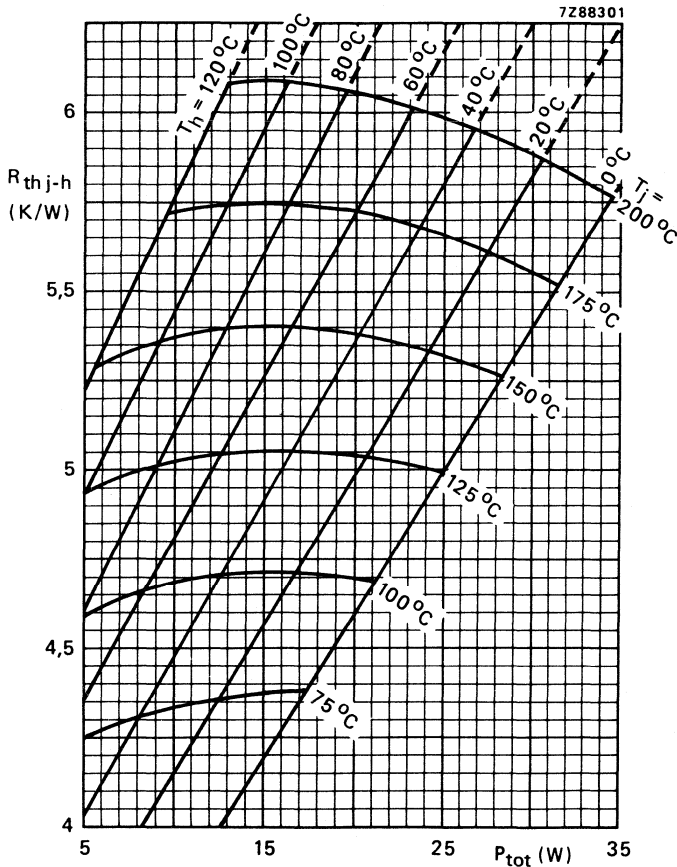


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,6\ K/W.$)

Example

Nominal class-A operation (without r.f. signal): $V_{CE} = 25\ V$; $I_C = 850\ mA$; $T_h = 70\ ^\circ C$.

Fig. 4 shows: $R_{th\ j-h}$ max. $6,05\ K/W$
 T_j max. $200\ ^\circ C$

Typical device: $R_{th\ j-h}$ typ. $5,35\ K/W$
 T_j typ. $183\ ^\circ C$

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 10\text{ mA}$

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

$V_{(BR)CES} > 50\text{ V}$

$V_{(BR)CEO} > 27\text{ V}$

Emitter-base breakdown voltage

open collector, $I_E = 5\text{ mA}$

$V_{(BR)EBO} > 3,5\text{ V}$

D.C. current gain*

$I_C = 850\text{ mA}; V_{CE} = 25\text{ V}$

$h_{FE} > 15$
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 $f = 500\text{ MHz}$ **

$-I_E = 850\text{ mA}; V_{CB} = 25\text{ V}$

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 $f = 1\text{ MHz}$

$I_C = 50\text{ mA}; V_{CE} = 25\text{ V}$

C_{re} typ. 15 pF

→ Collector-stud capacitance

C_{cs} typ. 1,2 pF

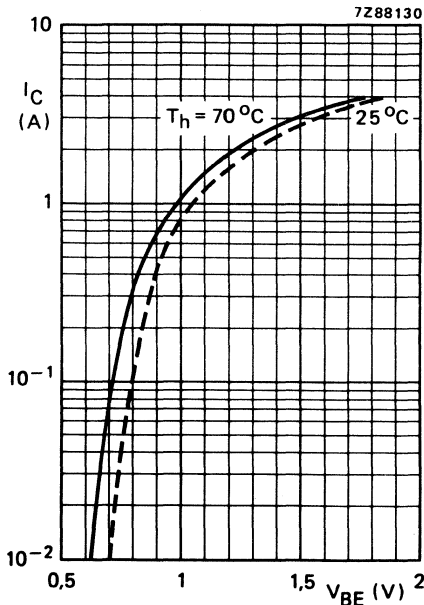


Fig. 5 Typical values; $V_{CE} = 25\text{ V}$.

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

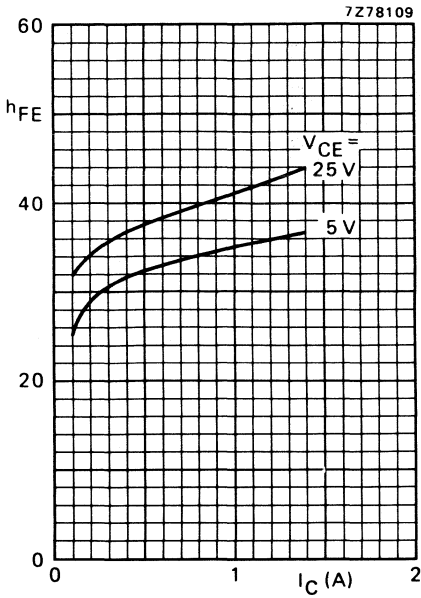


Fig. 6 Typical values; $T_j = 25^\circ\text{C}$.

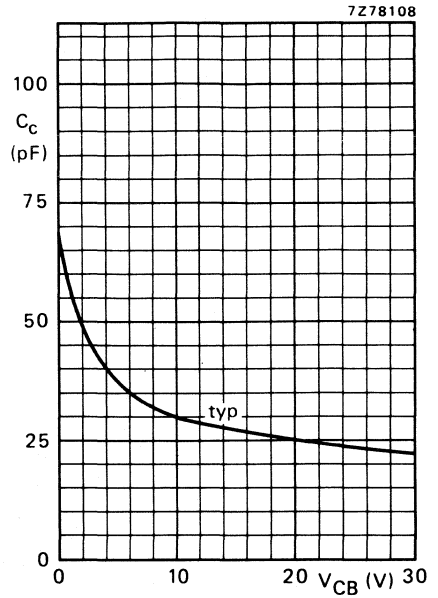


Fig. 7 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ\text{C}$.

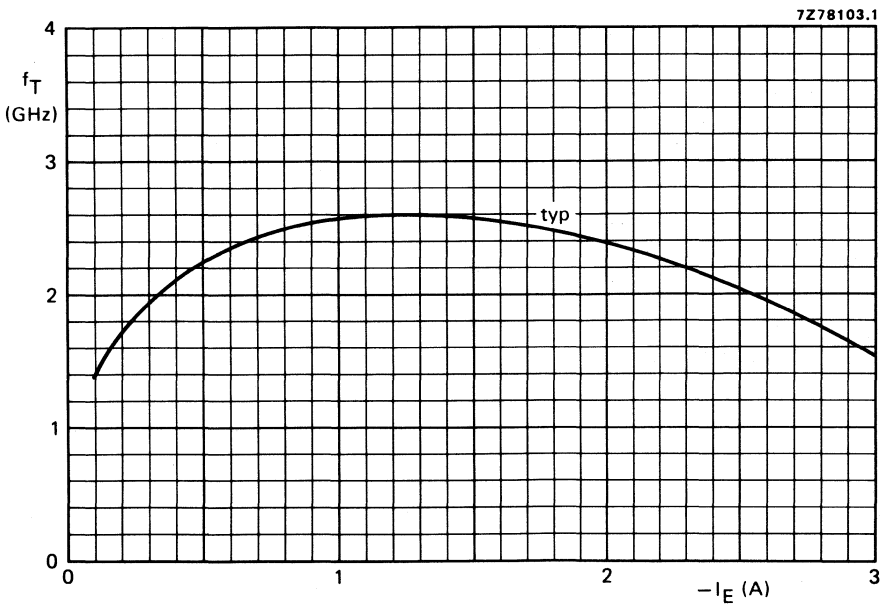


Fig. 8 $V_{CB} = 25$ V; $f = 500$ MHz; $T_j = 25^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-A operation (linear power amplifier)

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. 7,0
860	25	850	25	-60	typ. 4,4	typ. 7,0

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

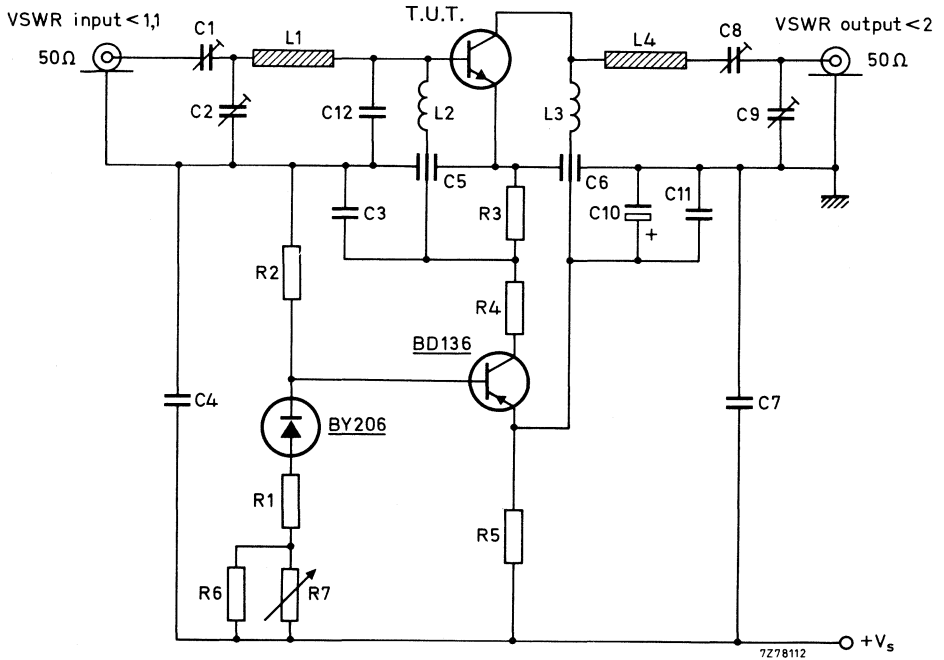


Fig. 9 Class-A test circuit at $f_{\text{vision}} = 860$ MHz.

List of components:

- C1 = C2 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C3 = C4 = 100 nF polyester capacitor
- C5 = C6 = 1 nF feed-through capacitor
- 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 μ F/40 V solid aluminium electrolytic capacitor
- C11 = 470 nF polyester capacitor
- C12 = 2 x 3,3 pF chip capacitors (in parallel)

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)

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)

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 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.

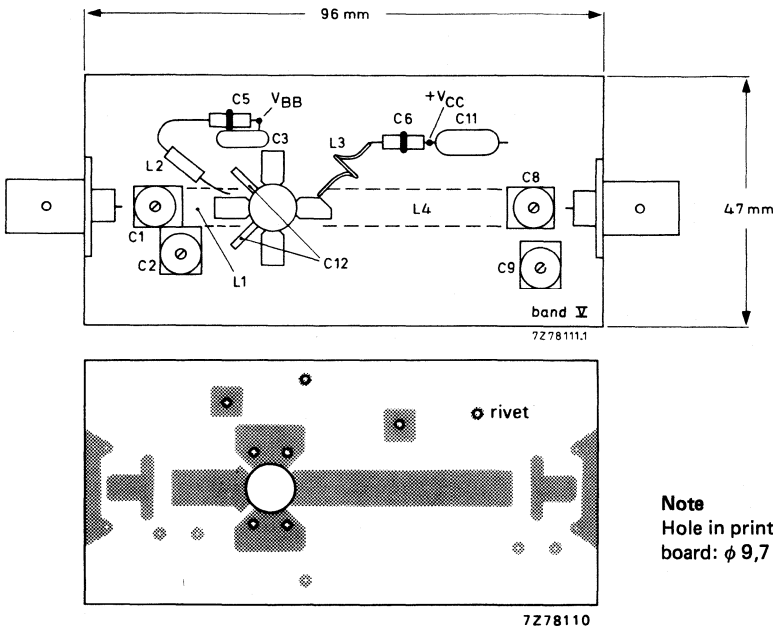


Fig. 10 Component layout and printed circuit board for 860 MHz class-A test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by hollow rivets.

Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

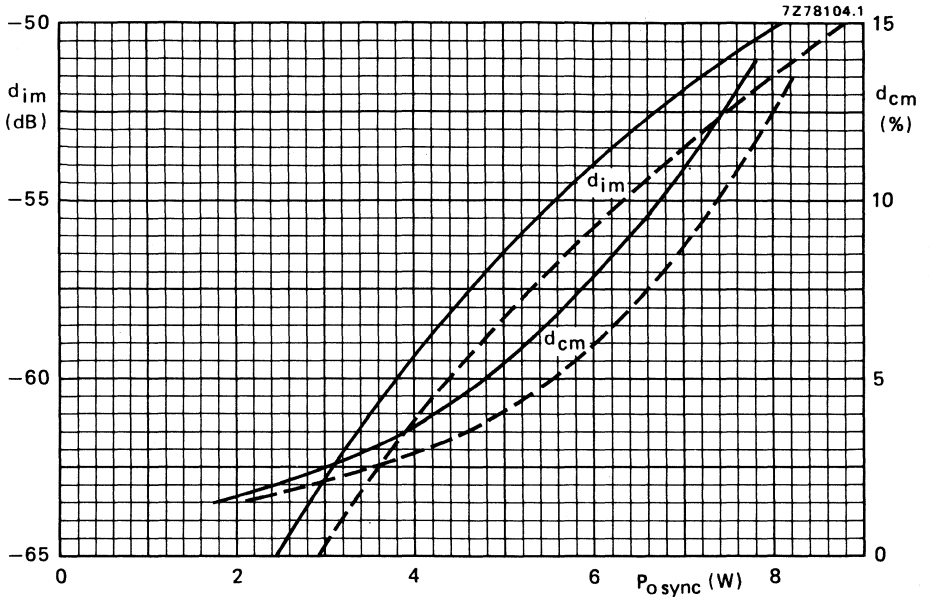


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of $P_{o\ sync}$. Typical values; $V_{CE} = 25\text{ V}$; $I_C = 850\text{ mA}$; --- $T_h = 25\text{ }^\circ\text{C}$; — $T_h = 70\text{ }^\circ\text{C}$; $f_{\text{vision}} = 860\text{ MHz}$.

* 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 $\leq -75\text{ dB}$.

** Two-tone test method (vision carrier 0 dB , sound carrier -7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to -20 dB .

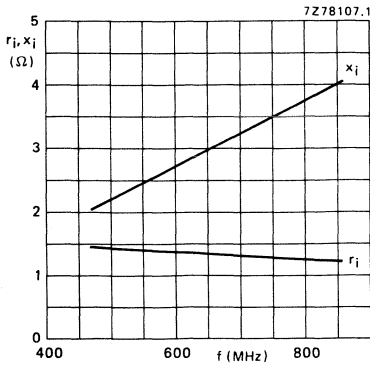


Fig. 12 Input impedance (series components).

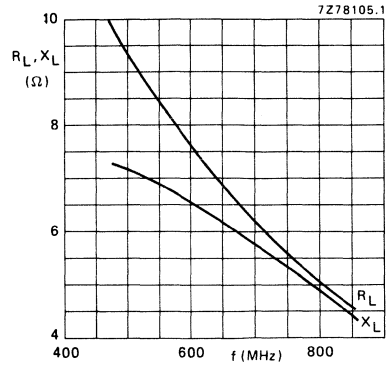


Fig. 13 Load impedance (series components).

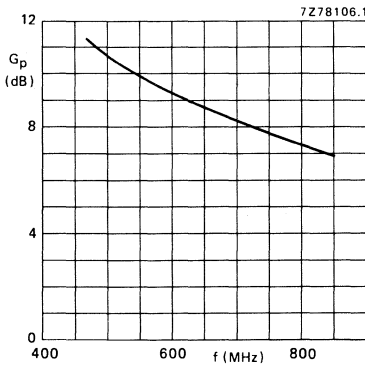


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 25$ V; $I_C = 850$ mA; class-A operation; $T_H = 70$ °C.

H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-AB and B operated high-power mobile transmitting equipment in the h.f. band.

The transistors are resistance-stabilized and are guaranteed to withstand severe load mismatch conditions. They are supplied in matched h_{FE} groups.

The transistor has a 1/2 in 4-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

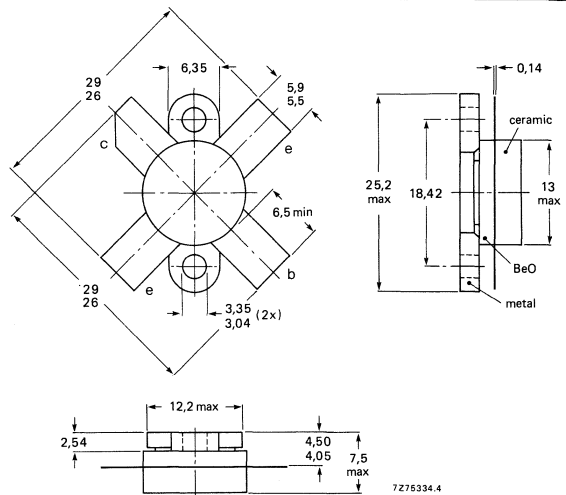
QUICK REFERENCE DATA

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

mode of operation	V_{CE} V	$I_{C(ZS)}$ A	f MHz	P_L W	G_p dB	η_{dt} %	d_3 dB	d_5 dB
s.s.b. class-AB	12,5	0,15	1,6-28	80 (P.E.P.)	> 12,5	> 35	< -24	< -24

MECHANICAL DATA

Fig. 1 SOT-121.



Torque on screw: min. 0,60 Nm (6,0 kg cm)
max. 0,75 Nm (7,5 kg cm)

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

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY 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. 36 V

open base

V_{CEO} max. 17 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

average

$I_{C(AV)}$ max. 18 A

(peak value); $f > 1$ MHz

I_{CM} max. 55 A

D.C. power dissipation at $T_{mb} = 25$ °C

$P_{tot(d.c.)}$ max. 154 W

R.F. power dissipation

$f > 1$ MHz; $T_{mb} = 25$ °C

$P_{tot(rf)}$ max. 192 W

Storage temperature

T_{stg} -65 to +150 °C

Operating junction temperature

T_j max. 200 °C

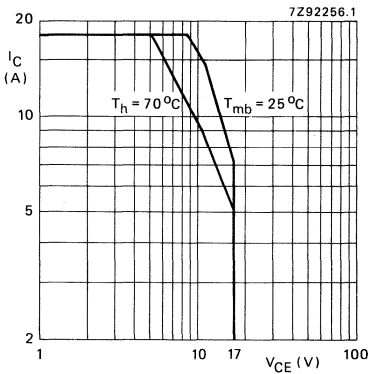


Fig. 2 D.C. SOAR.

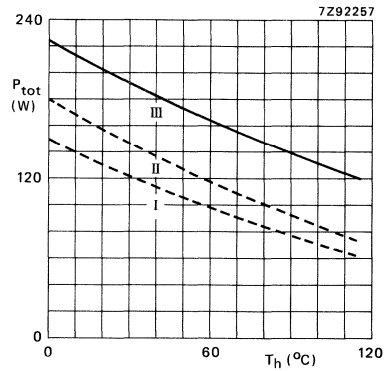


Fig. 3 Power/temperature derating curves.

- I Continuous d.c. operation
- II Continuous r.f. operation; ($f > 1$ MHz)
- III Short-time r.f. operation during mismatch ($f > 1$ MHz)

THERMAL RESISTANCE

Dissipation = 100 W; $T_{mb} = 25$ °C

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

$R_{th j-mb(dc)}$ = 1,00 K/W

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

$R_{th j-mb(rf)}$ = 0,75 K/W

From mounting base to heatsink

$R_{th mb-h}$ = 0,2 K/W

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 50\text{ mA}$

open base; $I_C = 100\text{ mA}$

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

$V_{(BR)CEO} > 17\text{ V}$

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

$E_{SBO} > 12,5\text{ mJ}$

$E_{SBR} > 12,5\text{ mJ}$

$R_{BE} = 10\text{ }\Omega$

D.C. current gain*

$I_C = 10\text{ A}; V_{CE} = 5\text{ V}$

h_{FE} typ. 35
15 to 80

D.C. current gain ratio of matched devices*

$I_C = 10\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE1}/h_{FE2} < 1,2$

Collector-emitter saturation voltage*

$I_C = 25\text{ A}; I_B = 5\text{ A}$

V_{CEsat} typ. 1,7 V

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

$-I_E = 10\text{ A}; V_{CB} = 12,5\text{ V}$

f_T typ. 290 MHz

$-I_E = 20\text{ A}; V_{CB} = 12,5\text{ V}$

f_T typ. 275 MHz

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

$I_E = I_e = 0; V_{CB} = 12,5\text{ V}$

C_C typ. 400 pF

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

$I_C = 0; V_{CE} = 12,5\text{ V}$

C_{re} typ. 265 pF

Collector-flange capacitance

C_{cf} typ. 4,5 pF

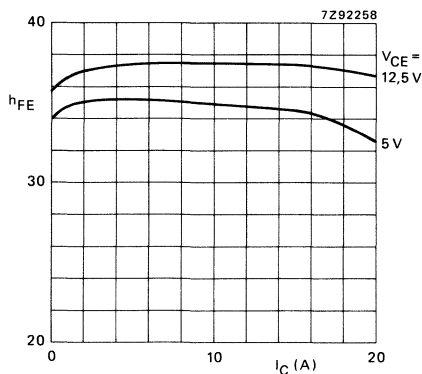


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$.

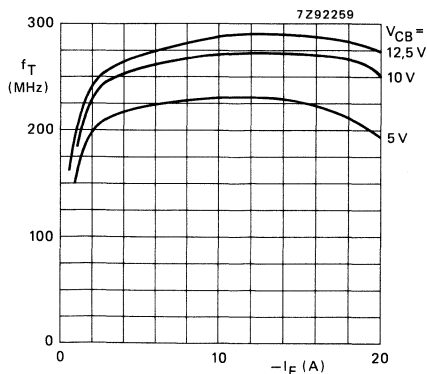


Fig. 5 $f = 100\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$.

* Measured under pulse conditions: $t_p = 500\text{ }\mu\text{s}$.

** Measured under pulse conditions: $t_p = 300\text{ }\mu\text{s}; \delta = 0,02$.

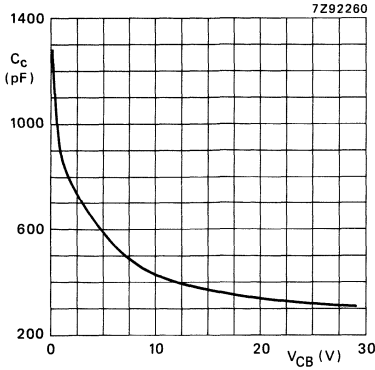


Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz;
 $T_j = 25$ °C.

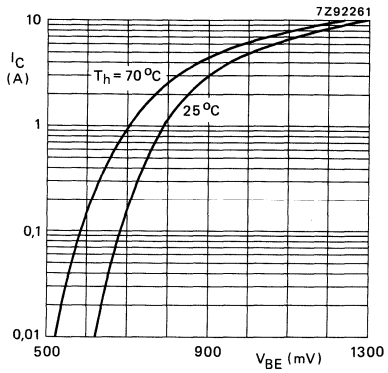


Fig. 7 $V_{CE} = 12,5$ V; typ. values.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier) $V_{CE} = 12,5$ V; $T_h = 25$ °C;
 $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz

output power W	G_p dB	η_{dt} %	I_C A	d_3^* dB	d_5^* dB	$I_C(ZS)$ A
80 (P.E.P.)	> 12,5 typ. 14	> 35 typ. 40	< 9,1 typ. 7,6	< -24 typ. -27	< -24 typ. -36	0,15

* The stated intermodulation distortion levels 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.

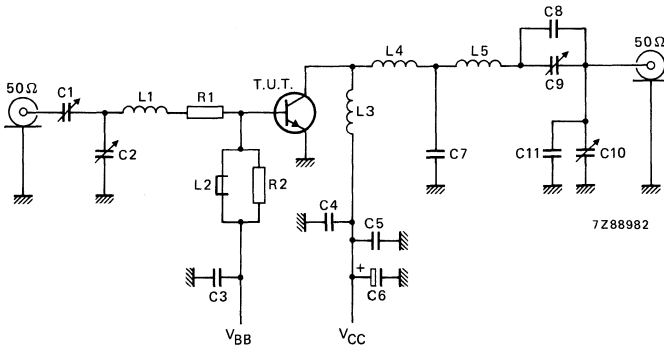


Fig. 8 Class-AB test circuit, s.s.b.

List of components:

C1 = C2 = 270 pF film dielectric trimmer capacitor

C3 = 220 nF chip capacitor

C4 = 1 nF chip capacitor

C5 = 100 nF chip capacitor

C6 = 47 μ F – 63 V electrolytic capacitor

C7 = 3 x 180 pF multilayer ceramic chip capacitors in parallel*

C8 = 2 x 150 pF (500 V) multilayer ceramic chip capacitors*

C9 = C10 = 100 pF film dielectric trimmer capacitor

C11 = 150 pF multilayer ceramic chip capacitor*

R1 = 4 x 1,2 Ω carbon resistors in parallel (4 x 0,125 W)R2 = 27 Ω carbon resistor (0,5 W)

L1 = 3 turns Cu wire (2 mm); int. dia. 8 mm; length 9 mm; leads 2 x 5 mm

L2 = Ferroxcube wide-band h.f. choke (cat. no. 4312 020 36640)

L3 = L4 = 2 turns Cu wire (2 mm); int. dia. 8 mm; length 5 mm; leads 2 x 5 mm

L5 = 3 turns Cu wire (2 mm); int. dia. 8,5 mm; length 8,5 mm; length 8,5 mm; leads 2 x 5 mm

* American Technical Ceramics capacitor type 100 B or capacitor of same quality.

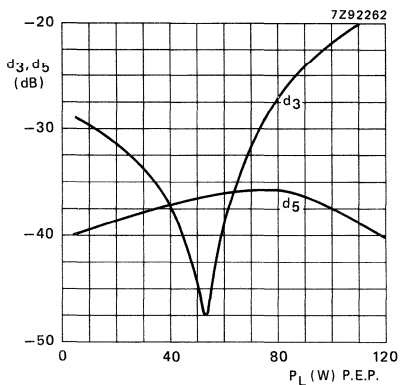


Fig. 9 Intermodulation distortion
(see note on preceding page); typ. values.

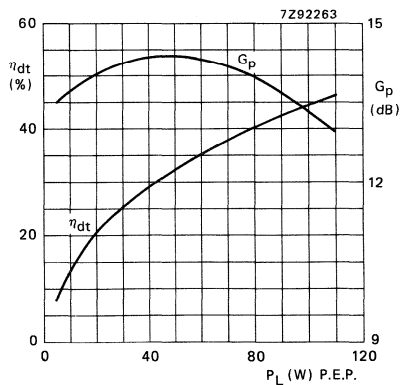


Fig. 10 Double-tone efficiency and power gain;
typ. values.

Conditions for Figs 9 and 10:

 $V_{CE} = 12,5 \text{ V}$; $I_{C(ZS)} = 0,15 \text{ A}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$.

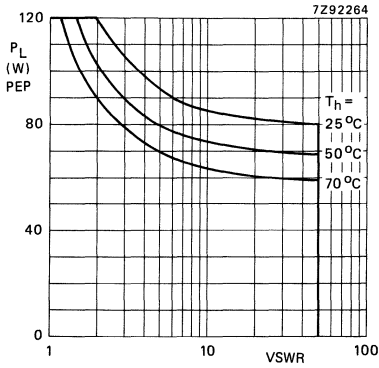


Fig. 11 R.F. SOAR: s.s.b. class-AB operation; $V_{CE} = 15\text{ V}$; $R_{th\text{ mb-h}} = 0,2\text{ K/W}$; $f_1 = 28,000\text{ MHz}$; $f_2 = 28,001\text{ MHz}$.

This graph shows the permissible output power as a function of VSWR during mismatch conditions with the heatsink temperature as parameter.

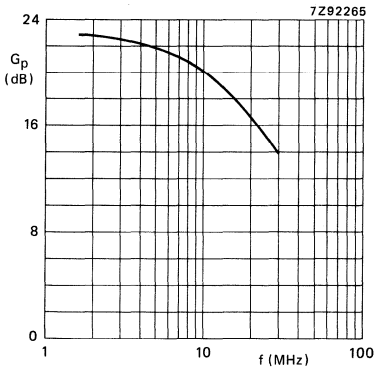


Fig. 12 Power gain.

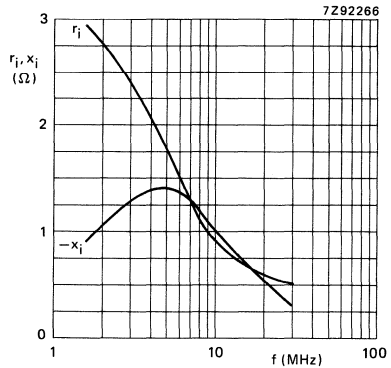


Fig. 13 Input impedance (series components).

Conditions for Figs 12 and 13:

$V_{CE} = 12,5\text{ V}$; $I_{C(ZS)} = 0,15\text{ A}$; $Z_L = 0,65\ \Omega$; $P_L = 80\text{ W (PEP)}$; $T_h = 25^\circ\text{C}$.

The curves in Figs 12 and 13 are typical and hold for one transistor of a push-pull amplifier in s.s.b. class-AB operation.

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 $\frac{1}{4}$ " capstan envelope with a moulded cap. All leads are isolated from the stud.

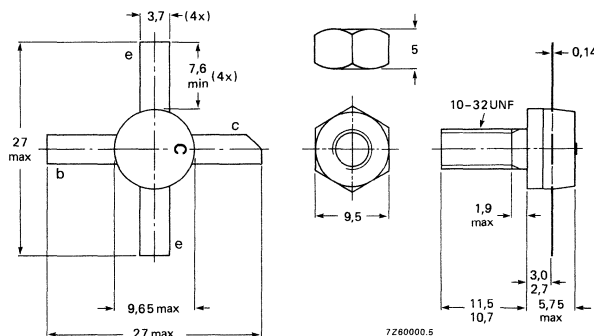
QUICK REFERENCE DATA

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 mS
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.



Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 4,9 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.

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

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ 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	ms
$-V_{BE} = 1.5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	8	ms

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

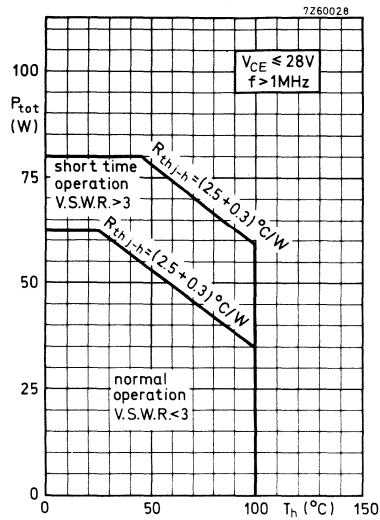
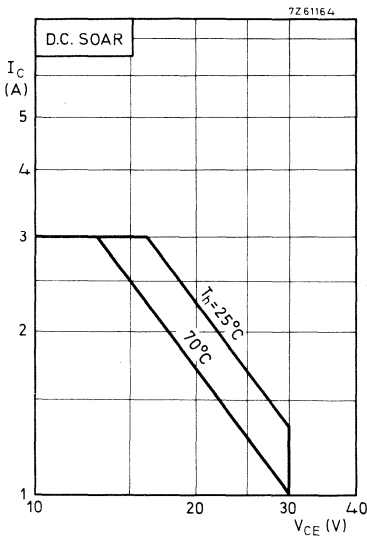
$I_C = 100\text{ mA}$; $V_{CE} = 30\text{ V}$	$-C_{re}$	typ.	31	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

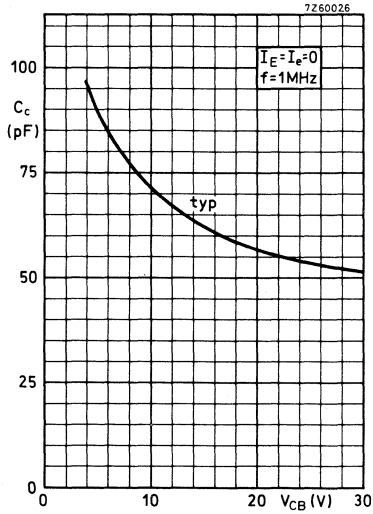
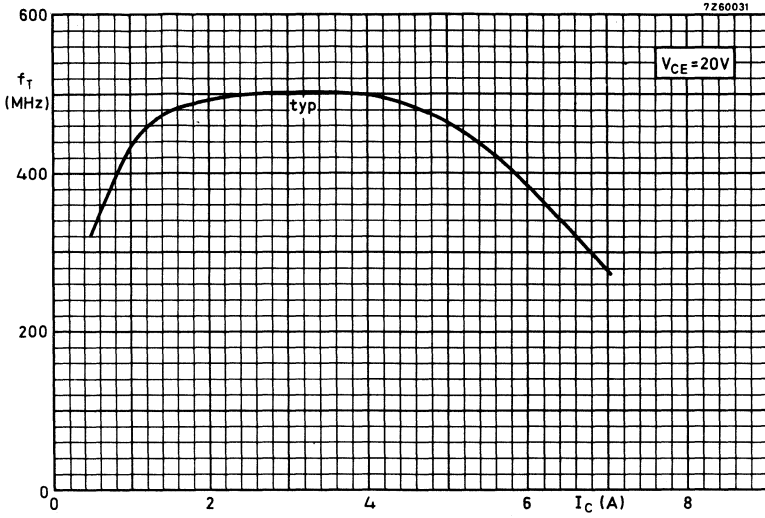
Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4.0	V
Collector current (average)	$I_C(AV)$	max.	3.0	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	6	A
Total power dissipation up to $T_h = 25$ °C $f > 1$ MHz	P_{tot}	max.	62.5	W

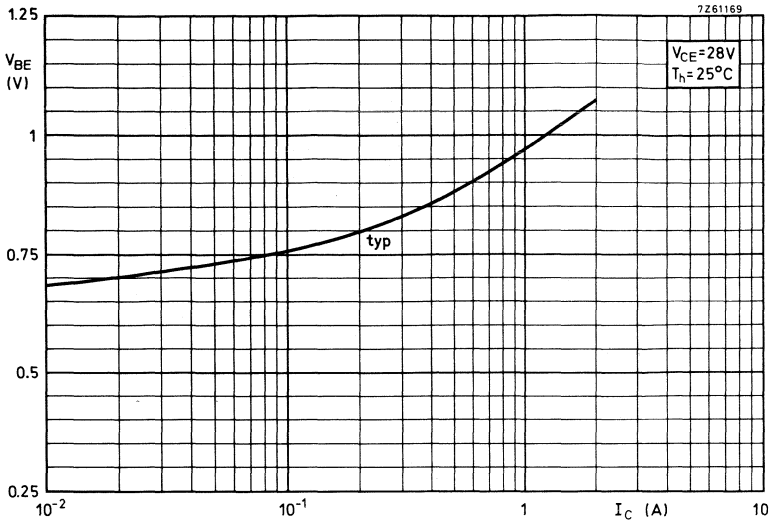


Storage temperature	T_{stg}	-30 to +200	°C
Operating junction temperature	T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	2.5	K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0.3	K/W





APPLICATION INFORMATION

R. F. performance in S. S. B. operation (linear power amplifier)

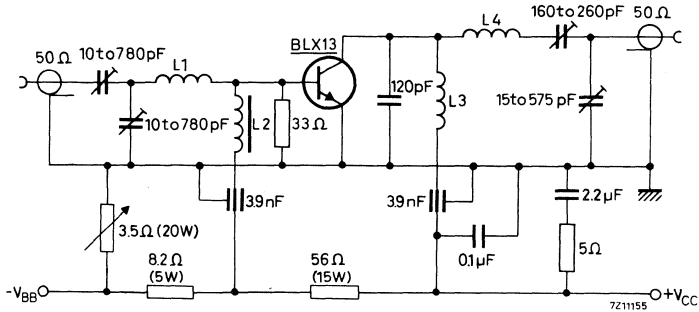
$V_{CE} = 26 \text{ V}$; T_h up to $25 \text{ }^\circ\text{C}$

$f_1 = 28.000 \text{ MHz}$; $f_2 = 28.001 \text{ MHz}$

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

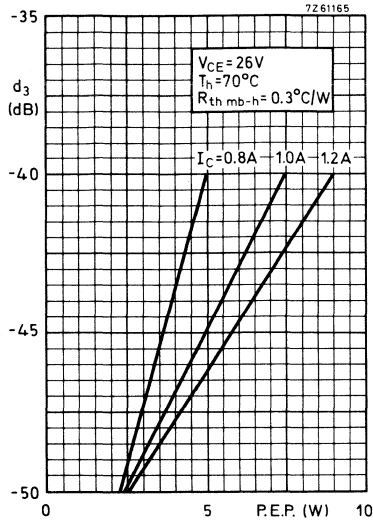
L2 = 7 turns enamelled Cu wire (0.7 mm) on 3H1 toroid; 60 μH
(code number of 3H1: 4322 020 36620)

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. 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	Gp dB	η_{dt} %	I_C A	d_3^* dB	$I_C(ZS)$ mA	T_h $^{\circ}\text{C}$
25 (P.E.P.)	> 18	typ. 35	typ. 1,28	typ. -35	25	25

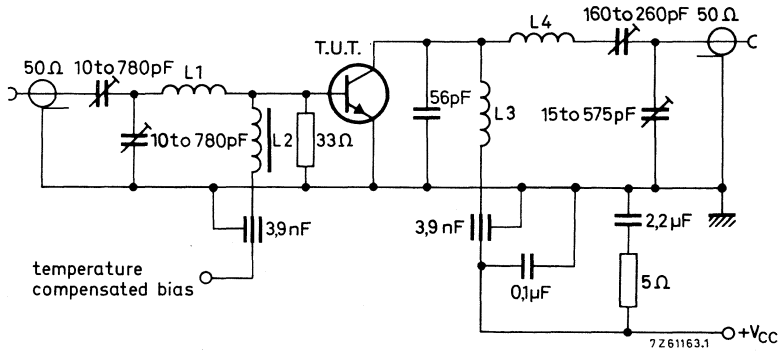
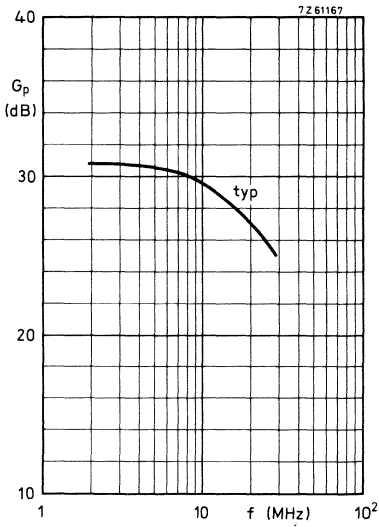
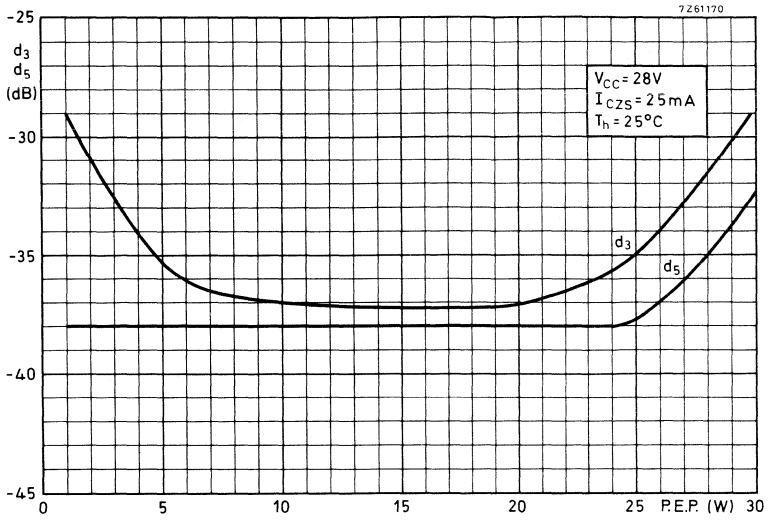


Fig. 9 Test circuit; s.s.b. class-AB.

List of components:

- L1 = 3 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 7,0 mm; leads 50 mm (total)
- L2 = 7 turns enamelled Cu wire (0,7 mm) on 3H1 toroid; 60 μH (cat. no. 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

* 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:

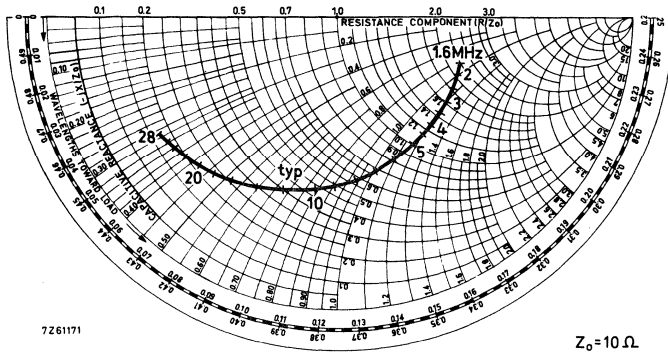
$P_L = 25\text{ W PEP}$

$V_{CC} = 28\text{ V}$

$I_{CZS} = 25\text{ mA}$

$Z_L = 12.5\ \Omega$

$T_h = 25\ ^\circ C$



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

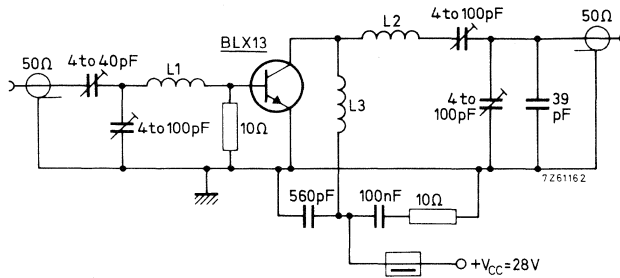
R. F. performance in c. w. operation (class B)

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

f (MHz)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	Z _i (Ω)	Y _L (mS)
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**

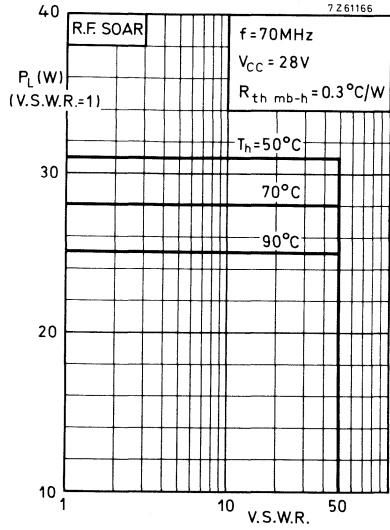
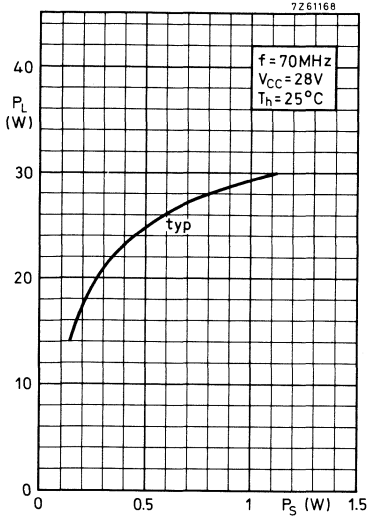


L1 = 93 nH; 3 turns enamelled Cu wire (1.5 mm); int. diam. 10 mm; length 8 mm; leads 2 x 5 mm

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.

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" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

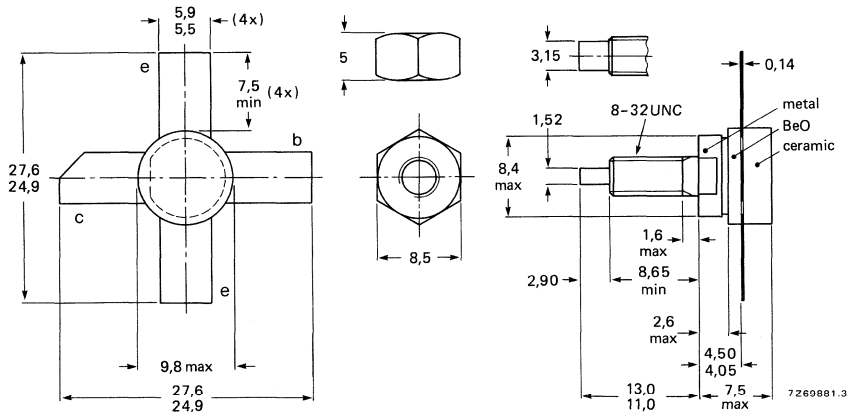
R.F. performance

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 – 8 (P.E.P.)	> 20	–	1,25	< –40	70
s.s.b. (class-AB)	28	1,6 – 28	3 – 25 (P.E.P.)	typ. 21	typ. 45	typ. 1,0	typ. –30	25

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.

PRODUCT SAFETY 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.	73 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

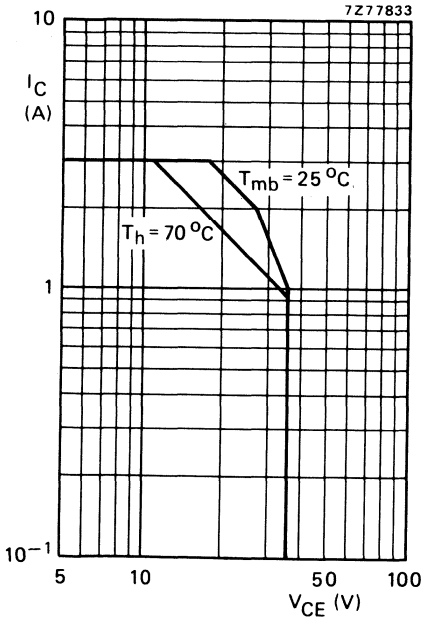


Fig. 2 D.C. SOAR.

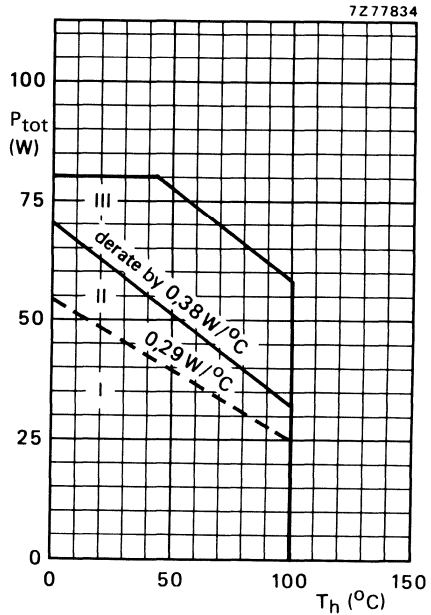


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th j-mb(rf)}$	=	2,65 K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,45 K/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

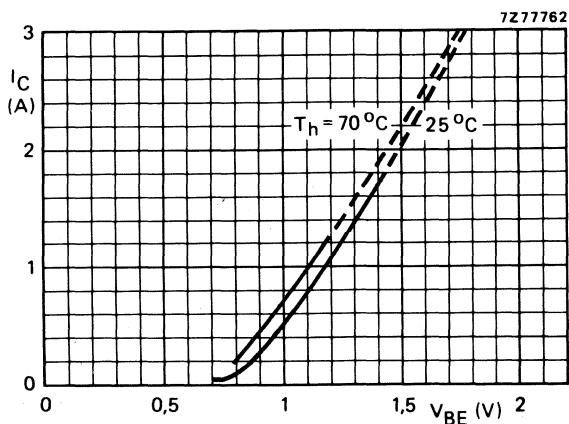


Fig. 4 Typical values; $V_{CE} = 28\text{ V}$.

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

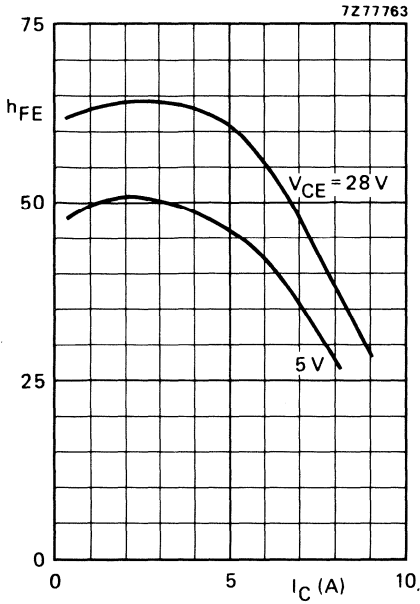


Fig. 5 Typical values; $T_j = 25^\circ C$.

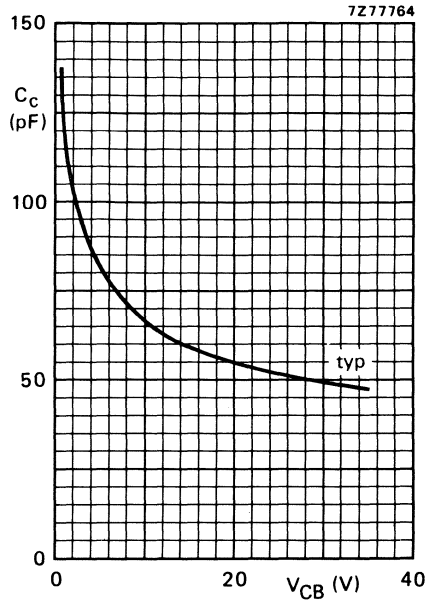


Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

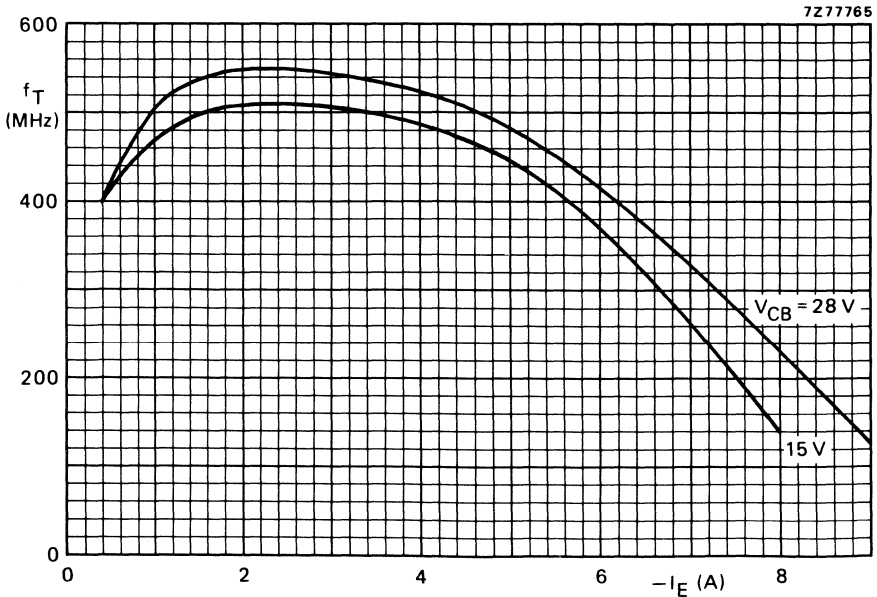


Fig. 7 Typical values; $f = 100$ MHz; $T_j = 25^\circ C$.

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 $^{\circ}\text{C}$
> 8 (P.E.P.)	> 20	1,25	-40	< -40	70
typ. 10 (P.E.P.)	typ. 24	1,25	-40	< -40	25

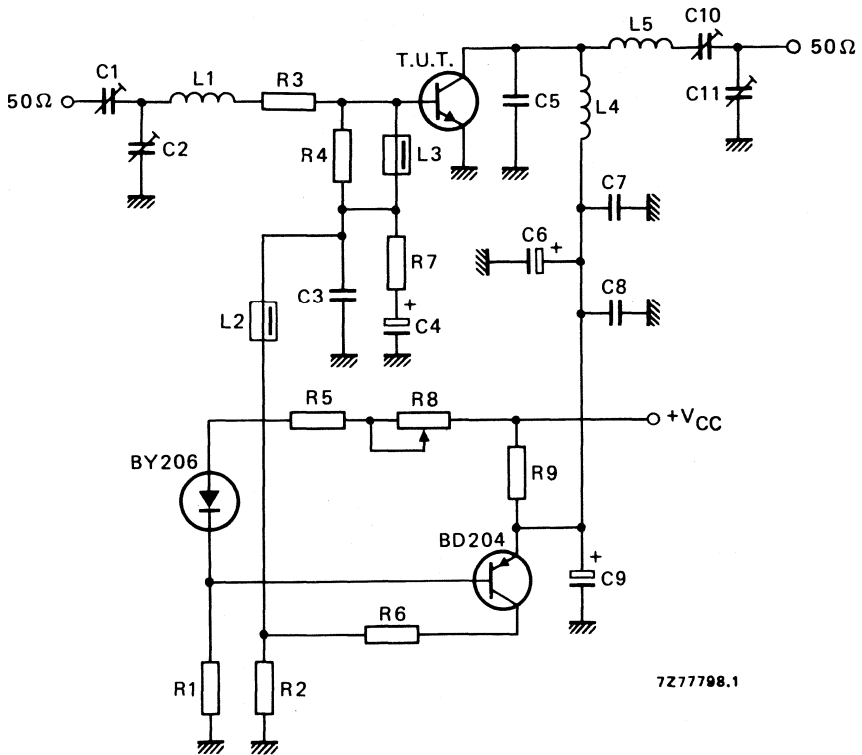


Fig. 8 Test circuit; s.s.b. class-A.

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)

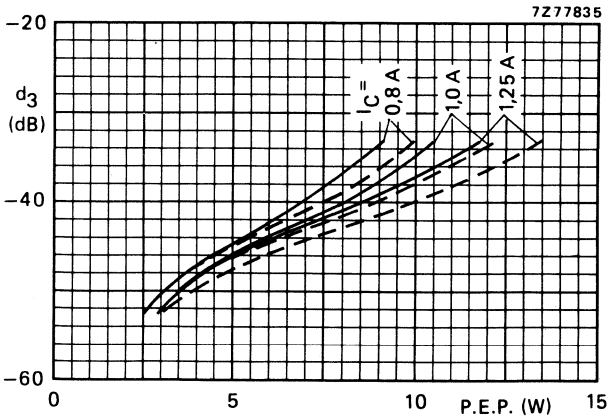


Fig. 9 Intermodulation distortion as a function of output power. Typical values; $V_{CE} = 26$ V; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz; — $T_h = 70^\circ C$; - - - $T_h = 25^\circ C$.

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

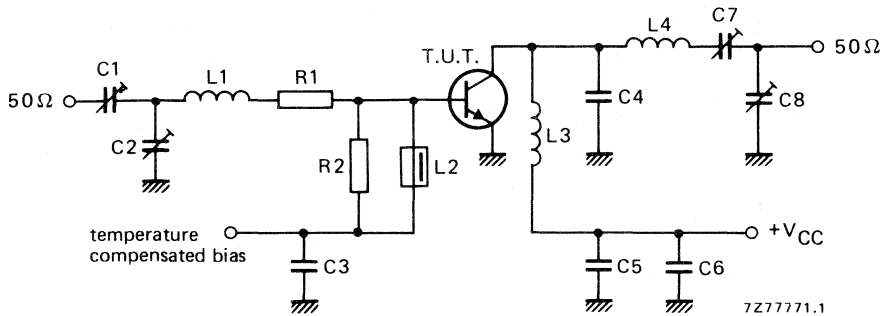


Fig. 10 Test circuit; s.s.b. class-AB.

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 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.

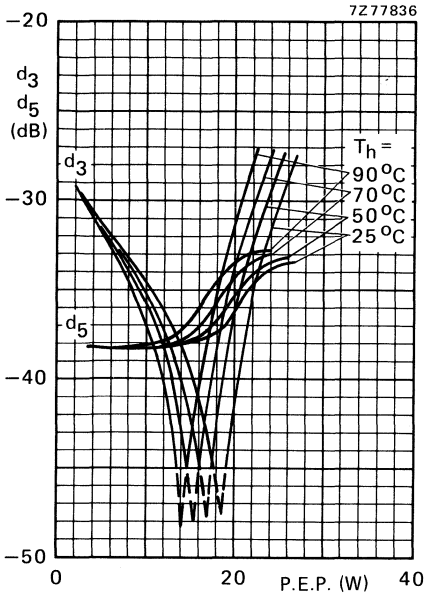


Fig. 11 Intermodulation distortion as a function of output power. *

Conditions for Fig. 11:

V_{CE} = 28 V; I_{C(ZS)} = 25 mA; f₁ = 28,000 MHz; f₂ = 28,001 MHz; typical values.

Conditions for Fig. 12:

V_{CE} = 28 V; I_{C(ZS)} = 25 mA; f₁ = 28,000 MHz; f₂ = 28,001 MHz; T_h = 25 °C; typical values.

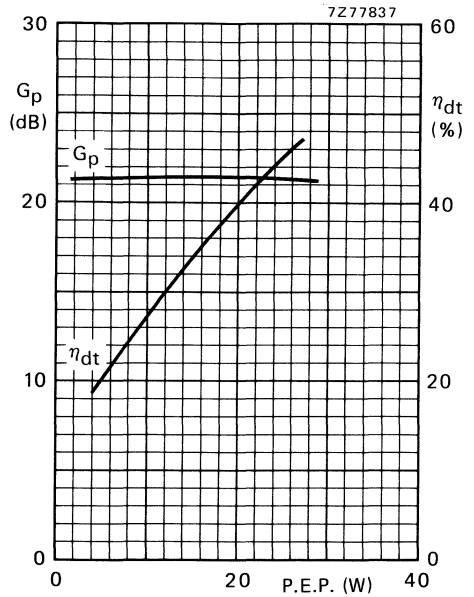


Fig. 12 Double-tone efficiency and power gain as a function of output power.

* See note on previous page.

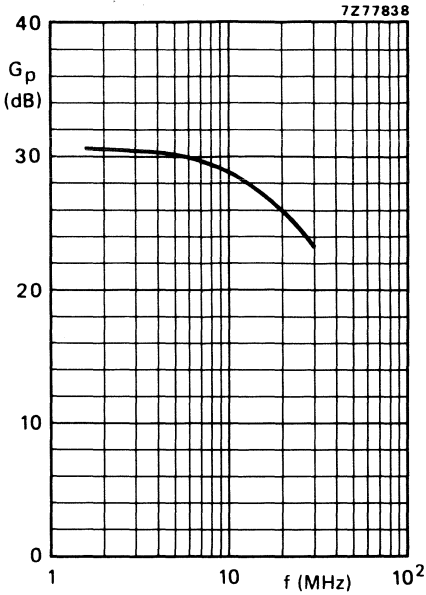


Fig. 13 Power gain as a function of frequency.

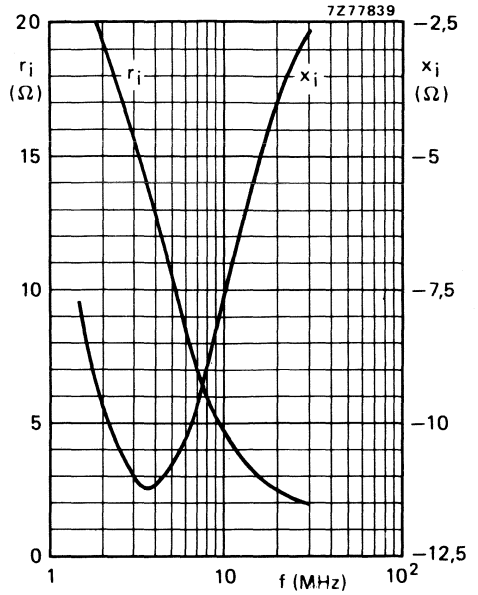


Fig. 14 Input impedance (series components) as a function of frequency.

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: $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $T_h = 70 \text{ }^\circ\text{C}$ and $P_L = 30 \text{ W (P.E.P.)}$.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, AB and B operated transmitting equipment in the h.f. and v.h.f. band.

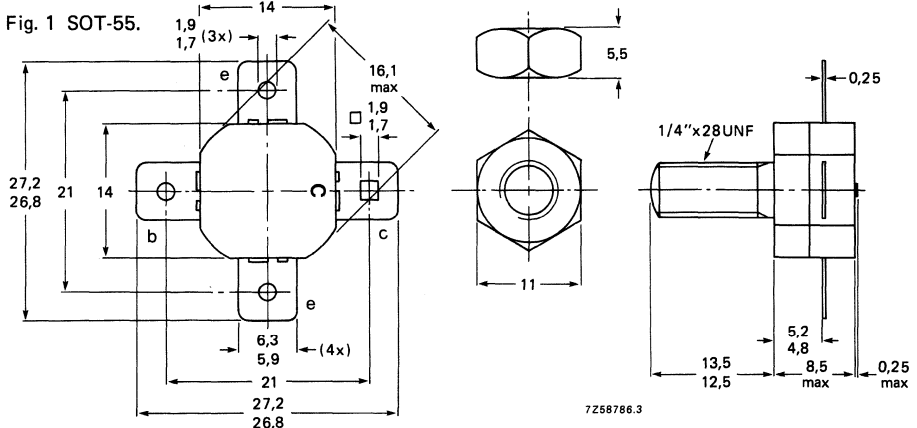
- rated for 50 W P.E.P. at 1,6 MHz to 28 MHz (intermodulation distortion better than -30 dB); full load mismatch permissible at stud temperatures up to 70 °C
- rated at 50 W for frequencies up to 70 MHz in c.w. operation
- supply voltage 28 V
- plastic stripline package

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.



Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

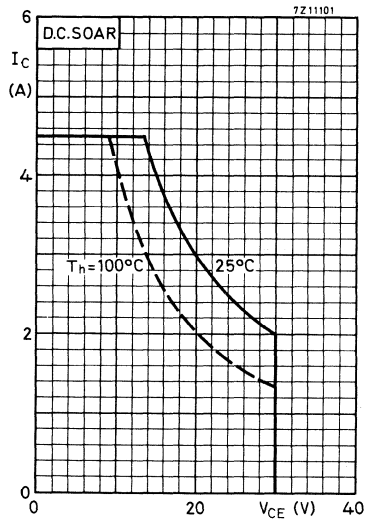
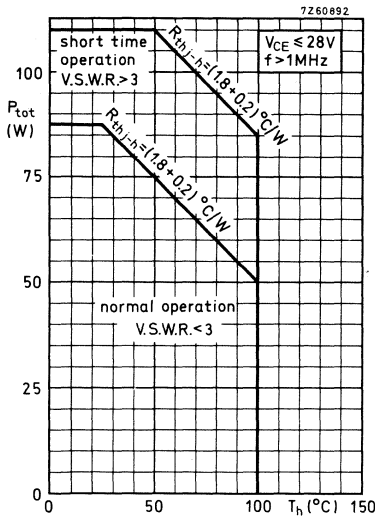
Diameter of clearance hole in heatsink: max. 6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

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

PRODUCT SAFETY 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.	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
Collector current (average)	I_{CAV}	max.	4.0 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	12 A
Total power dissipation up to $T_h = 25 \text{ }^\circ\text{C}$ $f > 1$ MHz	P_{tot}	max.	88 W



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

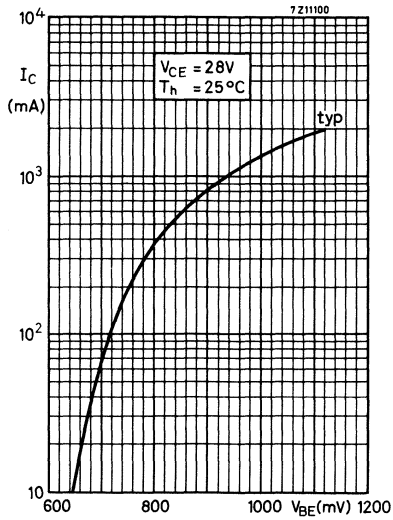
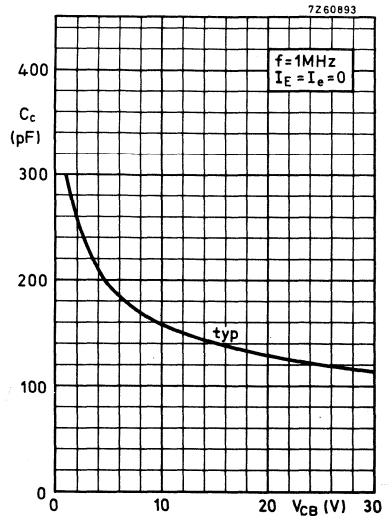
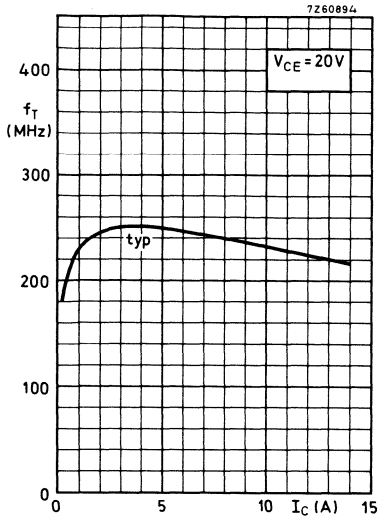
THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	=	1.8 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	0.2 K/W

CHARACTERISTICS

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

Collector-base breakdown voltage open emitter; $I_C = 25\text{ mA}$	$V_{(BR)CBO}$	>	85 V
Collector-emitter breakdown voltage $R_{BE} = 10\ \Omega$; $I_C = 25\text{ mA}$ open base; $I_C = 50\text{ mA}$	$V_{(BR)CER}$ $V_{(BR)CEO}$	> >	85 V 36 V
Emitter-base breakdown 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
Second breakdown energy; $L = 25\text{ mH}$; $f = 50\text{ Hz}$ open base	E_{SBO}	>	8 mJ
$R_{BE} = 33\ \Omega$	E_{SBR}	>	8 mJ
D.C. current gain $I_C = 1,4\text{ A}$; $V_{CE} = 6\text{ V}$	h_{FE}		15 to 100
Transition frequency $I_C = 3,0\text{ A}$; $V_{CE} = 20\text{ V}$	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
Collector-stud capacitance	C_{cs}	typ.	3,5 pF



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	Gp dB	η_{dt} %	I_C A	d_3^* dB	d_5^* dB	$I_C(ZS)$ A	T_h °C
7,5 to 50 (P.E.P.)	> 13	> 35	< 2,55	< -30	< -30	0,1	25

At temperatures up to 90 °C the output power relative to that at 25 °C is diminished by -40 mW/K.

The transistor is designed to withstand a full load mismatch operating under 50 W P.E.P. at $V_{CE} = 28 \text{ V}$ and $T_h = 70 \text{ °C}$.

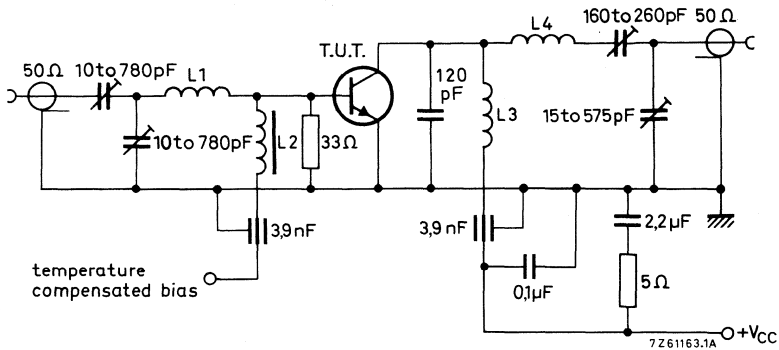
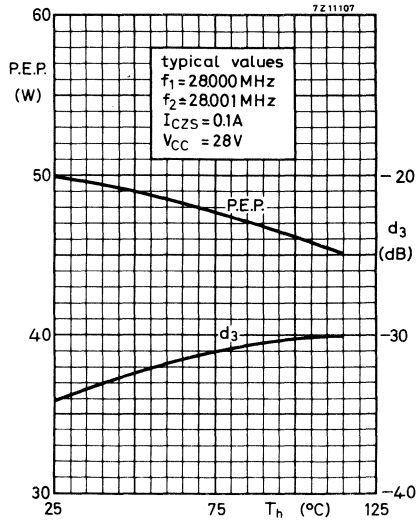
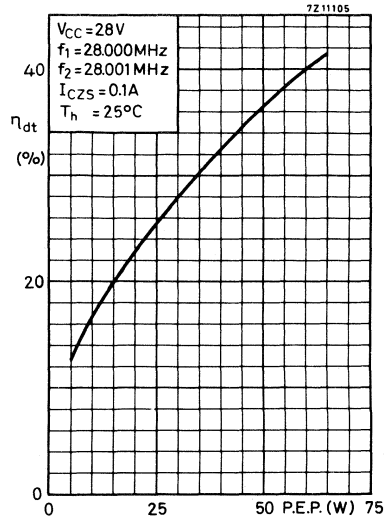
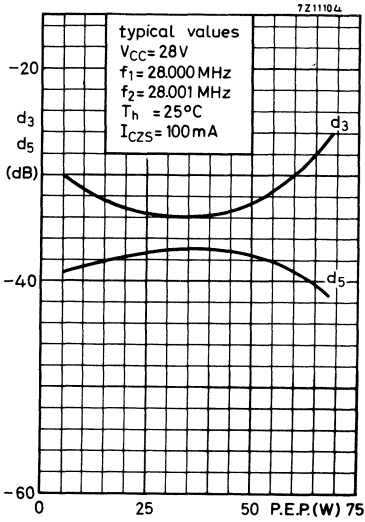


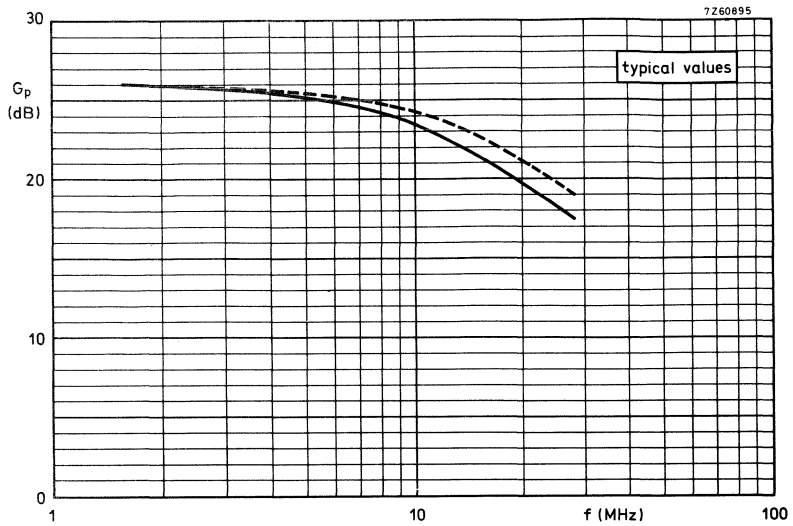
Fig. 7 Test circuit; s.s.b. class-AB.

List of components:

- L1 = 3 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 7,0 mm; leads 50 mm (total)
- L2 = 7 turns enamelled Cu wire (0,7 mm) on 3H1 toroid; 60 μH (cat. no. 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

* 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.



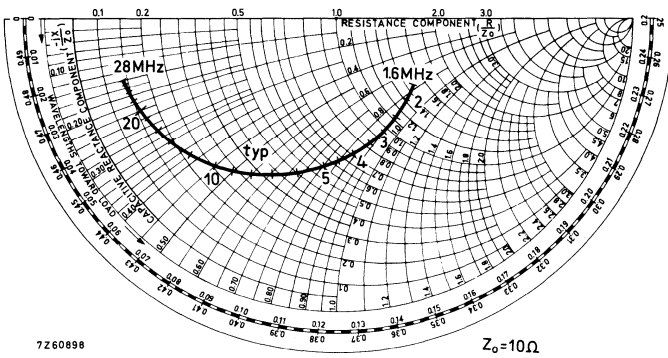
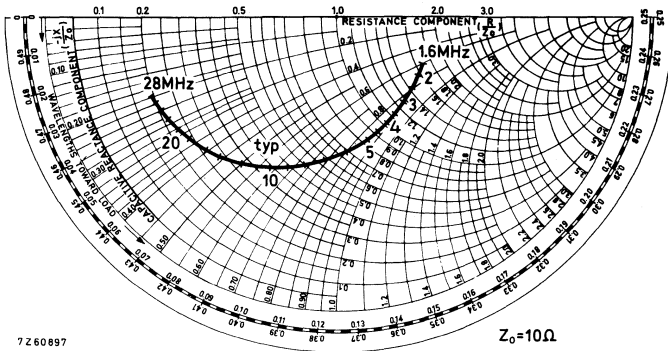


S.S.B. class AB operation

$$\begin{aligned}
 P_L &= 50 \text{ W PEP} \\
 V_{CC} &= 28 \text{ V} \\
 I_C &= 100 \text{ mA} \\
 Z_L &= 6.25 \Omega \\
 T_h &= 25^\circ \text{C}
 \end{aligned}$$

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

- $P_L = 50 \text{ W PEP}$
- $V_{CC} = 28 \text{ V}$
- $I_C = 100 \text{ mA}$
- $Z_L = 6.25 \Omega$
- $T_h = 25 \text{ }^\circ\text{C}$

The 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)

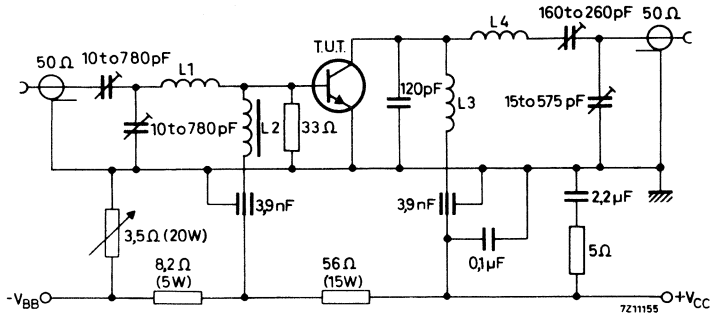
R. F. performance in s. s. b. operation (linear power amplifier)

$V_{CC} = 28 \text{ V}$; 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

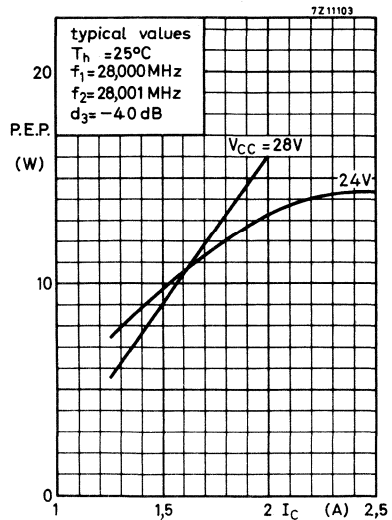
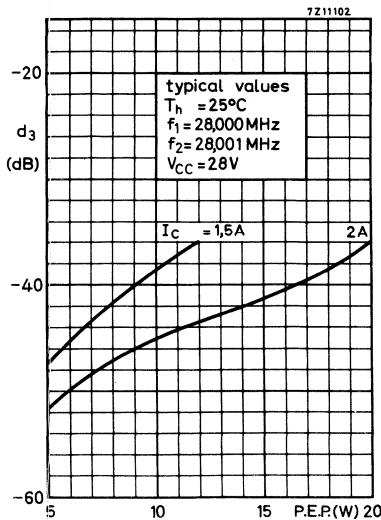


L1 = 3 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 7 mm leads 50 mm totally

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)

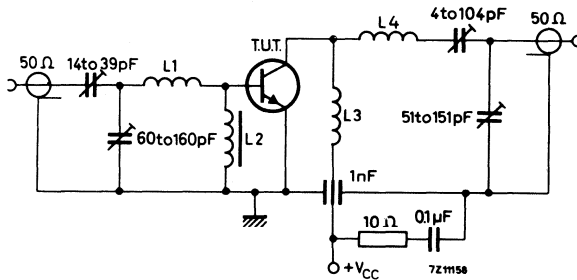
$V_{CC} = 28 \text{ V}$; T_H up to $25 \text{ }^\circ\text{C}$

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mS)
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 mW/K

Test circuit :

**C.W.
70 MHz**

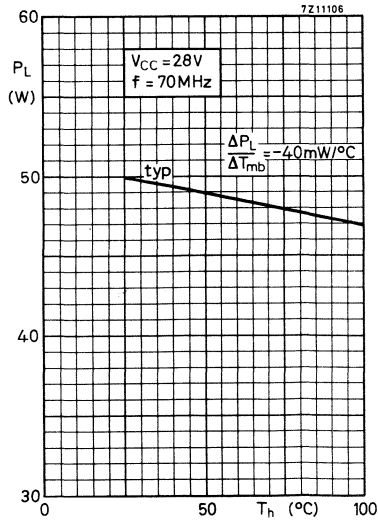
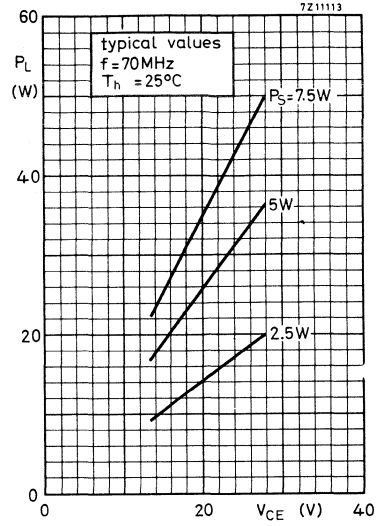
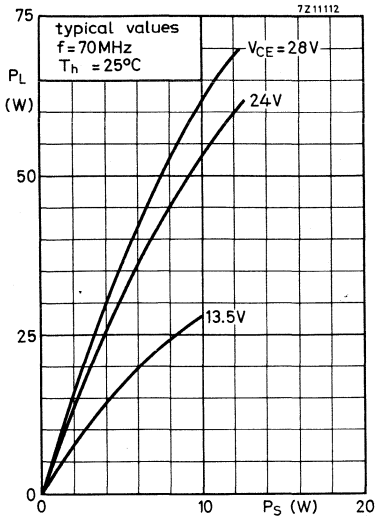


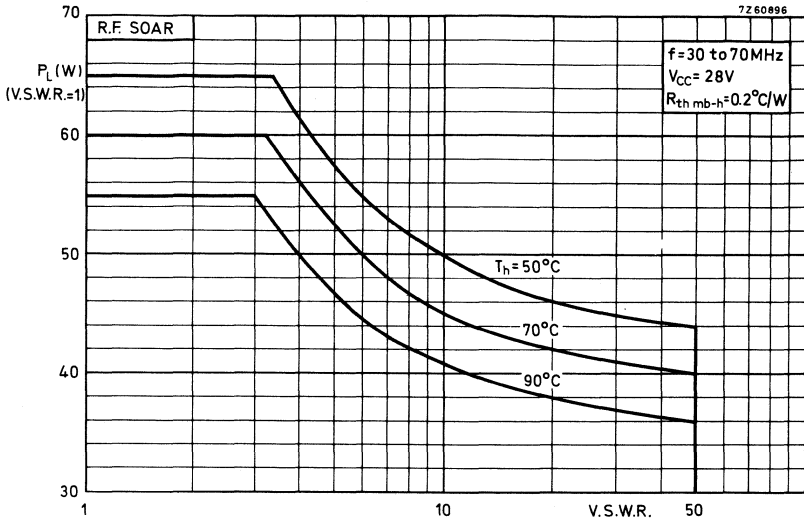
L1 = 60 mm straight enamelled Cu wire (1.5 mm); 9 mm above chassis

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

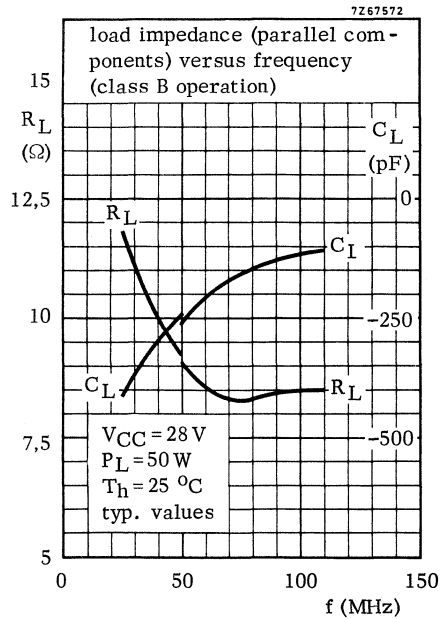
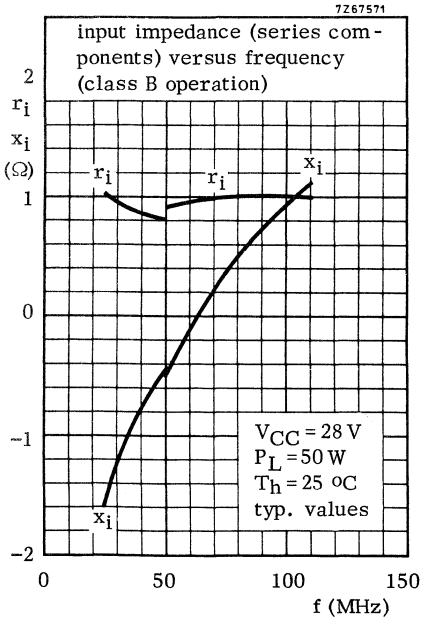
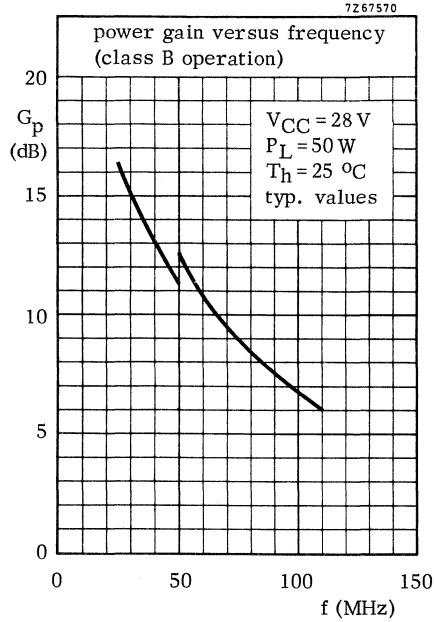
L4 = 3 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; internal diam. 10 mm; leads 50 mm totally





For high voltage operation, a stabilized power supply 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.



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

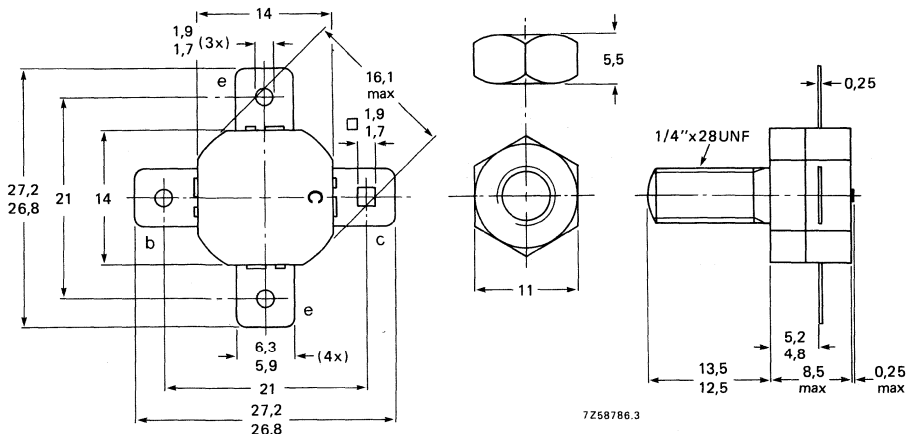
QUICK REFERENCE DATA

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. 7,4	-	-

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-55.



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

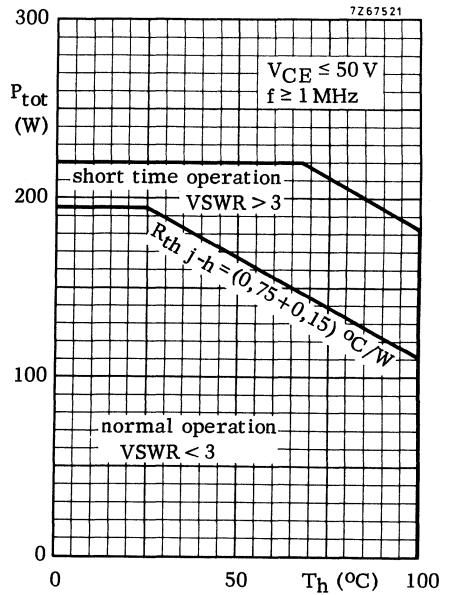
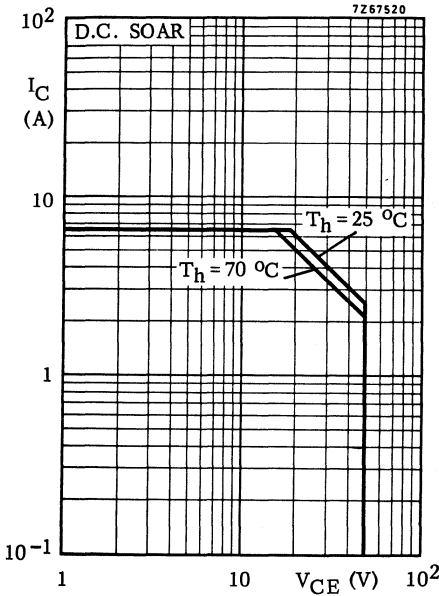
Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

Diameter of clearance hole in heatsink: max. 6,4 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.

PRODUCT SAFETY 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)

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
Collector current (average)	$I_{C(AV)}$	max.	6,5 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	20 A



Storage temperature
Junction temperature

T_{stg}	-65 to +200 °C
T_j	max. 200 °C

THERMAL RESISTANCE

From junction to mounting base
From mounting base to heatsink

$R_{th j-mb}$	=	0,75 K/W
$R_{th mb-h}$	=	0,15 K/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	ms
$-V_{BE} = 1,5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	12,5	ms

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 $f = 1\text{ MHz}$

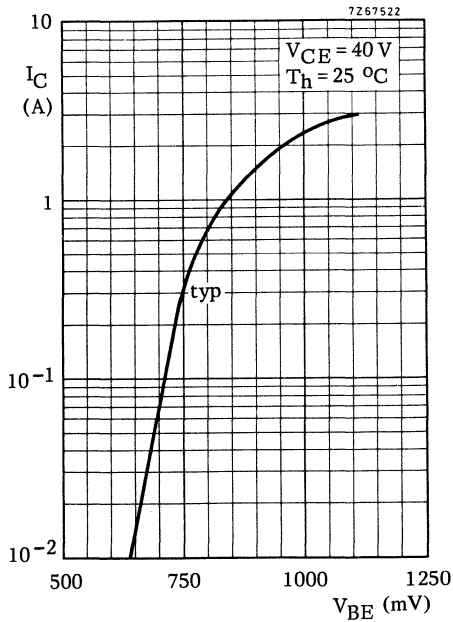
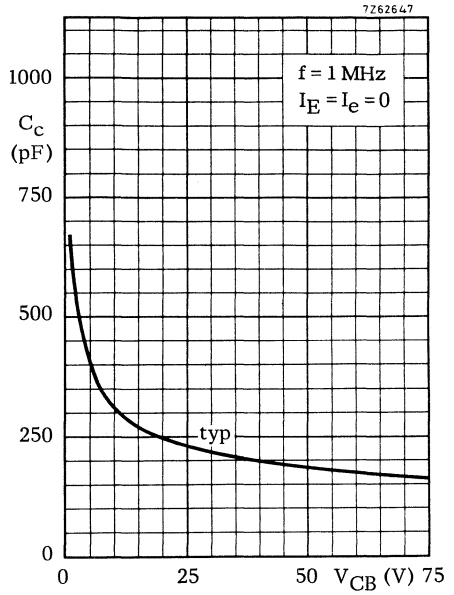
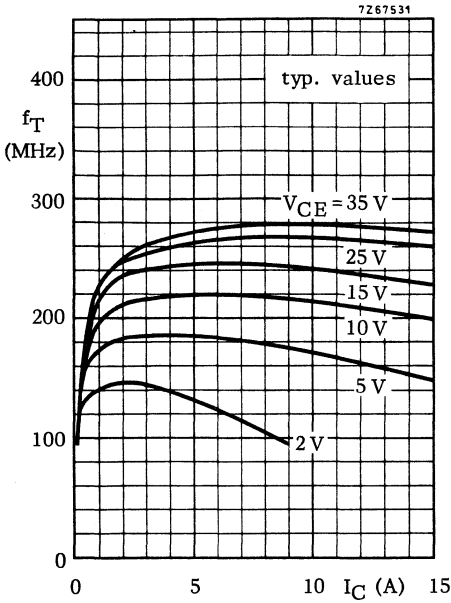
$I_E = I_e = 0$; $V_{CB} = 50\text{ V}$	C_c	typ. <	185 220	pF pF
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Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 150\text{ mA}$; $V_{CE} = 50\text{ V}$	C_{re}	typ.	115	pF
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Collector-stud capacitance

	C_{CS}	typ.	3,5	pF
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APPLICATION INFORMATION

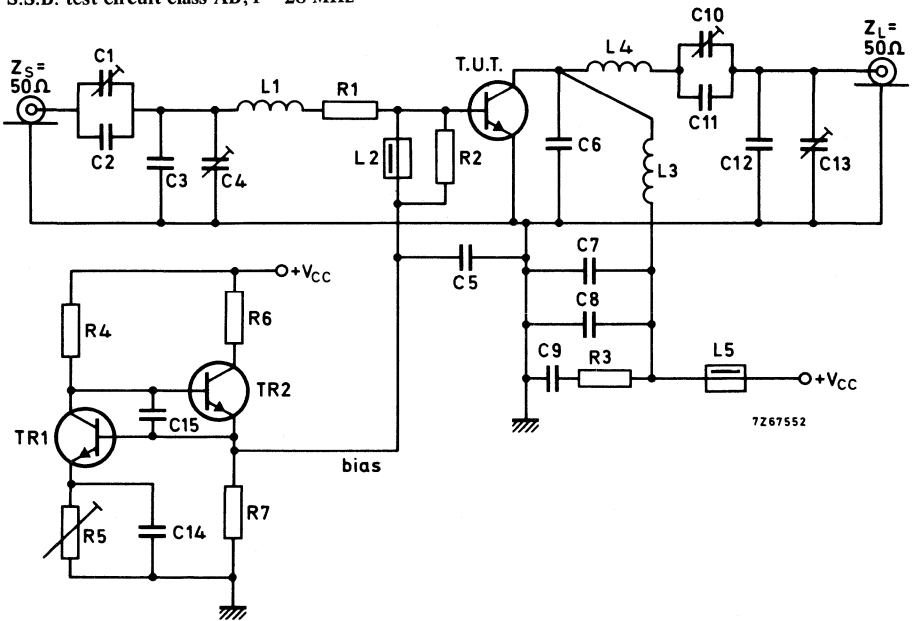
R. F. performance in s. s. b. operation (linear power amplifier)

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



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 6 dB.

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)

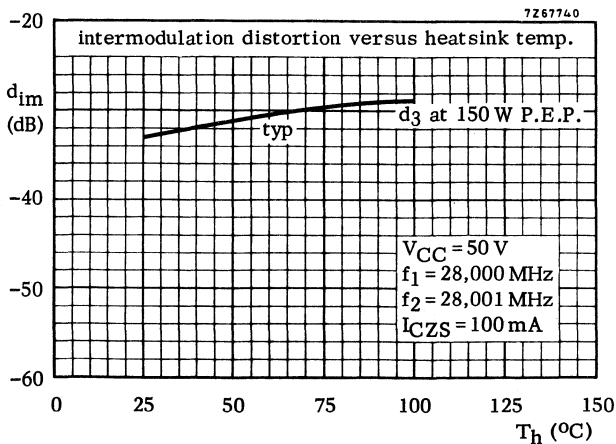
R3 = 4,7 Ω carbon resistor ($\pm 5\%$; 0,5 W)

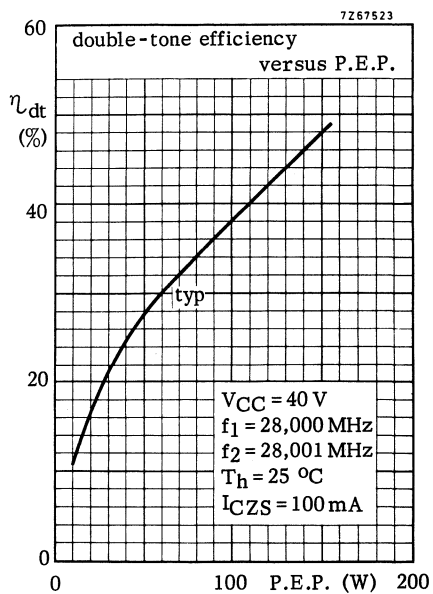
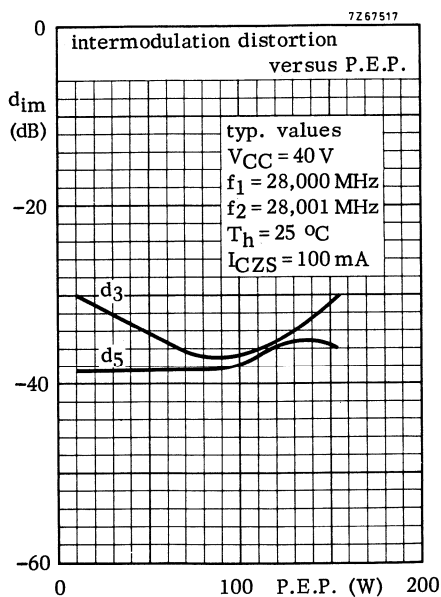
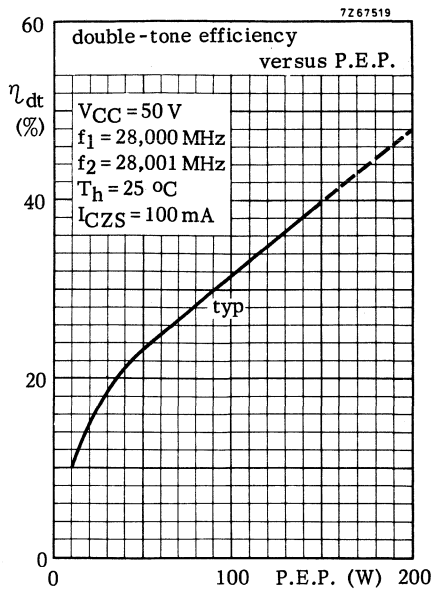
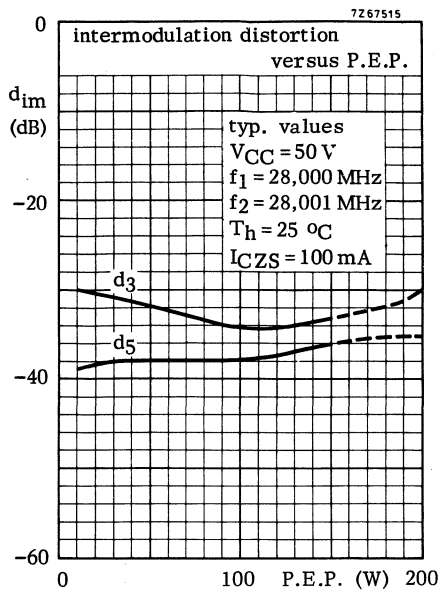
R4 = 5,6 k Ω carbon resistor ($\pm 5\%$; 1 W)

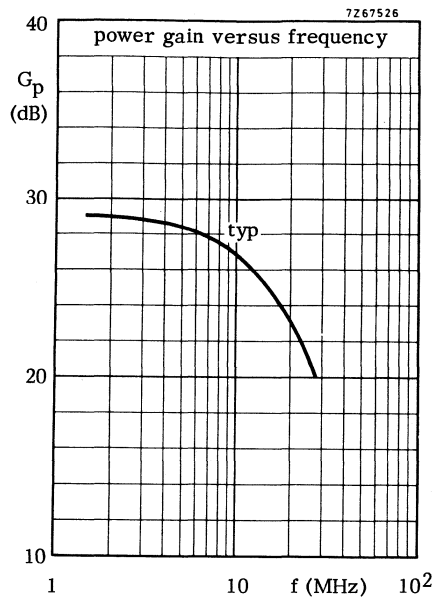
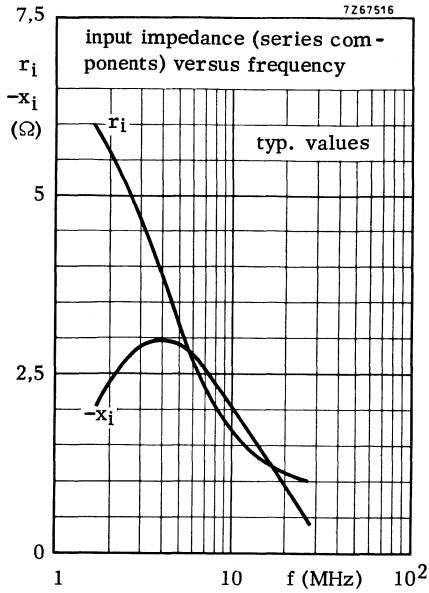
R5 = 15 Ω wire-wound potentiometer (3W)

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

$P_L = 150 \text{ W (PEP)}$

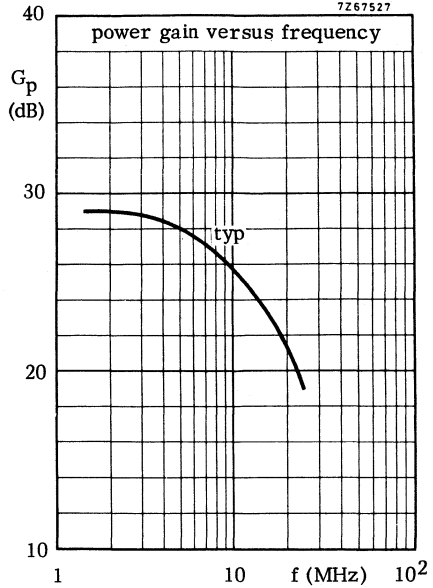
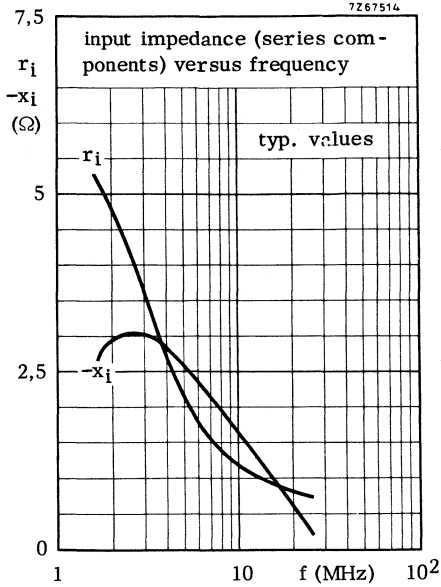
$V_{CC} = 50 \text{ V}$

$I_{CZS} = 100 \text{ mA}$

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

$Z_L = 6,25 \text{ } \Omega$ in series with $10,4 \text{ nH}$ (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

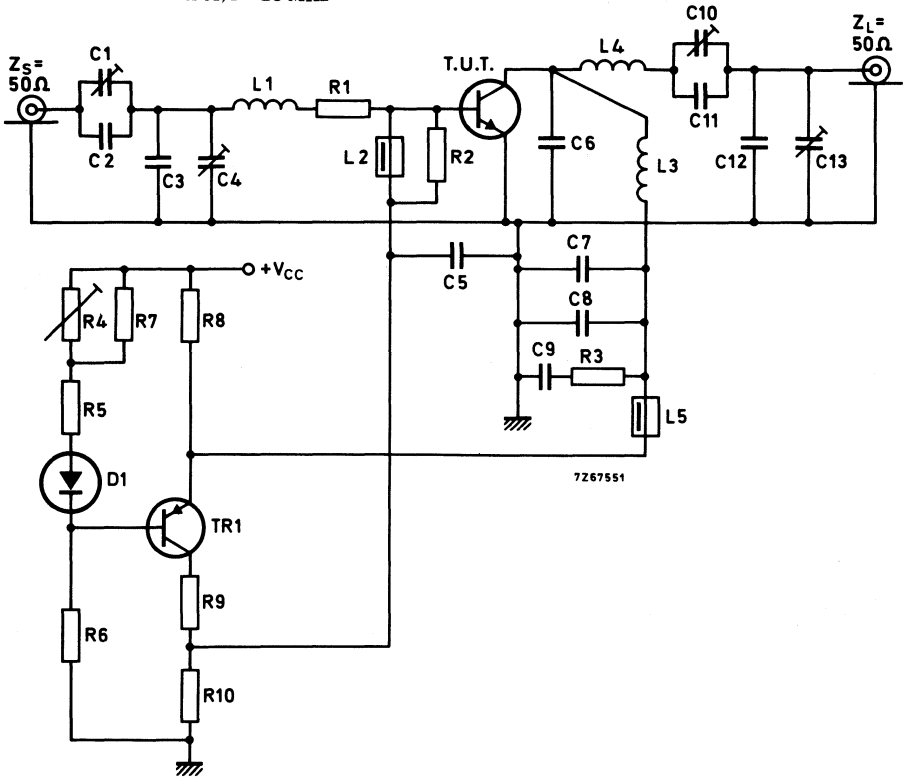
$T_h = 25$ °C

$Z_L = 6,25 \Omega$ 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:

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

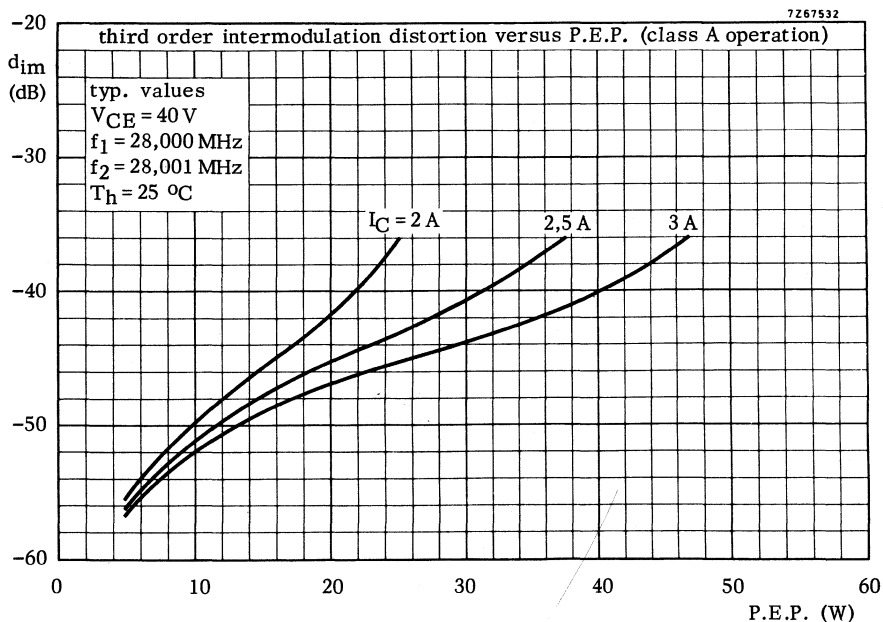
C11 = 68 pF ceramic capacitor

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)



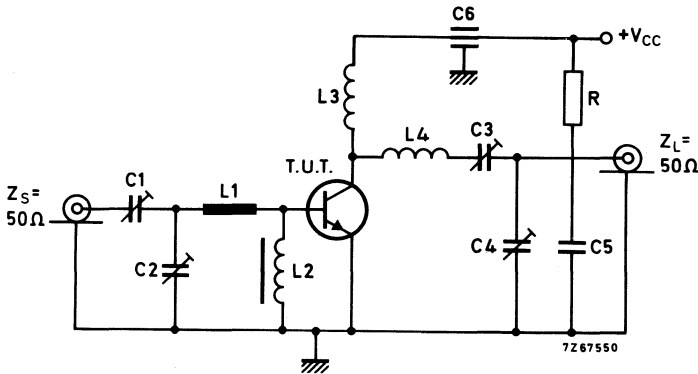
APPLICATION INFORMATION (continued)

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. 27	150	typ. 4,0	typ. 7,4	typ. 75

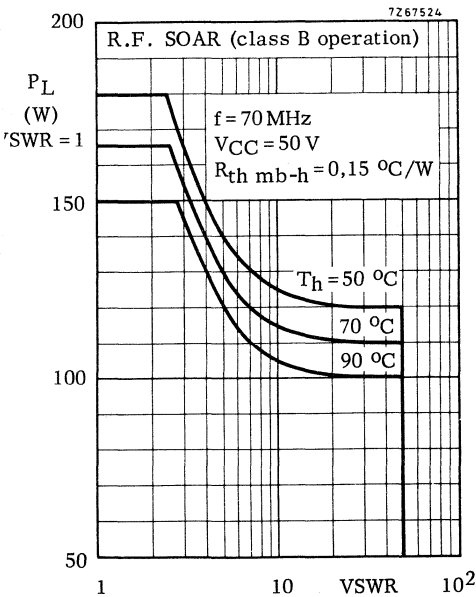
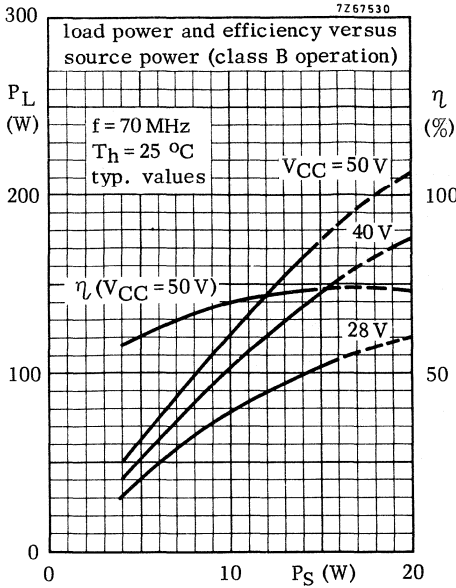
Test circuit: 70 MHz; c.w. class-B.



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 mW/K .



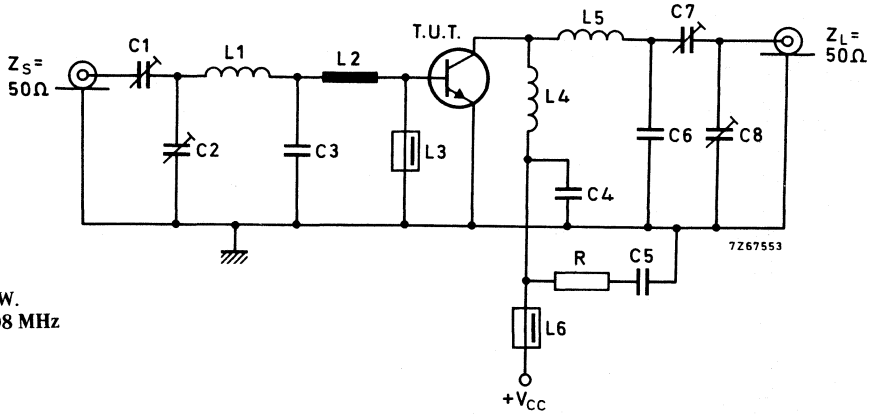
Indicated load power as a function of overload.

The graph has been derived from an evaluation of the performance of transistors matched up to 180W load power in the test amplifier and subsequently subjected to various mismatch conditions at 50V 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:



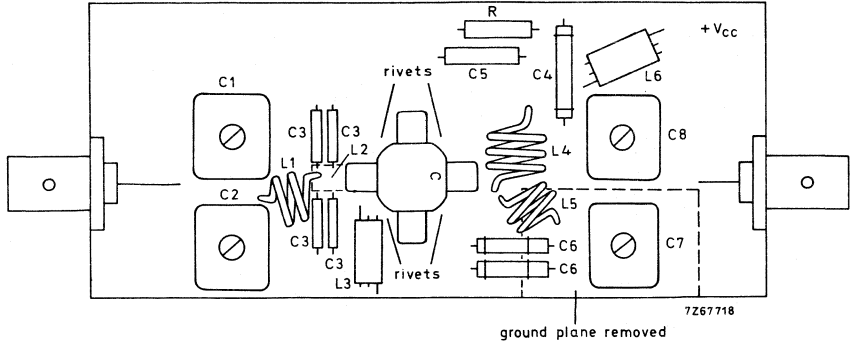
C.W.
108 MHz

List of components:

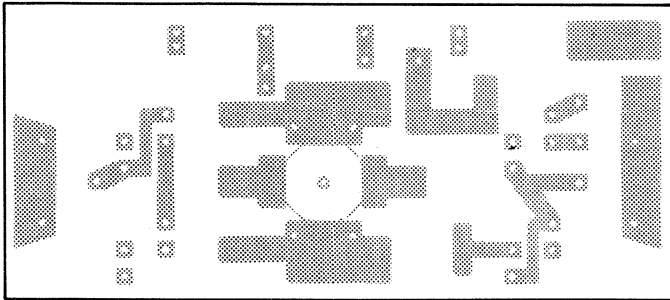
- C1 = C2 = 40 pF film dielectric trimmer
 C3 = 400 pF parallel connection of 4 x 100 pF ceramic capacitors
 C4 = 270 pF ceramic capacitor
 C5 = 100 nF polyester capacitor ($\pm 10\%$)
 C6 = 20 pF parallel connection of 2 x 10 pF ceramic capacitors
 C7 = C8 = 60 pF film dielectric trimmer
 L1 = 49 nH; 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 = ferroxcube 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 (0,5W)

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 108 MHz test circuit.

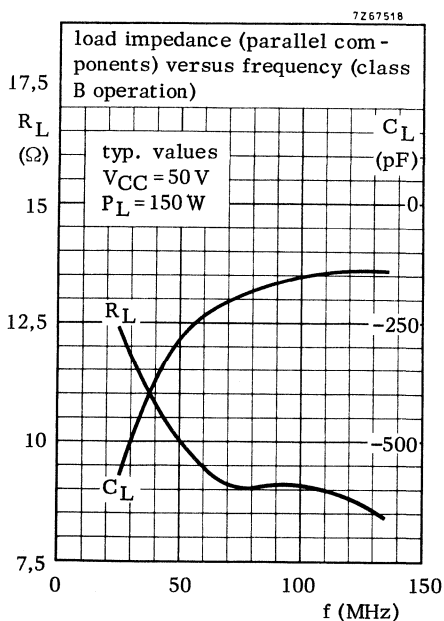
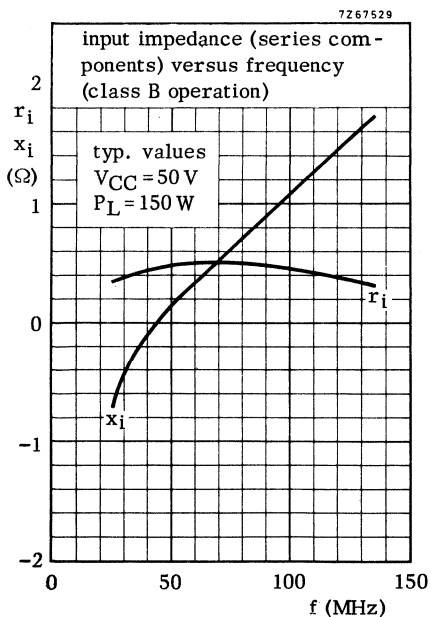
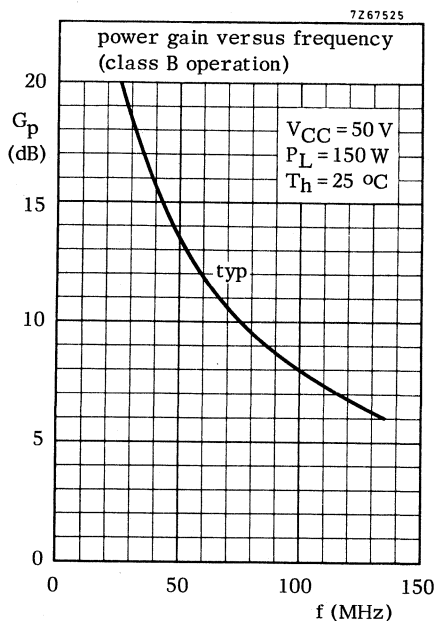
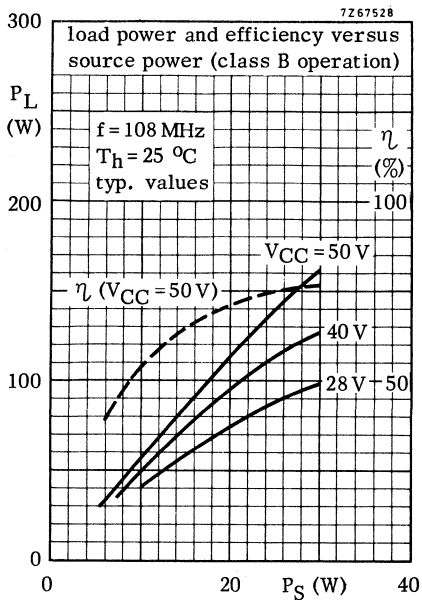


Dimensions of printed circuit board 123 mm x 55 mm.



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 inter-connection of L5, C6 and C7 has been removed.



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

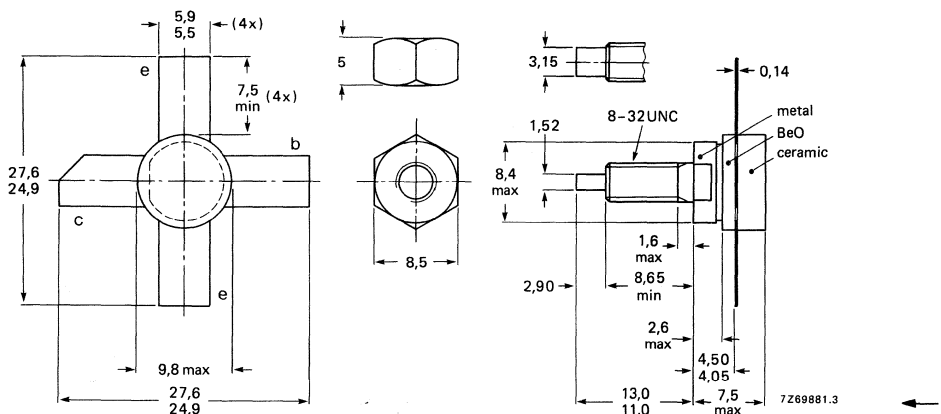
R.F. performance up to $T_h = 25^\circ\text{C}$

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS	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.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device 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

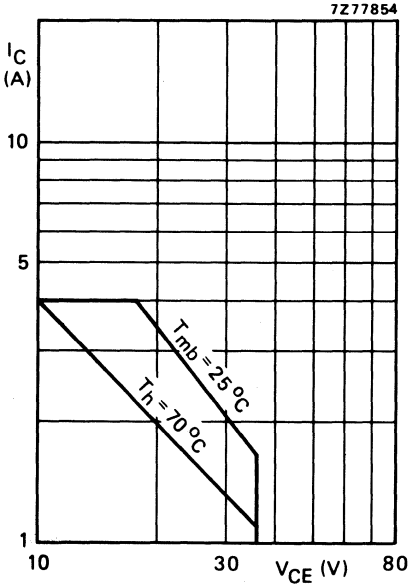


Fig. 2 D.C. SOAR.

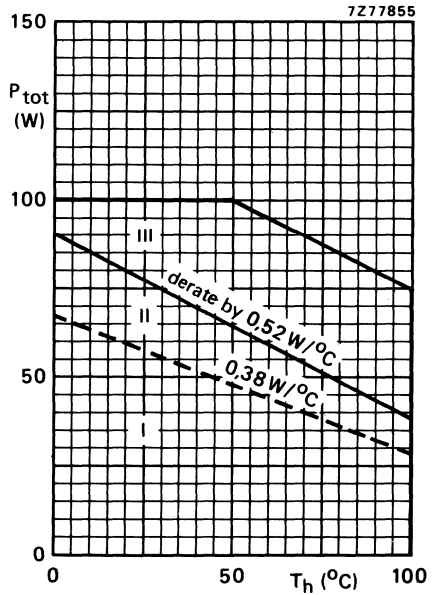


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	2,05 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,45 K/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

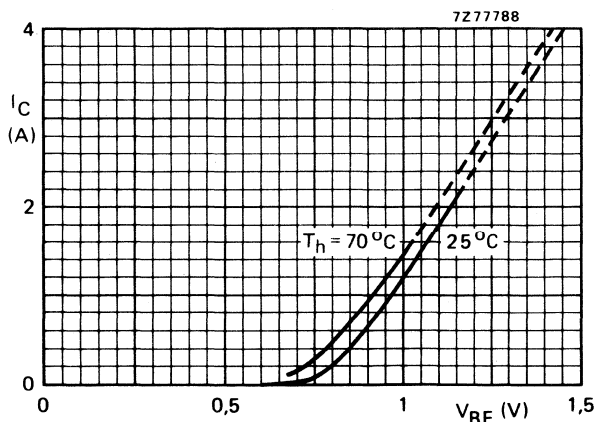


Fig. 4 Typical values; $V_{CE} = 28\text{ V}$.

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

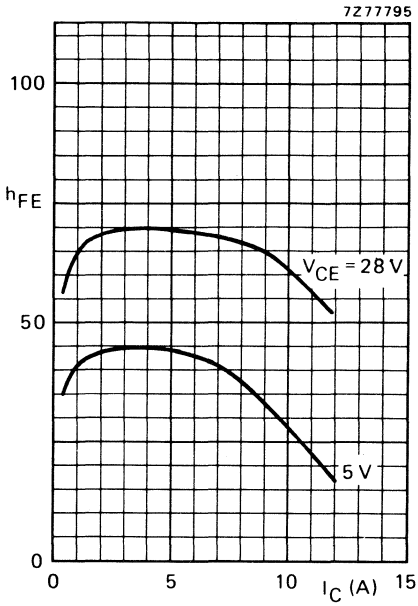


Fig. 5 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

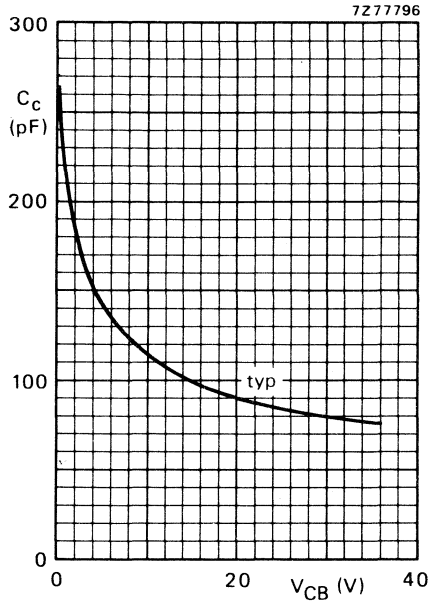


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

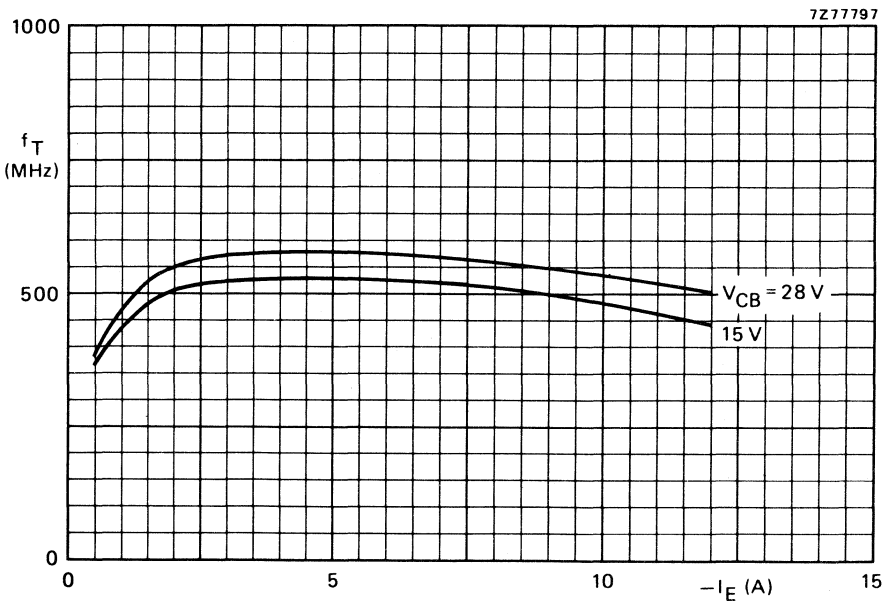


Fig. 7 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

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

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

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 (mS)
175	28	45	< 8	> 7,5	< 2,47	> 70	$0,7 + j1,3$	$110 - j62$

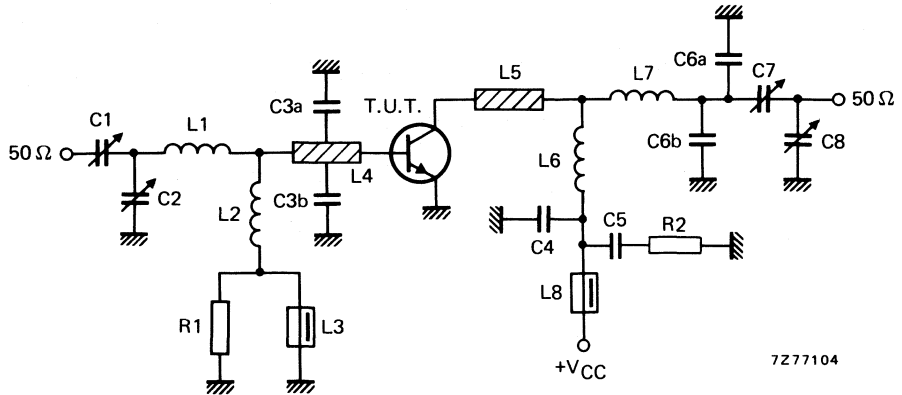


Fig. 8 Test circuit; c.w. class-B.

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.

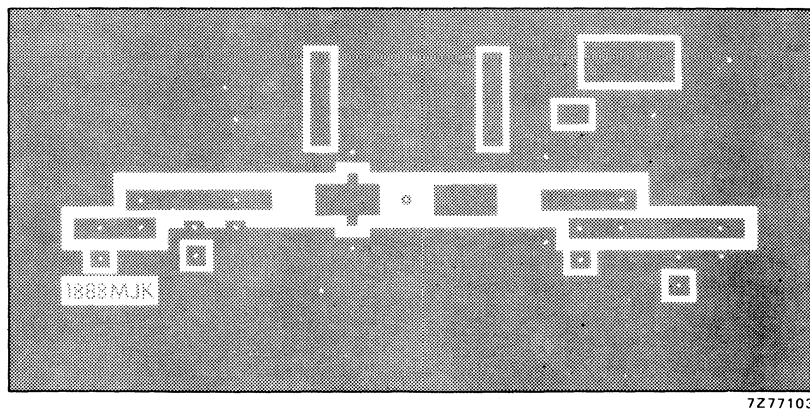
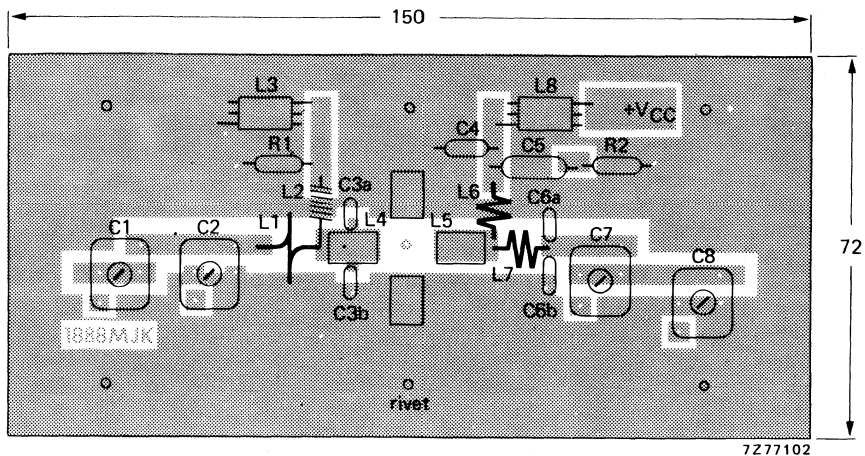


Fig. 9 Component layout and printed-circuit board for 175 MHz test circuit.

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.

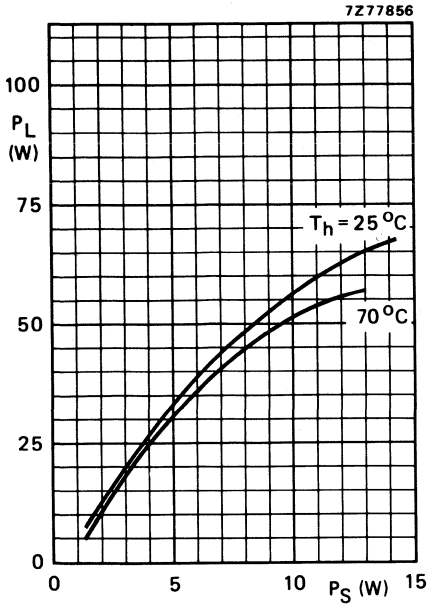


Fig. 10 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$.

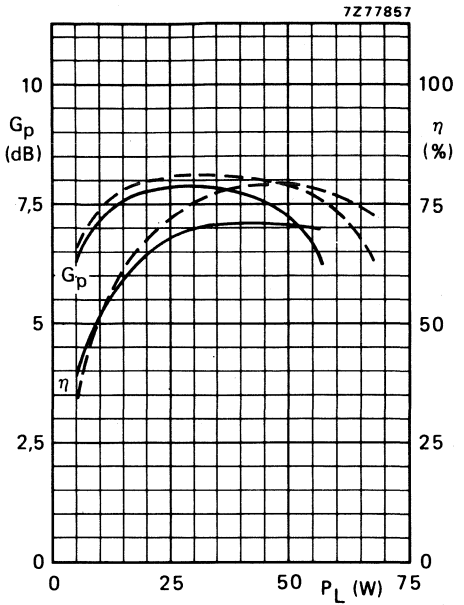


Fig. 11 Typical values; $V_{CE} = 28\text{ V}$; $f = 175\text{ MHz}$; --- $T_h = 25^\circ\text{C}$; — $T_h = 70^\circ\text{C}$.

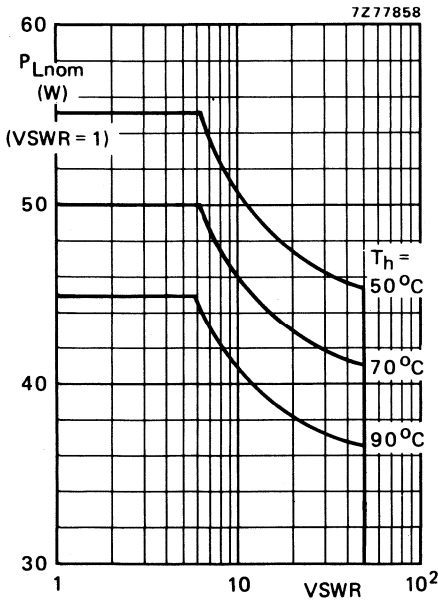


Fig. 12 R.F. SOAR; c.w. class-B operation; $f = 175\text{ MHz}$; $V_{CE} = 28\text{ V}$; $R_{th\text{ mb-h}} = 0,45\text{ K/W}$. The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

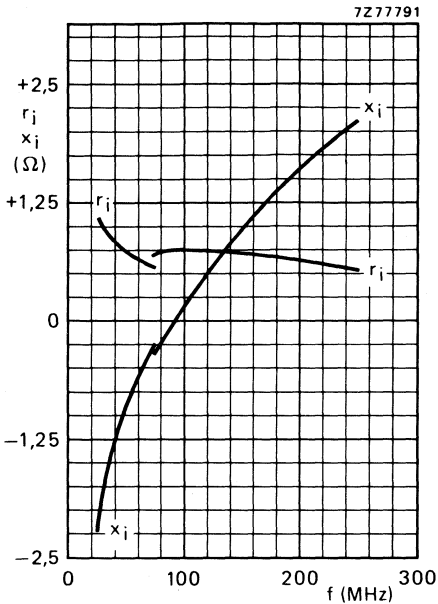


Fig. 13 Input impedance (series components).

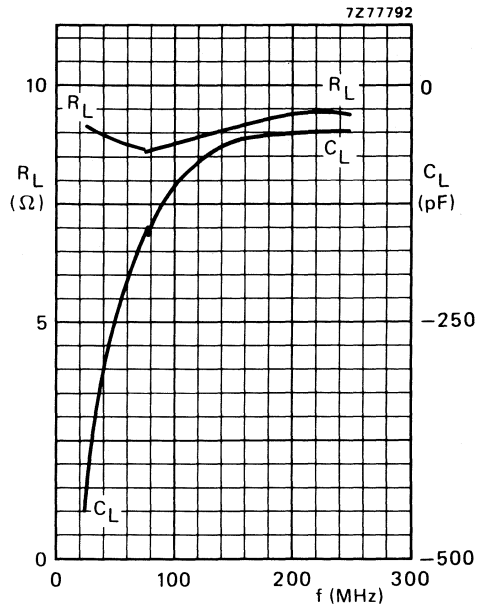


Fig. 14 Load impedance (parallel components).

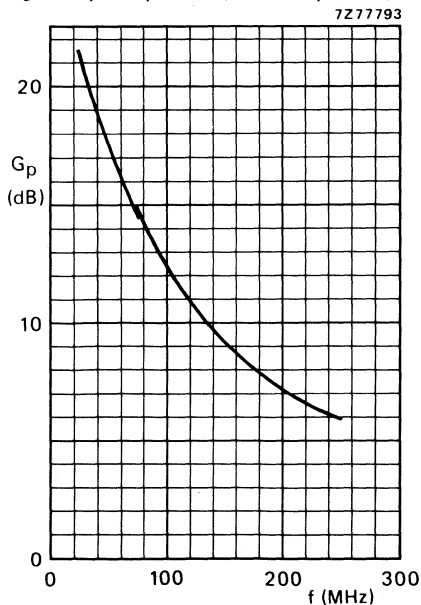


Fig. 15 Power gain versus frequency.

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	$\eta_{dt}(\%)$ at 42,5 W (P.E.P)	I_C (A)	d_3 dB*	d_5 dB*	$I_C(ZS)$ mA	T_h °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

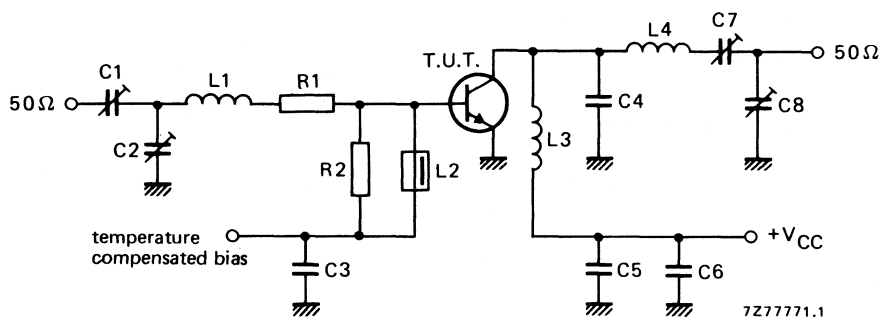


Fig. 16 Test circuit; s.s.b. class-AB.

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.

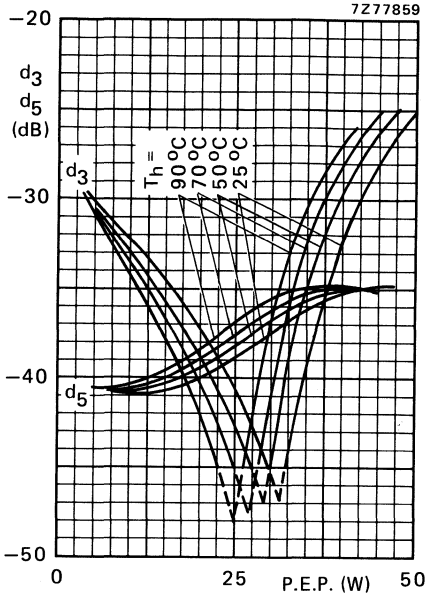


Fig. 17 Intermodulation distortion as a function of output power.*

Conditions for Fig. 17:

VCE = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 18:

VCE = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 70 °C; typical values.

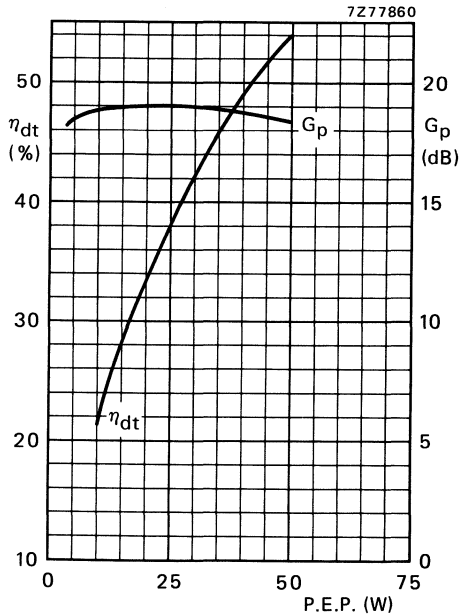


Fig. 18 Double-tone efficiency and power gain as a function of output power.

* See note on previous page.

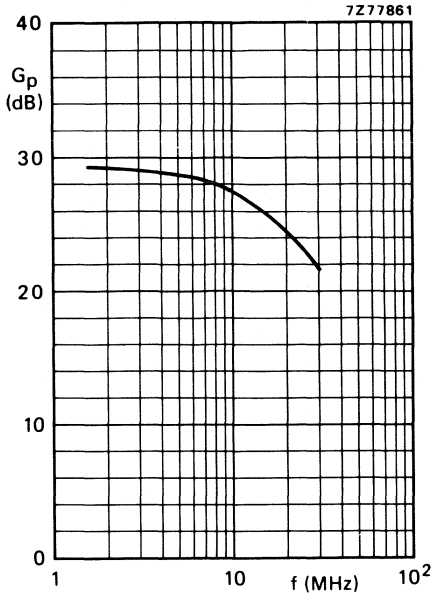


Fig. 19 Power gain as a function of frequency.

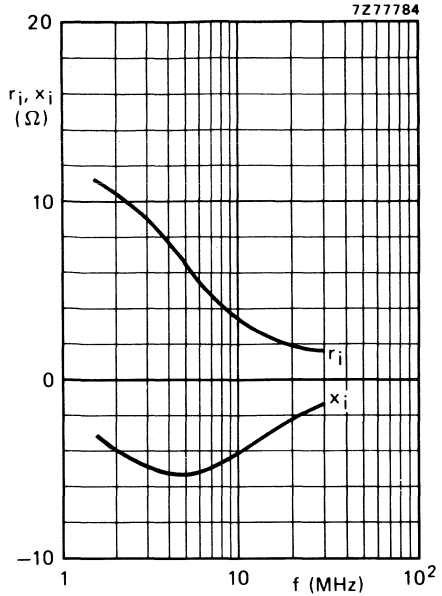


Fig. 20 Input impedance (series components) as a function of frequency.

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 ($VSWR = 50$) 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 $P_{Lnom} = 45 \text{ W P.E.P.}$

R.F. performance in s.s.b. class-A operation (linear power amplifier)

$V_{CE} = 26 \text{ V}$; $T_h = 70 \text{ }^\circ\text{C}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

output power W	G_p dB	I_C A	d_3 dB *	d_5 dB *
15 (P.E.P)	typ. 20	1,55	typ. -42	< -40

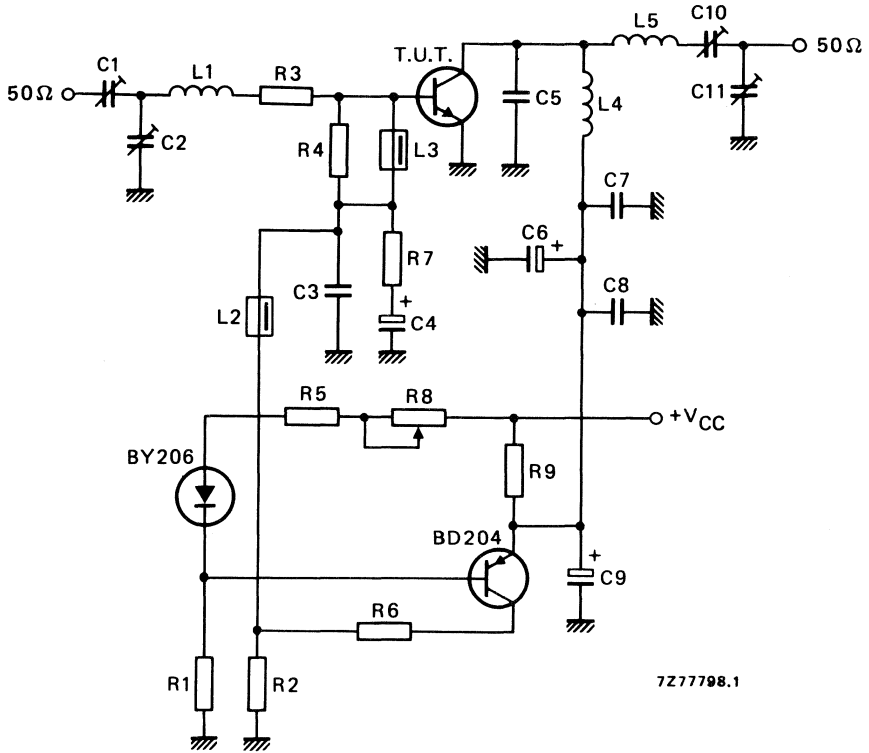


Fig. 21 Test circuit; s.s.b. class-A.

* 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)

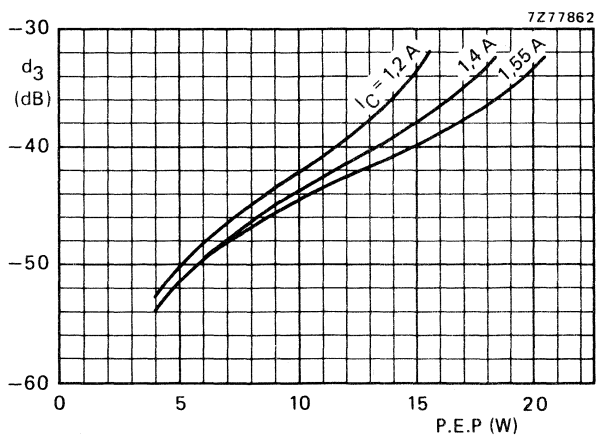


Fig. 22 Intermodulation distortion as a function of output power. Typical values; $V_{CE} = 26$ V; $T_h = 70$ $^{\circ}$ C; $f_1 = 28,000$ MHz; $f_2 = 28,001$ MHz.

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

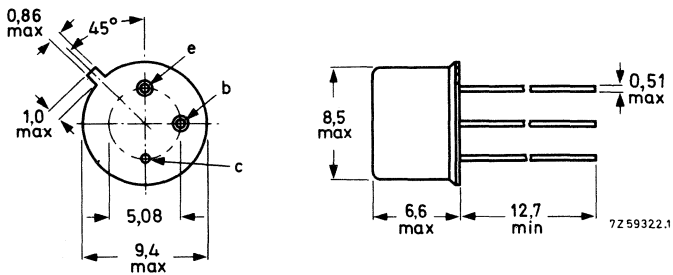
R.F. performance up to $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_{S} W	P_{L} W	I_{C} A	G_{p} dB	η %	\bar{z}_i Ω	\bar{y}_L mS
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: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

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
Collector current (average)	$I_{C(AV)}$	max.	0.7	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	2.0	A
Total power dissipation up to $T_{case} = 90$ °C $f > 10$ MHz	P_{tot}	max.	3.0	W
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	K/W
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{th\ mb-h}$	=	2.5	K/W

CHARACTERISTICST_j = 25 °C unless otherwise specified

Breakdown voltages

Collector-base voltage
open emitter, I_C = 10 mAV_{(BR)CBO} > 36 VCollector-emitter voltage
V_{BE} = 0; I_C = 10 mAV_{(BR)CES} > 36 VCollector-emitter voltage
open base, I_C = 25 mAV_{(BR)CEO} > 18 VEmitter-base voltage
open collector, I_E = 1.0 mAV_{(BR)EBO} > 4 V

Collector-emitter saturation voltage

I_C = 100 mA; I_B = 20 mAV_{CEsat} typ. 0.1 V

D. C. current gain

I_C = 100 mA; V_{CE} = 5 Vh_{FE} > 10
typ. 40

Transition frequency

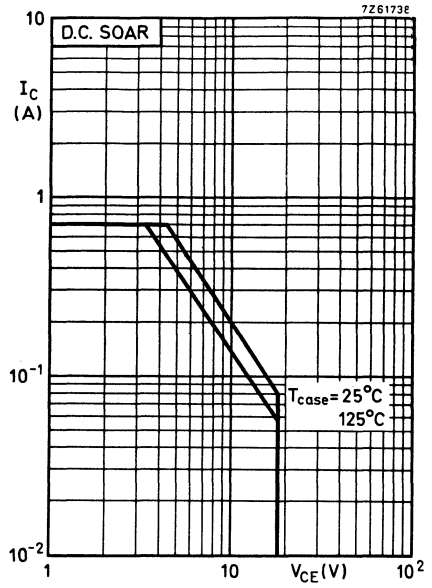
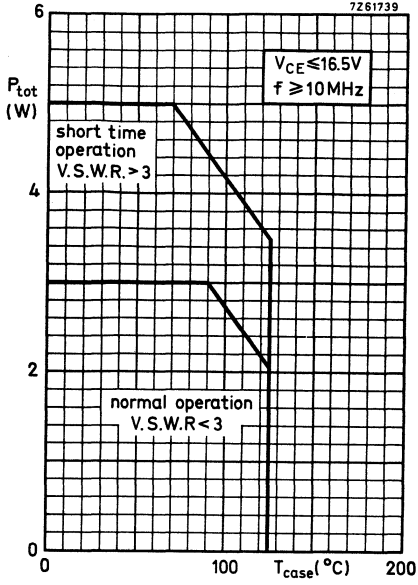
I_C = 200 mA; V_{CE} = 5 V; f = 500 MHzf_T typ. 1400 MHz

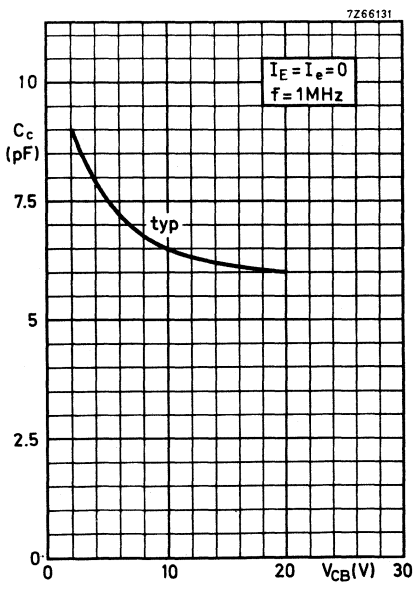
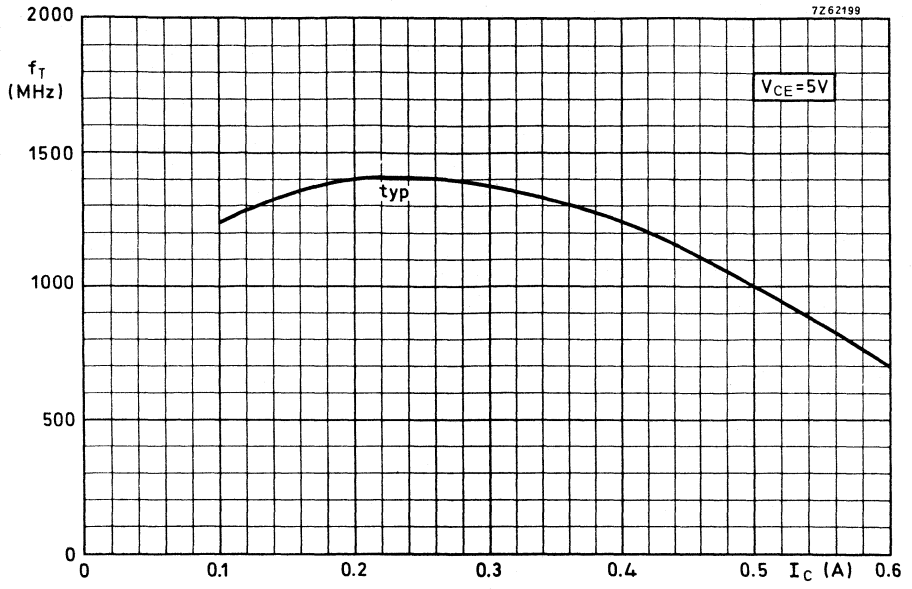
Collector capacitance at f = 1 MHz

I_E = I_e = 0; V_{CB} = 10 VC_c typ. 6.5 pF
< 9.0 pF

Feedback capacitance at f = 1 MHz

I_C = 20 mA; V_{CE} = 10 V-C_{re} typ. 4.8 pF





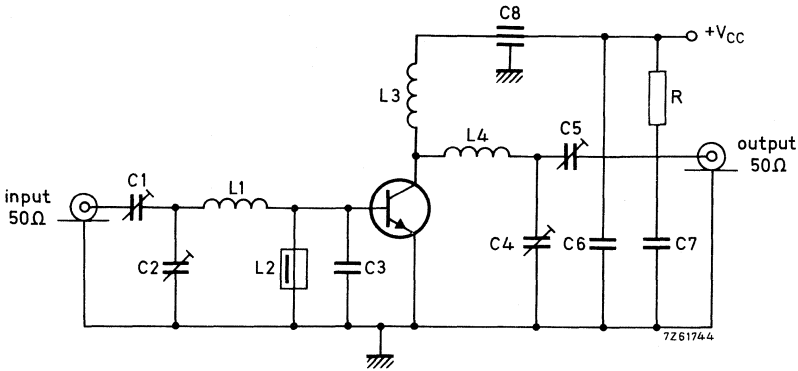
APPLICATION INFORMATION

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 (%)	\bar{z}_i (Ω)	\bar{Y}_L (mS)
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 1 (470 Mhz)



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/K

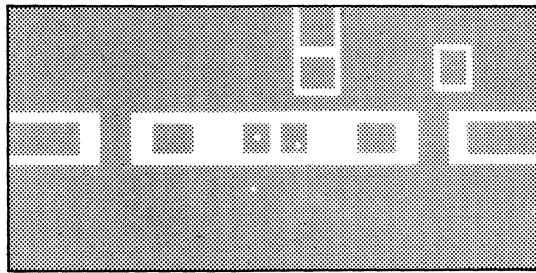
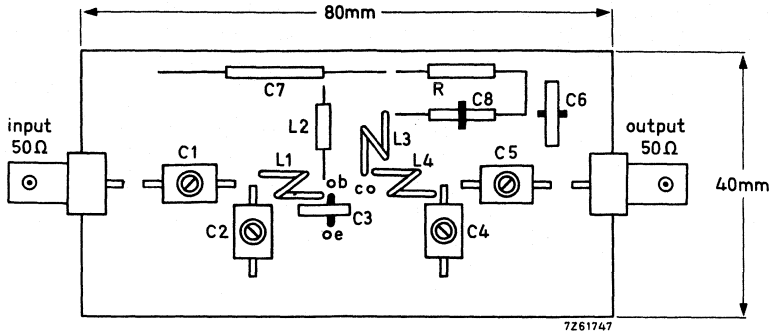
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions : V_{CC} = 16.5 V; f = 470 MHz; T_{case} = 70 °C

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.

APPLICATION INFORMATION (continued)

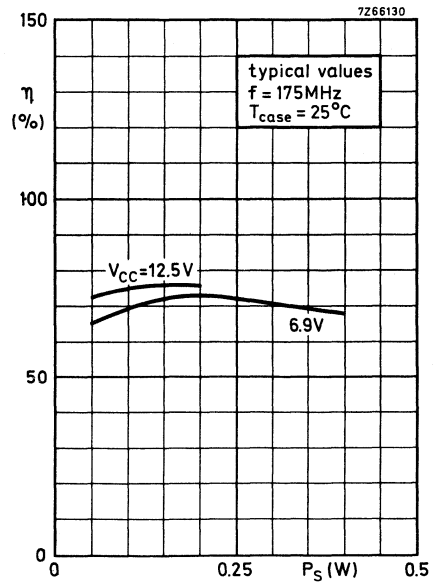
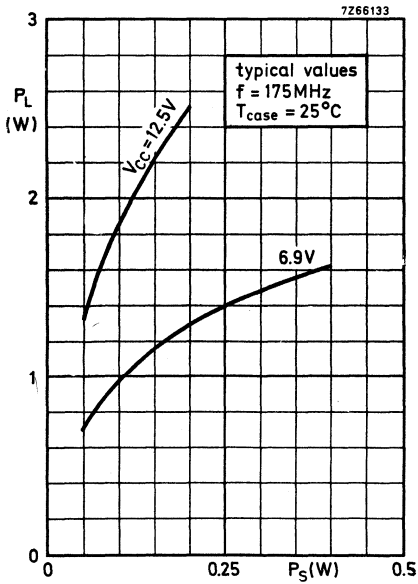
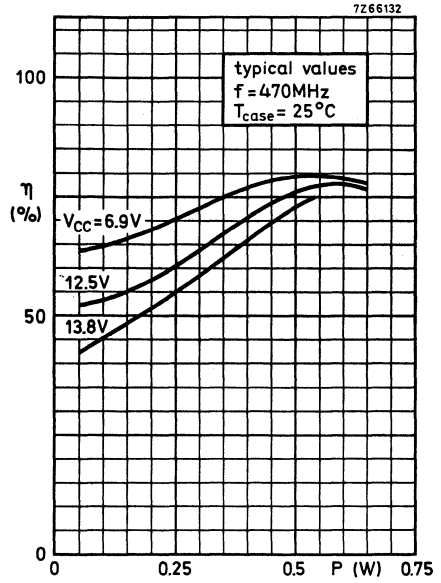
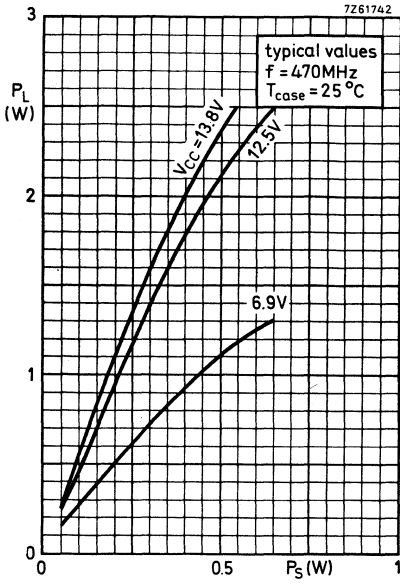
Component lay-out and printed circuit board for 470 MHz test circuit.

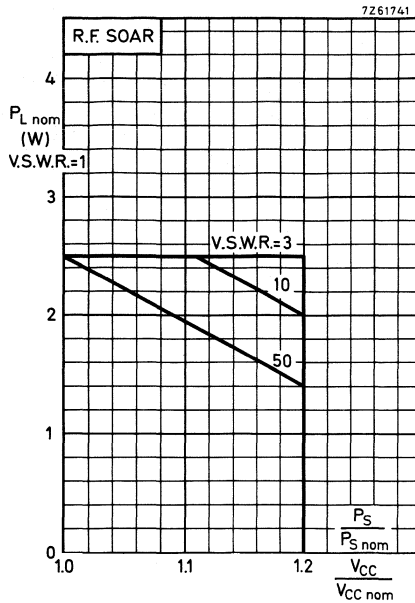


Shaded area copper

Back area not metalized

Material of printed circuit board: 1.5 mm epoxy fibre-glass





Conditions for R. F. SOAR

$f = 470 \text{ MHz}$

$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and $V.S.W.R. = 1$

$T_{case} = 70 \text{ }^\circ\text{C}$

$V_{CCnom} = 13.8 \text{ V}$

The transistor was developed for use with unstabilized supply voltage V_{CC} .

The above graph is based on its measured performance in test circuit 1.

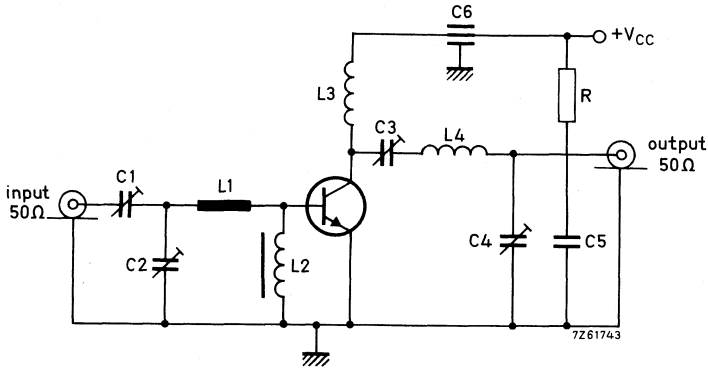
Supply voltage was varied from V_{CCnom} to $1.2 V_{CCnom}$, and $V.S.W.R.$ from 1 to 50. It shows the maximum allowable output power under nominal conditions in order not to exceed the maximum allowable power dissipation under conditions of supply overvoltage ($V_{CC} > V_{CCnom}$) and load mismatch ($V.S.W.R. > 1$).

It is assumed that the drive power increases linearly with the supply voltage; i.e.

$$P_S/P_{Snom} = V_{CC}/V_{CCnom}$$

APPLICATION INFORMATION (continued)

Test circuit II (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 μ F 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 311399116740)

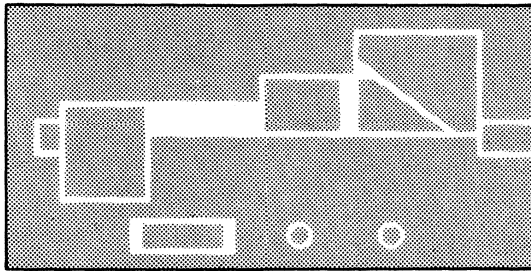
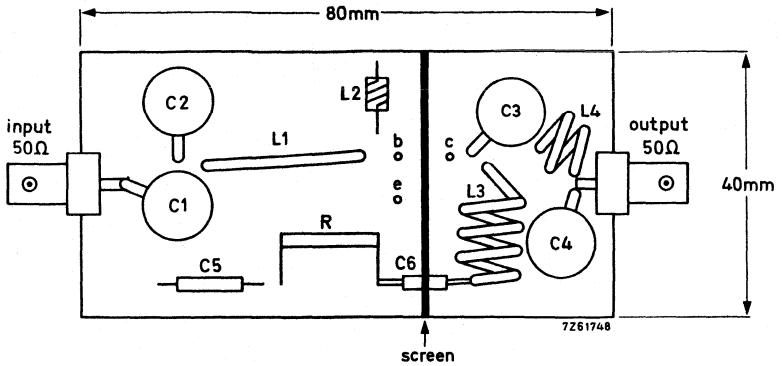
L3 = 5 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

L4 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

R = 10 Ω carbon

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit :

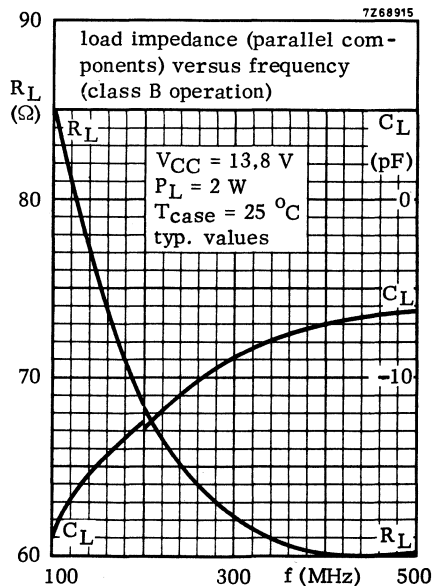
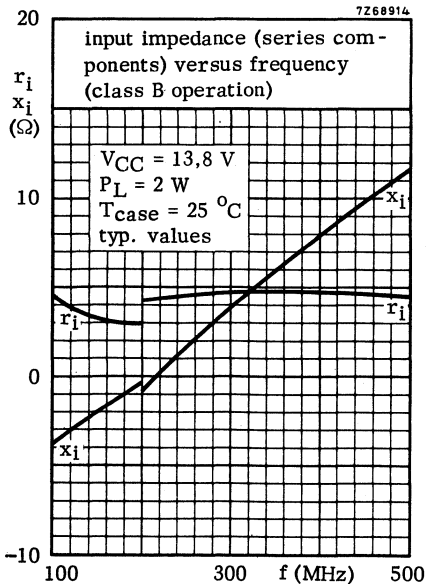
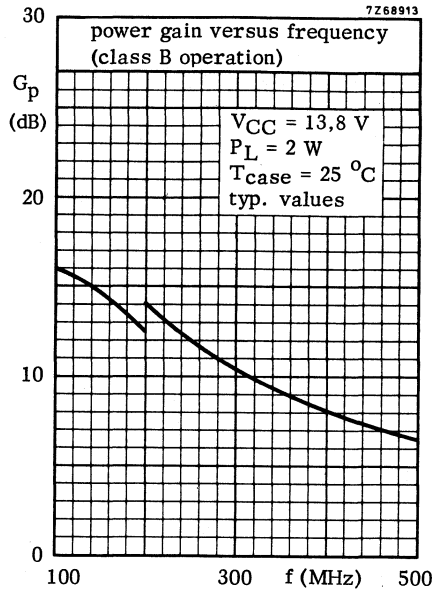


Shaded area copper

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.



V.H.F./U.H.F. POWER TRANSISTORS

N-P-N silicon planar epitaxial transistors in TO-39 envelope designed for use in portable and mobile radio transmitters in the v.h.f. and u.h.f. bands.

QUICK REFERENCE DATA

R.F. performance at $T_c = 25^\circ\text{C}$ in a common-emitter class-B circuit.

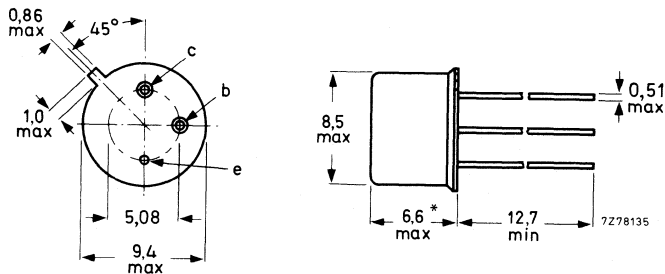
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
C.W.; narrow band	12,5	175	2	typ. 16	typ. 68
	12,5	470	2	≥ 9	≥ 55

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39/3.

Emitter connected
to case.



* Max. 4,9 for BLX65ES.

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

BLX65E BLX65ES

RATINGS

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

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current d.c. or average (peak value); $f \geq 1$ MHz	I_C I_{CM}	max.	0,7 A 2,0 A
Total power dissipation at $T_{mb} \leq 90$ °C; $f \geq 1$ MHz	P_{tot}	max.	3,0 W
Storage temperature	T_{stg}		-65 to + 175 °C

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector-base breakdown voltage open emitter; $I_C = 10$ mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; $+I_E = 1,0$ mA	$V_{(BR)EBO}$	>	4 V
Collector-emitter saturation voltage $I_C = 100$ mA; $I_B = 20$ mA	V_{CEsat}	typ.	0,1 V
D.C. current gain $I_C = 100$ mA; $V_{CE} = 5$ V	h_{FE}	> typ.	10 40
Transition frequency at $f = 500$ MHz $-I_E = 200$ mA; $V_{CB} = 5$ V	f_T	typ.	1,4 GHz
Collector capacitance at $f = 1$ MHz $I_E = I_e = 0$; $V_{CB} = 10$ V	C_C	typ.	6,5 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class B); $T_c = 25\text{ }^\circ\text{C}$

V_{CE} V	f MHz	P_L W	G_p dB	η_C %	Z_i Ω	Z_L Ω
9,6	175	2,0	typ. 13	typ. 68	—	—
12,5	175	2,0	typ. 16	typ. 68	—	—
12,5	470	2,0	≥ 9	> 55	$3 + j8$	$12 - j17$
12,5	470	2,0	typ. 10,6	typ. 68	—	—

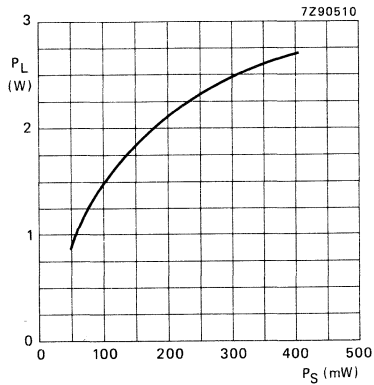


Fig. 2 Load power vs. source power; $V_{CE} = 12,5\text{ V}$; $f = 470\text{ MHz}$;
 $T_{mb} = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch ($V_{SWR} = 50$; all phases) at rated load power up to a supply voltage of $15,0\text{ V}$, $P_S + 20\%$, $f = 470\text{ MHz}$ and $T_{mb} = 25\text{ }^\circ\text{C}$.

U.H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon transistor 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

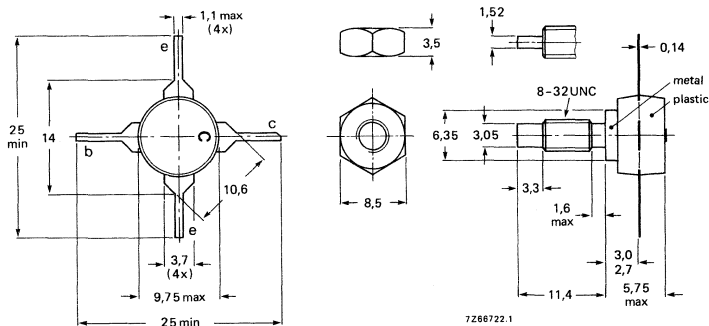
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

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 mS
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

Fig. 1 SOT-48/3



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.

PRODUCT SAFETY 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)

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
Collector current (average)	$I_{C(AV)}$	max.	0.7	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	2.0	A
Total power dissipation up to $T_h = 90$ °C $f > 10$ MHz	P_{tot}	max.	4.5	W
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	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6	K/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

 $I_C = 100\text{ mA}; I_B = 20\text{ mA}$ $V_{CEsat} \text{ typ. } 0,1\text{ V}$

D. C. current gain

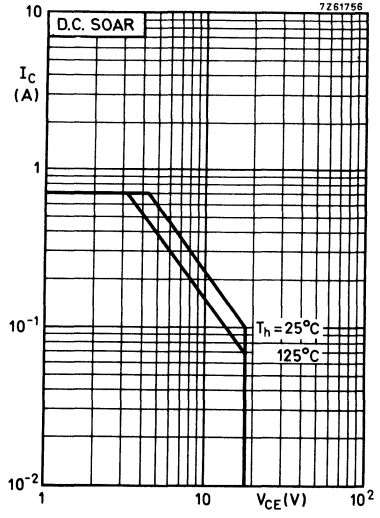
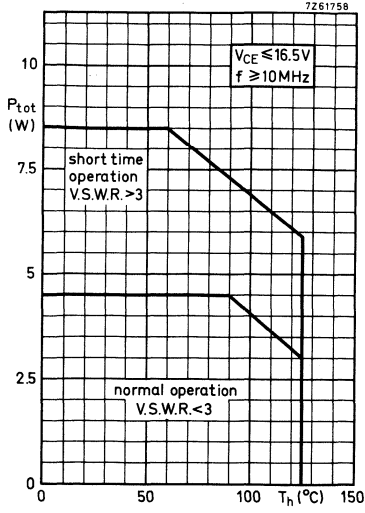
 $I_C = 100\text{ mA}; V_{CE} = 5\text{ V}$ $h_{FE} > 10$
typ. 40

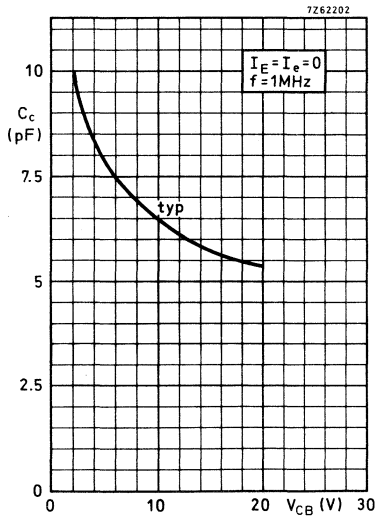
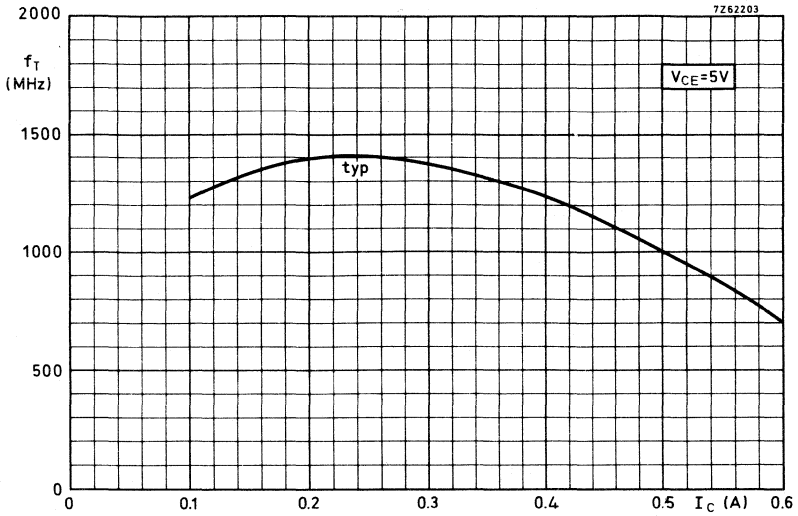
Transition frequency

 $I_C = 0,2\text{ A}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$ $f_T \text{ typ. } 1400\text{ MHz}$ Collector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 10\text{ V}$ $C_c \text{ typ. } 6,5\text{ pF}$
< 9,0 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 20\text{ mA}; V_{CE} = 10\text{ V}$ $C_{re} \text{ typ. } 4,8\text{ pF}$

Collector-stud capacitance

 $C_{cs} \text{ typ. } 2\text{ pF}$





APPLICATION INFORMATION

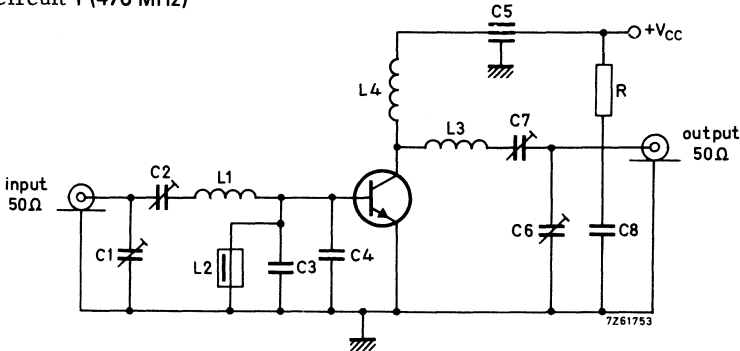
$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

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 _D (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mS)
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 1 (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 mW/K

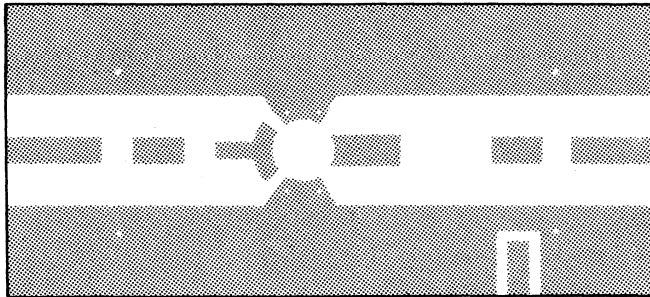
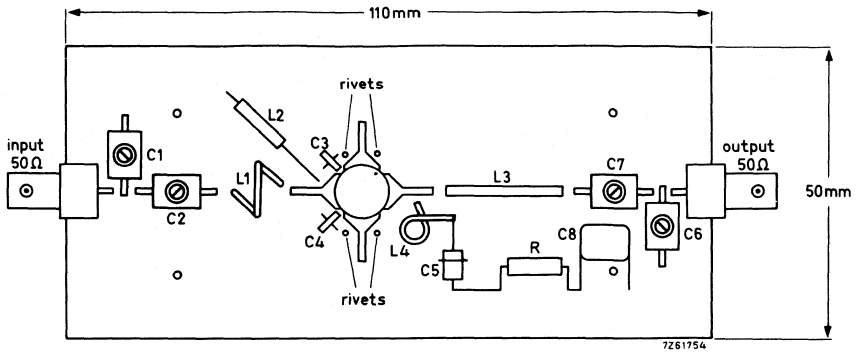
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 16.5\text{ V}$; $f = 470\text{ MHz}$; $T_h = 70\text{ }^\circ\text{C}$;

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 $V_{CC} = 13.8\text{ V}$

APPLICATION INFORMATION (continued)

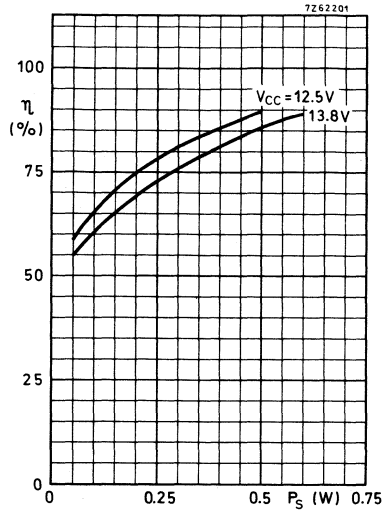
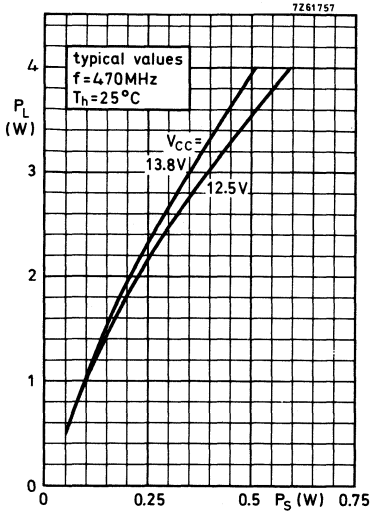
Component lay-out and printed circuit board for 470 MHz test circuit.

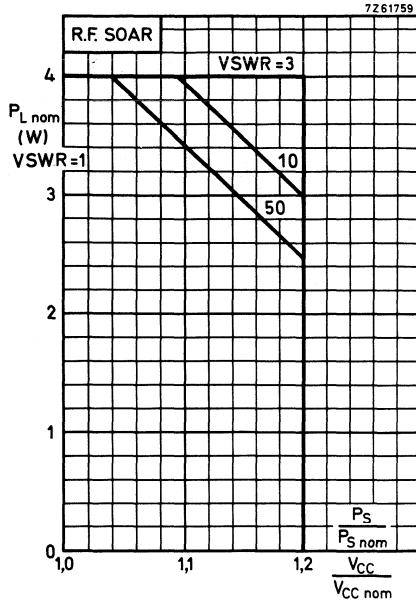


Shaded area copper

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 $VSWR = 1$

$T_h = 70 \text{ }^\circ\text{C}$

$R_{th \text{ mb-h}} = 0,6 \text{ K/W}$

$V_{CCnom} = 13,8 \text{ V}$

The transistor was developed for use with unstabilized supply voltage V_{CC} .

The above graph is based on its measured performance in test circuit 1.

Supply voltage was varied from V_{CCnom} to $1,2 V_{CCnom}$, and $VSWR$ from 1 to 50.

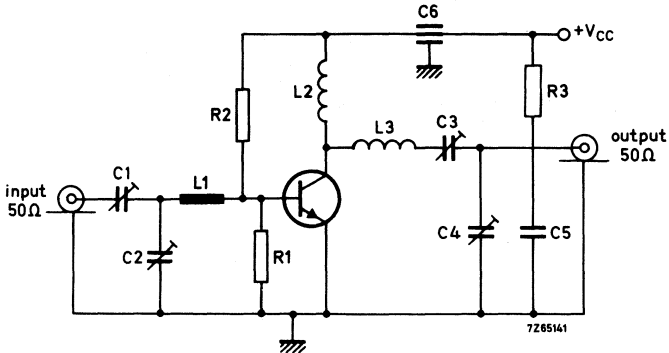
It shows the max. permissible output power under nominal conditions in order not to exceed the max. permissible power dissipation under conditions of supply over-voltage ($V_{CC} > V_{CCnom}$) and load mismatch ($VSWR > 1$).

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 II (175 MHz)



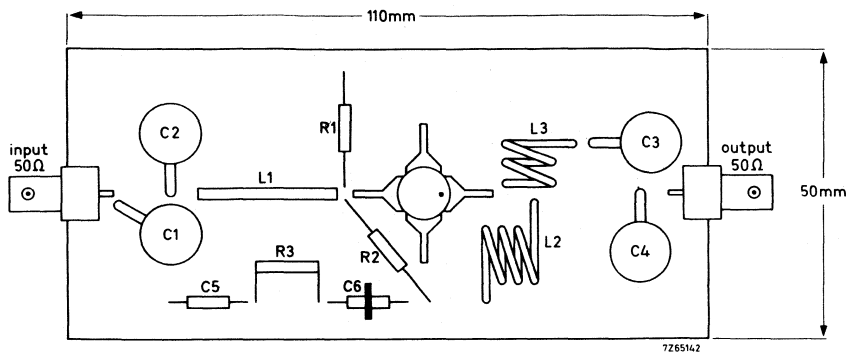
- C1 = C3 = C4 = 30 pF concentric air trimmer
 C2 = 60 pF concentric air trimmer
 C5 = 0.25 μ F ceramic capacitor
 C6 = 4 nF polyester capacitor

- 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

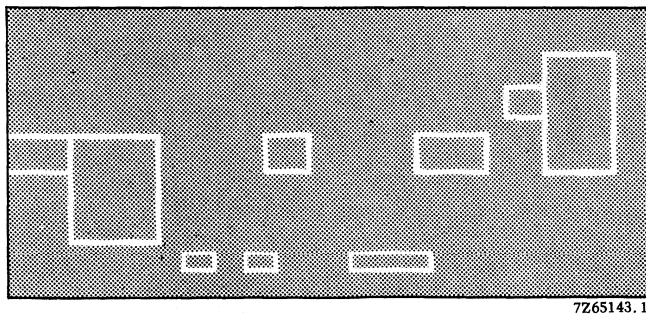
- R1 = 50 Ω carbon
 R2 = 1.2 k Ω carbon
 R3 = 5 Ω carbon

APPLICATION INFORMATION (continued)

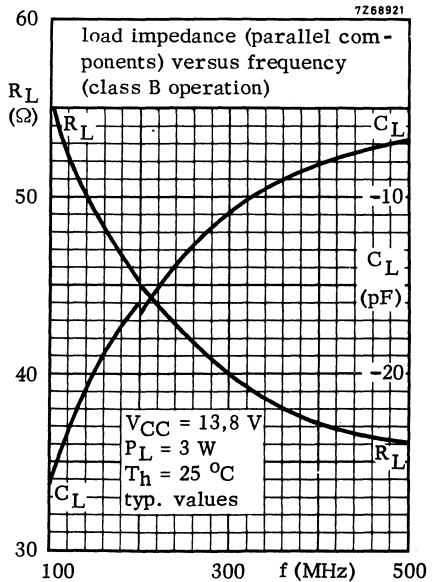
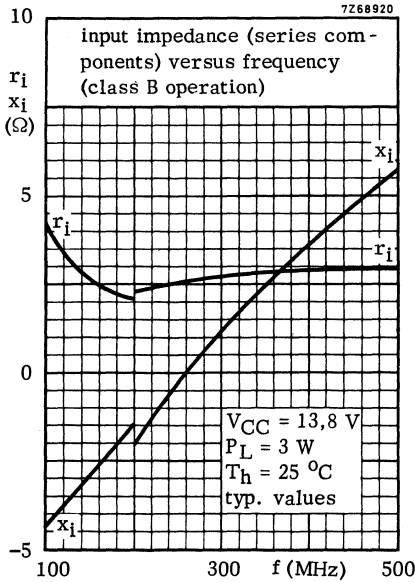
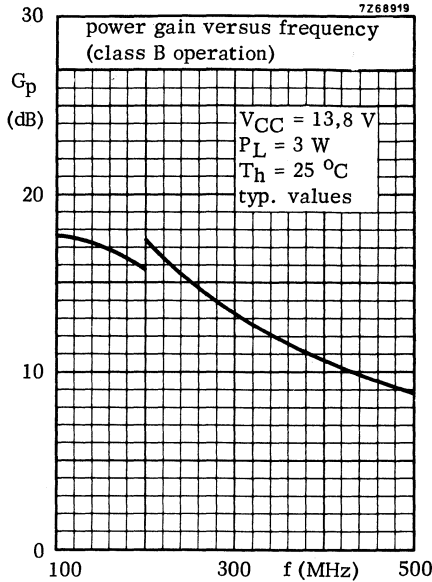
Component lay-out and printed circuit board for 175MHz test circuit.



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 silicon transistor 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

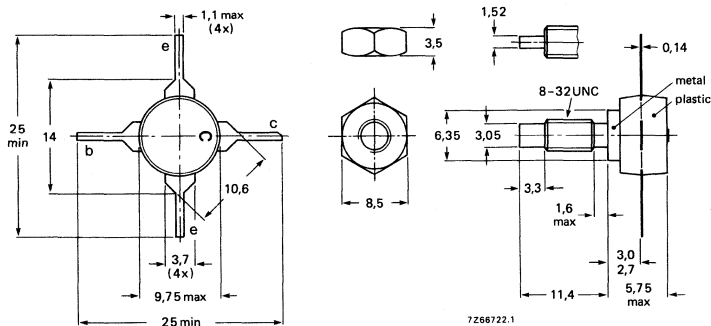
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit.

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 mS
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

Dimensions in mm

Fig. 1 SOT-48/3.



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.

PRODUCT SAFETY 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.	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
Collector current (average)	$I_{C(AV)}$	max.	1.0 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	4.0 A
Total power dissipation up to $T_h = 70$ °C $f > 10$ MHz	P_{tot}	max.	10 W
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 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6 K/W

CHARACTERISTICS

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

Breakdown voltages

Collector-base voltage open emitter, $I_C = 10\text{ mA}$	$V_{(BR)CBO}$	>	36 V
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Collector-emitter voltage $V_{BE} = 0$; $I_C = 10\text{ mA}$	$V_{(BR)CES}$	>	36 V
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Collector-emitter voltage open base, $I_C = 25\text{ mA}$	$V_{(BR)CEO}$	>	18 V
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Emitter-base voltage open collector, $I_E = 1.0\text{ mA}$	$V_{(BR)EBO}$	>	4 V
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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
--	-------	------	----------

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 $f = 1\text{ MHz}$

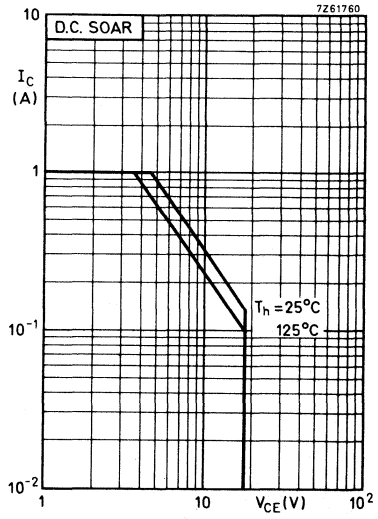
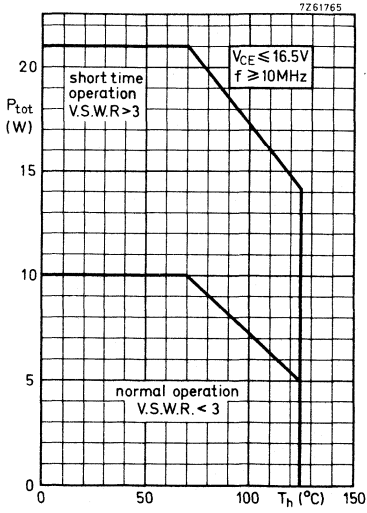
$I_C = I_c = 0$; $V_{EB} = 0$	C_e	typ.	65 pF
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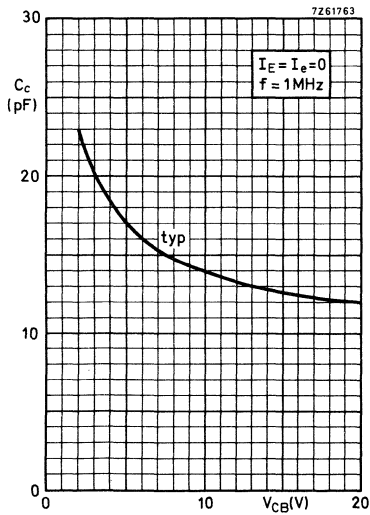
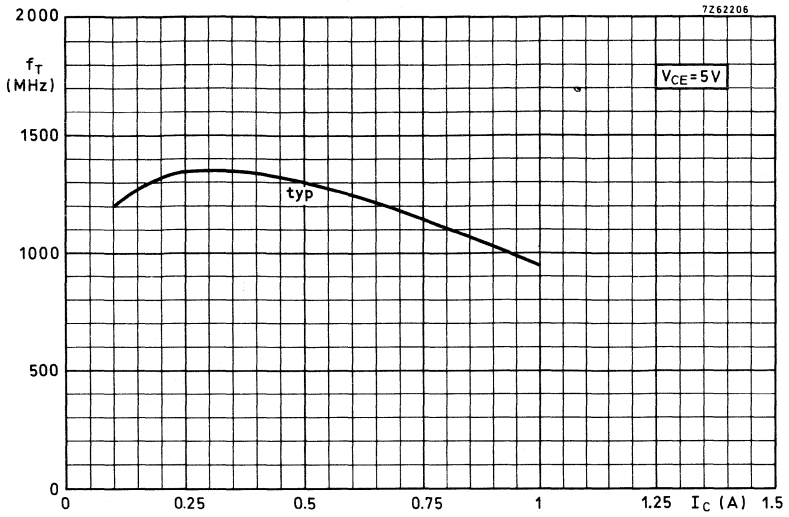
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 50\text{ mA}$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	10.5 pF
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Collector-stud capacitance

	C_{cs}	typ.	2 pF
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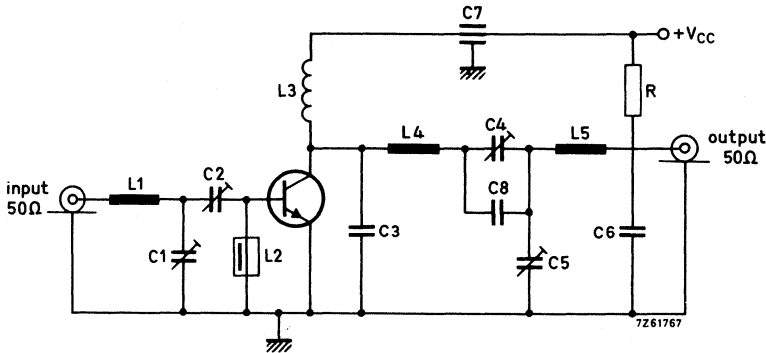
APPLICATION INFORMATION

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 _p (dB)	η (%)	\bar{z}_i (Ω)	\bar{V}_L (mS)
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 I (470 MHz)



- C1 = C2 = C4 = C5 = 1.8 to 18 pF film dielectric trimmer
- C3 = 6.8 pF ceramic capacitor
- C6 = 0.1 μF 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 μH 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/K

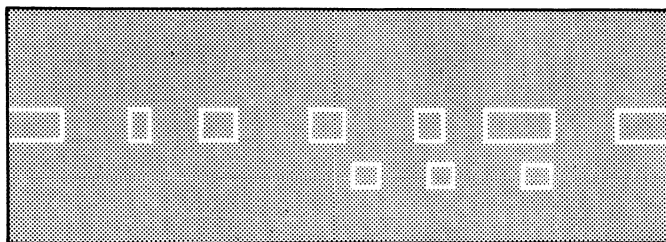
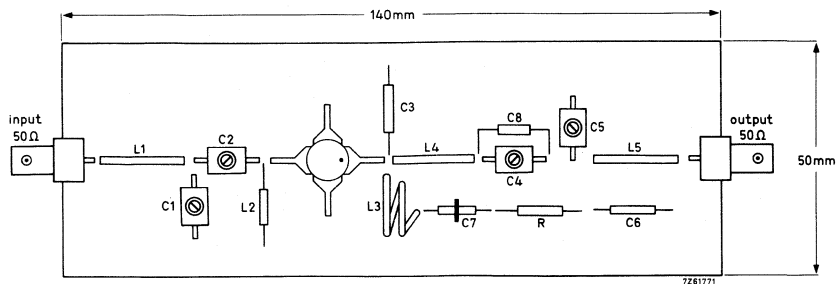
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 16.5$ V; $f = 470$ MHz; $T_h = 70$ °C;

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

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 470 MHz test circuit.

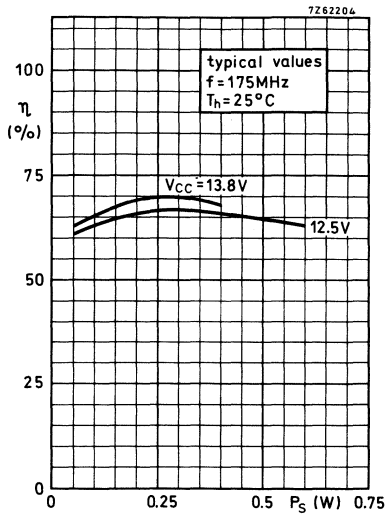
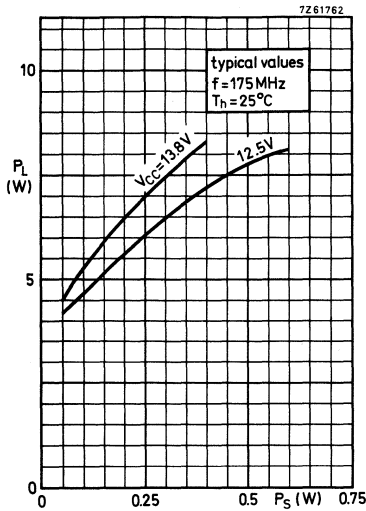
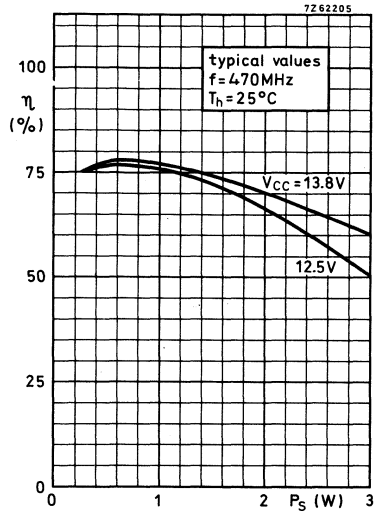
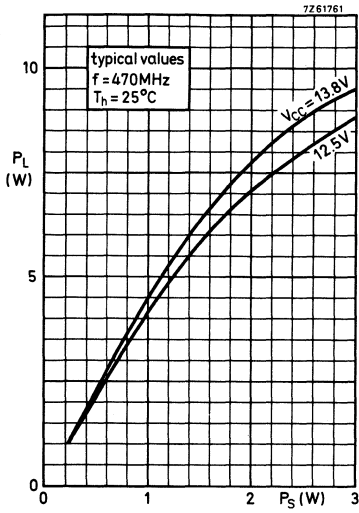


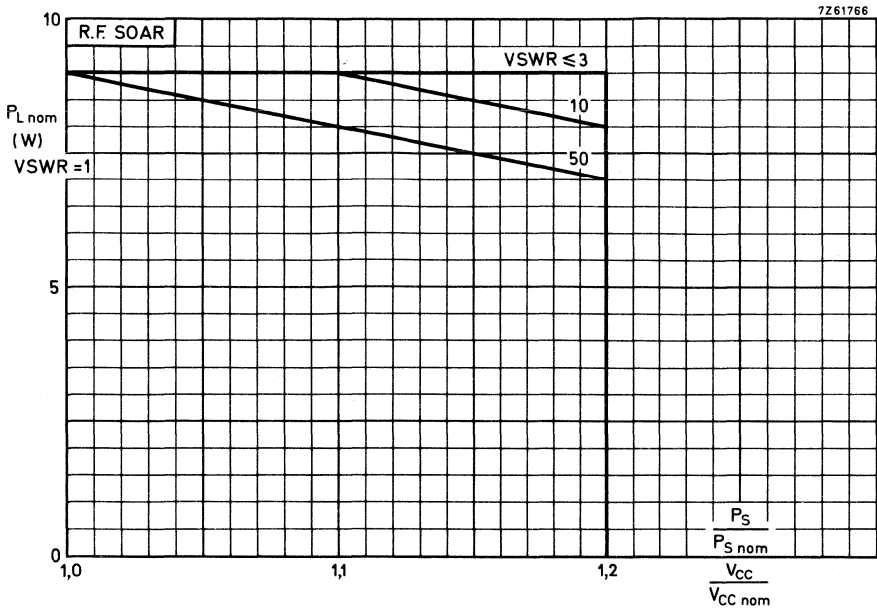
7Z61770.1

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 $VSWR = 1$

$T_h = 70 \text{ }^\circ\text{C}$

$V_{CCnom} = 13,8 \text{ V}$

The transistor was developed for use with unstabilized supply voltage V_{CC} .

The above graph is based on its measured performance in test circuit 1.

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 ($VSWR > 1$).

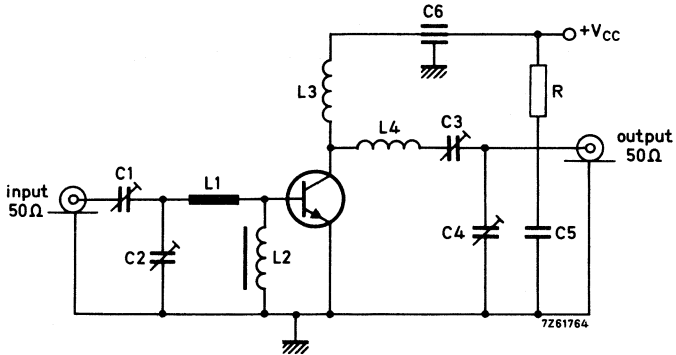
It is assumed that the drive power increases linearly with the supply voltage; i. e.

$P_S/P_{Snom} = V_{CC}/V_{CCnom}$.

$P_S/P_{Snom} = V_{CC}/V_{CCnom}$.

APPLICATION INFORMATION (continued)

Test circuit II (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 311399116740)

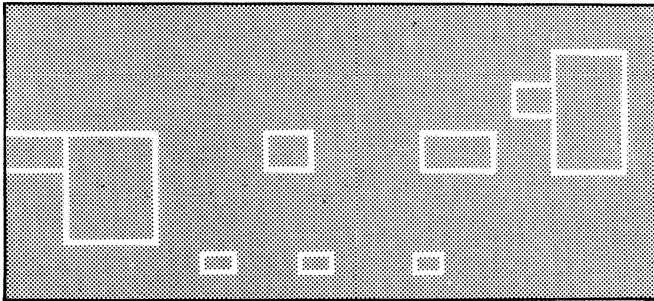
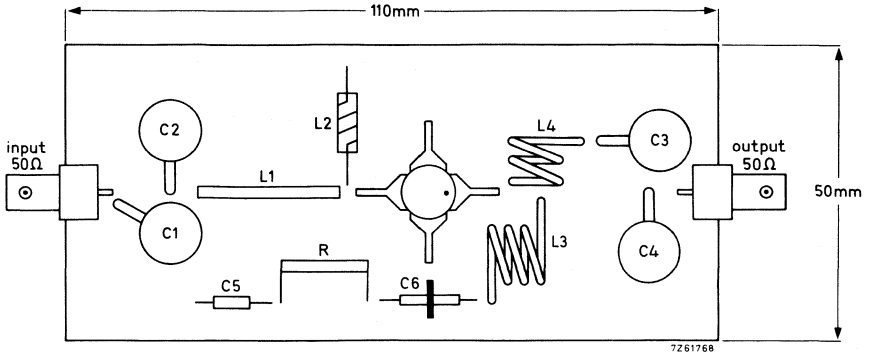
L3 = 5 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

L4 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

R = 10 Ω carbon

APPLICATION INFORMATION (continued)

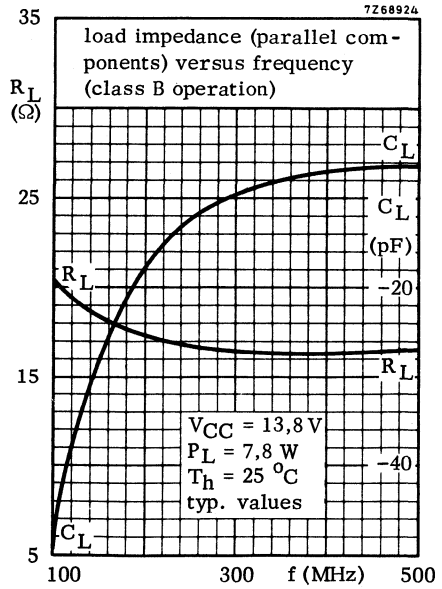
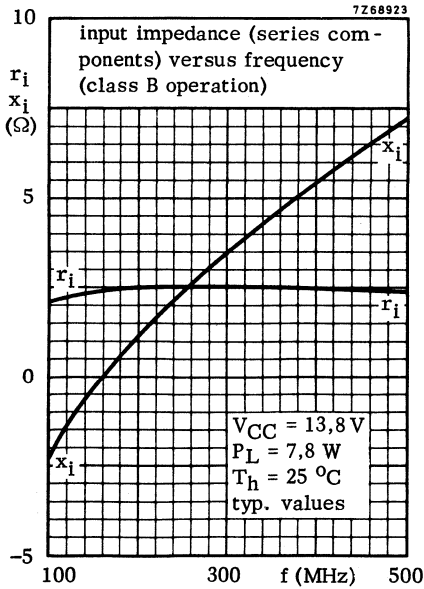
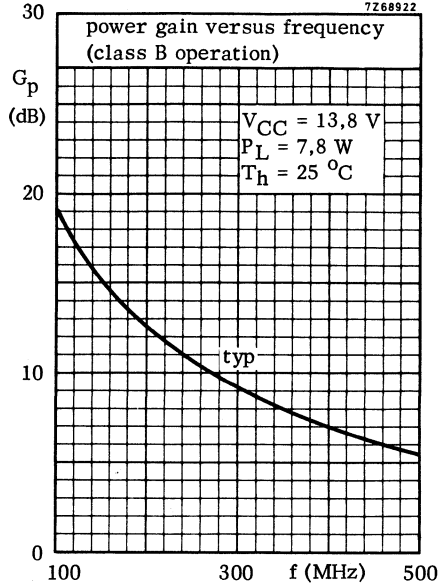
Component lay-out and printed circuit board for 175 MHz test circuit



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 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 and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. 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

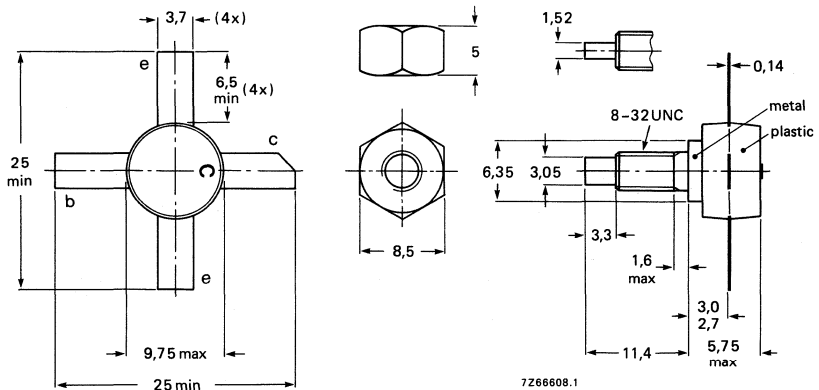
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

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 mS
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

Fig. 1 SOT-48/2.

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.

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

BLX69A

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.	36	V
V_{CEO}	max.	18	V
V_{EBO}	max.	4	V

Currents

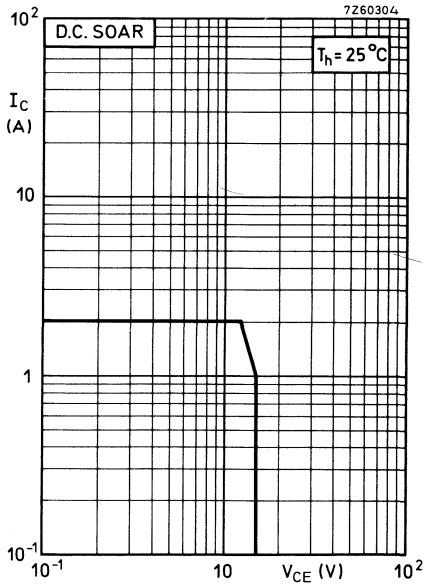
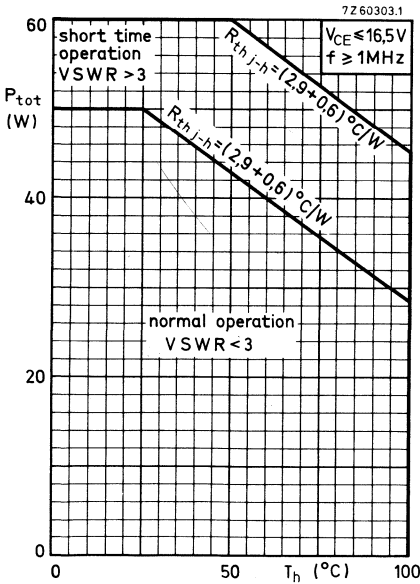
Collector current (average)
 Collector current (peak value) $f > 1$ MHz

$I_{C(AV)}$	max.	3,5	A
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
 Junction temperature

T_{stg}	-65 to +200	°C
T_j	max. 200	°C

THERMAL RESISTANCE

From junction to mounting base
 From mounting base to heatsink

$R_{th j-mb}$	=	2,9	K/W
$R_{th mb-h}$	=	0,6	K/W

CHARACTERISTICS

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

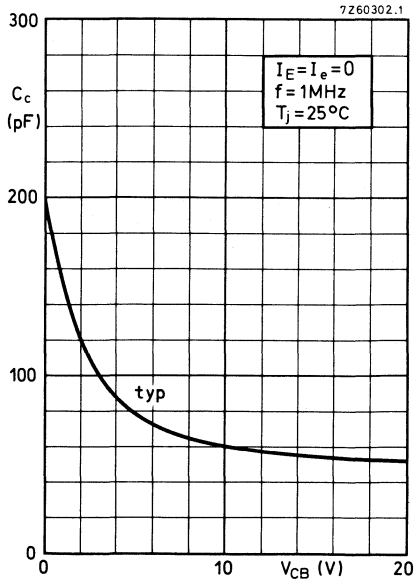
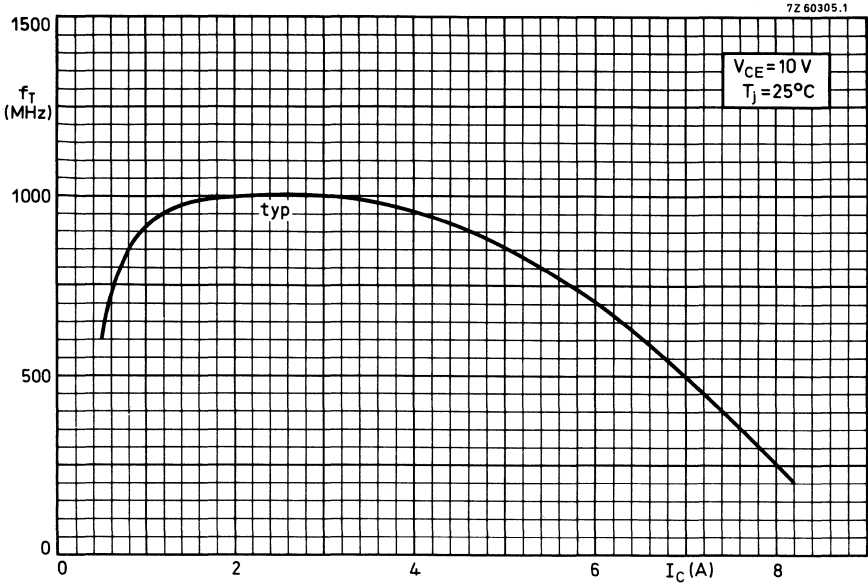
Feedback capacitance

$I_C = 100\text{ mA}$; $V_{CE} = 15\text{ V}$	C_{re}	typ.	32	pF
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Collector-stud capacitance

	C_{cs}	typ.	2	pF
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BLX69A



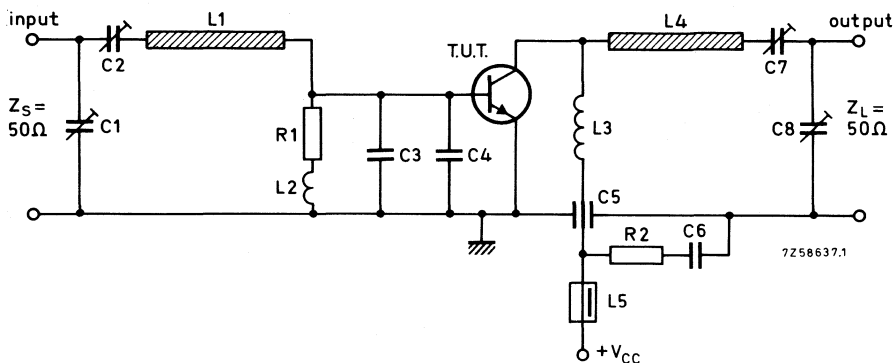
APPLICATION INFORMATION

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 (mS)
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)

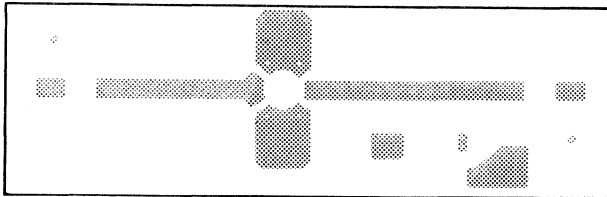
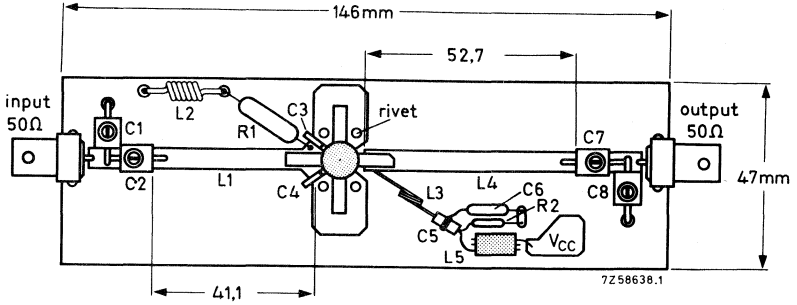
L5 = Ferroxcube choke coil. Z (at f = 50 MHz) = 750 Ω \pm 20% (cat. no. 4312 020 36640)

L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric.

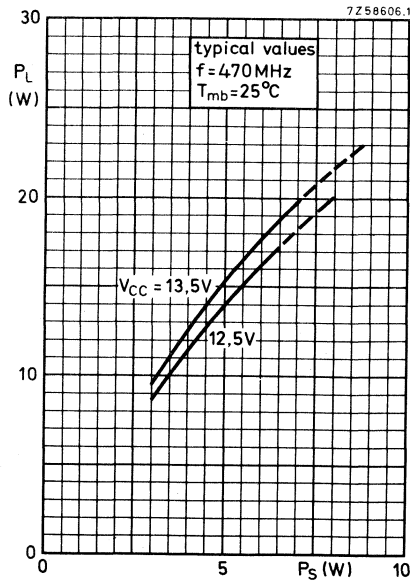
 $(\epsilon_r = 2,74)$; thickness 1,45 mm.

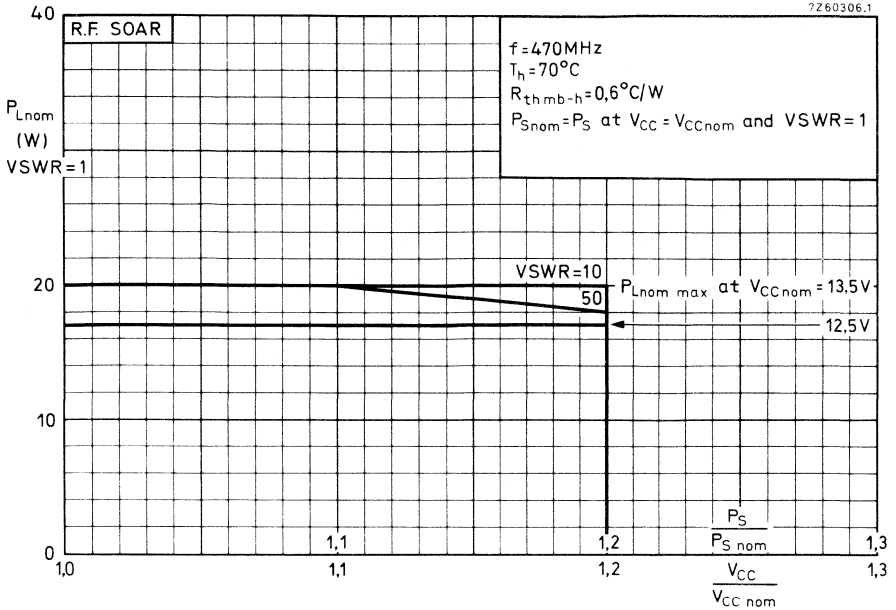
APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.



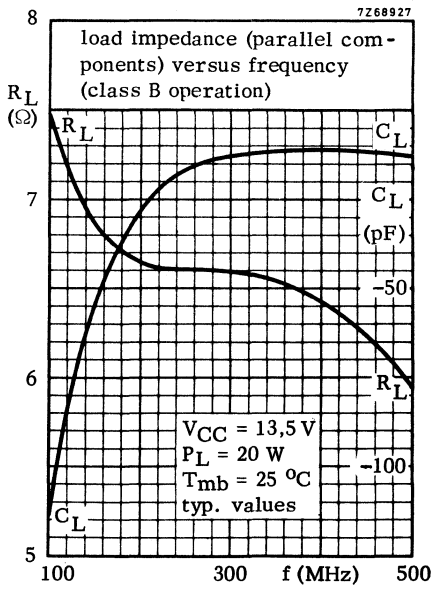
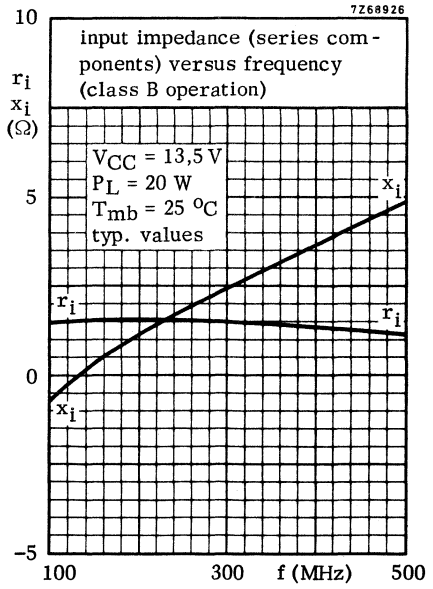
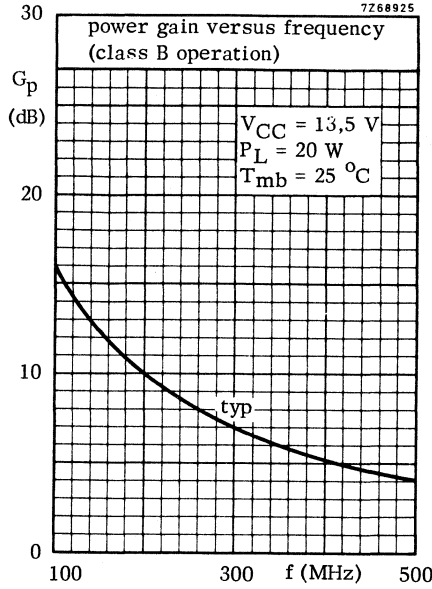
The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.





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 $V_{CCnom} = 13,5 V$.
 For $V_{CCnom} = 12,5 V$, P_L should be derated to 17 W.



U.H.F. POWER 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 guaranteed to withstand 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

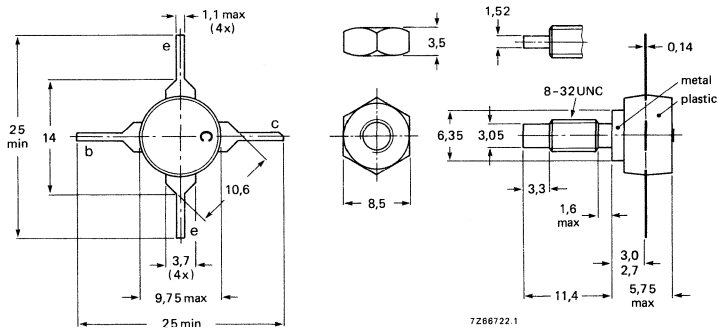
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S mW	P_L W	I_C mA	G_p dB	η %	\bar{Z}_i Ω	\bar{Y}_L mS
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

Fig. 1 SOT-48/3.



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.

PRODUCT SAFETY 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-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

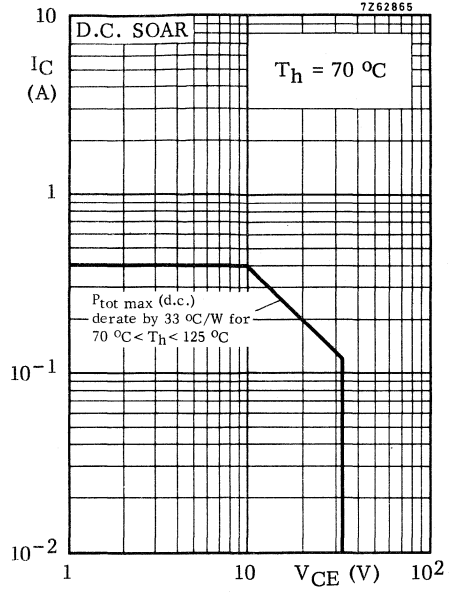
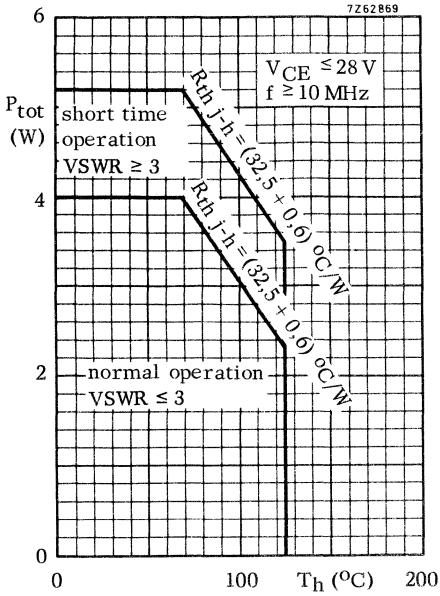
Total power dissipation up to $T_h = 70$ °C $f \geq 10$ MHz	P_{tot}	max.	4,0	W
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Temperatures

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	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	K/W



CHARACTERISTICS

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

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 10\text{ mA}$ $V_{(BR)CBO} > 65\text{ V}$

Collector-emitter voltage
 $V_{BE} = 0$, $I_C = 10\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$

Collector-emitter voltage
open base, $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 33\text{ V}$

Emitter-base voltage
open collector, $I_E = 1,0\text{ mA}$ $V_{(BR)EBO} > 4,0\text{ V}$

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

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

$I_E = I_e = 0$; $V_{CB} = 10\text{ V}$ C_c typ. 3,5 pF

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

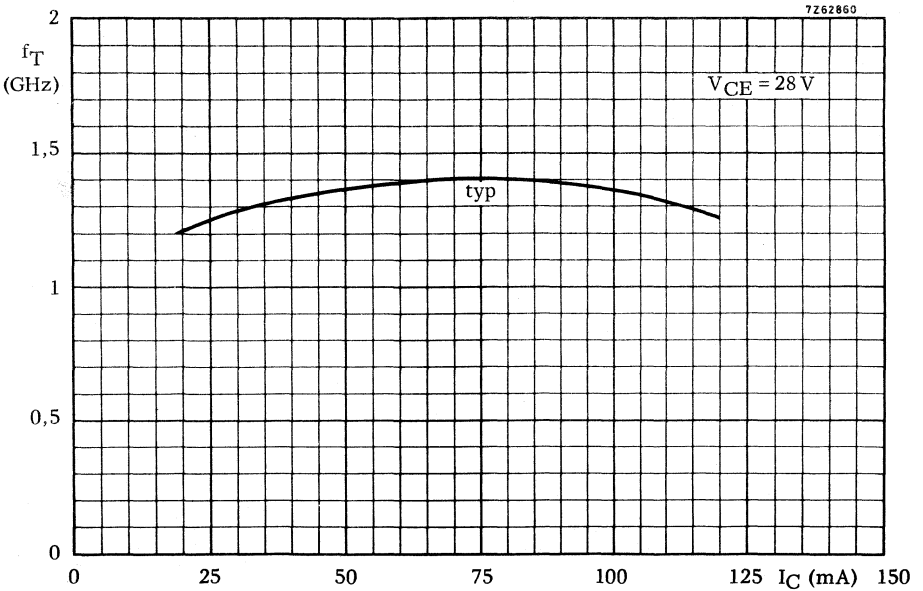
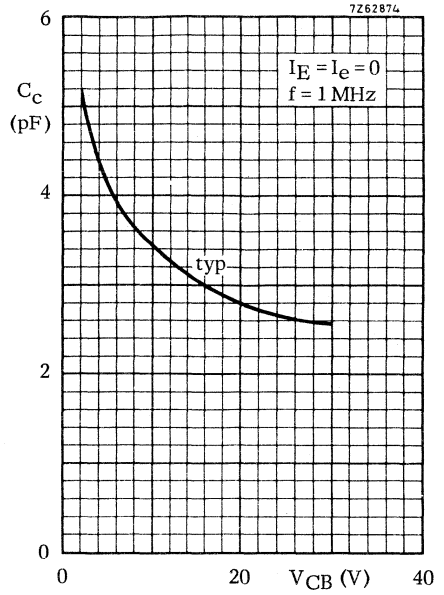
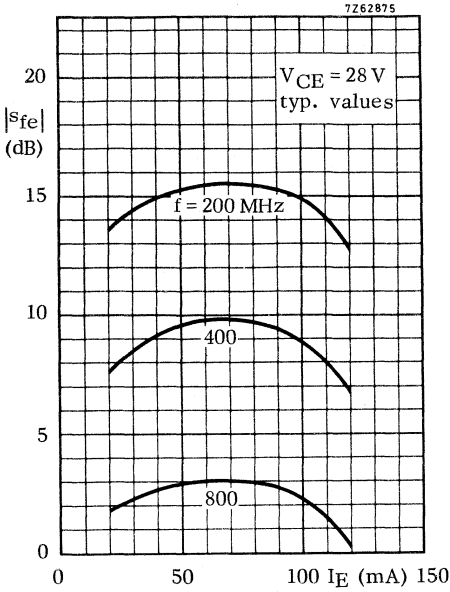
$I_C = I_c = 0$; $V_{EB} = 0$ C_e typ. 11 pF

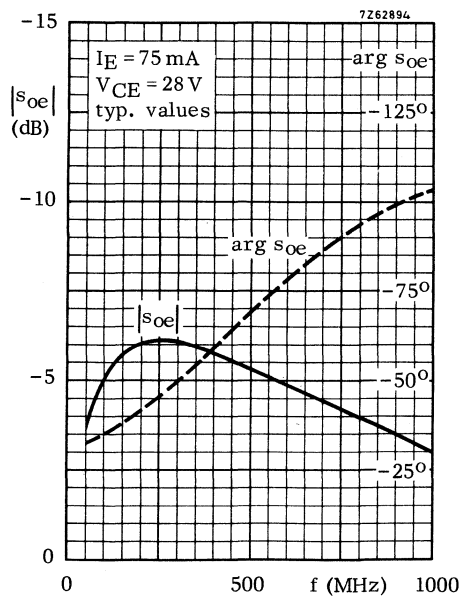
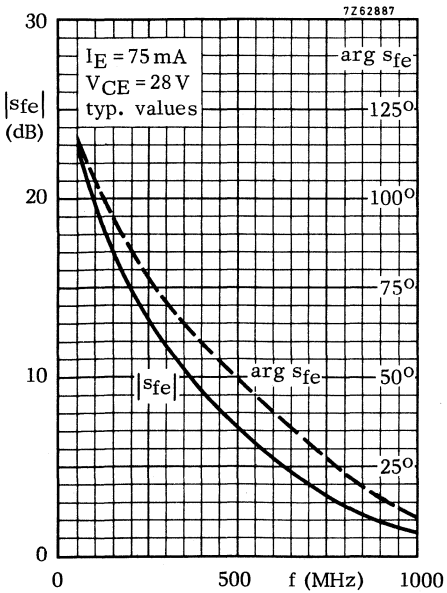
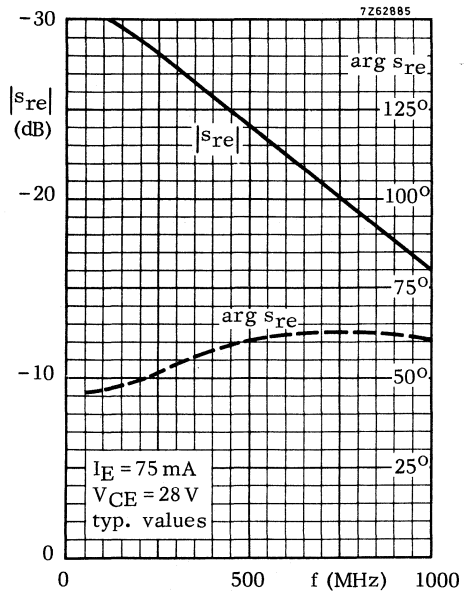
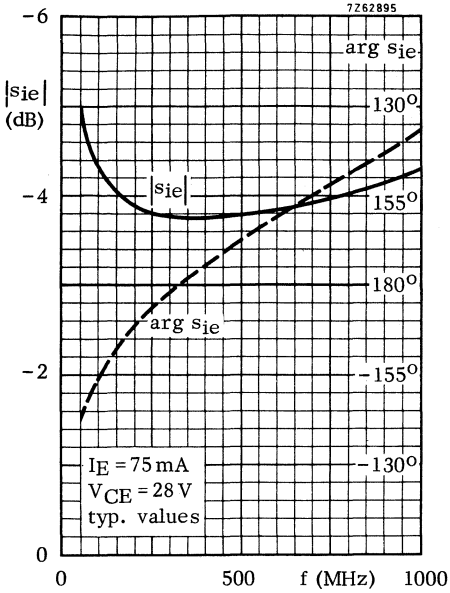
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 5\text{ mA}$; $V_{CE} = 10\text{ V}$ C_{re} typ. 2,5 pF

Collector-stud capacitance

C_{cs} typ. 2,0 pF





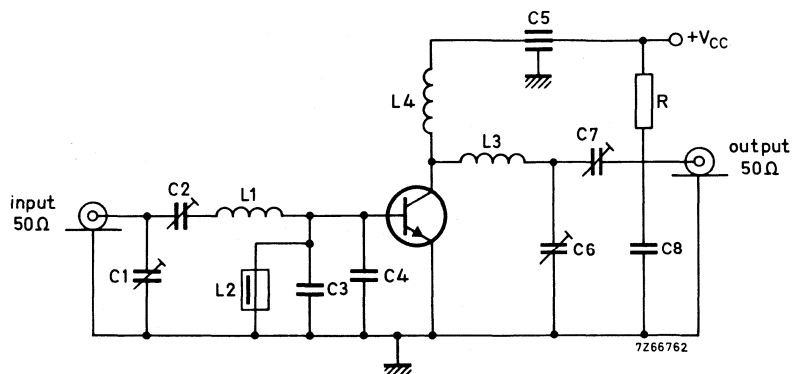
APPLICATION INFORMATION

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 (mS)
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

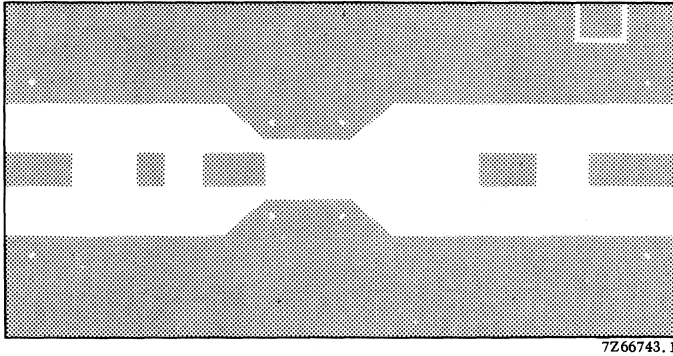
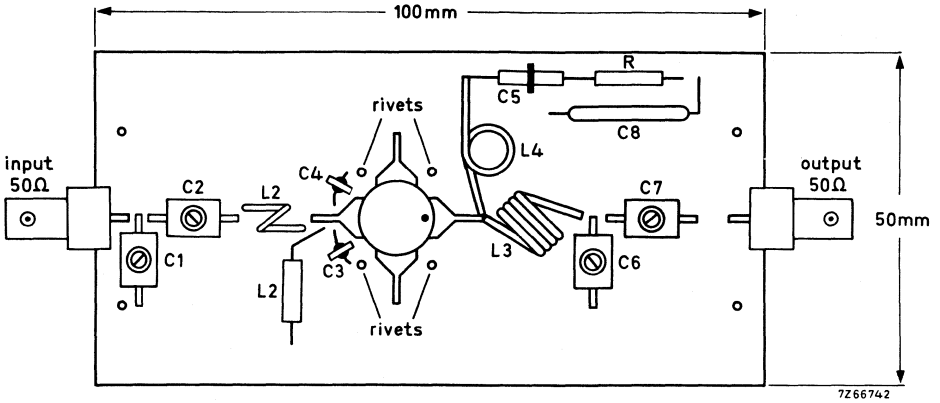
At $P_L = 1,0$ W and $V_{CC} = 28$ V, the output power at heatsink temperatures between 25 $^\circ$ C and 90 $^\circ$ C relative to that at 25 $^\circ$ C is diminished by typ. 2 mW/K

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; $P_L = 1,2$ W.

APPLICATION INFORMATION (continued)

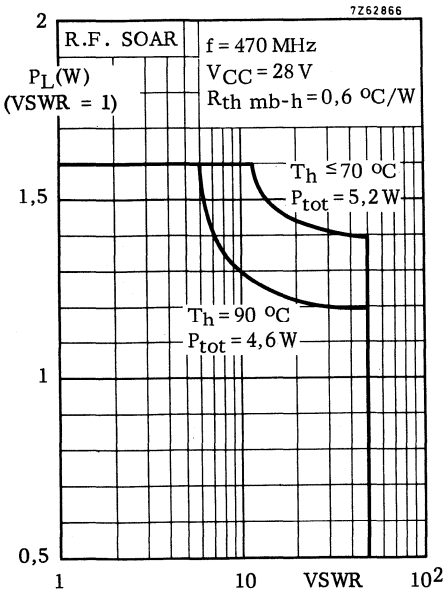
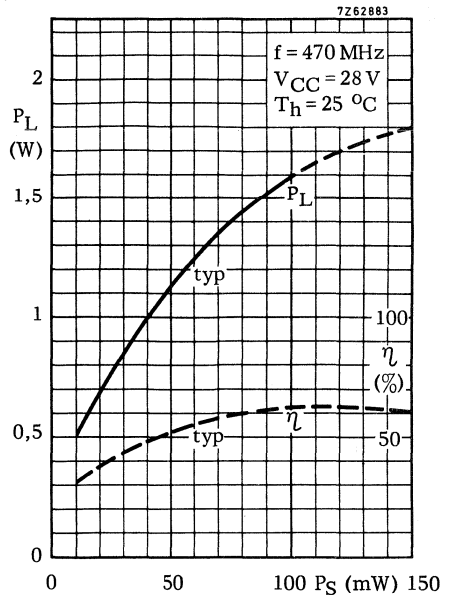
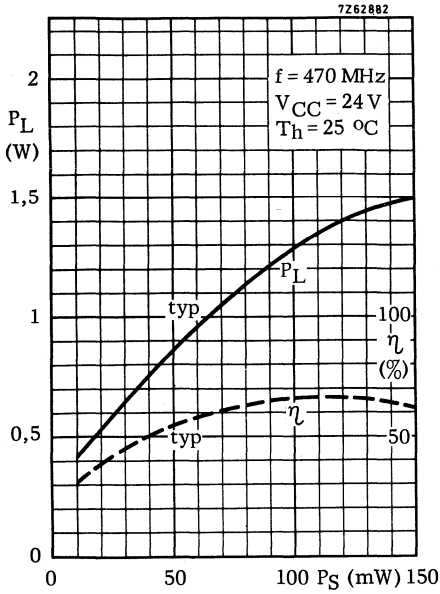
Component layout and printed-circuit board for 470 MHz test circuit.



Shaded area copper

Back area completely copper clad

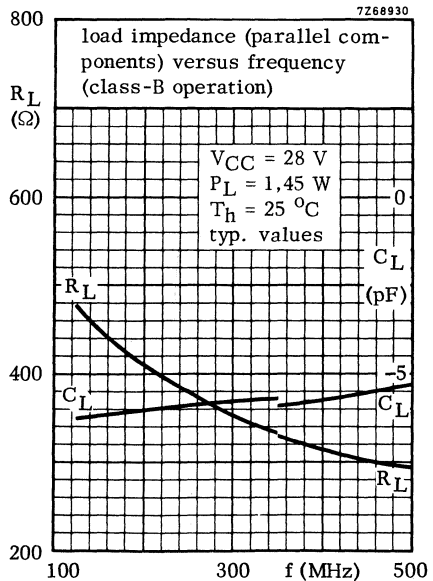
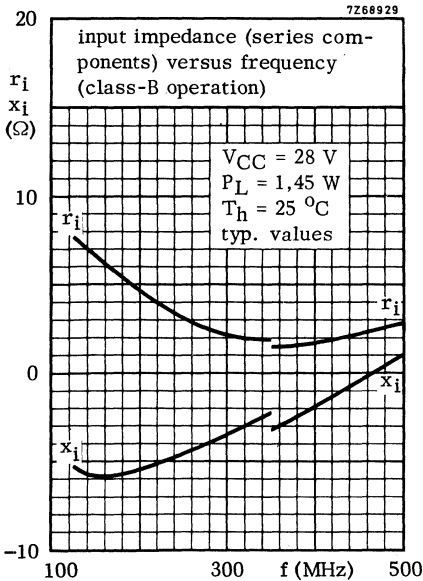
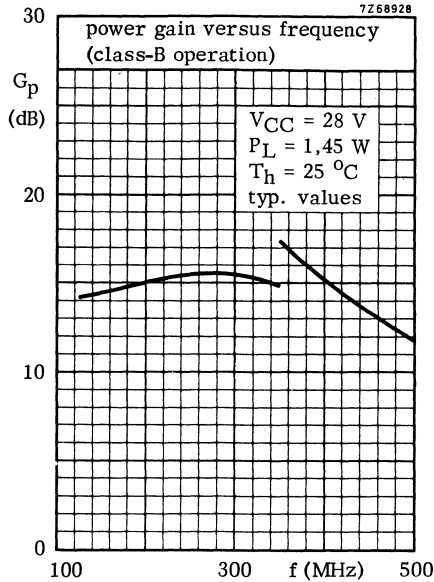
Material of printed-circuit board: 1,5 mm epoxy fibre-glass



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 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.



SILICON PLANAR EPITAXIAL TRANSISTOR

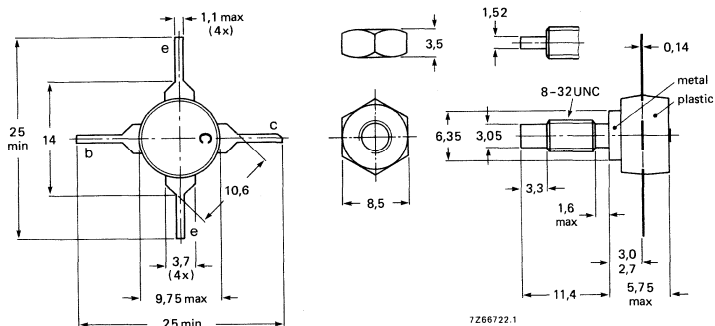
N-P-N silicon planar epitaxial transistor primarily designed for use in fast-switching wide-band video amplifiers for driving the cathode of a picture tube.

The transistor has a common-base pin configuration and is sealed in a capstan envelope with a moulded cap. All the leads are isolated from the stud.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



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 holes 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.

PRODUCT SAFETY 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

V_{CESM}	max.	65 V
V_{CEO}	max.	33 V

Emitter-base voltage (open collector)

V_{EBO}	max.	4 V
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Collector current

d.c.
(peak value); $f > 1$ MHz

I_C	max.	400 mA
I_{CM}	max.	800 mA

D.C. power dissipation up to $T_h = 70$ °C

(see D.C. SOAR in Fig. 2)

$P_{d.c.}$	max.	4 W
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Storage temperature

T_{stg}	-65 to +150 °C
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Operating junction temperature

T_j	max.	200 °C
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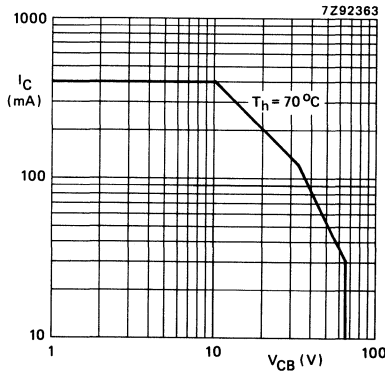


Fig. 2 D.C. SOAR.

THERMAL RESISTANCE

From junction to mounting base (d.c.)

$R_{th\ j-mb}$	=	32,5 K/W
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From mounting base to heatsink

$R_{th\ mb-h}$	=	0,6 K/W
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CHARACTERISTICS

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

Collector-emitter breakdown voltage

$$V_{BE} = 0; I_C = 10\text{ mA}$$

$$I_C = 25\text{ mA}; I_B = 0$$

$$V_{(BR)CES} > 65\text{ V}$$

$$V_{(BR)CEO} > 33\text{ V}$$

Emitter-base breakdown voltage

$$I_E = 1\text{ mA}; I_C = 0$$

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

Collector-base leakage current

$$V_{CB} = 20\text{ V}; I_E = 0$$

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

D.C. current gain

$$I_C = 100\text{ mA}; V_{CE} = 5\text{ V}$$

$$h_{FE} \text{ 10 to 160}$$

typ. 50

Transition frequency

$$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$$

$$f_T \text{ typ. 1,0 GHz}$$

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

$$I_E = i_e = 0; V_{CB} = 10\text{ V}$$

$$C_c \text{ typ. 3,5 pF}$$

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

$$I_C = i_c = 0; V_{EB} = 0,5\text{ V}$$

$$C_e \text{ typ. 11 pF}$$

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

$$I_C = 5\text{ mA}; V_{CE} = 10\text{ V}$$

$$C_{re} \text{ typ. 2,5 pF}$$

Collector-stud capacitance

$$C_{cs} \text{ typ. 2 pF}$$

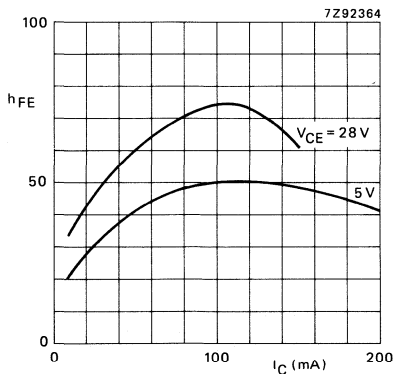


Fig. 3 Current gain (d.c.) versus collector current.

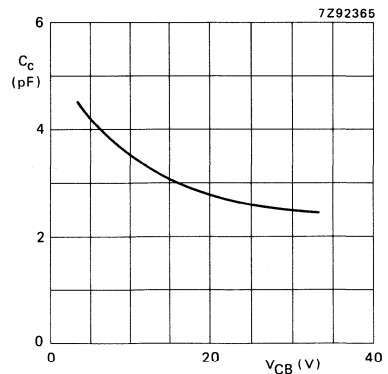


Fig. 4 Collector capacitance versus V_{CB} ; $I_E = i_e = 0$; $f = 1\text{ MHz}$.

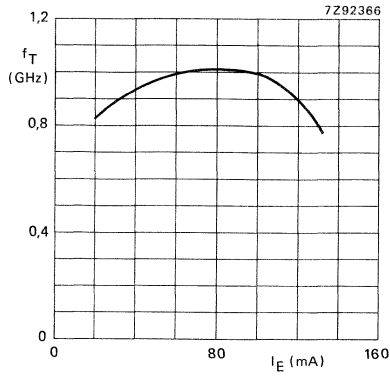


Fig. 5 Transition frequency versus emitter current; $V_{CB} = 28$ V.

U.H.F. POWER 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 guaranteed to withstand 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

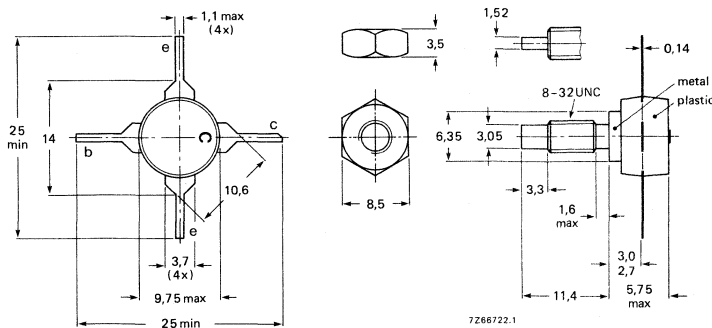
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C mA	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
c.w.	24	470	typ. 0,2	2,4	typ. 143	typ. 10,8	typ. 70	—	—
c.w.	28	470	< 0,2	2,5	< 149	> 11,0	> 60	—	—
c.w.	28	470	typ. 0,2	3,0	typ. 162	typ. 11,7	typ. 66	$1,8 + j2,8$	$7,2 - j24$
c.w.	28	1000	typ. 0,7	2,5	typ. 179	typ. 5,5	typ. 50	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



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.

PRODUCT SAFETY 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)

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
Collector current (d. c.)	I_C	max.	0,7	A
Collector current (peak value) $f \geq 10$ MHz	I_{CM}	max.	2,0	A
Total power dissipation up to $T_h = 70$ °C $f \geq 10$ MHz	P_{tot}	max.	6,0	W
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	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	K/W

CHARACTERISTICS

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

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 10\text{ mA}$ $V_{(BR)CBO} > 65\text{ V}$

Collector-emitter voltage
 $V_{BE} = 0$, $I_C = 10\text{ mA}$ $V_{(BR)CES} > 65\text{ V}$

Collector-emitter voltage
open base, $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 33\text{ V}$

Emitter-base voltage
open collector, $I_E = 1,0\text{ mA}$ $V_{(BR)EBO} > 4,0\text{ V}$

Collector-emitter saturation voltage

$I_C = 100\text{ mA}$; $I_B = 20\text{ mA}$ $V_{CEsat} \text{ typ. } 0,17\text{ V}$

D. C. current gain

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

Transition frequency

$I_C = 100\text{ mA}$; $V_{CE} = 5,0\text{ V}$ $f_T \text{ typ. } 1,2\text{ GHz}$

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

$I_E = I_e = 0$; $V_{CB} = 10\text{ V}$ $C_C \text{ typ. } 6,5\text{ pF}$

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

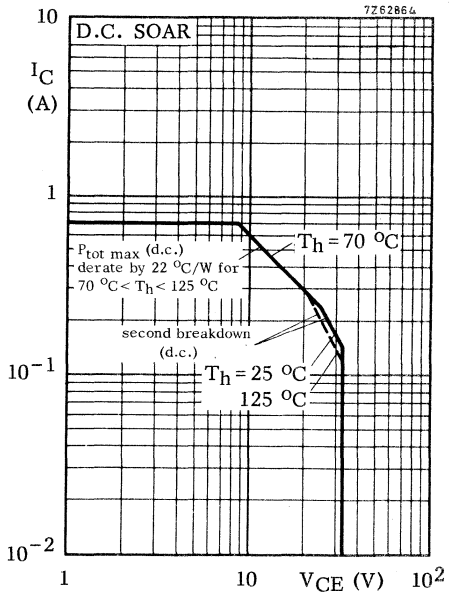
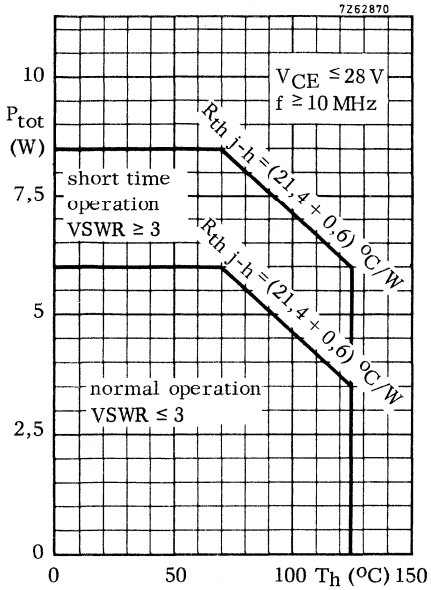
$I_C = I_c = 0$; $V_{EB} = 0$ $C_e \text{ typ. } 25\text{ pF}$

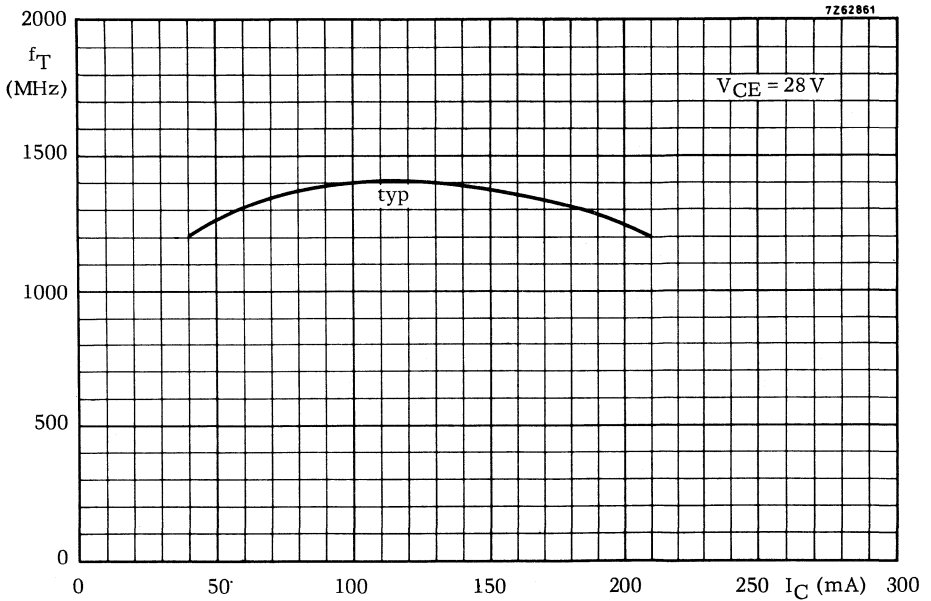
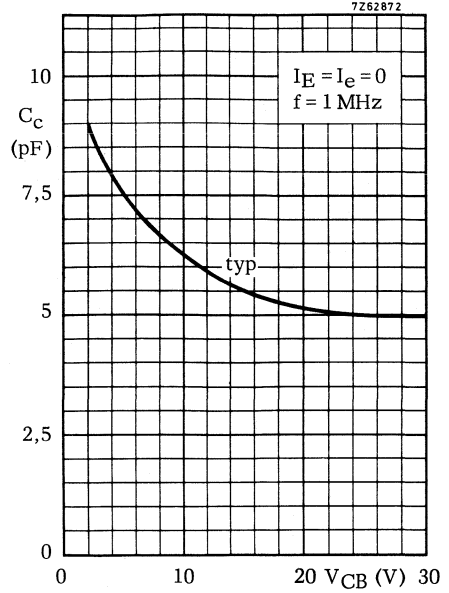
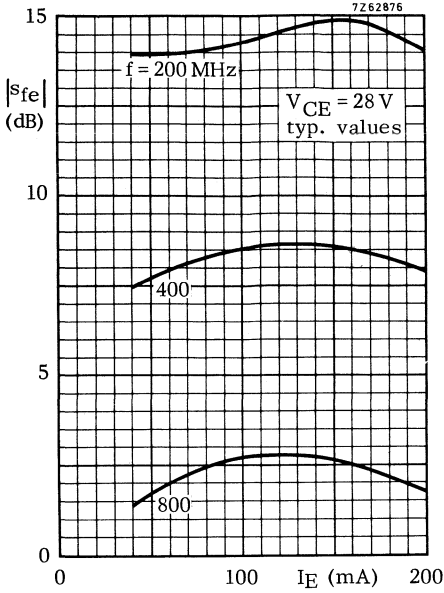
Feedback capacitance at $f = 1\text{ MHz}$

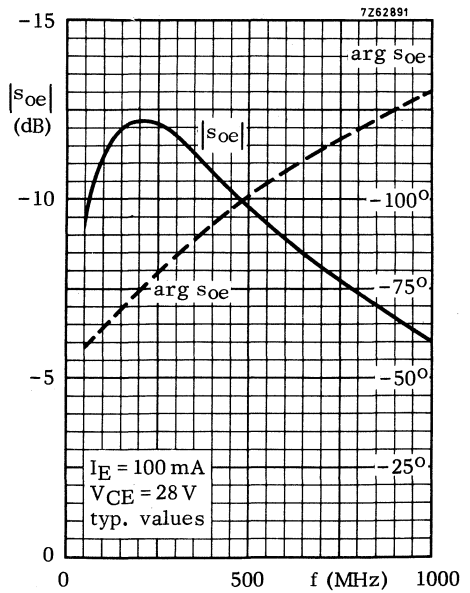
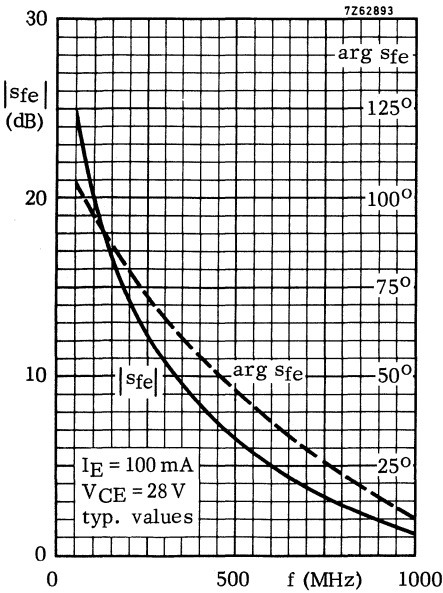
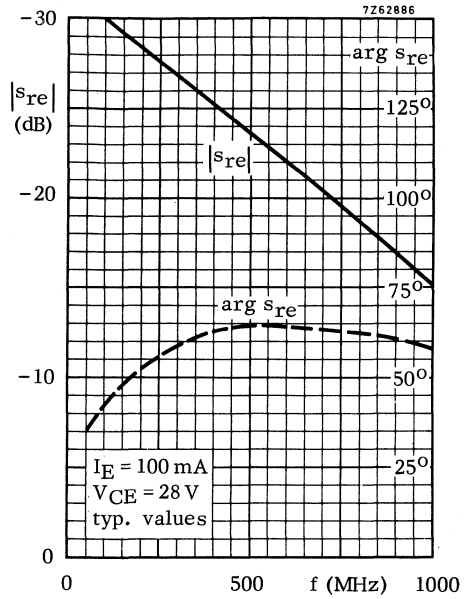
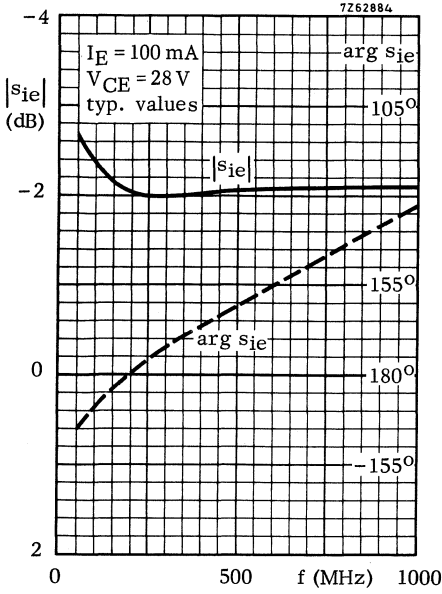
$I_C = 10\text{ mA}$; $V_{CE} = 10\text{ V}$ $C_{re} \text{ typ. } 4,8\text{ pF}$

Collector-stud capacitance

$C_{cs} \text{ typ. } 2,0\text{ pF}$







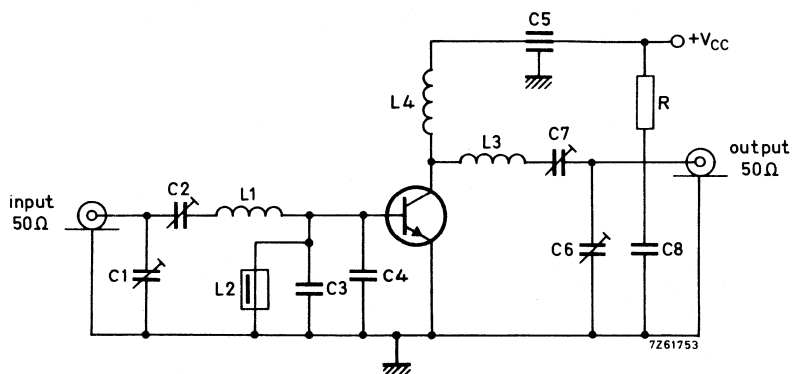
APPLICATION INFORMATION

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 (mS)
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

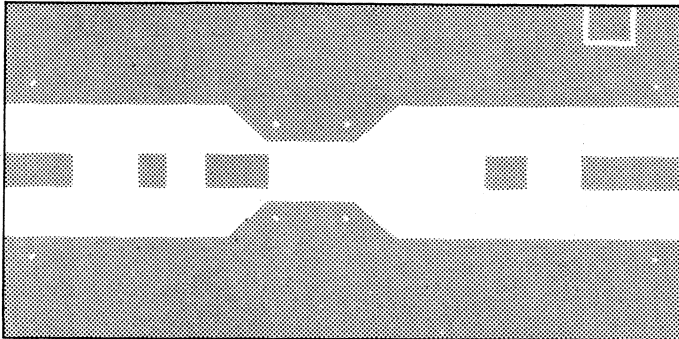
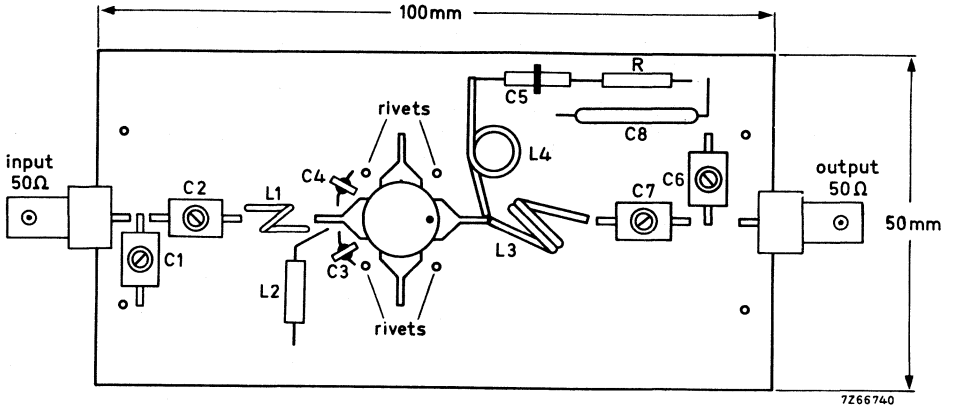
At $P_L = 2,5$ W and $V_{CC} = 28$ V, the output power at heatsink temperatures between 25 $^{\circ}$ C and 90 $^{\circ}$ C relative to that at 25 $^{\circ}$ C is diminished by typ. 5 mw/K

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.

APPLICATION INFORMATION (continued)

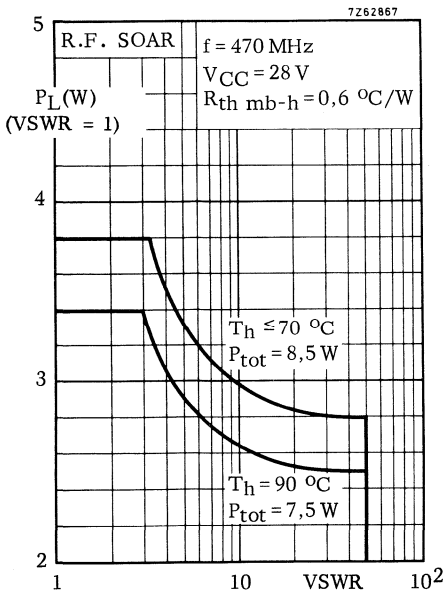
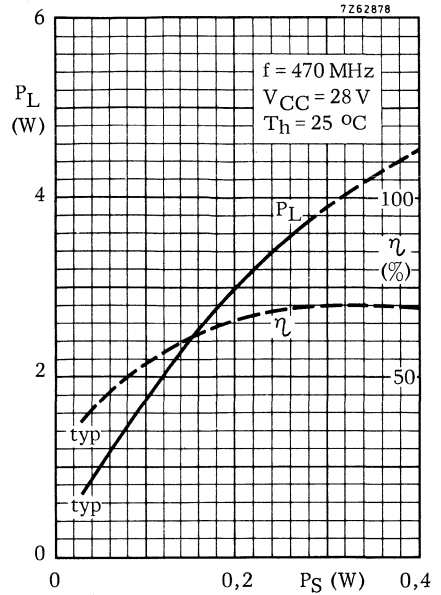
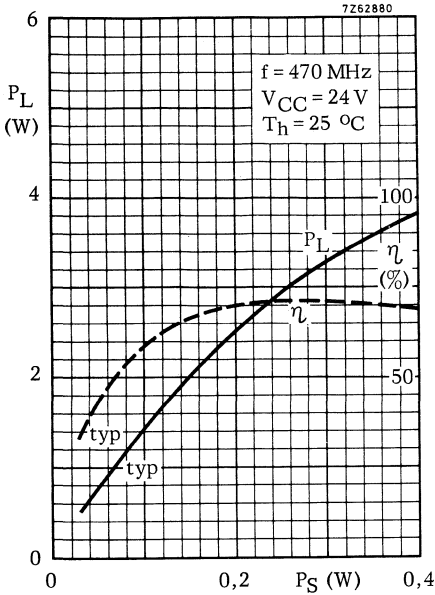
Component layout and printed-circuit board for 470 MHz test circuit.



Shade area copper

Back area completely copper clad

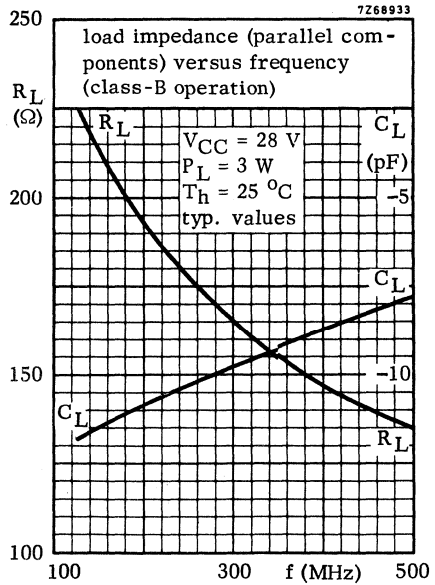
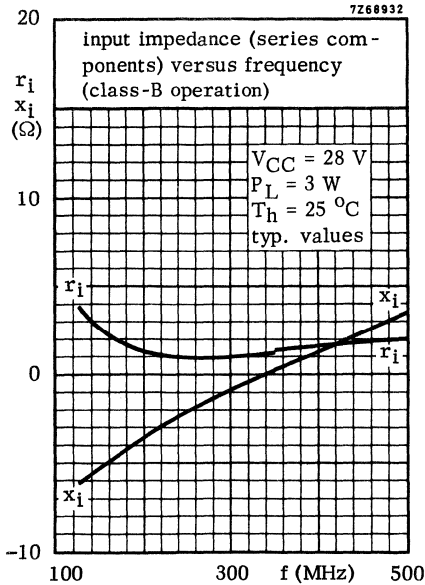
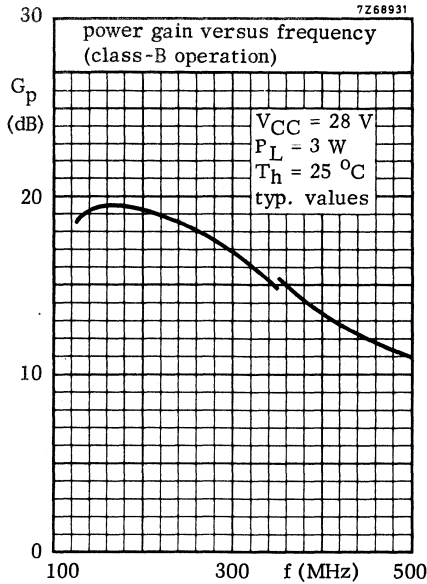
Material of printed-circuit board: 1,5 mm epoxy fibre-glass



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 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. POWER 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 guaranteed to withstand 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

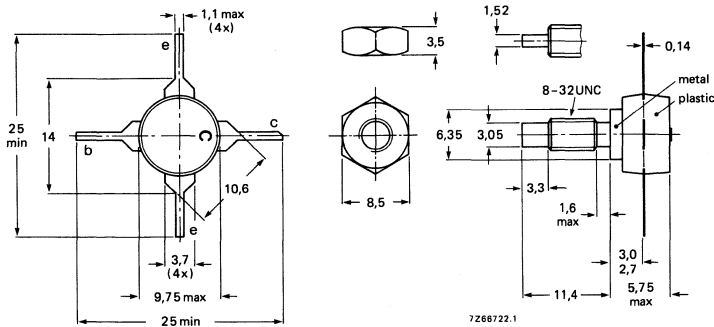
R.F. performance up to $T_h = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	\bar{Z}_i Ω	\bar{Y}_L mS
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

Fig. 1 SOT-48/3.



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.

PRODUCT SAFETY 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)

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
Collector current (d. c.)	I_C	max.	1,0	A
Collector current (peak value) $f \geq 10$ MHz	I_{CM}	max.	3,0	A
Total power dissipation up to $T_h = 70$ °C $f \geq 10$ MHz	P_{tot}	max.	12,5	W
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	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	K/W

CHARACTERISTICS

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

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 10\text{ mA}$

$V_{(BR)CBO} > 65\text{ V}$

Collector-emitter voltage
open base, $I_C = 10\text{ mA}$

$V_{(BR)CES} > 65\text{ V}$

Collector-emitter voltage
open base, $I_C = 25\text{ mA}$

$V_{(BR)CEO} > 33\text{ V}$

Emitter-base voltage
open collector, $I_E = 1,0\text{ mA}$

$V_{(BR)EBO} > 4,0\text{ V}$

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

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

$I_E = I_e = 0$; $V_{CB} = 10\text{ V}$

C_c typ. 14 pF

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

$I_C = I_c = 0$; $V_{EB} = 0$

C_e typ. 60 pF

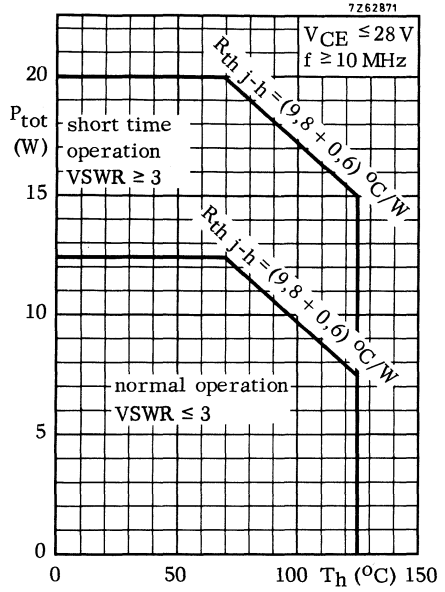
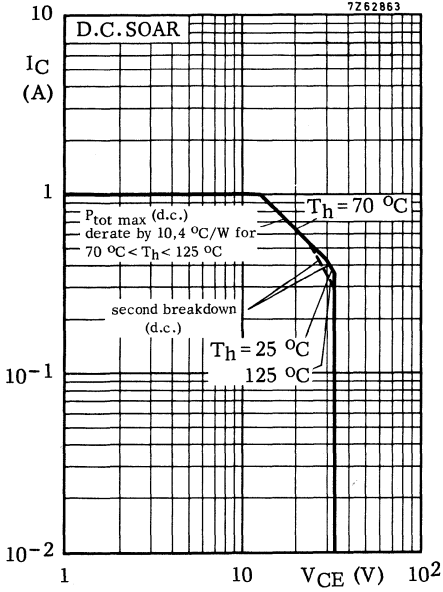
Feedback capacitance at $f = 1\text{ MHz}$

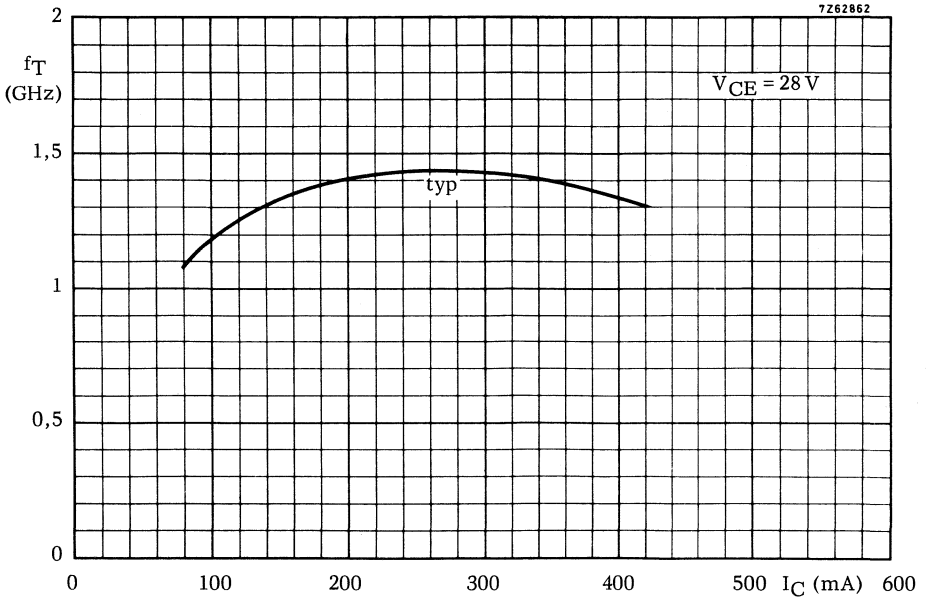
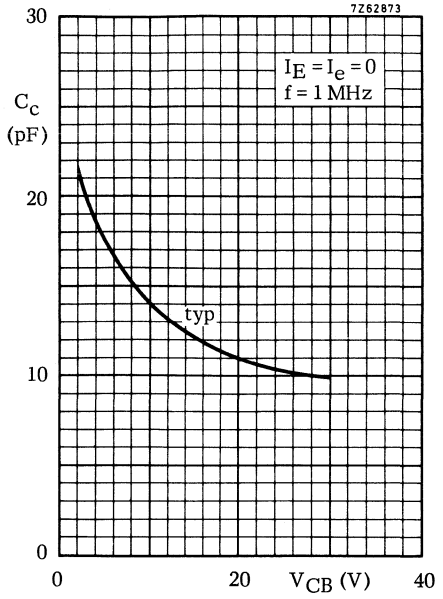
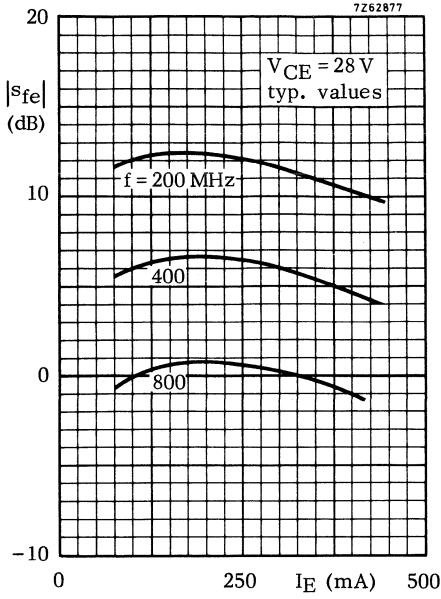
$I_C = 20\text{ mA}$; $V_{CE} = 10\text{ V}$

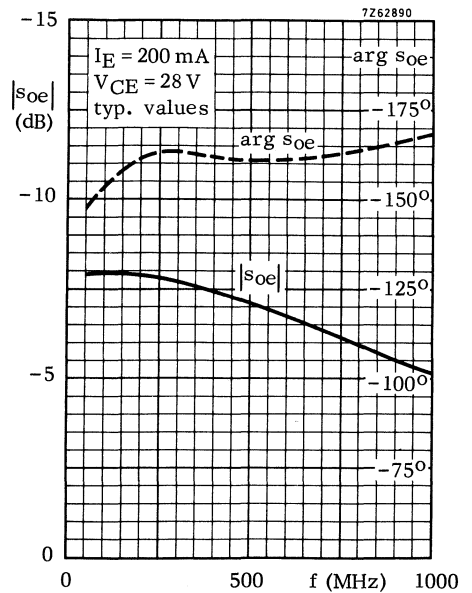
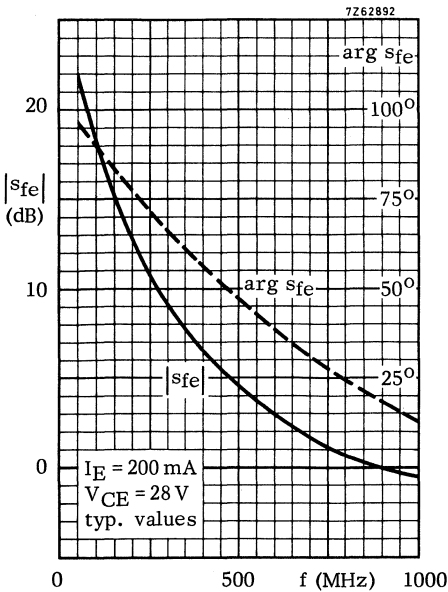
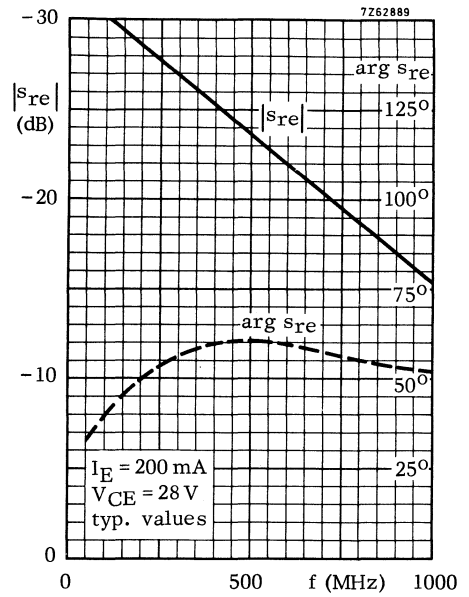
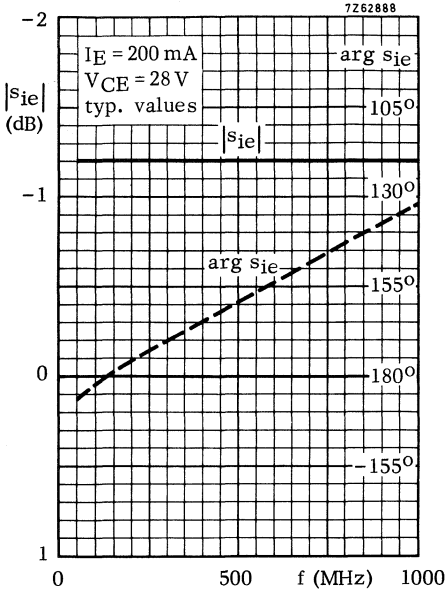
C_{re} typ. 10 pF

Collector-stud capacitance

C_{cs} typ. 2,0 pF







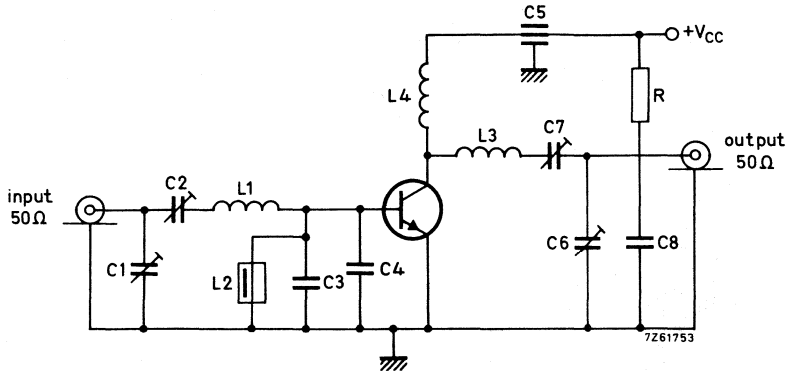
APPLICATION INFORMATION

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 (mS)
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

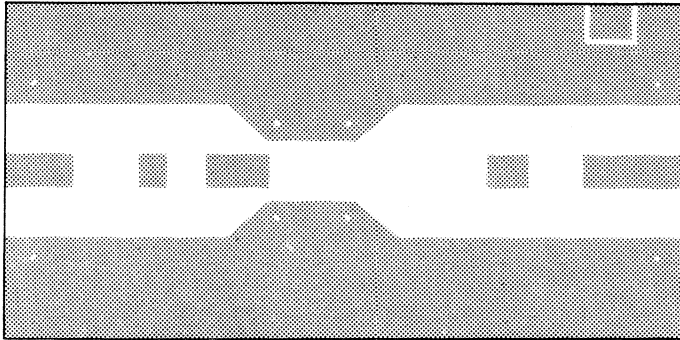
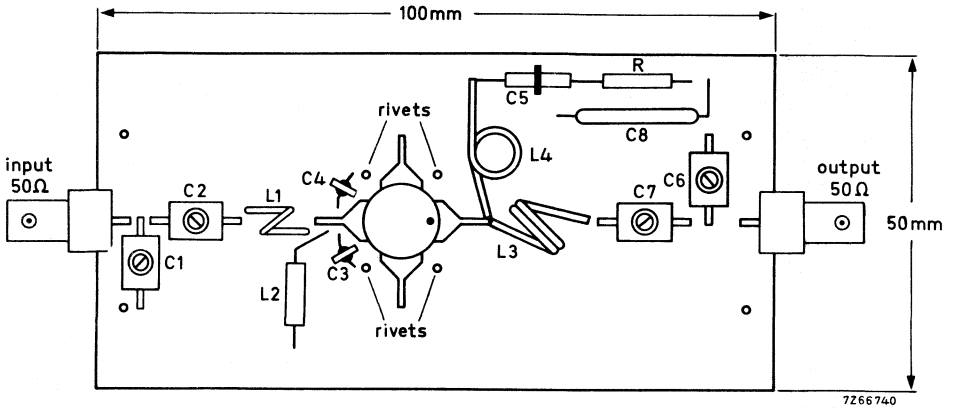
At $P_L = 7,0\text{ W}$ and $V_{CC} = 28\text{ V}$, the output power at heatsink temperatures between $25\text{ }^\circ\text{C}$ and $90\text{ }^\circ\text{C}$ relative to that at $25\text{ }^\circ\text{C}$ is diminished by typ. 10 mW/K

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: $V_{CC} = 28\text{ V}$; $f = 470\text{ MHz}$; $T_h = 90\text{ }^\circ\text{C}$.

VSWR = 50 : 1 through all phases; $P_L = 7,0\text{ W}$.

APPLICATION INFORMATION (continued)

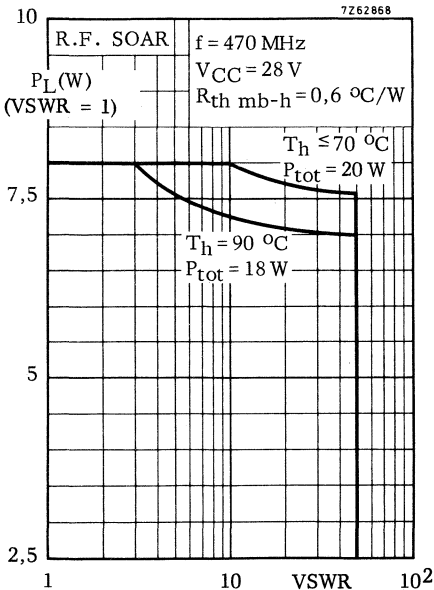
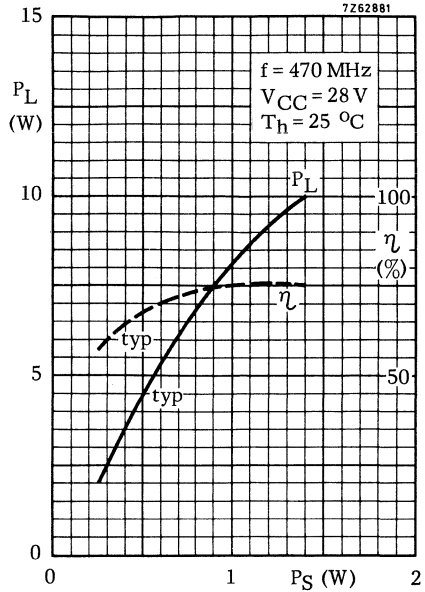
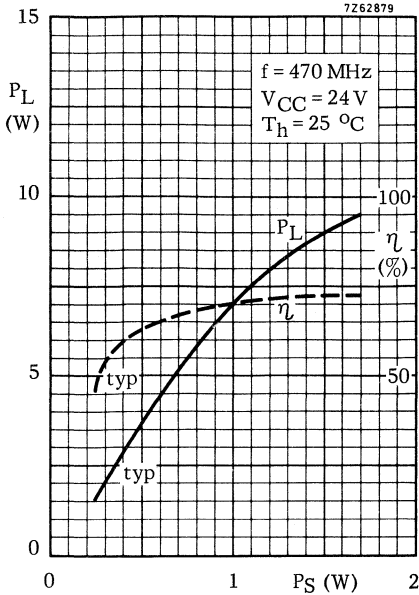
Component layout and printed-circuit board for 470 MHz test circuit.



Shaded area copper

Back area completely copper clad

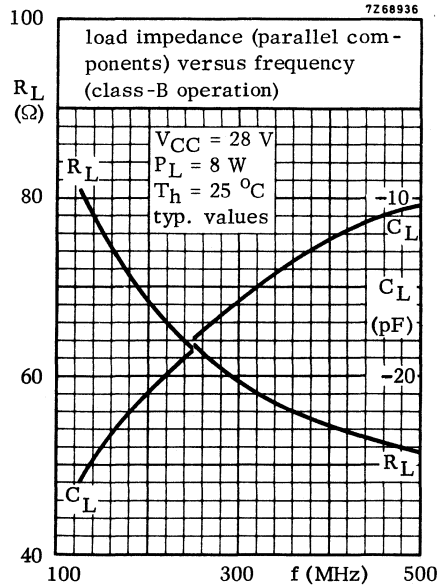
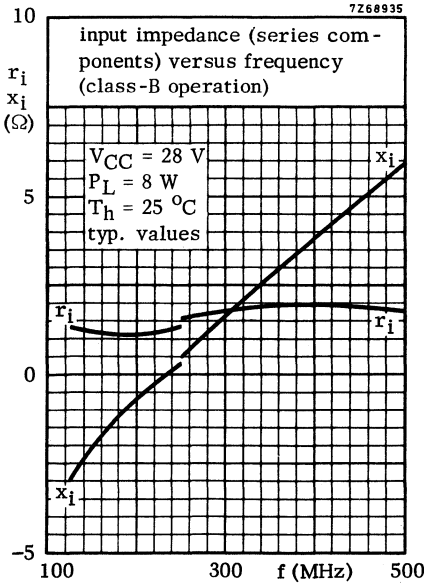
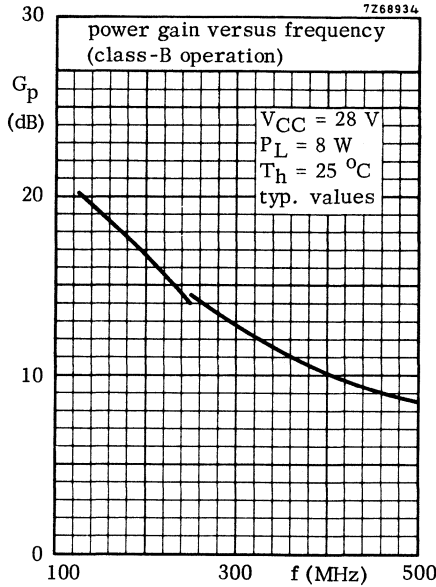
Material of printed-circuit board : 1,5 mm epoxy fibre-glass



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 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 TRANSISTORS

N-P-N silicon planar epitaxial transistors suitable for transmitting applications in class-A, B or C in the u.h.f. range for a nominal supply voltage up to 28 V. The transistors are resistance stabilized and tested under severe load mismatch conditions. Diffused emitter-ballasting resistors and gold sandwich metallization ensure excellent reliability properties.

These transistors are housed in capstan envelopes with ¼" studs, the **BLX94A** has a transfer-moulded cap and the **BLX94C** a ceramic cap.

All leads are isolated from the stud.

QUICK REFERENCE DATA

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

type number	mode of operation	V _{CE} V	f MHz	P _L W	G _p dB	η %
BLX94A	c.w.	28	470	25	> 6	> 55
BLX94C	c.w.	28	470	25	> 6,5	> 55

MECHANICAL DATA

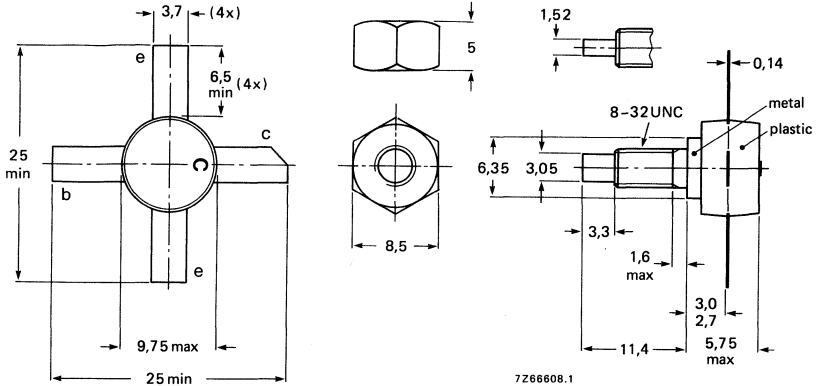
SOT-48/2 (see Fig. 1a)

SOT-122 (see Fig. 1b)

MECHANICAL DATA

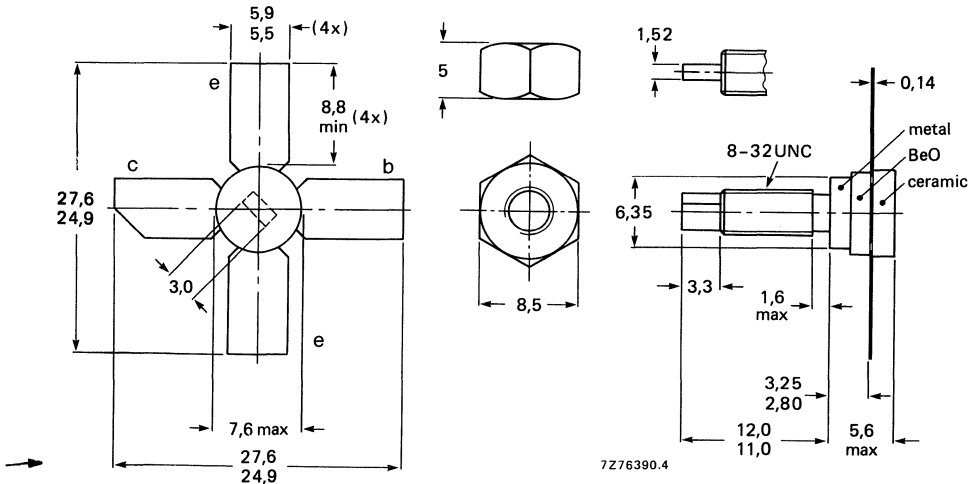
Dimensions in mm

→ Fig. 1a SOT-48/2 (BLX94A)



7266608.1

Fig. 1b SOT-122 (BLX94C)



7276390.4

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.

PRODUCT SAFETY 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

V_{CESM} max. 65 V

V_{CEO} max. 30 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current

d.c. or average

$I_C; I_C(AV)$ max. 2,5 A

(peak value); $f > 1$ MHz

I_{CM} max. 6,0 A

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

P_{rf} max. 60 W

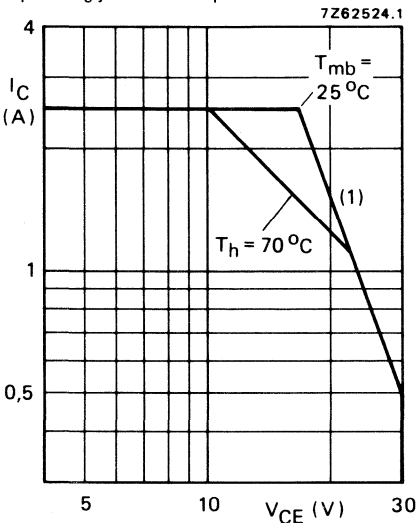
Storage temperature

BLX94A T_{stg} -65 to +200 °C

BLX94C 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.

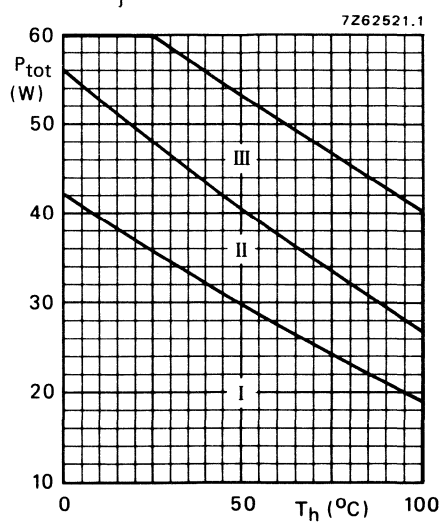


Fig. 3 Power derating curve vs. temperature.

I Continuous d.c. operation

II Continuous r.f. operation

III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 20 W; $T_{mb} = 82$ °C, i.e. $T_h = 70$ °C)

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

$R_{th\ j-mb(dc)}$ = 4,0 K/W

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

$R_{th\ j-mb(rf)}$ = 2,7 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,6 K/W

BLX94A BLX94C

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 25\text{ mA}$

$V_{(BR)CES} > 65\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$

$V_{(BR)CEO} > 30\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$

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

Collector cut-off current

$V_{BE} = 0; V_{CE} = 30\text{ V}$

$I_{CES} < 10\text{ mA}$

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

open base

$R_{BE} = 10\text{ }\Omega$

$E_{SBO} > 3\text{ mJ}$

$E_{SBR} > 3\text{ mJ}$

D.C. current gain *

$I_C = 1,5\text{ A}; V_{CE} = 5\text{ V}$

$h_{FE} > 15$

typ. 50

Collector-emitter saturation voltage*

$I_C = 4,0\text{ A}; I_B = 0,8\text{ A}$

V_{CEsat} typ. 1,5 V

Transition frequency at $f = 500\text{ MHz}$ *

$-I_E = 1,5\text{ A}; V_{CB} = 28\text{ V}$

$-I_E = 4,0\text{ A}; V_{CB} = 28\text{ V}$

f_T typ. 1,1 GHz

f_T typ. 0,75 GHz

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

$I_E = I_e = 0; V_{CB} = 28\text{ V}$

C_c typ. 33 pF

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

$I_C = 20\text{ mA}; V_{CE} = 28\text{ V}$

C_{re} typ. 18 pF

→ Collector-stud capacitance

C_{cs} typ. 1,2 pF

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

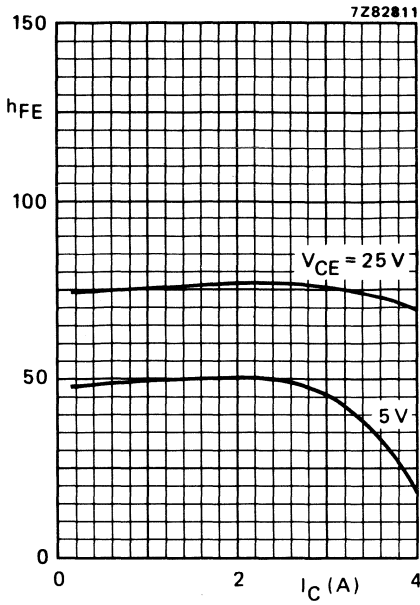


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

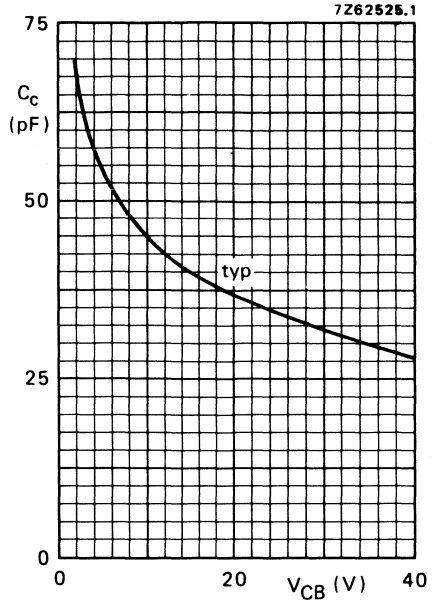


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

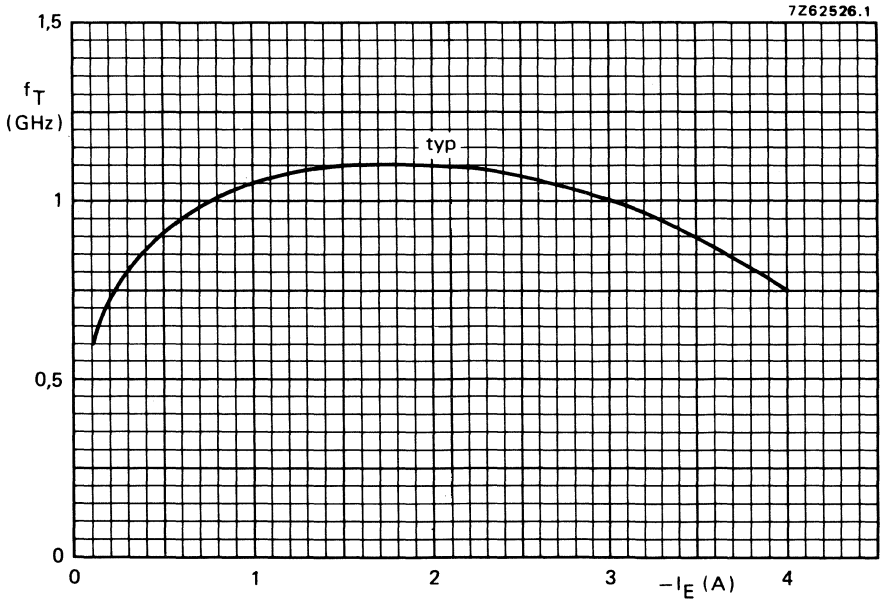


Fig. 6 $V_{CB} = 28\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

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

$f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$

type number	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	\bar{z}_i (Ω)	\bar{Z}_L (Ω)
BLX94A	28	25	< 6,25 >	6	< 1,62 >	55	—	—
	28	25	typ. 5,6	typ. 6,5	typ. 1,49	typ. 60	$0,9 + j4,1$	$6,6 + j6,4$
BLX94C	28	25	< 5,6 >	6,5	< 1,62 >	55	—	—
	28	25	typ. 4,7	typ. 7,25	typ. 1,54	typ. 58	$0,7 + j2,6$	$5,8 + j6,3$

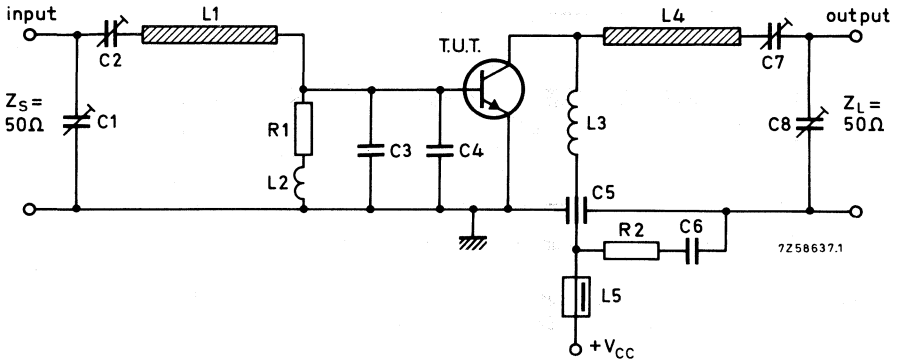


Fig. 7 470 MHz test circuit; c.w. class-B. For component layout and p.c.b. see Fig. 8.

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 resistor

R2 = 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

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 $f = 50 \text{ MHz}$) = $750 \Omega \pm 20\%$ (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.

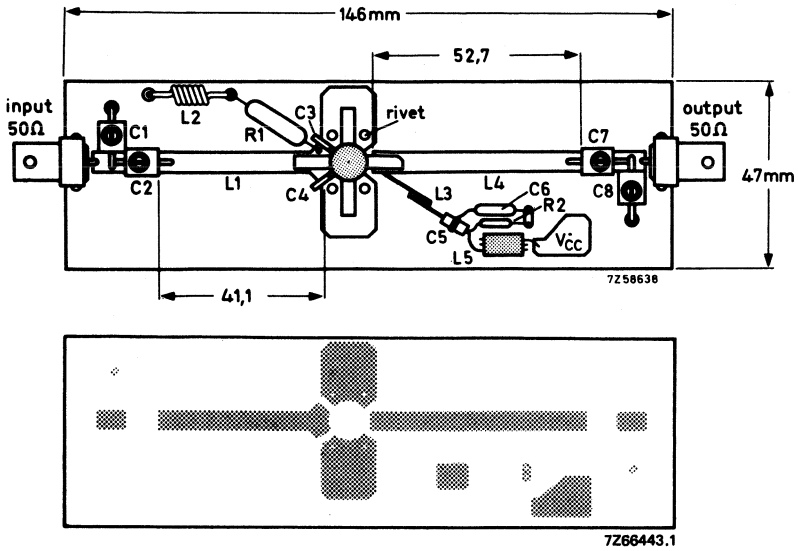


Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

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.

BLX94A
BLX94C

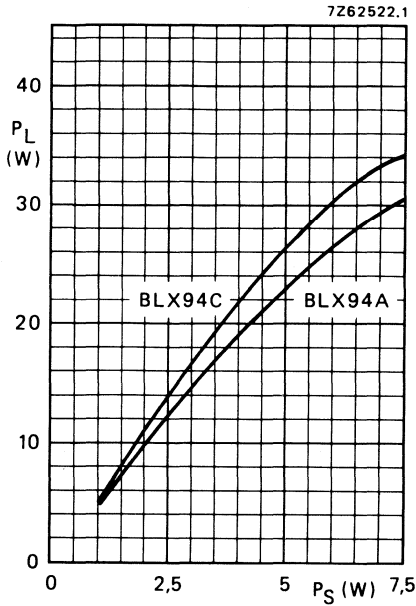


Fig. 9 $V_{CE} = 28 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; typical values.

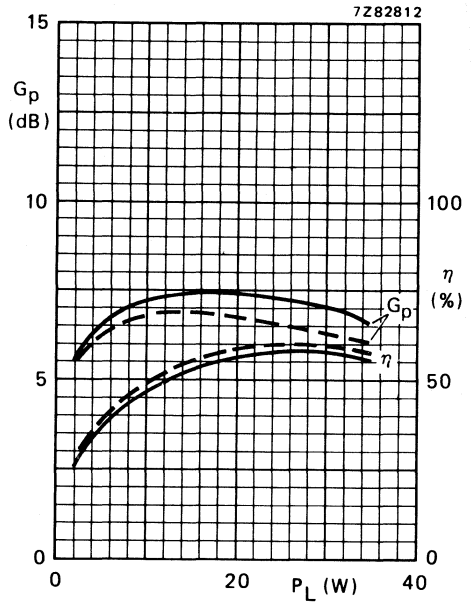


Fig. 10 $V_{CE} = 28 \text{ V}$; $f = 470 \text{ MHz}$; $T_h = 25 \text{ }^\circ\text{C}$; typ. values; — BLX94A; — BLX94C.

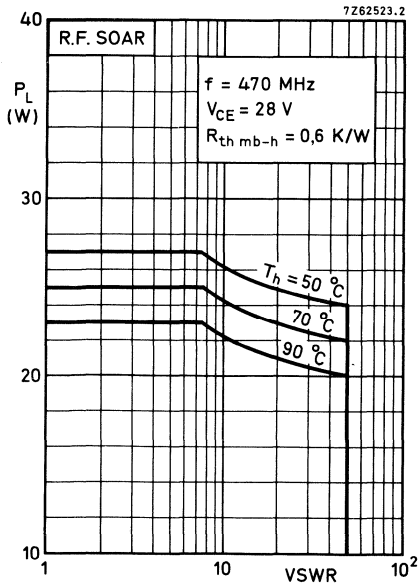


Fig. 11 For high voltage operation, a stabilized power supply is generally used. The graph shows the permissible output power under nominal conditions as a function of the VSWR, with heatsink temperature as parameter.

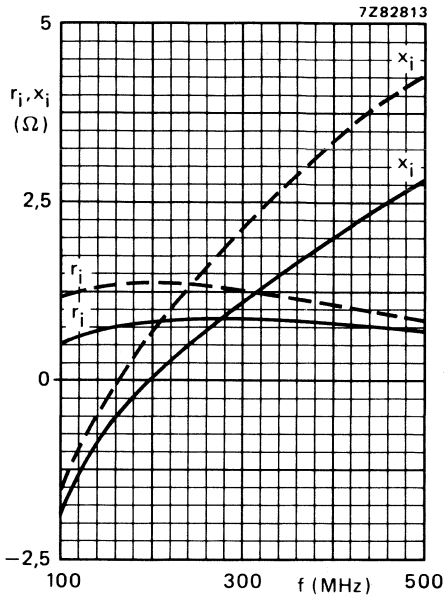


Fig. 12 Input impedance (series components).

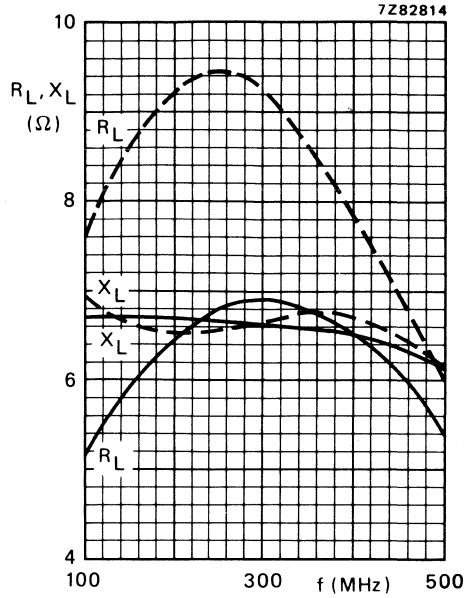


Fig. 13 Load impedance (series components).

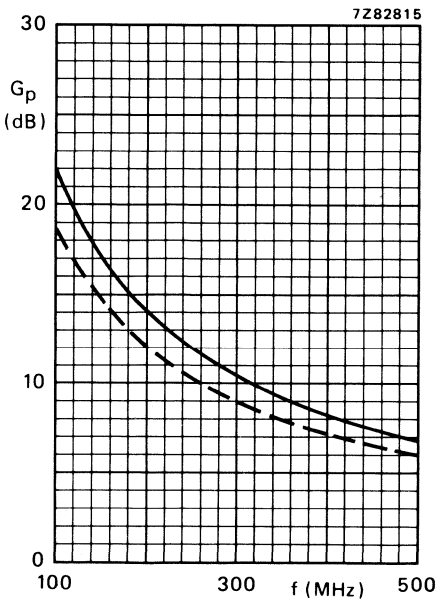


Fig. 14.

Conditions for Figs 12, 13 and 14:
 Typical values; $V_{CE} = 28$ V; $P_L = 25$ W;
 $T_h = 25$ °C; class-B operation;
 ---- BLX94A; — BLX94C.

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

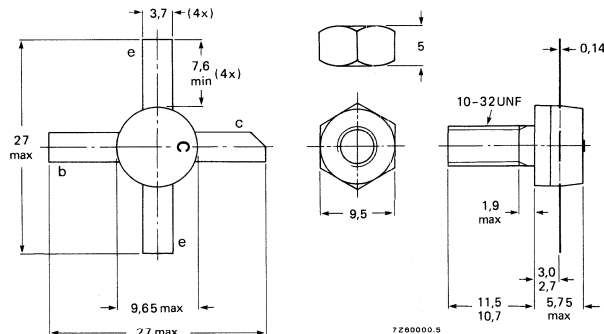
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %
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.



Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

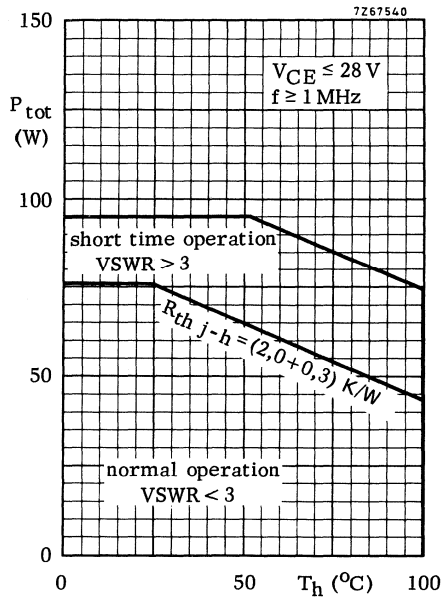
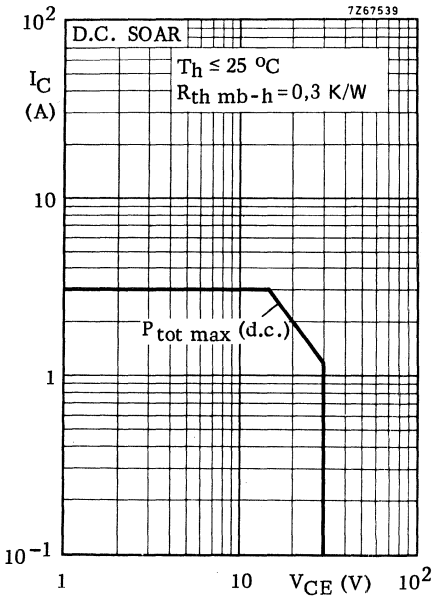
Diameter of clearance hole in heatsink: max. 4,9 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

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

PRODUCT SAFETY 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)

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
Collector current (average)	$I_{C(AV)}$	max.	3,0 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	10,0 A



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	$R_{th\text{ j-mb}}$	=	2,0	K/W
From mounting base to heatsink	$R_{th\text{ mb-h}}$	=	0,3	K/W

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

Breakdown voltages

Collector-base voltage
open emitter, $I_C = 50\text{ mA}$ $V_{(BR)CBO} > 65\text{ V}$ Collector-emitter voltage
 $R_{BE} = 10\ \Omega$, $I_C = 50\text{ mA}$ $V_{(BR)CER} > 65\text{ V}$ Collector-emitter voltage
open base, $I_C = 50\text{ mA}$ $V_{(BR)CEO} > 30\text{ V}$ 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
 $-V_{BE} = 1,5\text{ V}$; $R_{BE} = 33\ \Omega$ $E > 4,5\text{ mS}$
 $E > 4,5\text{ mS}$

D.C. current gain

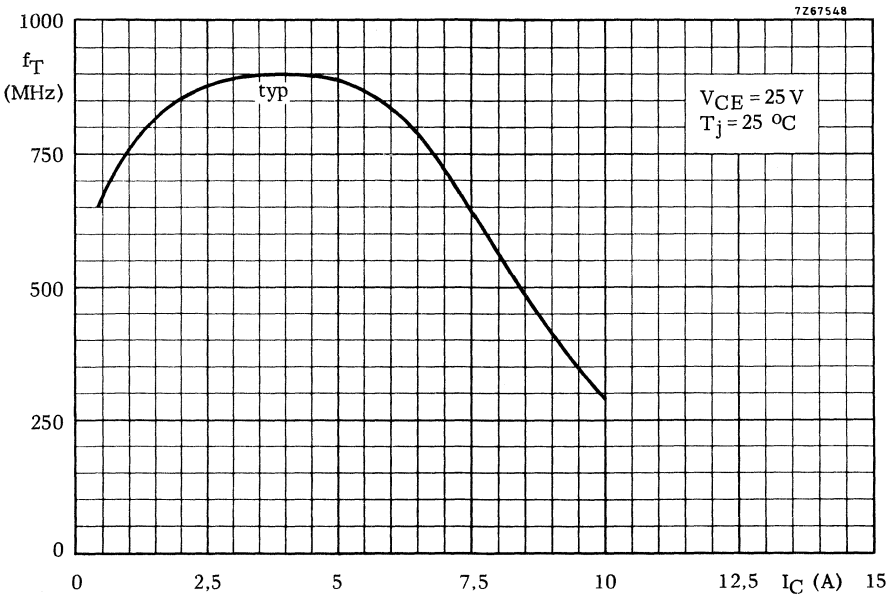
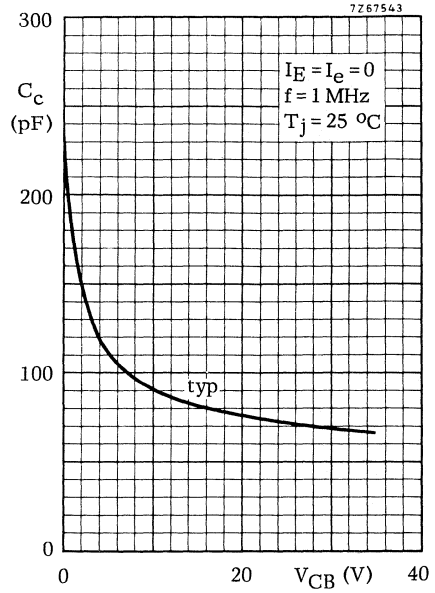
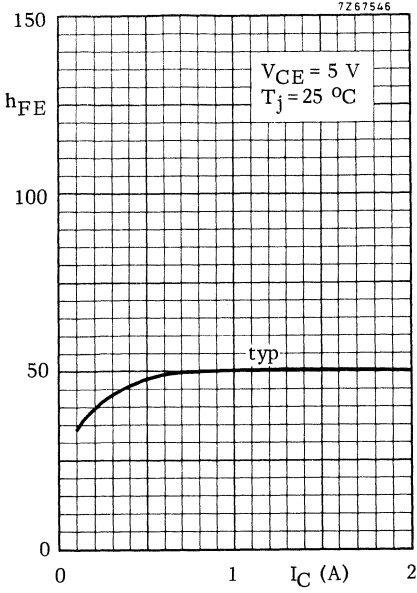
 $I_C = 1,0\text{ A}$; $V_{CE} = 5\text{ V}$ $h_{FE} \quad 25\text{ to }100$

Transition frequency

 $I_C = 4\text{ A}$; $V_{CE} = 25\text{ V}$ $f_T \quad \text{typ. } 900\text{ MHz}$ Collector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0$; $V_{CB} = 30\text{ V}$ $C_c \quad \text{typ. } 68\text{ pF}$
 $< 80\text{ pF}$ Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 200\text{ mA}$; $V_{CE} = 30\text{ V}$ $C_{re} \quad \text{typ. } 39\text{ pF}$

Collector-stud capacitance

 $C_{cs} \quad \text{typ. } 2\text{ pF}$



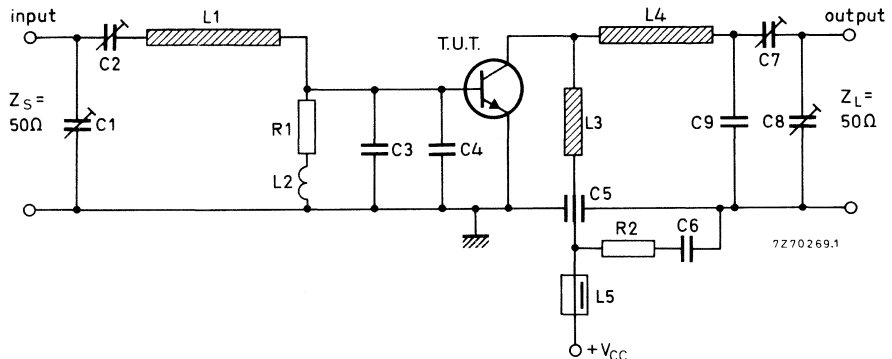
APPLICATION INFORMATION

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)

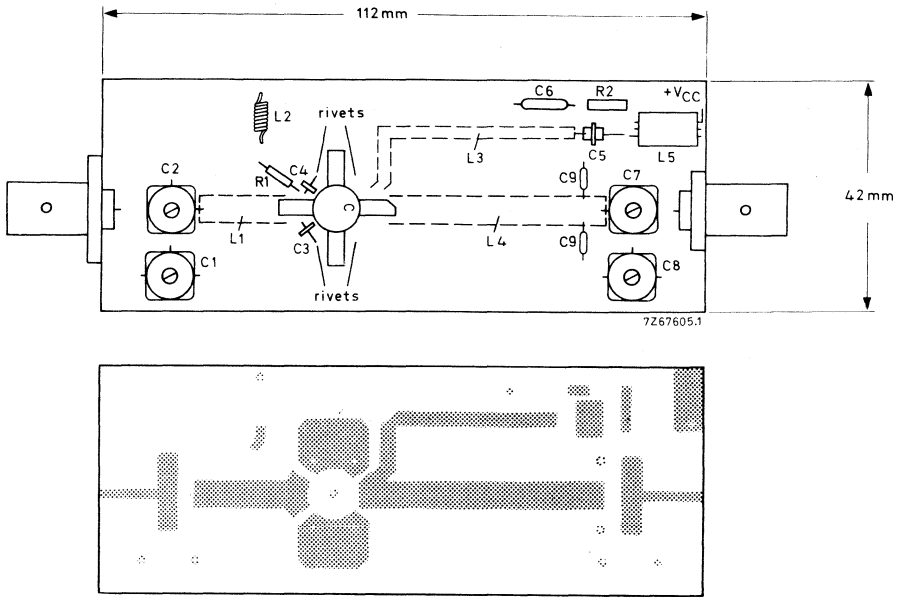
L4 = stripline (45,5 mm x 5,3 mm)

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

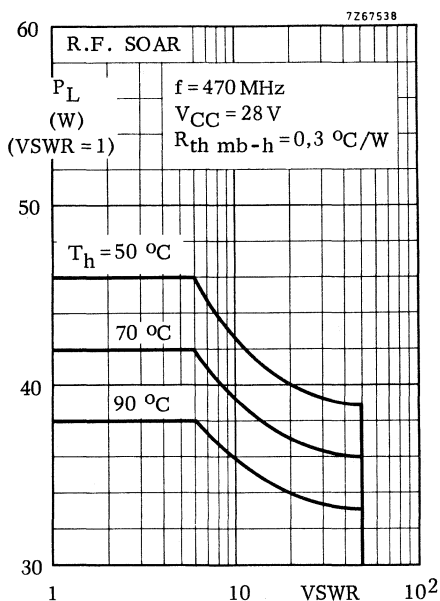
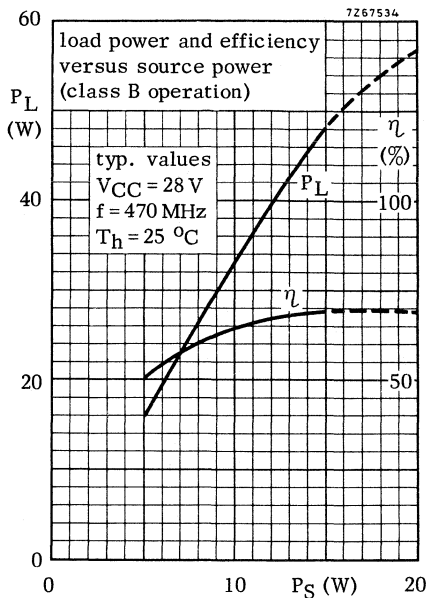
L1; L3; L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric. ($\epsilon_r = 2,74$); thickness 1/32".At $P_L = 40 \text{ W}$ and $V_{CE} = 28 \text{ V}$, the output power at heatsink temperatures between $25 \text{ }^\circ\text{C}$ and $70 \text{ }^\circ\text{C}$ relative to that at $25 \text{ }^\circ\text{C}$ is diminished by typ. 50 mW/K.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; $P_L = 36 \text{ W}$.

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.



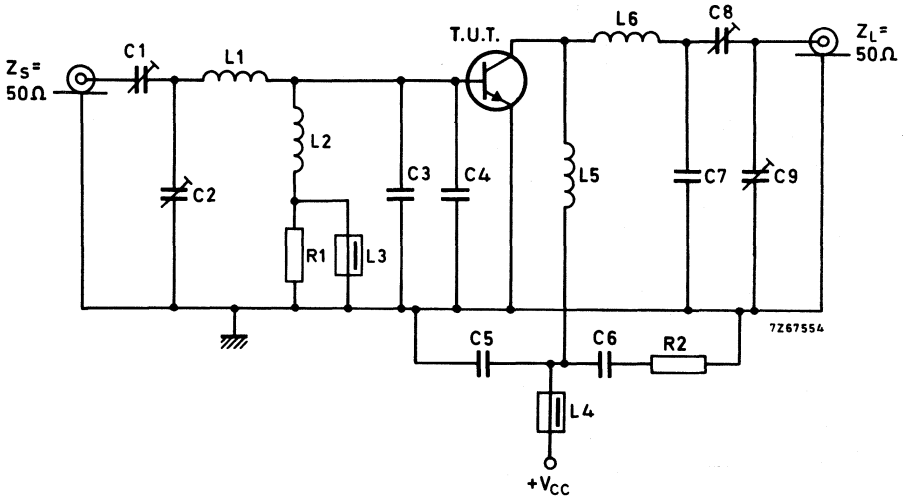
Indicated load power as a function of overload.

The graph has been derived from an evaluation of the performance of transistors matched up to 46W load power in the test amplifier 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:

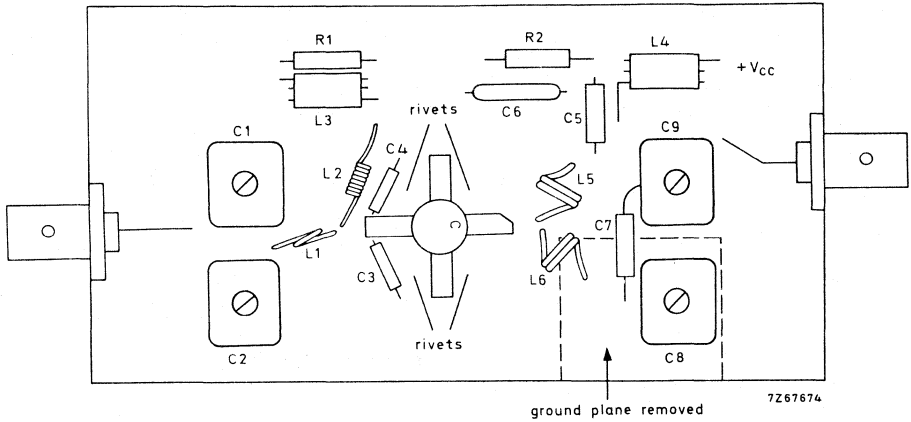


List of components:

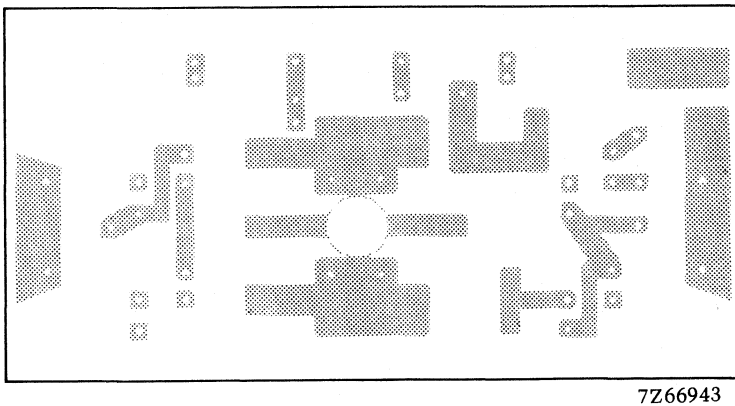
- C1 = 2,5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
- C2 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
- C3 = C4 = 47 pF ceramic capacitor
- C5 = 100 pF ceramic capacitor
- C6 = 100 nF polyester capacitor
- C7 = 6,8 pF ceramic capacitor
- C8 = 4 to 60 pF film 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 = ferroxcube 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)

APPLICATION INFORMATION (continued)

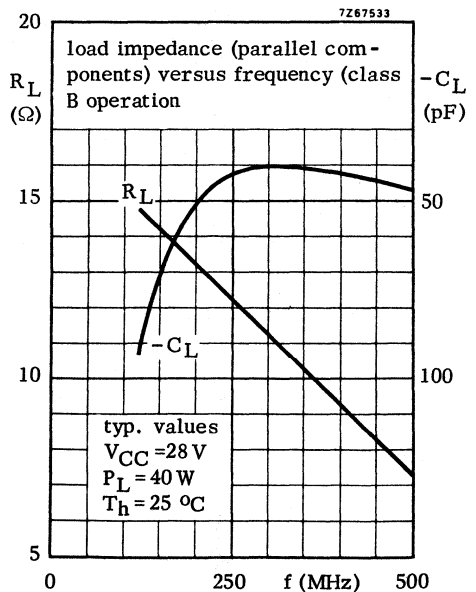
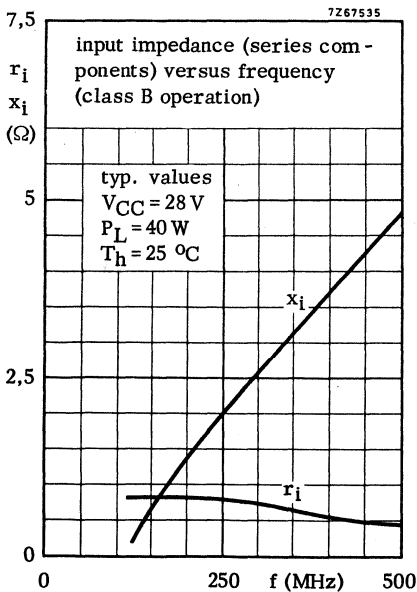
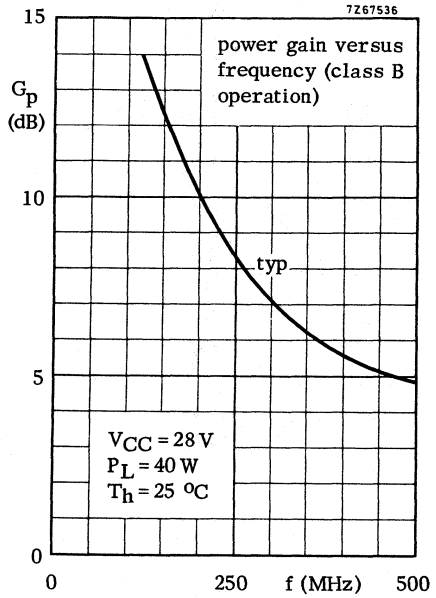
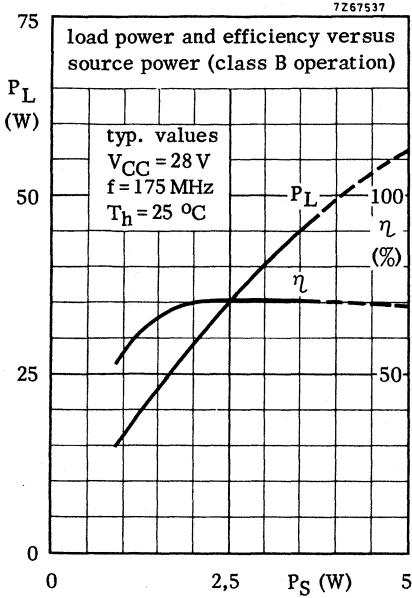
Component lay-out and printed circuit board for 175 MHz test circuit.



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.



U.H.F. LINEAR POWER TRANSISTOR

N-P-N multi-emitter silicon planar epitaxial transistor primarily for use in linear u.h.f. amplifiers for television transposers and transmitters.

Features:

- guaranteed low intermodulation figures;
- gold metallization ensures excellent reliability.

The transistor has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

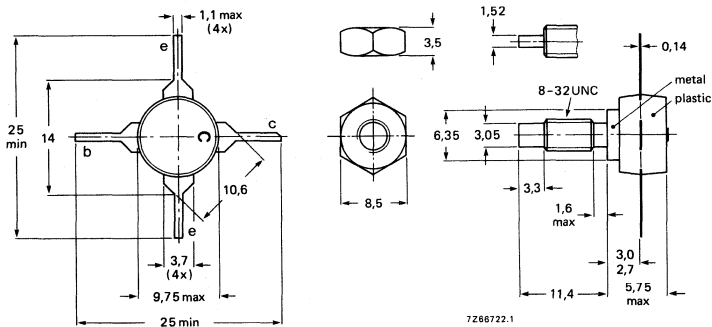
mode of operation	f _{vision} MHz	V _{CE} V	I _C mA	T _h °C	d _{im} * dB	P _{O sync} * W	G _p dB
class-A	860	25	250	25	-60	> 0,5	> 6
class-A	860	25	250	25	-60	typ. 0,6	typ. 7

* 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-48/3.



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

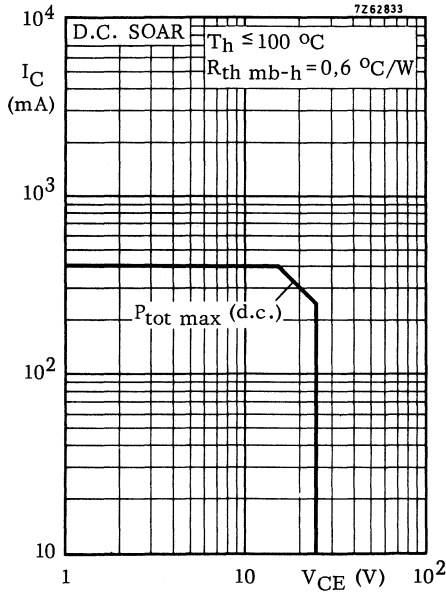
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

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

PRODUCT SAFETY 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)

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
Collector current (d.c.)	I_C	max.	0,4	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	1	A
Total power dissipation up to $T_h = 100 \text{ }^\circ\text{C}$	P_{tot}	max.	6,25	W



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	K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,6	K/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} < 100 μA

Breakdown voltages

Collector-base voltage
open emitter; $I_C = 1\text{ mA}$

$V_{(BR)CBO}$ > 40 V

Collector-emitter voltage
 $R_{BE} = 10\ \Omega; I_C = 5\text{ mA}$
open base; $I_C = 5\text{ mA}$

$V_{(BR)CER}$ > 40 V
 $V_{(BR)CEO}$ > 27 V

Emitter-base voltage
open collector; $I_E = 1\text{ mA}$

$V_{(BR)EBO}$ > 3,5 V

Saturation voltage

$I_C = 200\text{ mA}; I_B = 20\text{ mA}$ V_{CEsat} < 0,75 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 GHz

$I_C = 350\text{ mA}; V_{CE} = 20\text{ V}$ f_T > 1,0 GHz

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

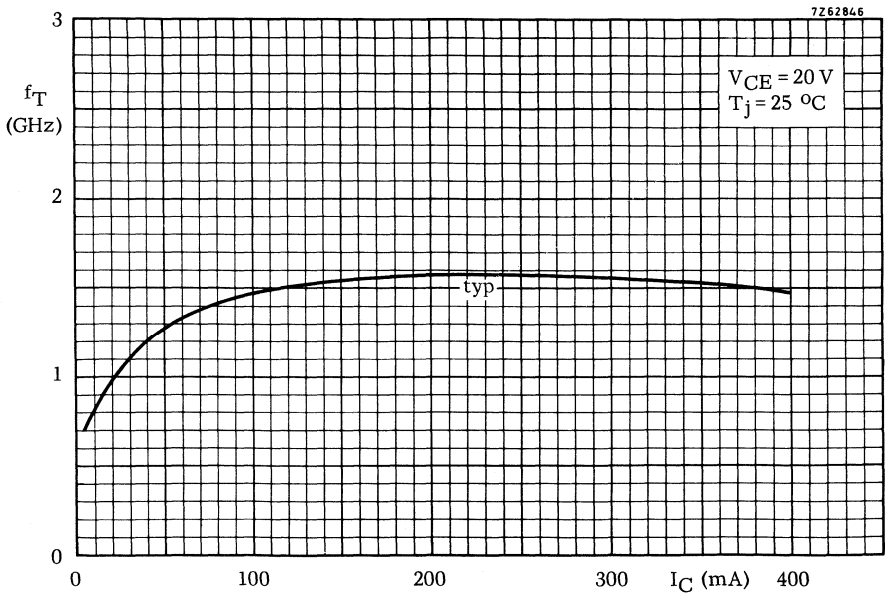
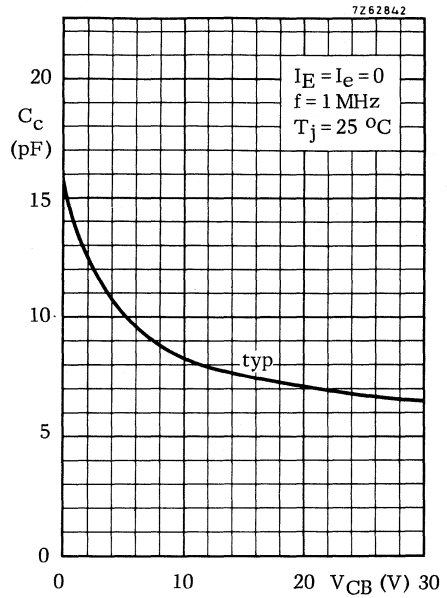
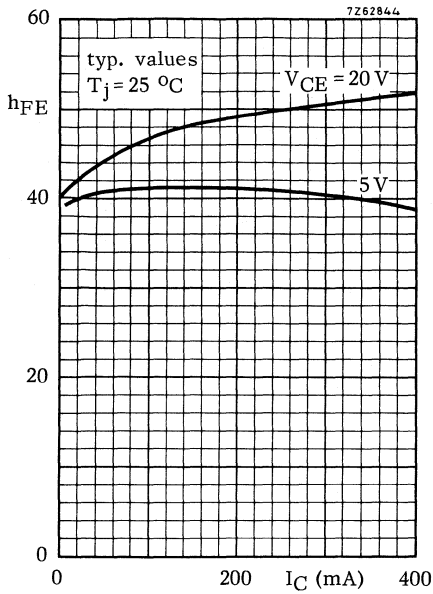
$I_E = I_e = 0; V_{CB} = 20\text{ V}$ C_c < 10 pF

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} typ. 3,5 pF

Collector-stud capacitance

C_{cs} typ. 2 pF

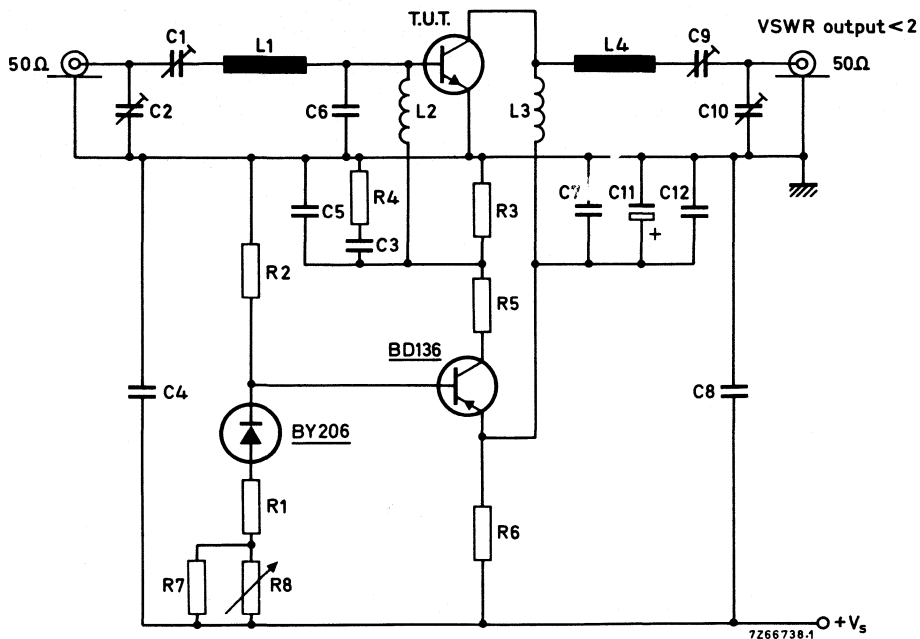


APPLICATION INFORMATION

$d_{im}(dB)^*$	f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	G_p (dB)	$P_{o\ sync}$ (W) [*]	T_h (°C)
-60	860	25	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:

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)

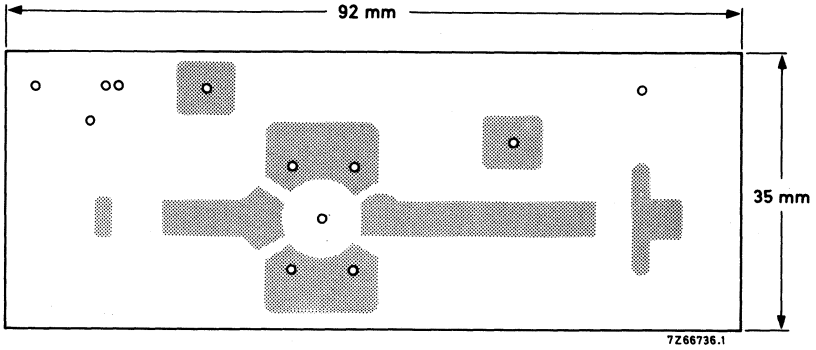
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

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)

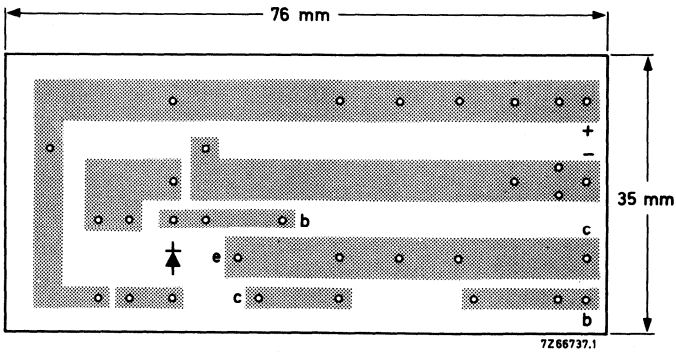
L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,45 mm.

Layout of printed-circuit board for 860 MHz test circuit.

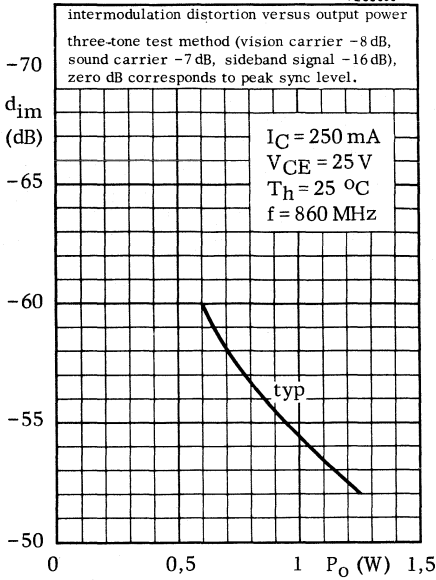


The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

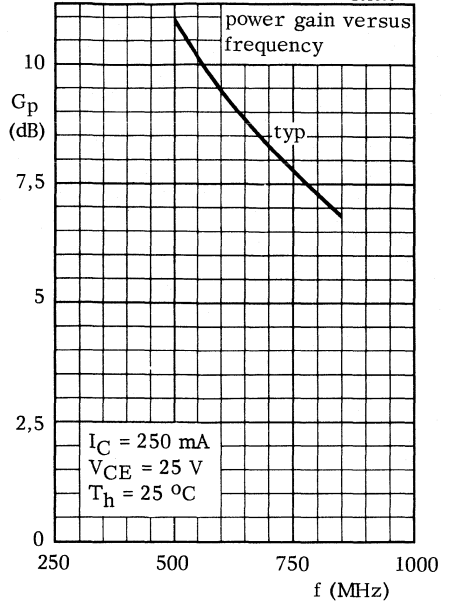
Layout of printed board bias circuit.



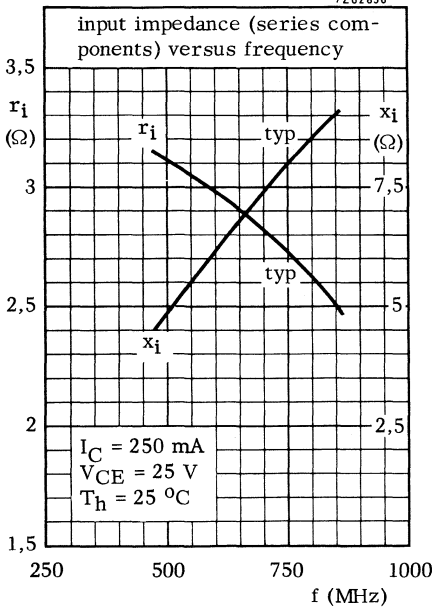
7Z62839



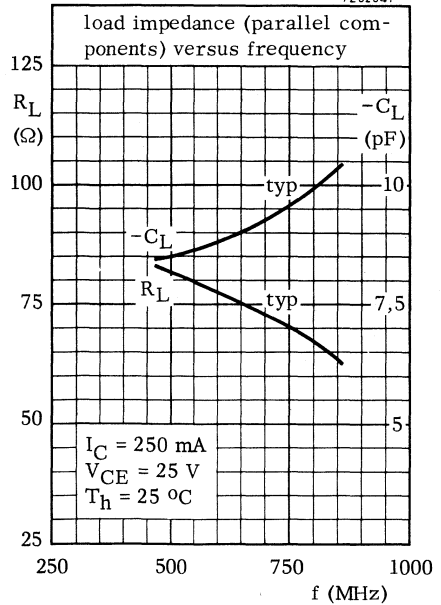
7Z62835



7Z62838



7Z62841



U.H.F. LINEAR POWER TRANSISTOR

N-P-N multi-emitter silicon planar epitaxial transistor primarily for use in linear u.h.f. amplifiers for television transposers and transmitters.

Features:

- guaranteed low intermodulation figures;
- gold metallization ensures excellent reliability.

The transistor has a 1/4" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

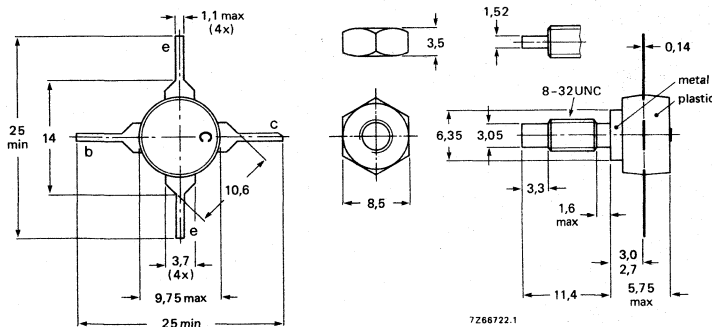
mode of operation	f_{vision} MHz	V_{CE} V	I_{C} mA	T_{h} °C	d_{im}^* dB	$P_{\text{o sync}}^*$ W	G_{p} dB
class-A	860	25	500	25	-60	> 1,0	> 5,5
class-A	860	25	500	25	-60	typ. 1,1	typ. 6,5

* 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

Dimensions in mm

Fig. 1 SOT-48/3.



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

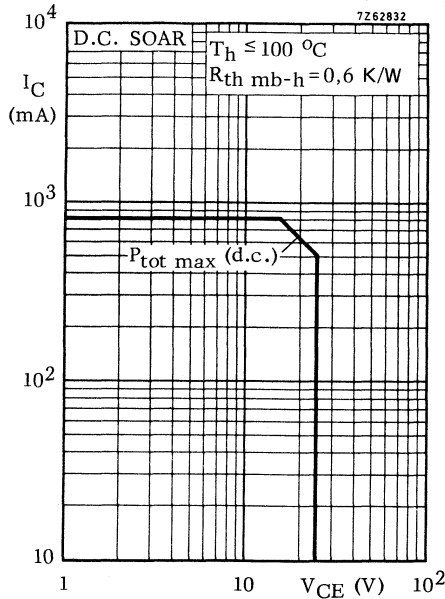
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

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

PRODUCT SAFETY 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)

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
Collector current (d.c.)	I_C	max.	0,8	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	2	A
Total power dissipation up to $T_h = 100 \text{ }^\circ\text{C}$	P_{tot}	max.	12,5	W



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	K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,6	K/W

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

Collector cut-off current

$$I_E = 0; V_{CB} = 20\text{ V} \quad I_{CBO} < 200\text{ }\mu\text{A}$$

Breakdown voltages

Collector-base voltage

$$\text{open emitter; } I_C = 2\text{ mA} \quad V_{(BR)CBO} > 40\text{ V}$$

Collector-emitter voltage

$$R_{BE} = 10\text{ }\Omega; I_C = 10\text{ mA} \quad V_{(BR)CER} > 40\text{ V}$$

$$\text{open base; } I_C = 10\text{ mA} \quad V_{(BR)CEO} > 27\text{ V}$$

Emitter-base voltage

$$\text{open collector; } I_E = 2\text{ mA} \quad V_{(BR)EBO} > 3,5\text{ V}$$

Saturation voltage

$$I_C = 400\text{ mA; } I_B = 40\text{ mA} \quad V_{CEsat} < 0,75\text{ V}$$

D. C. current gain

$$I_C = 400\text{ mA; } V_{CE} = 20\text{ V} \quad h_{FE} > 30$$

$$I_C = 800\text{ mA; } V_{CE} = 20\text{ V} \quad h_{FE} > 20$$

Transition frequency

$$I_C = 400\text{ mA; } V_{CE} = 20\text{ V} \quad f_T > 1,2\text{ GHz}$$

$$I_C = 700\text{ mA; } V_{CE} = 20\text{ V} \quad f_T > 1,0\text{ GHz}$$

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

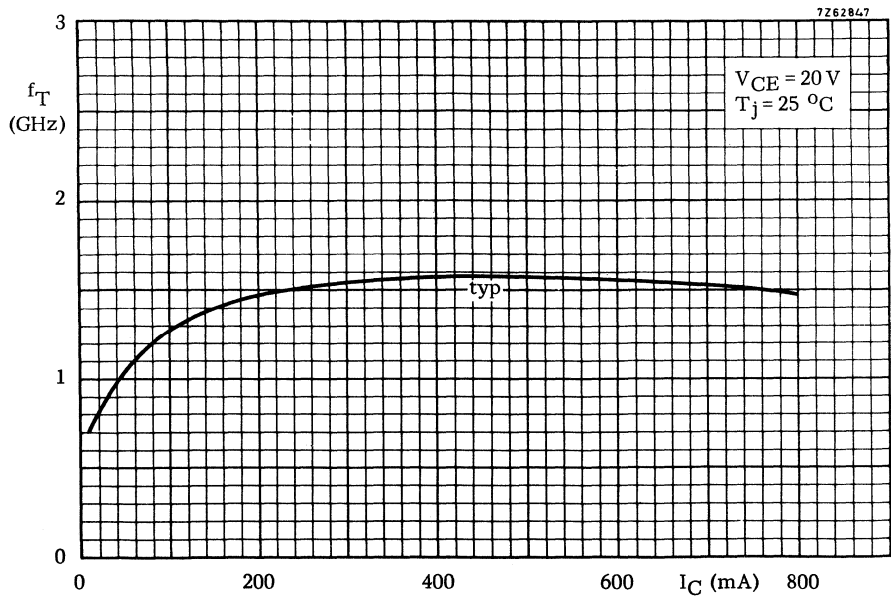
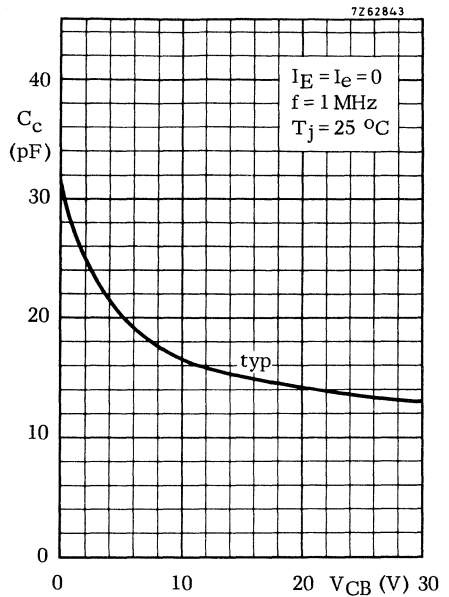
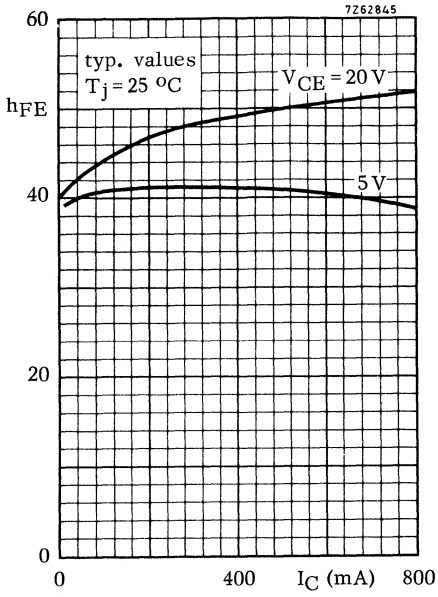
$$I_E = I_e = 0; V_{CB} = 20\text{ V} \quad C_c < 20\text{ pF}$$

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

$$I_C = 20\text{ mA; } V_{CE} = 20\text{ V; } T_{mb} = 25\text{ }^{\circ}\text{C} \quad C_{re} \text{ typ. } 7\text{ pF}$$

Collector-stud capacitance

$$C_{CS} \text{ typ. } 2\text{ pF}$$

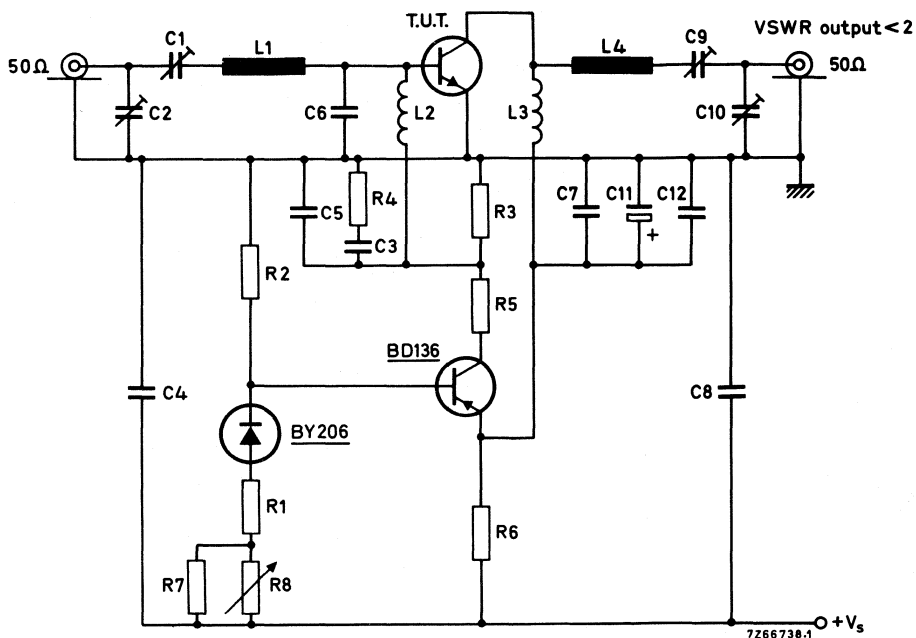


APPLICATION INFORMATION

dim (dB) *)	f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	G_{p} (dB)	$P_{\text{O sync}}$ (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 $f_{\text{vision}} = 860$ 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 μ F/40 V solid aluminium electrolytic capacitor

R1 = 220 Ω

R5 = 470 Ω (1 W)

R2 = 4,7 k Ω

R6 = 3 x 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)

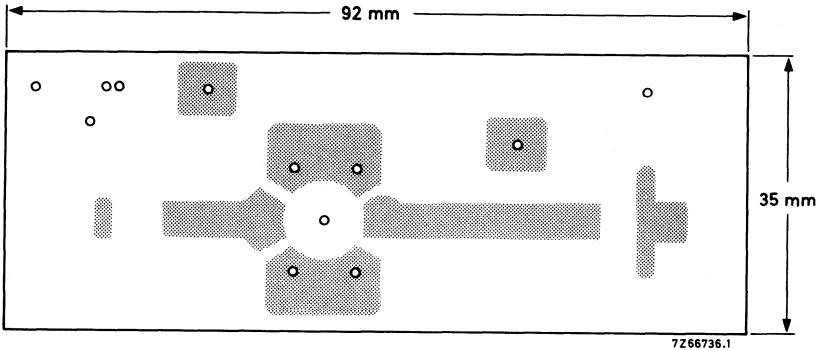
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm

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)

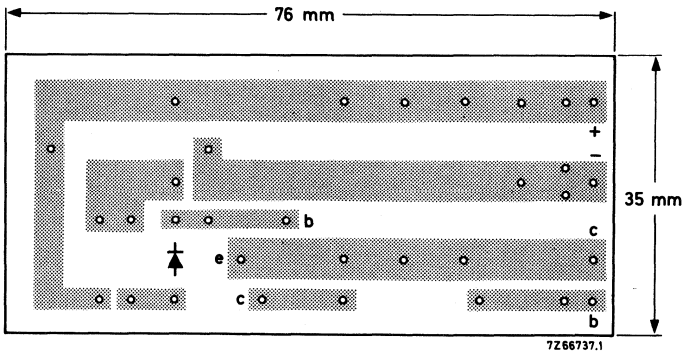
L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric ($\epsilon_r = 2,74$); thickness 1,45 mm.

Layout of printed-circuit board for 860 MHz test circuit.

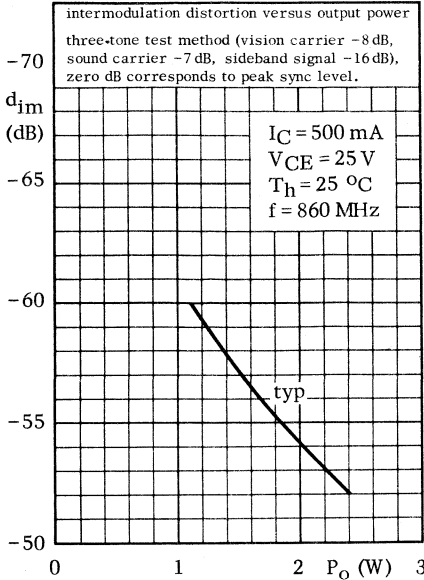


The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

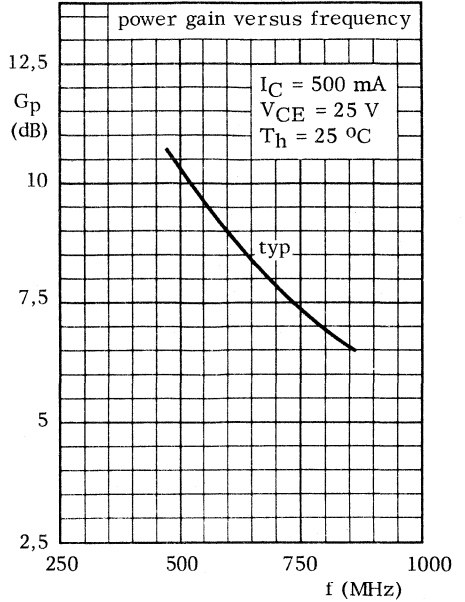
Layout of printed board bias circuit.



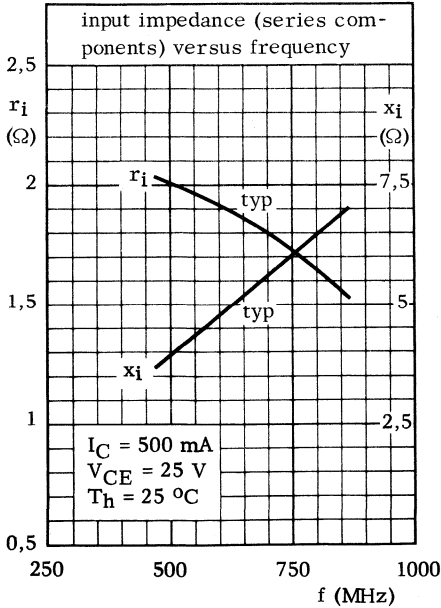
7Z62840



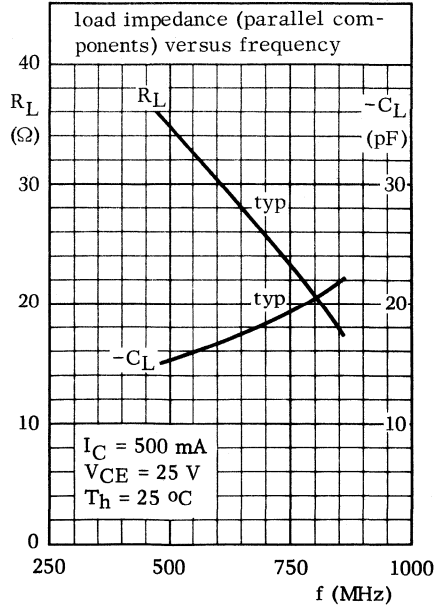
7Z62834



7Z62837



7Z62836



U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear u.h.f. amplifiers of television transposers and transmitters in band IV-V.

Features:

- diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a $\frac{1}{4}$ " capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

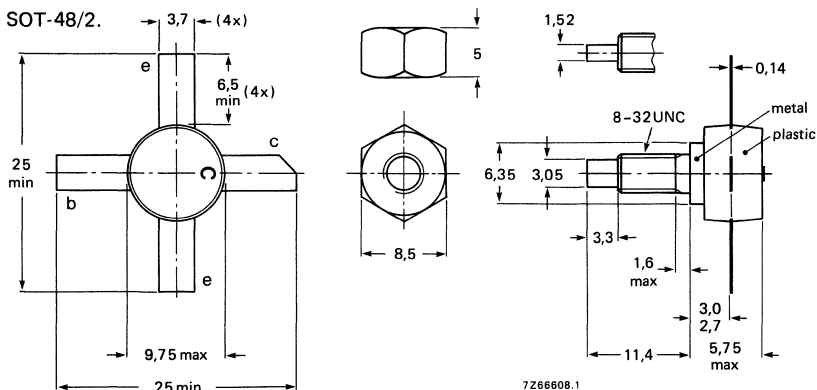
R.F. performance in linear amplifier

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	860	25	850	70	-60	> 3,5	> 5,0
class-A	860	25	850	70	-60	typ. 4,0	typ. 5,5

* 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-48/2.



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.

PRODUCT SAFETY 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

V_{CESM} max. 50 V

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

(peak value); $f > 1$ MHz

I_{CM} max. 4 A

Total power dissipation at $T_h = 70$ °C

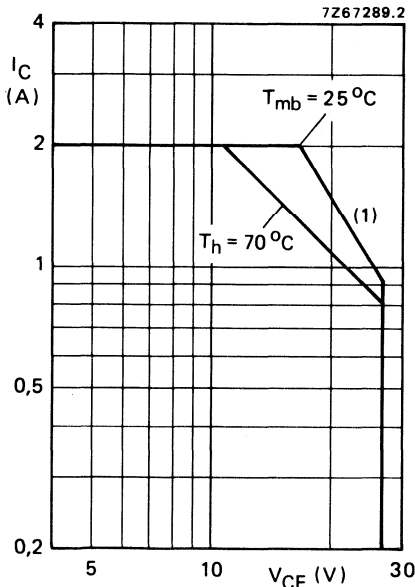
P_{tot} max. 21,5 W

Storage temperature

T_{stg} -65 to +200 °C

Junction temperature

T_j max. 200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

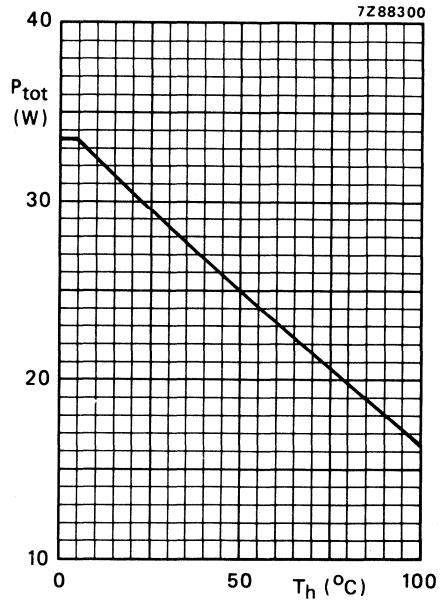


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (dissipation = 21,25 W; $T_{mb} = 82,75$ °C, i.e. $T_h = 70$ °C).

From junction to mounting base

$R_{th\ j-mb}$ = 5,45 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,6 K/W

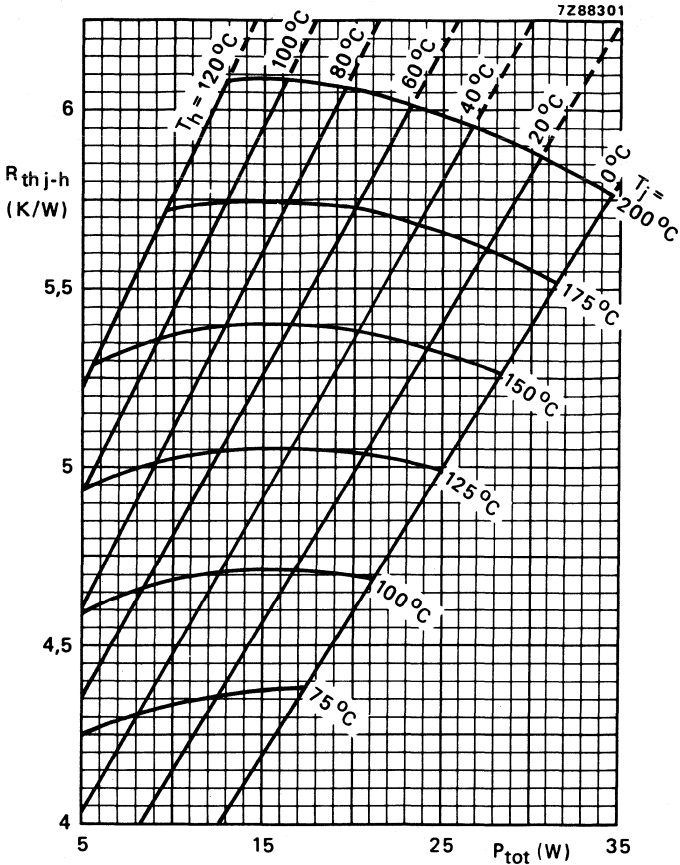


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h} = 0,6\ K/W$.)

Example

Nominal class-A operation (without r.f. signal): $V_{CE} = 25\ V$; $I_C = 850\ mA$; $T_h = 70\ ^\circ C$.

Fig. 4 shows: $R_{th\ j-h}$ max. 6,05 K/W
 T_j max. 200 $^\circ C$

Typical device: $R_{th\ j-h}$ typ. 5,35 K/W
 T_j typ. 183 $^\circ C$

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$V_{BE} = 0; I_C = 10\text{ mA}$

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

$V_{(BR)CES} > 50\text{ V}$

$V_{(BR)CEO} > 27\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 5\text{ mA}$

$V_{(BR)EBO} > 3,5\text{ V}$

D.C. current gain*

$I_C = 850\text{ mA}; V_{CE} = 25\text{ V}$

$h_{FE} > 15$
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 $f = 500\text{ MHz}$ **

$-I_E = 850\text{ mA}; V_{CB} = 25\text{ V}$

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 $f = 1\text{ MHz}$

$I_C = 50\text{ mA}; V_{CE} = 25\text{ V}$

C_{re} typ. 15 pF

Collector-stud capacitance

C_{cs} typ. 2 pF

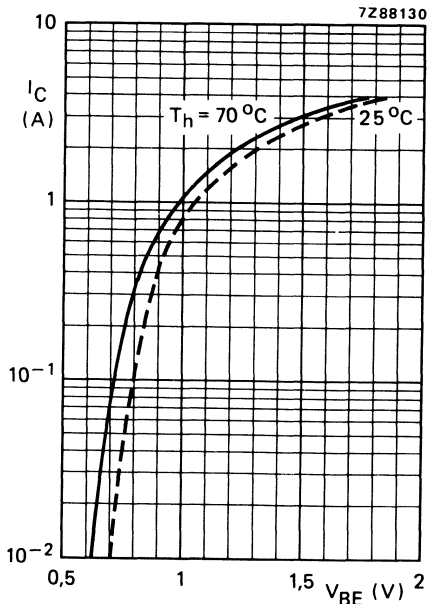


Fig. 5 Typical values; $V_{CE} = 25\text{ V}$.

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\text{ }\mu\text{s}; \delta \leq 0,01$.

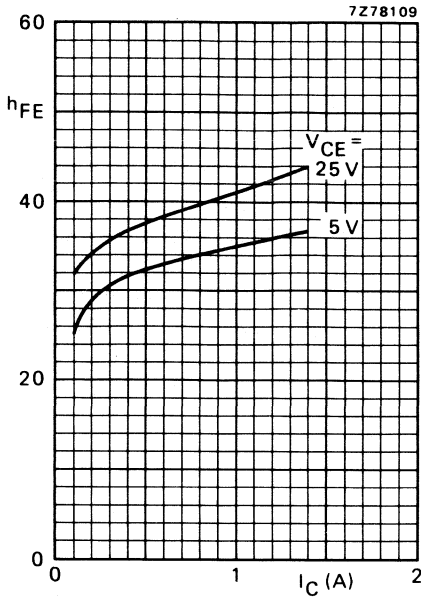


Fig. 6 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

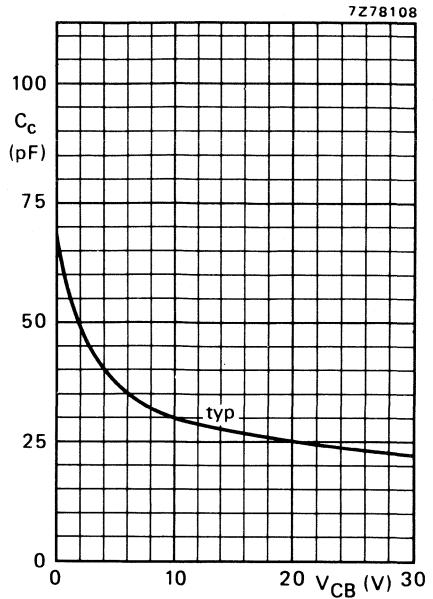


Fig. 7 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

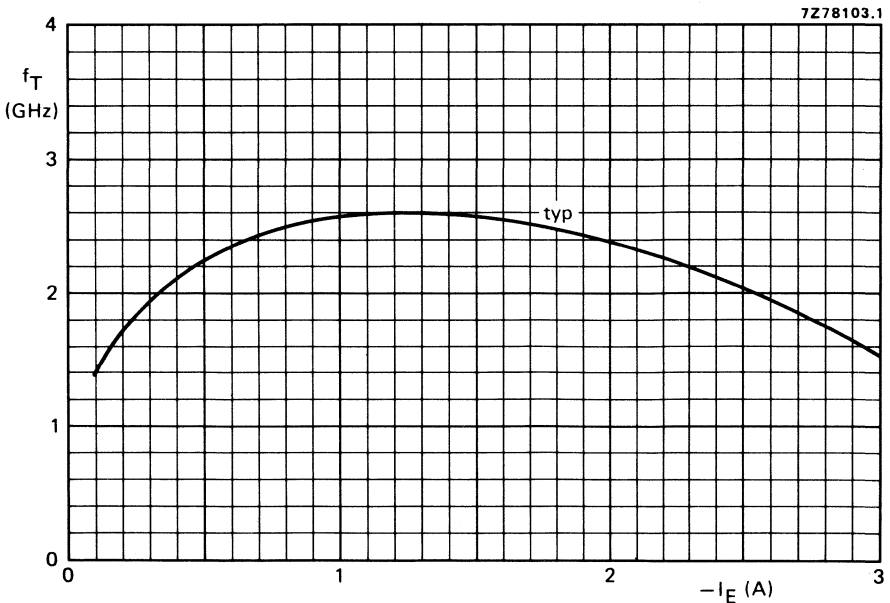


Fig. 8 $V_{CB} = 25\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_{C} (mA)	T_{h} (°C)	d_{im} (dB)*	P_{osync} (W)*	G_{p} (dB)
860	25	850	70	-60	> 3,5	> 5,0
860	25	850	70	-60	typ. 4,0	typ. 5,5

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

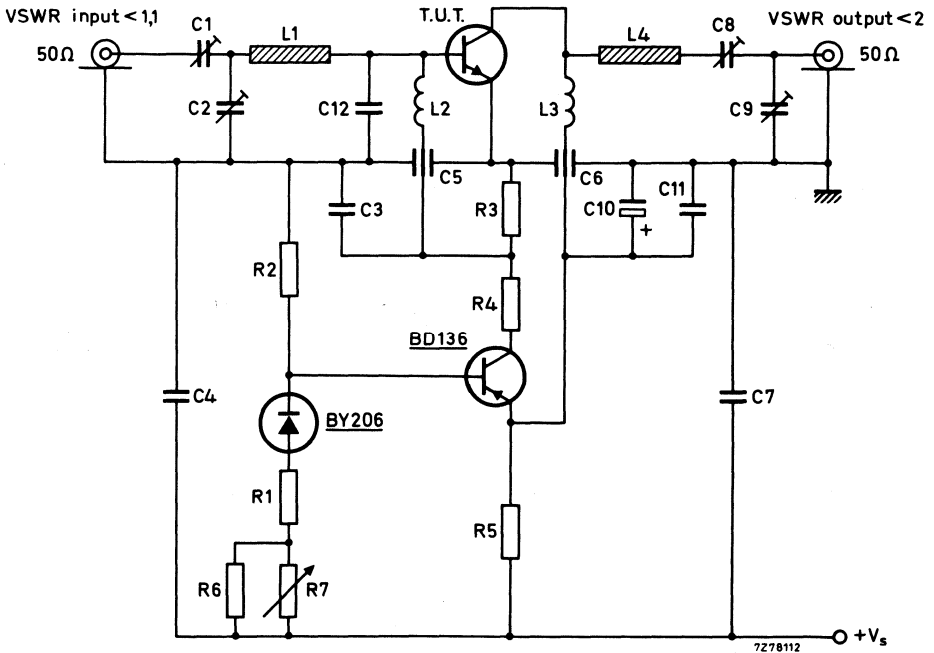


Fig. 9 Class-A test circuit at $f_{\text{vision}} = 860$ MHz.

List of components:

- C1 = C2 = 1,4 to 5,5 pF film dielectric trimmer (cat.no. 2222 809 09001)
- C3 = C4 = 100 nF polyester capacitor
- C5 = C6 = 1 nF feed-through capacitor
- 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 μ F/40 V solid aluminium electrolytic capacitor
- C11 = 470 nF polyester capacitor
- C12 = 2 x 3,3 pF chip capacitors (in parallel)

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)

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)

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 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.

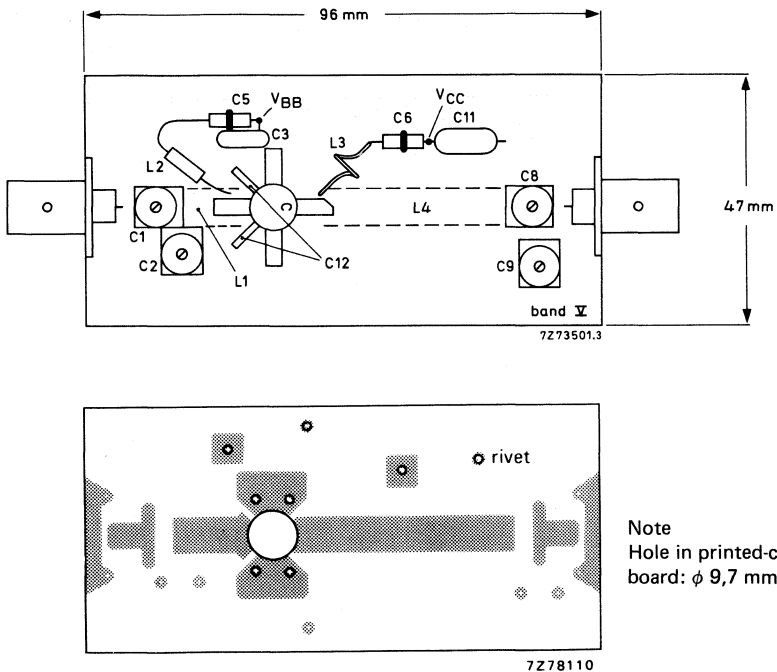


Fig. 10 Component layout and printed-circuit board for 860 MHz class-A test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by hollow rivets.

Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

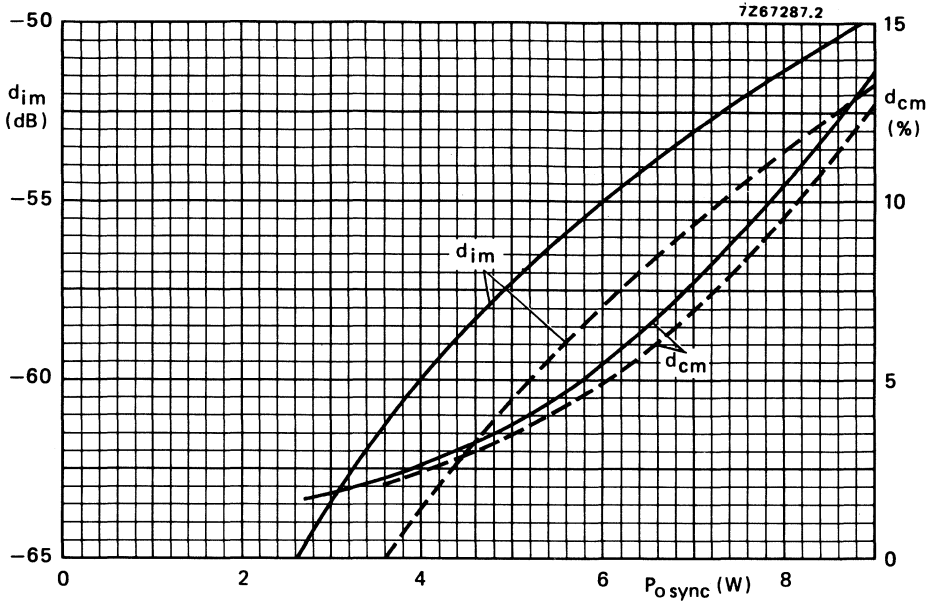


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of $P_{O\ sync}$. Typical values; $V_{CE} = 25\ \text{C}$; $I_C = 850\ \text{mA}$; --- $T_h = 25\ ^\circ\text{C}$; — $T_h = 70\ ^\circ\text{C}$; $f_{\text{vision}} = 860\ \text{MHz}$.

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

Intermodulation distortion of input signal $\leq -75\ \text{dB}$.

** Two-tone test method (vision carrier $0\ \text{dB}$, sound carrier $-7\ \text{dB}$), zero dB corresponds to peak sync level.

Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from $0\ \text{dB}$ to $-20\ \text{dB}$.

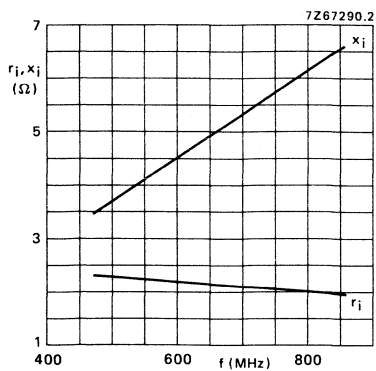


Fig. 12 Input impedance (series components).

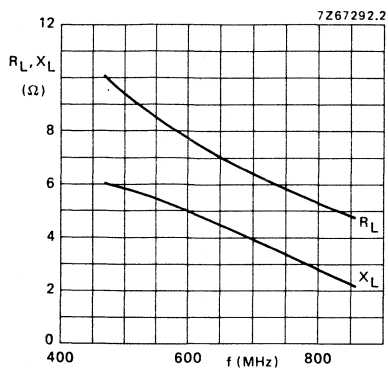


Fig. 13 Load impedance (series components).

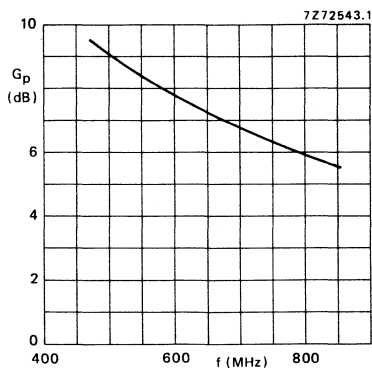


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 25$ V; $I_C = 850$ mA; class-A operation; $T_H = 70$ °C.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, B and C operated mobile and military transmitters with a 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 ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

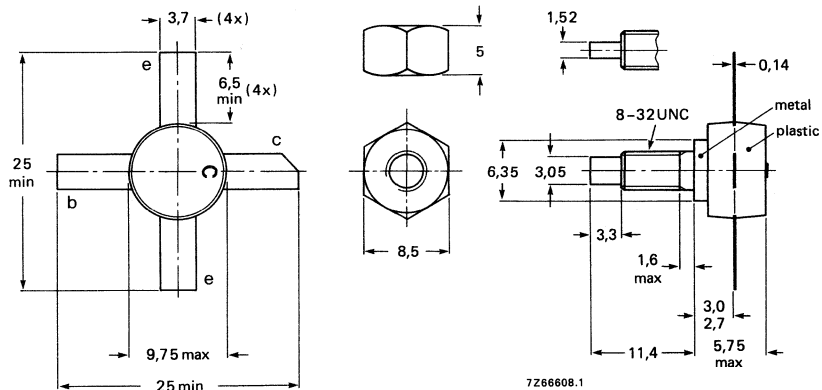
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit.

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

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



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.

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

BLY87A

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

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

Collector current (average)

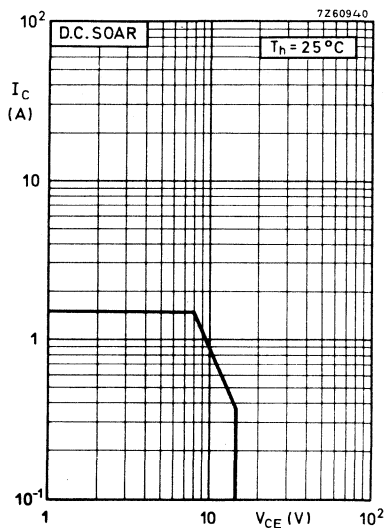
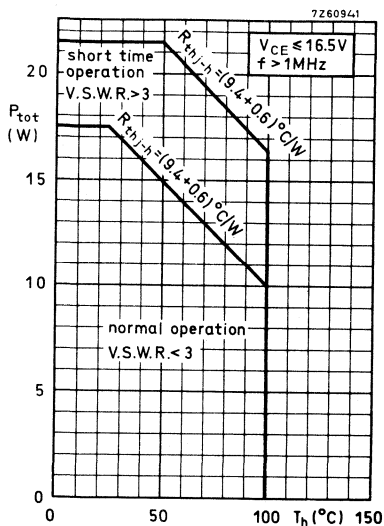
$I_{C(AV)}$ max. 1.25 A

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

I_{CM} max. 3.75 A

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

P_{tot} max. 17.5 W



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

$R_{th\ j-mb} = 9.4$ K/W

From mounting base to heatsink

$R_{th\ mb-h} = 0.6$ K/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	mS
$-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$	E	>	0.5	mS

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 typ. 700 MHz

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

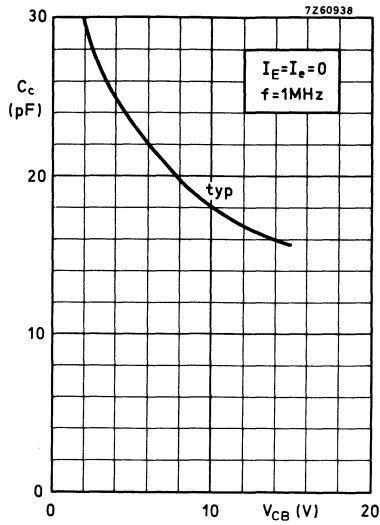
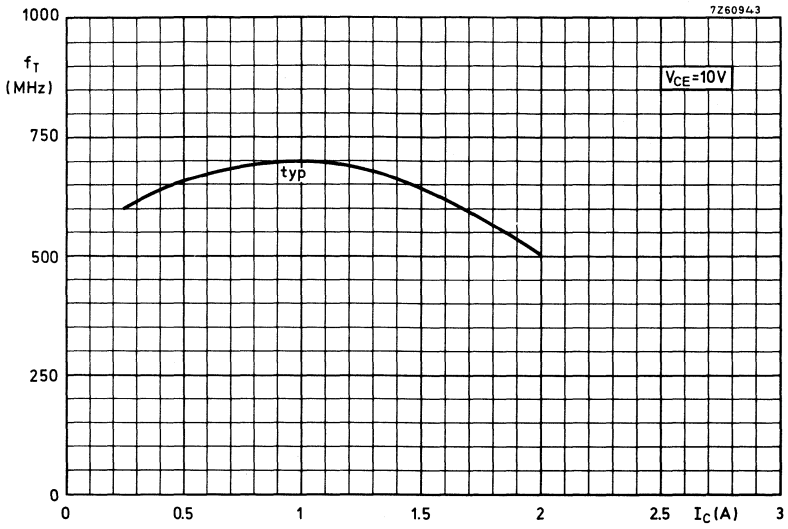
$I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_c typ. 15 pF
< 20 pF

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

$I_C = 100\text{ mA}; V_{CE} = 15\text{ V}$ $-C_{re}$ typ. 11 pF

Collector-stud capacitance

C_{cs} typ. 2 pF



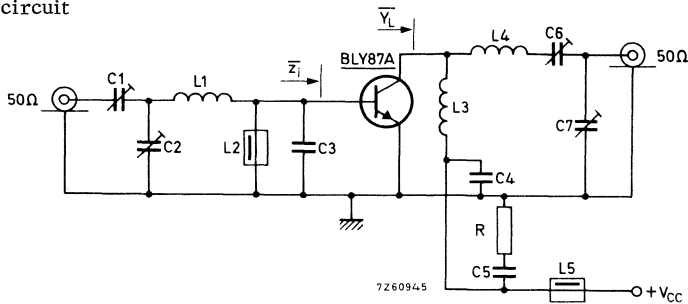
APPLICATION INFORMATION

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

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

$V_{CC}(\text{V})$	$P_S(\text{W})$	$P_L(\text{W})$	$I_C(\text{A})$	$G_p(\text{dB})$	$\eta(\%)$	$\bar{z}_i(\Omega)$	$\bar{Y}_L(\text{mS})$
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)

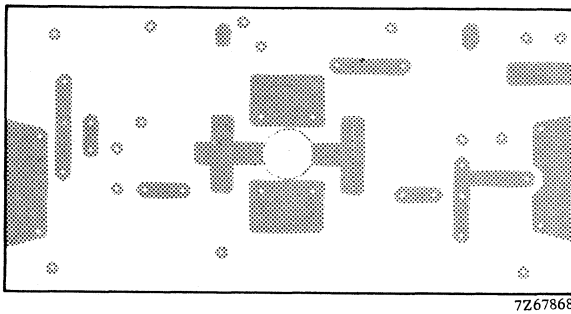
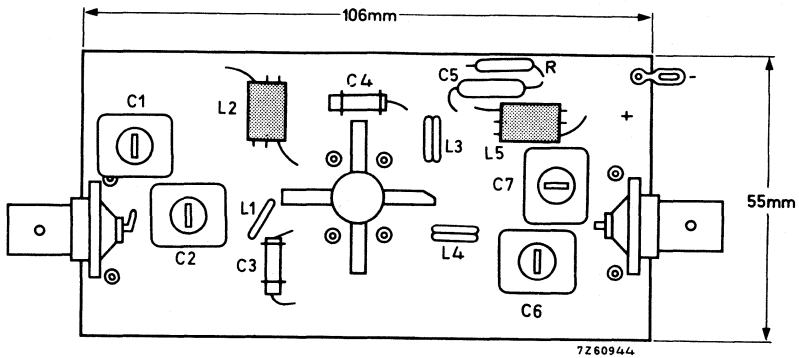
L3 = 2.5 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

L4 = 4.5 turns enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

R = 10 Ω carbon

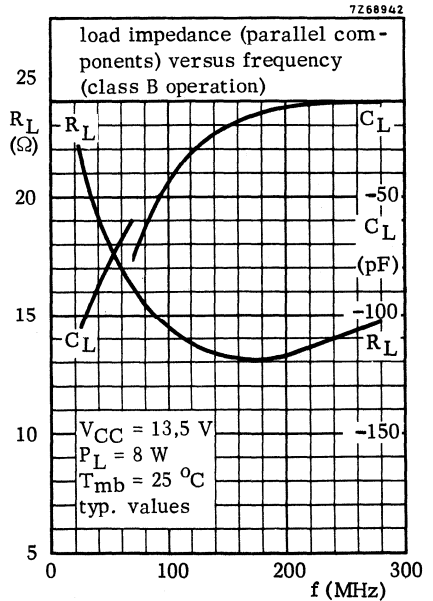
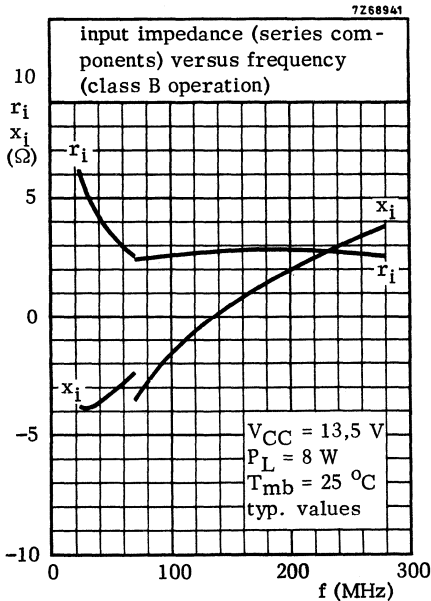
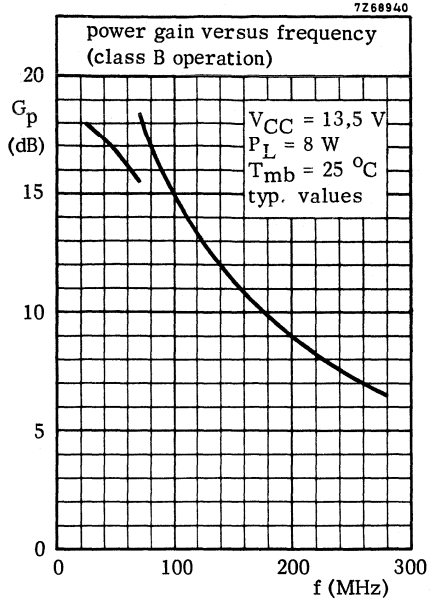
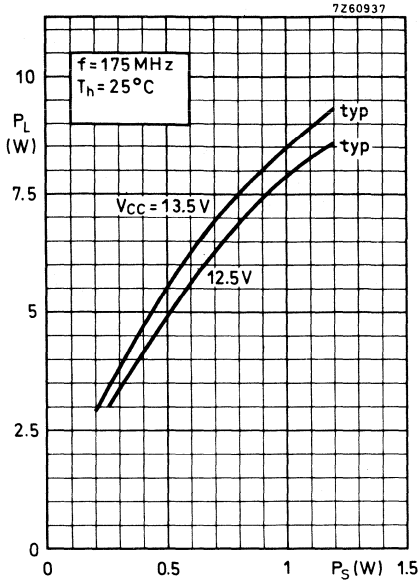
APPLICATION INFORMATION (continued)

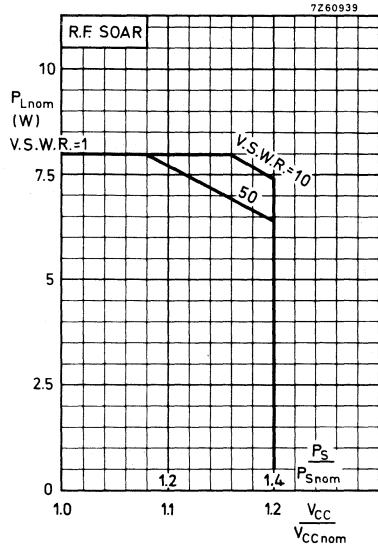
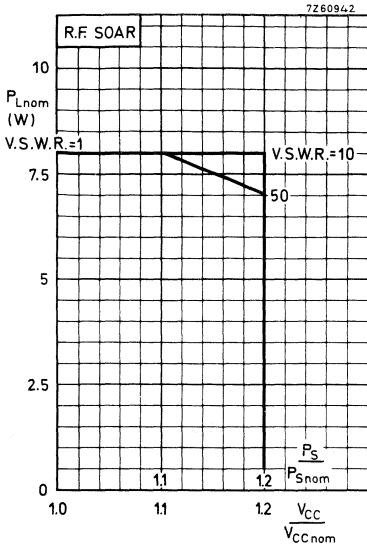
Component lay-out and printed circuit board for 175 MHz test circuit.



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 $V.S.W.R. = 1$
 $T_h = 70^\circ\text{C}$ $R_{th mb-h} \cong 0.6 \text{ K/W}$
 $V_{CCnom} = 12.5 \text{ or } 13.5 \text{ V}$

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.

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

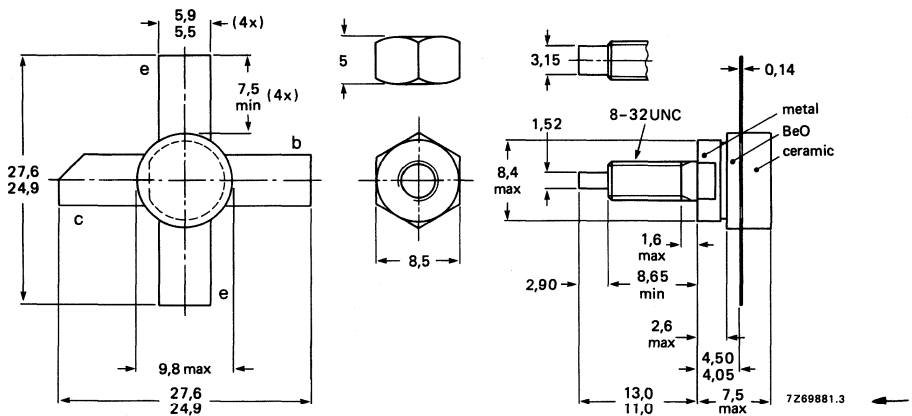
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

PRODUCT SAFETY 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

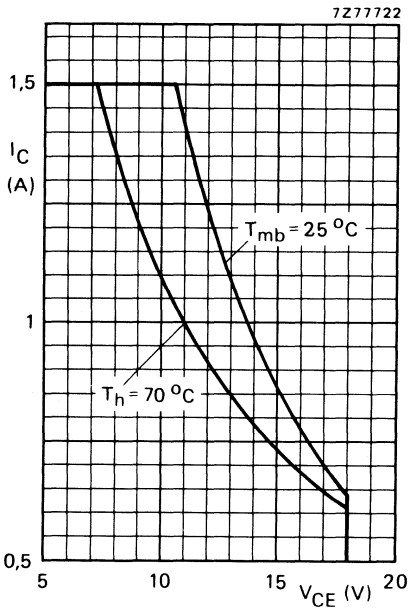


Fig. 2 D.C. SOAR.

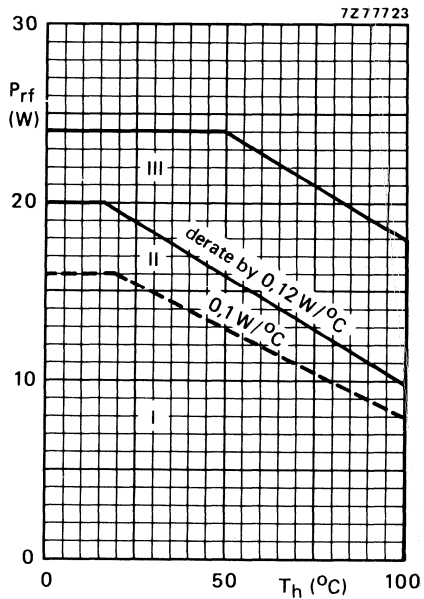


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th j-mb(rf)}$	=	8,6 K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,45 K/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

 $ESBO > 0,5\text{ mJ}$ $R_{BE} = 10\ \Omega$ $ESBR > 0,5\text{ mJ}$

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: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

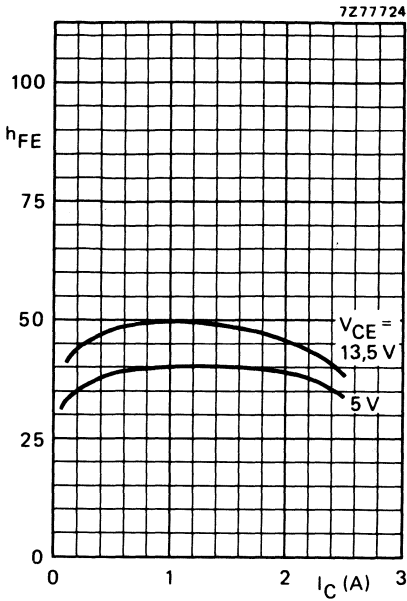


Fig. 4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

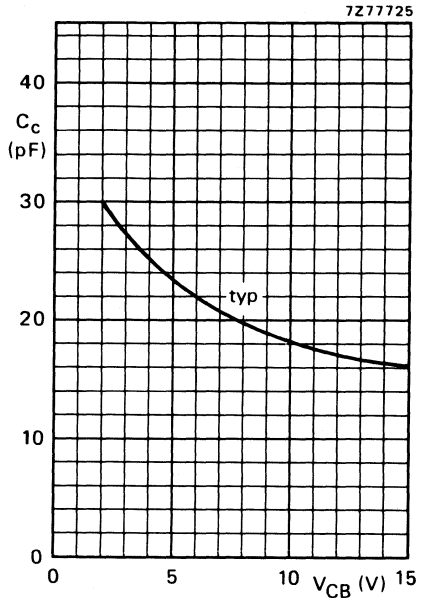


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

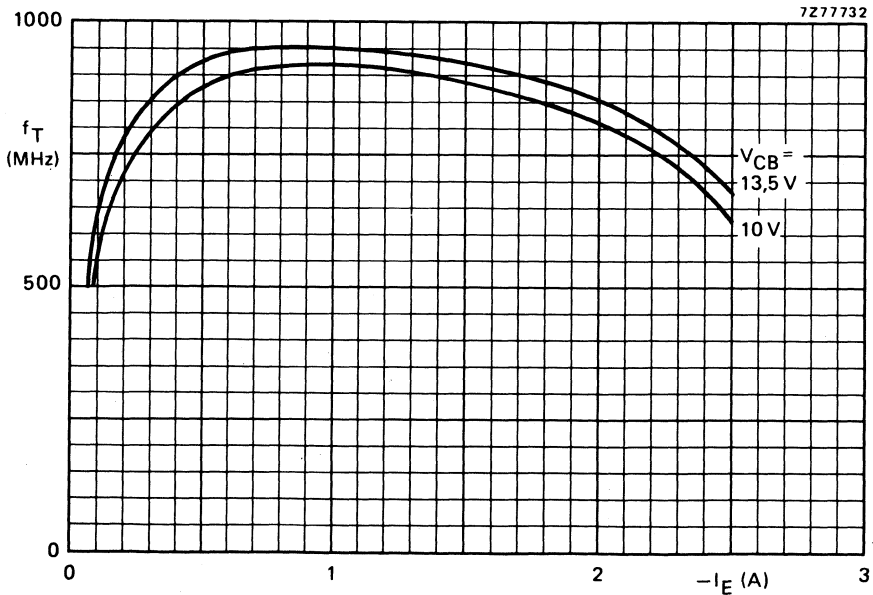


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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 (mS)
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	—	—

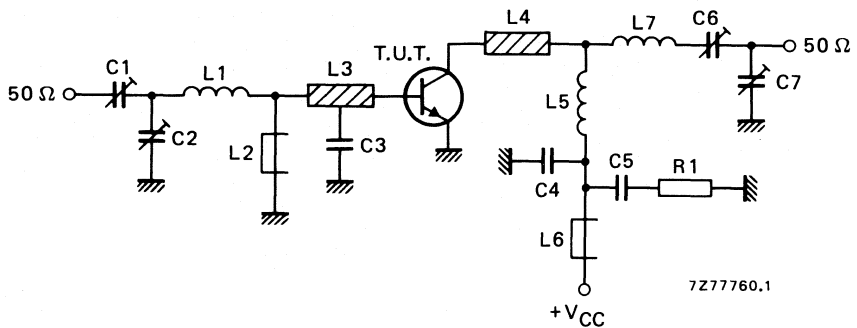


Fig. 7 Test circuit; c.w. class-B.

List of components:

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

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

C3 = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

C7 = 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 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = L4 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor

L5 = 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

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistor

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

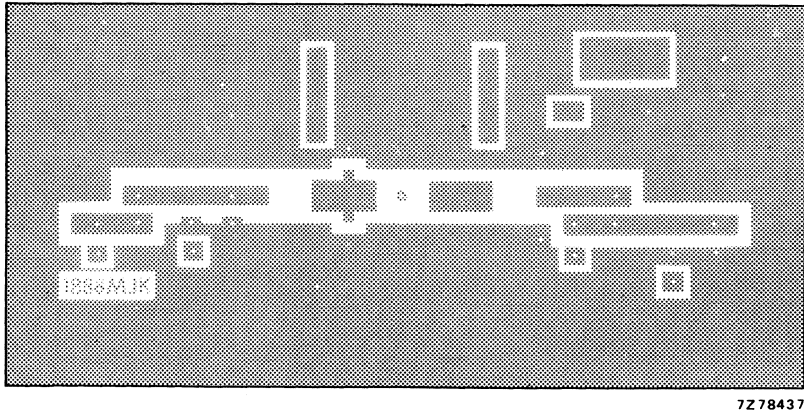
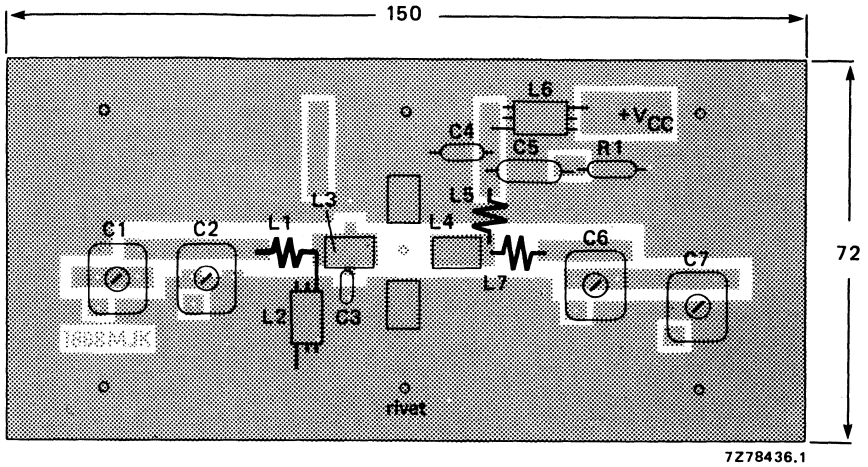


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

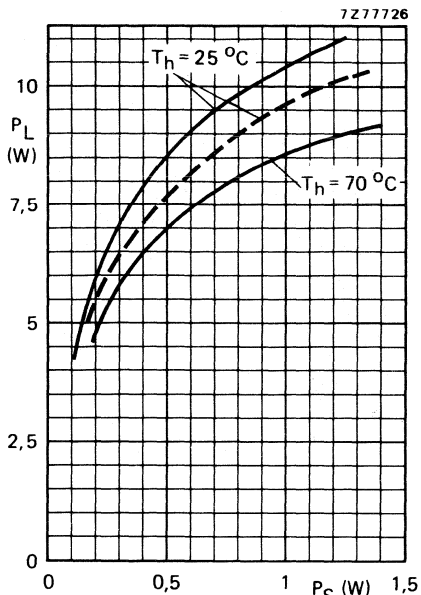


Fig. 9 Typical values; $f = 175$ MHz;
 — $V_{CE} = 13,5$ V; - - - $V_{CE} = 12,5$ V.

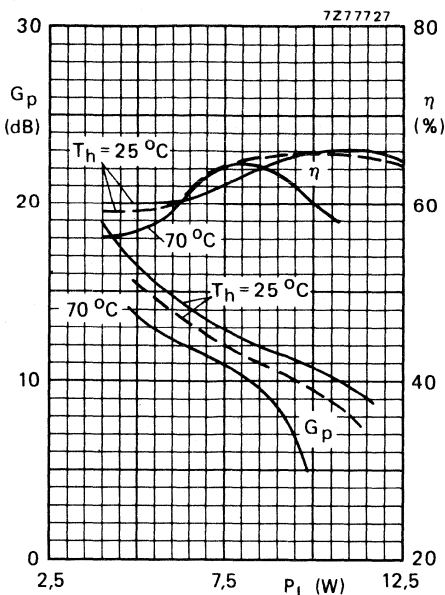


Fig. 10 Typical values; $f = 175$ MHz;
 — $V_{CE} = 13,5$ V; - - - $V_{CE} = 12,5$ V.

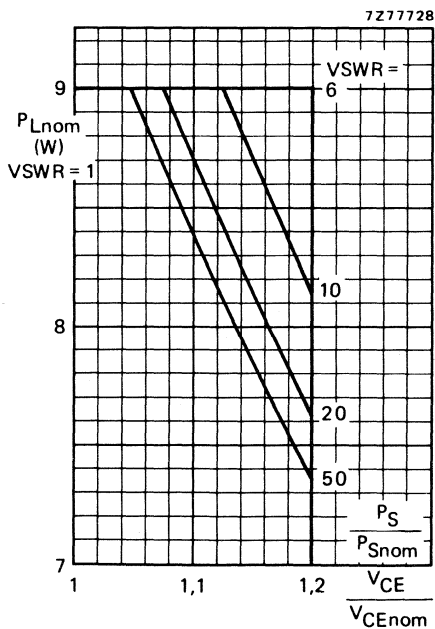


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175$ MHz; $T_h = 70$ °C; $R_{th\ mb-h} = 0,45$ K/W; $V_{CEnom} = 13,5$ V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and $VSWR = 1$.

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.

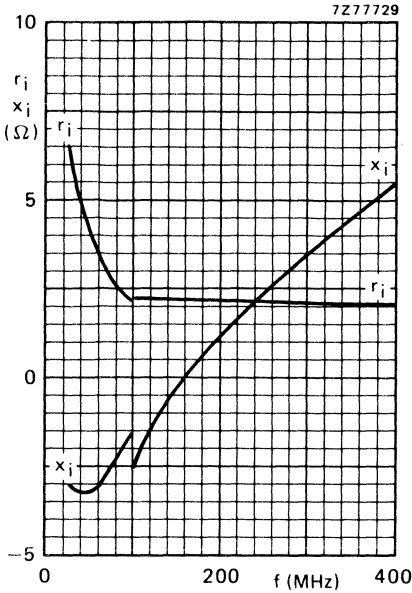


Fig. 12 Input impedance (series components).

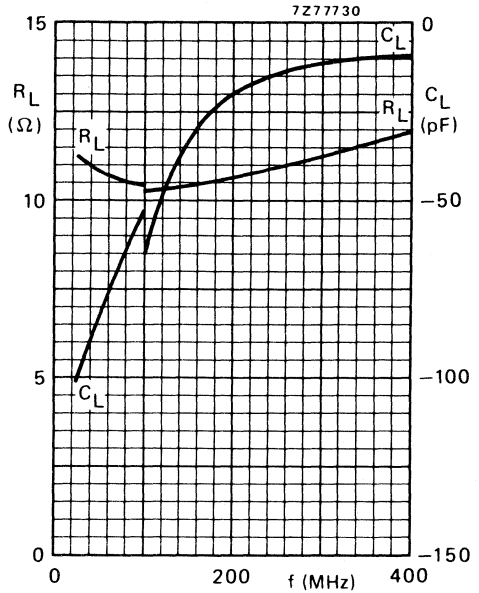


Fig. 13 Load impedance (parallel components).

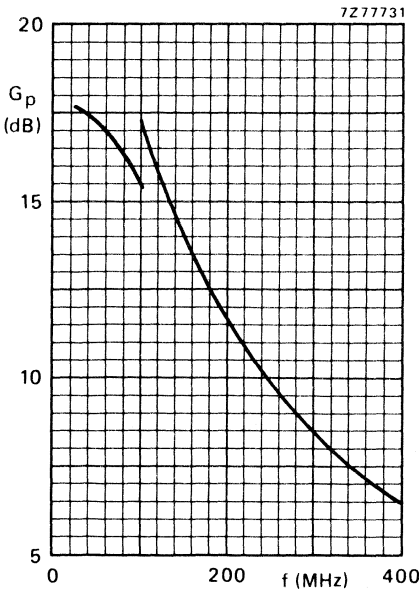


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; $V_{CE} = 13,5$ V; $P_L = 8$ W;
 $T_h = 25$ $^{\circ}$ 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 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 and is guaranteed to withstand 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

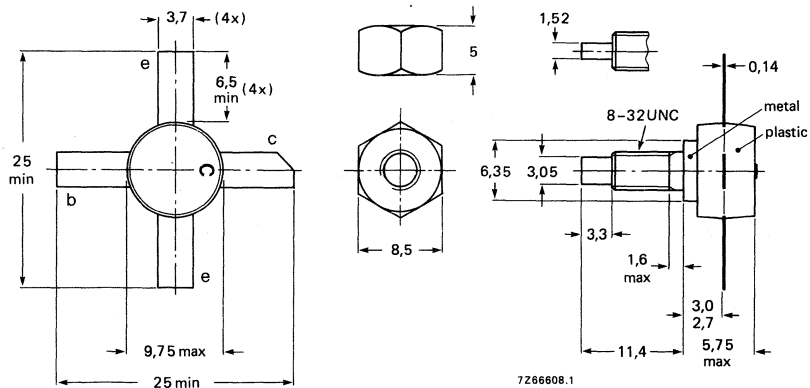
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
c.w.	13,5	175	15	> 7,5	> 65	2,3 + j2,2	128 - j4,4
c.w.	12,5	175	15	typ. 7,5	typ. 65	-	-

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



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.

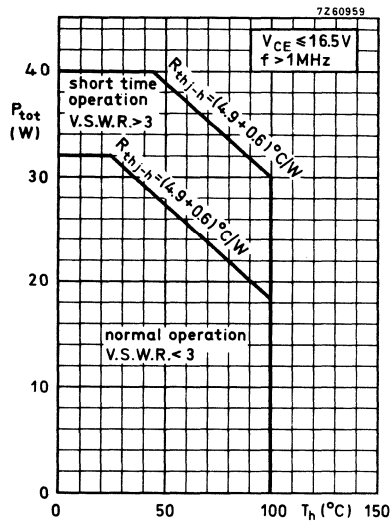
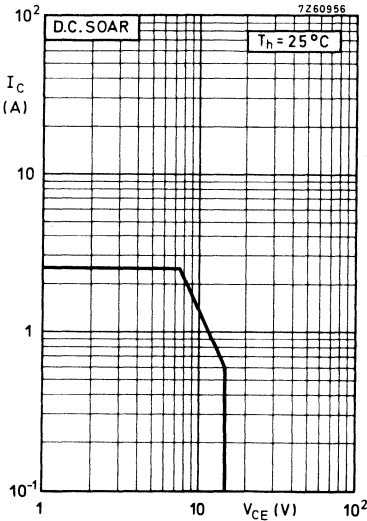
When locking is required an adhesive is preferred instead of a lock washer.

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

BLY88A

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

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
Collector current (average)	$I_C(AV)$	max.	2.5	A
Collector (peak value) $f > 1$ MHz	I_{CM}	max.	7.5	A
Total power dissipation up to $T_h = 25^\circ\text{C}$ $f > 1$ MHz	P_{tot}	max.	32	W



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	K/W
From mounting base to heatsink	R_{mb-h}	=	0.6	K/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
 $-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$ $E > 2.0\text{ ms}$
 $E > 4.5\text{ ms}$

D.C. current gain

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

Transition frequency

$I_C = 1\text{ A}; V_{CE} = 10\text{ V}$ $f_T \text{ typ. } 700\text{ MHz}$

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

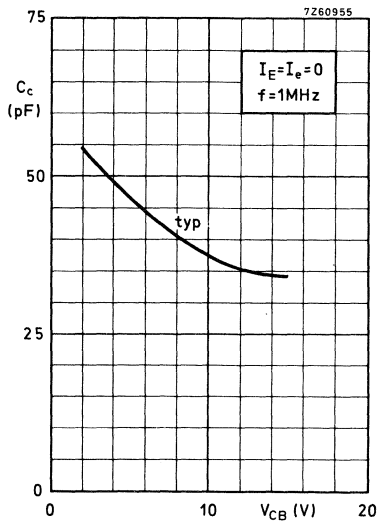
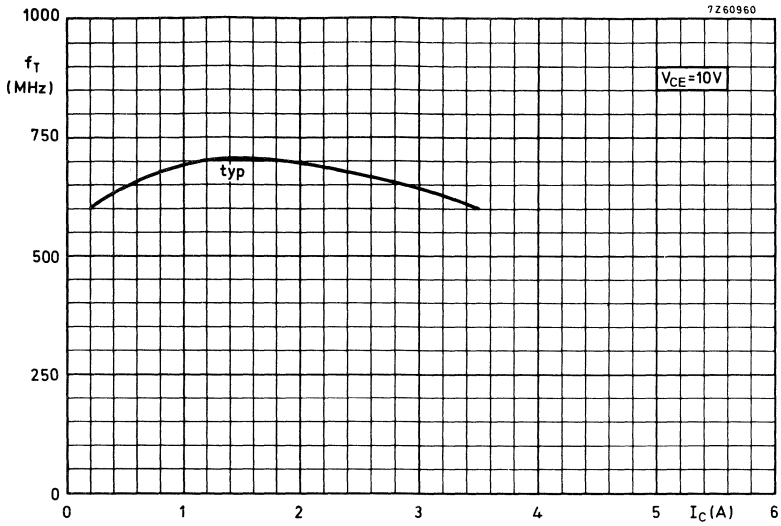
$I_E = I_e = 0; V_{CB} = 15\text{ V}$ $C_c \text{ typ. } 34\text{ pF}$
 $< 40\text{ pF}$

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

$I_C = 100\text{ mA}; V_{CE} = 15\text{ V}$ $-C_{re} \text{ typ. } 25\text{ pF}$

Collector-stud capacitance

$C_{CS} \text{ typ. } 2\text{ pF}$



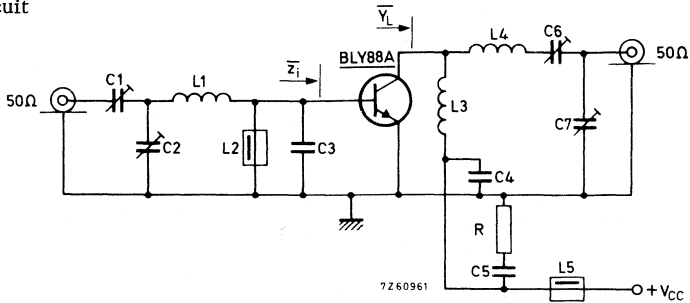
APPLICATION INFORMATION

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

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

$V_{CC}(\text{V})$	$P_S(\text{W})$	$P_L(\text{W})$	$I_C(\text{A})$	$G_p(\text{dB})$	$\eta(\%)$	$\bar{z}_i(\Omega)$	$\bar{Y}_L(\text{mS})$
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



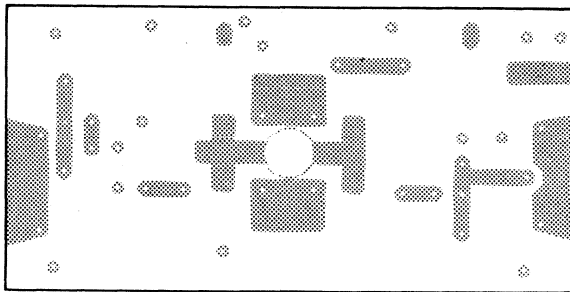
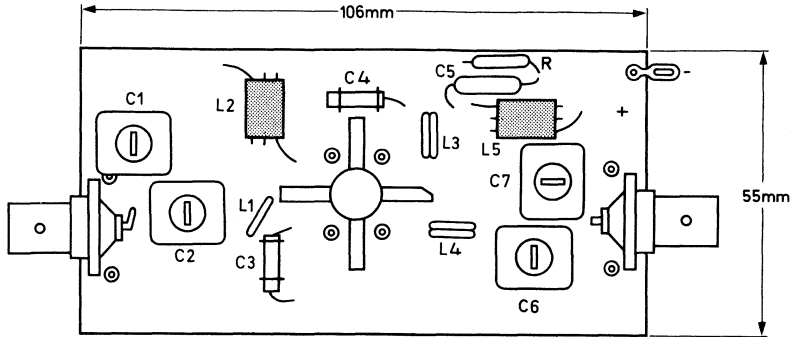
- $C1 =$ 2.5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
 $C2=C6=C7 =$ 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
 $C3 =$ 47 pF ceramic
 $C4 =$ 100 pF ceramic
 $C5 =$ 150 nF polyester

- $L1 =$ 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

$R = 10 \Omega$ carbon

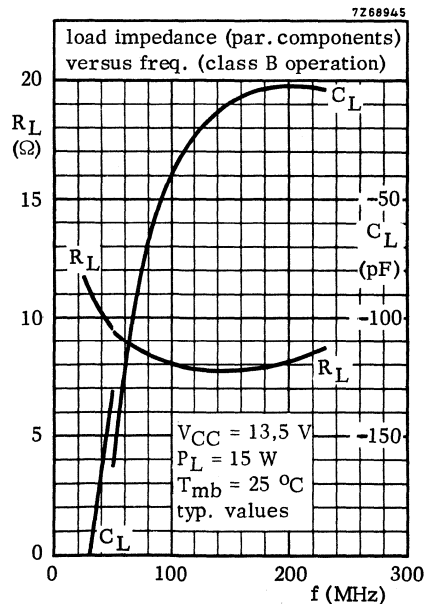
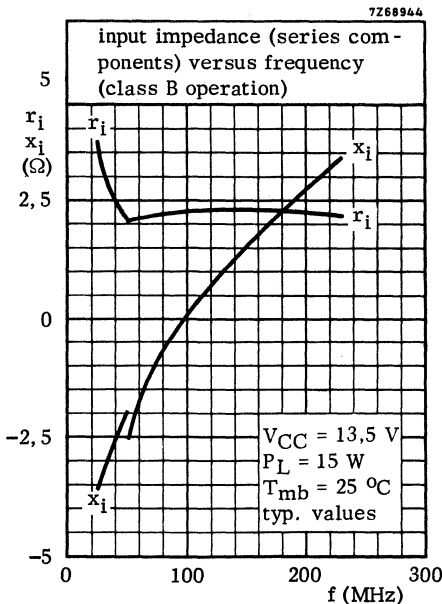
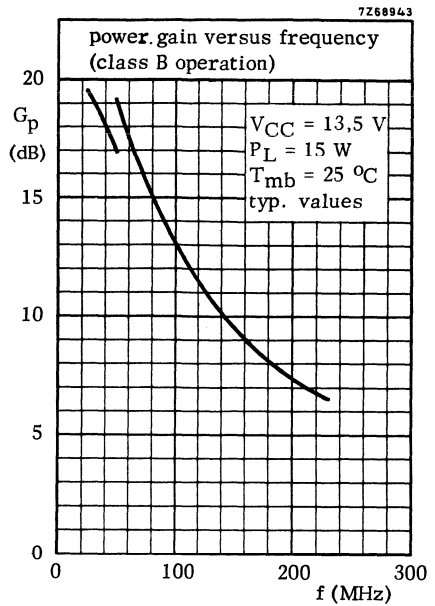
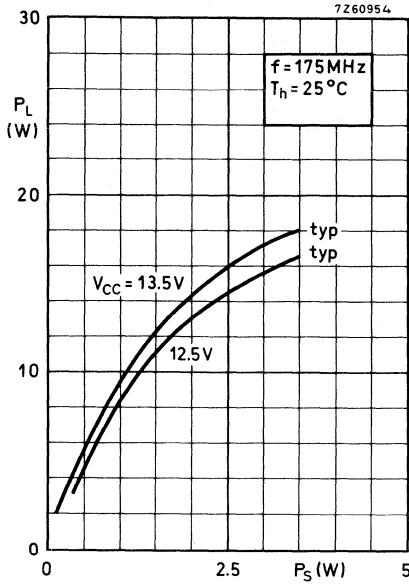
APPLICATION INFORMATION (continued)

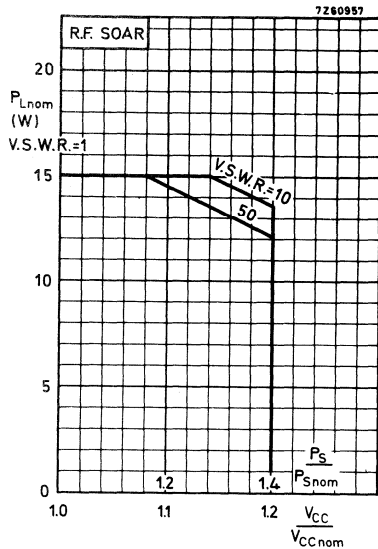
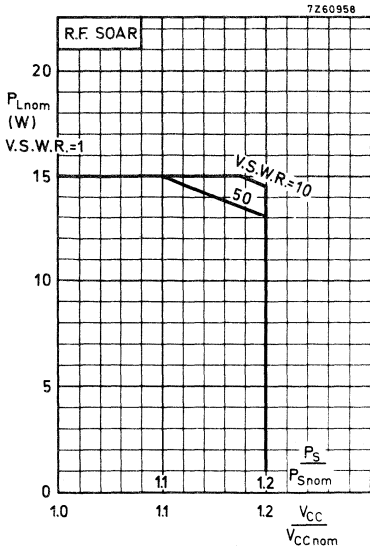
Component lay-out and printed circuit board for 175 MHz test circuit.



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 10Ω 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 $V.S.W.R. = 1$
 $T_h = 70 \text{ }^\circ\text{C}$ $R_{th \text{ mb-h}} = 0.6 \text{ K/W}$
 $V_{CCnom} = 12.5 \text{ or } 13.5 \text{ V}$ 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

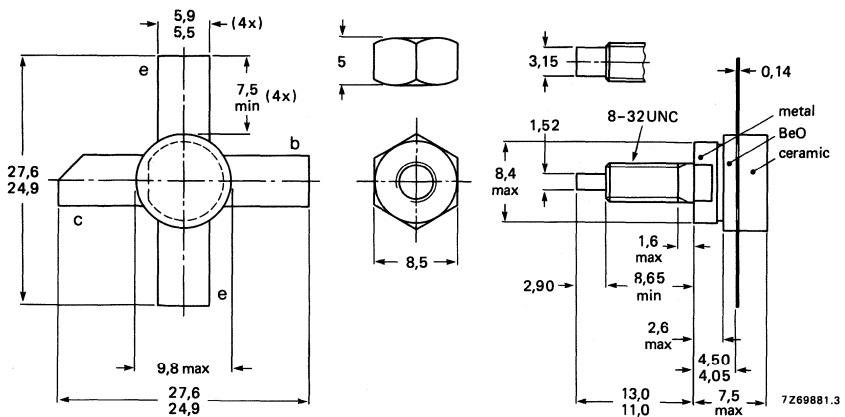
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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-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.

PRODUCT SAFETY 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

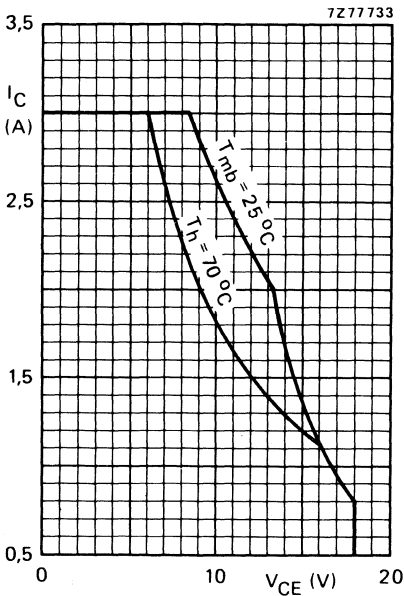


Fig. 2 D.C. SOAR.

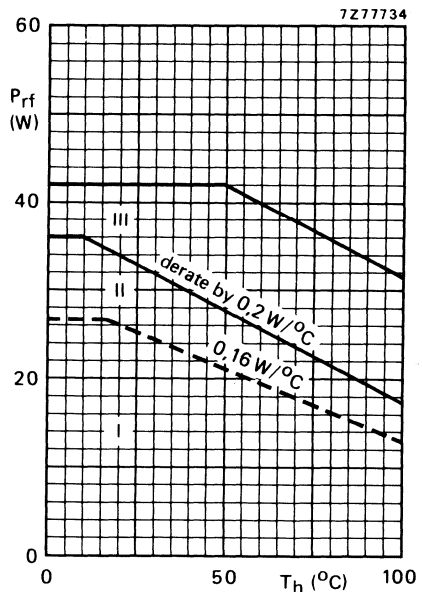


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; $f > 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	= 4,95 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	= 0,45 K/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

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

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: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

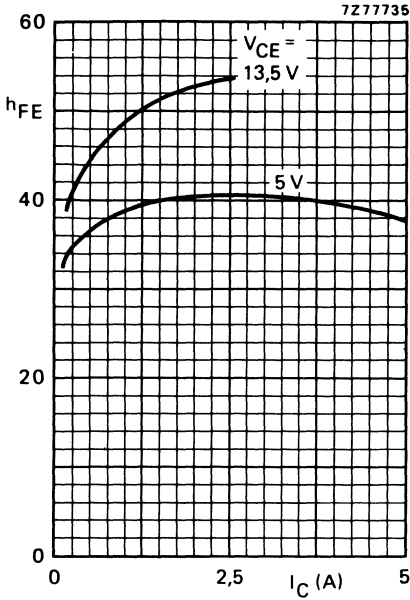


Fig. 4 Typical values; $T_j = 25$ °C.

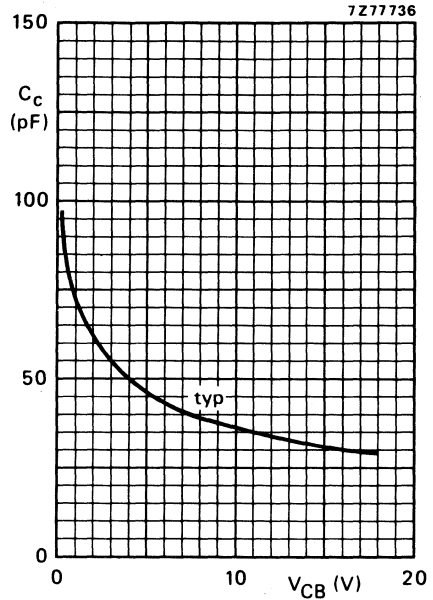


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C.

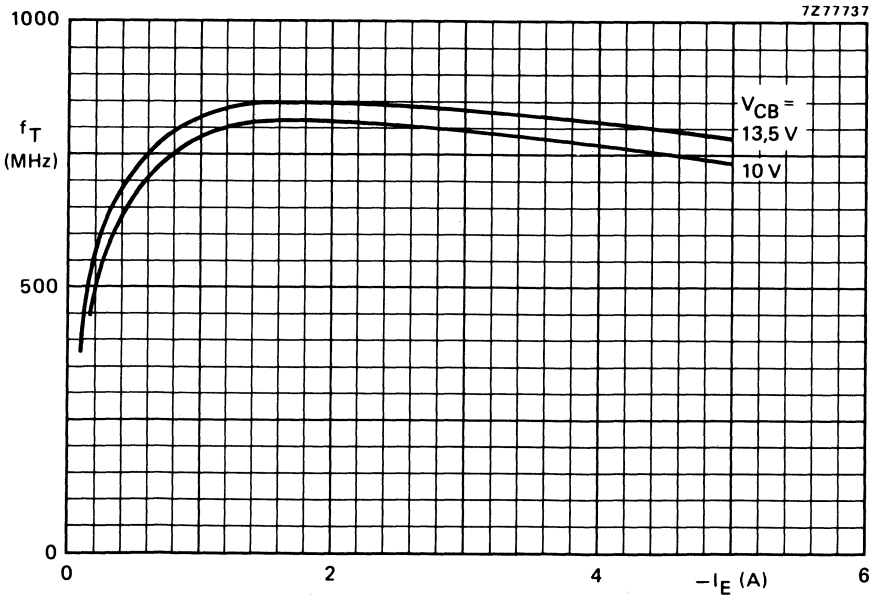


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25$ °C.

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 (mS)
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	—	—

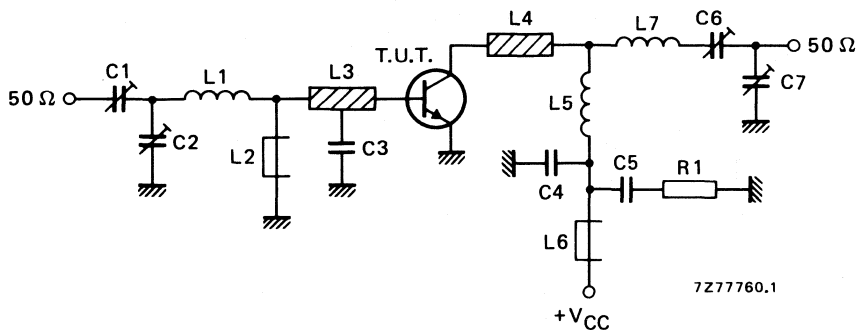


Fig. 7 Test circuit; c.w. class-B.

List of components:

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

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

C3 = 47 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

C7 = 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 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L3 = L4 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor

L5 = 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

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistor

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

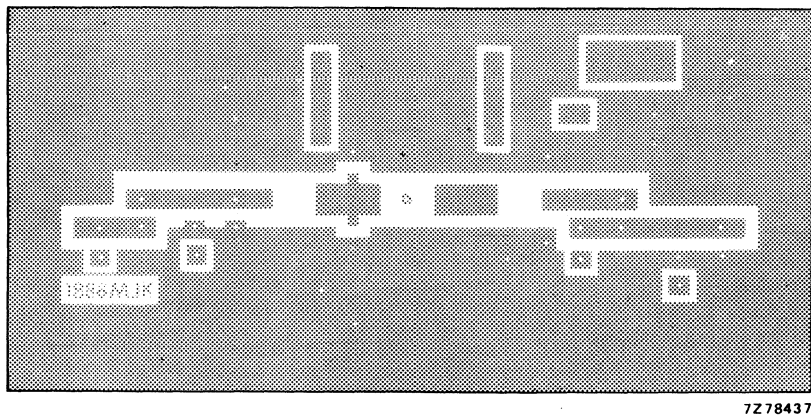
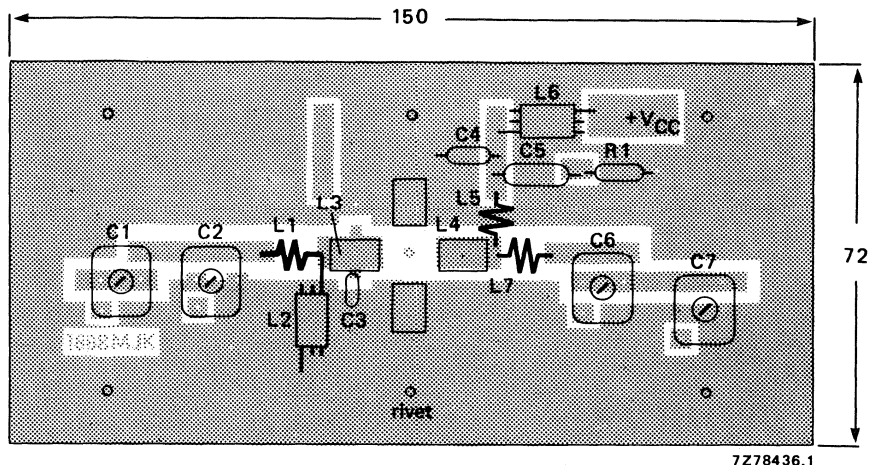


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

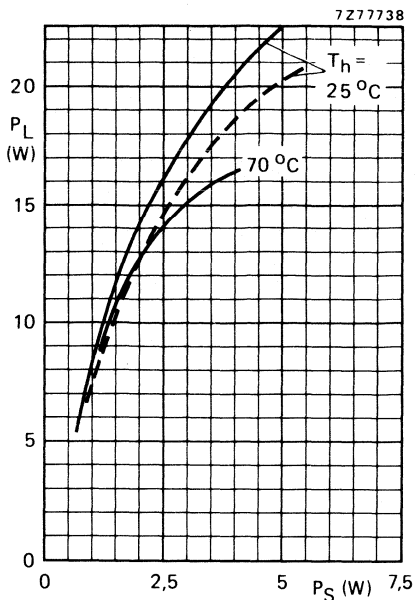


Fig. 9 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

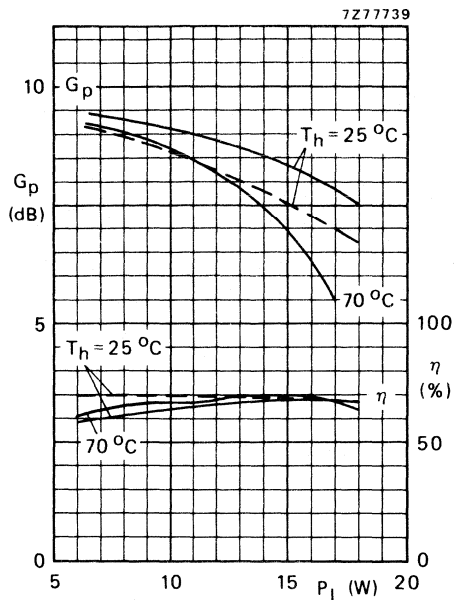


Fig. 10 Typical values; $f = 175 \text{ MHz}$;
 — $V_{CE} = 13,5 \text{ V}$; - - - $V_{CE} = 12,5 \text{ V}$.

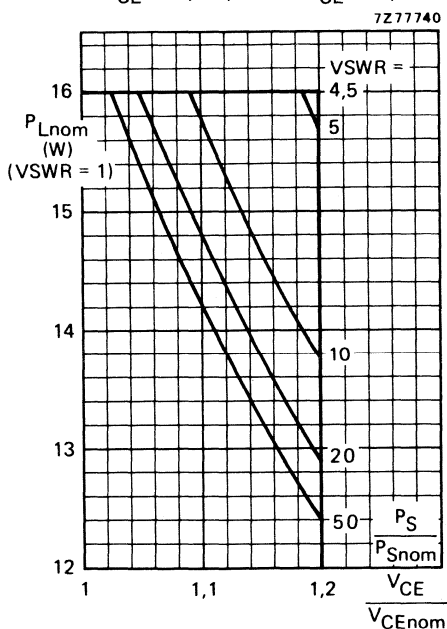


Fig. 11 R.F. SOAR (short-time operation during mismatch); $f = 175 \text{ MHz}$; $T_h = 70 \text{ }^\circ\text{C}$;
 $R_{th \text{ mb-h}} = 0,45 \text{ K/W}$; $V_{CE \text{ nom}} = 13,5 \text{ V}$ or $12,5 \text{ V}$; $P_S = P_{S \text{ nom}}$ at $V_{CE \text{ nom}}$ and $V_{SWR} = 1$.

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.

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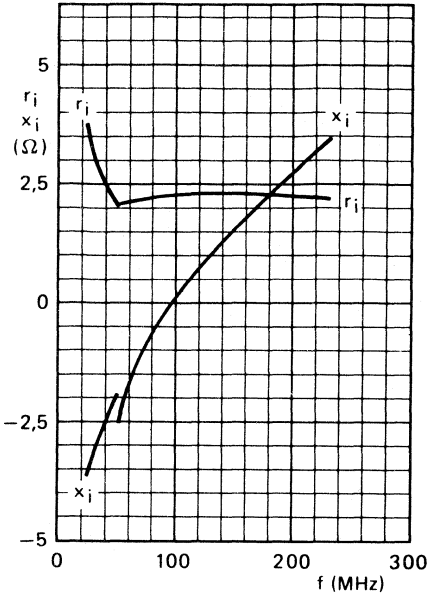


Fig. 12 Input impedance (series components).

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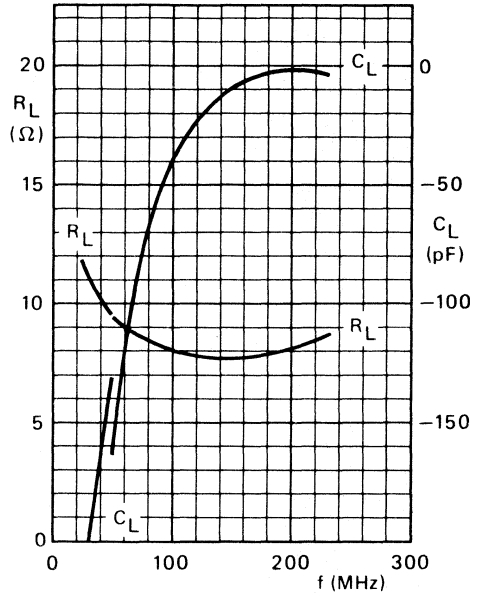


Fig. 13 Load impedance (parallel components).

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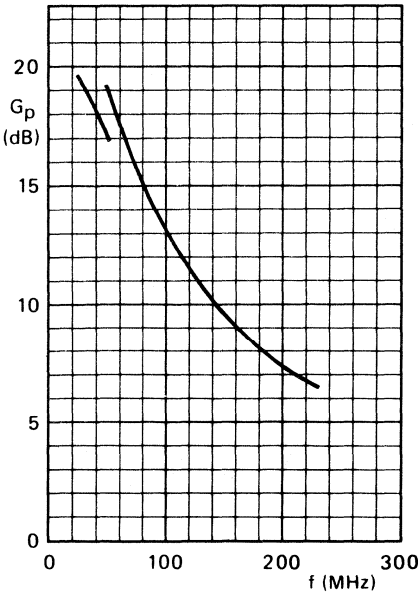


Fig. 14.

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 1/4" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

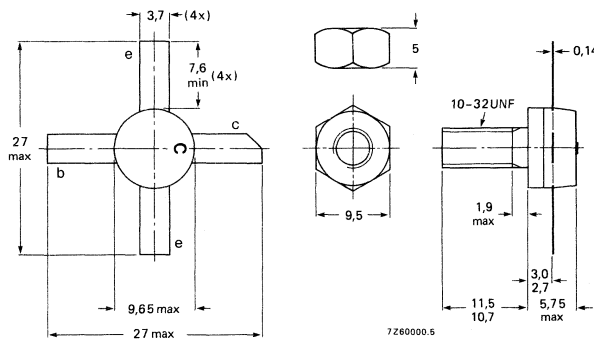
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

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 mS
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.



Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

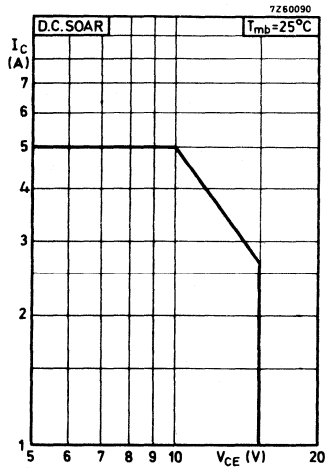
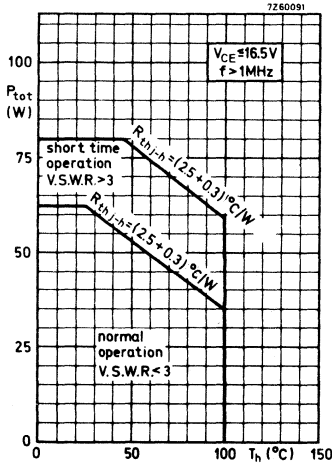
Diameter of clearance hole in heatsink: max. 4,9 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

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

PRODUCT SAFETY 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.	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.	5 A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	10 A
Total power dissipation up to $T_{mb} = 25$ °C $f > 1$ MHz	P_{tot}	max.	70 W



Storage temperature

T_{stg} -30 to +200 °C

Operating junction temperature

T_j max. 200 °C

THERMAL RESISTANCE

From junction to mounting base

$R_{th j-mb} = 2.5$ K/W

From mounting base to heatsink

$R_{th mb-h} = 0.3$ K/W

CHARACTERISTICS

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

Breakdown voltages

Collector-base voltage open emitter, $I_C = 50\text{ mA}$	$V_{(BR)CBO}$	>	36 V
Collector-emitter voltage open base, $I_C = 50\text{ mA}$	$V_{(BR)CEO}$	>	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	>	8 ms
$-V_{BE} = 1.5\text{ V}$; $R_{BE} = 33\Omega$	E	>	8 ms

D.C. current gain

$I_C = 1\text{ A}$; $V_{CE} = 5\text{ V}$

h_{FE}	typ.	50
		10 to 120

Transition frequency

$I_C = 4\text{ A}$; $V_{CE} = 10\text{ V}$

f_T	typ.	650 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.	65 pF
	<	90 pF

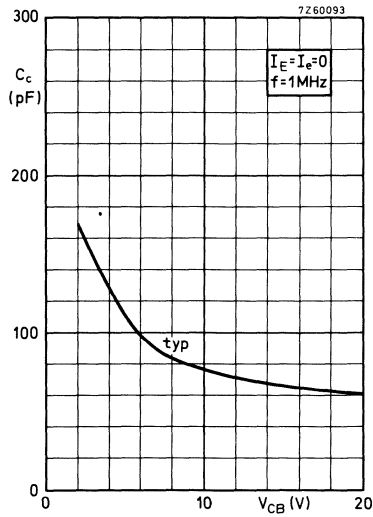
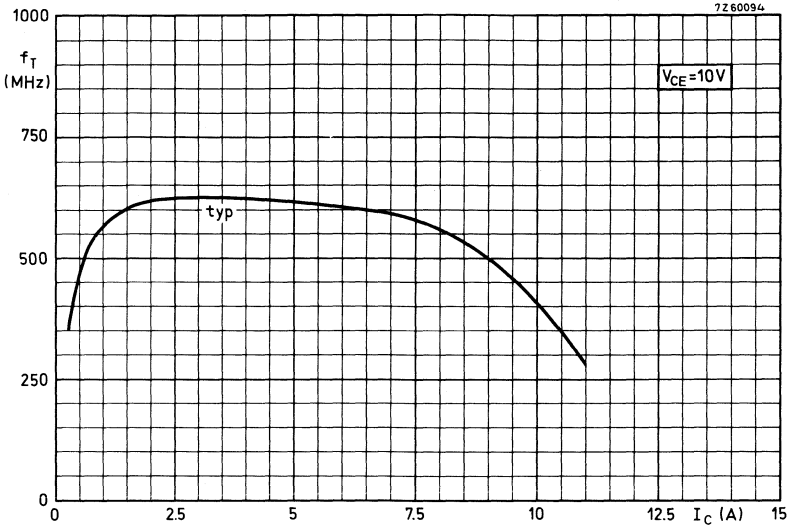
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}$; $V_{CE} = 15\text{ V}$

C_{re}	typ.	41 pF
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Collector-stud capacitance

C_{cs}	typ.	2 pF
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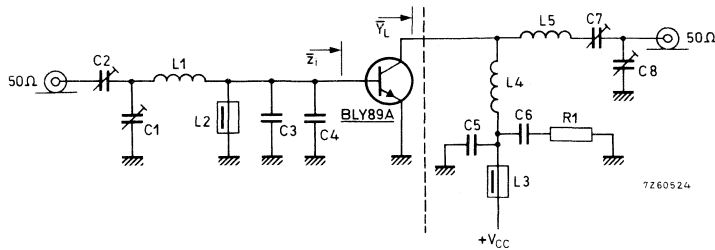
APPLICATION INFORMATION

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

 $V_{CC} = 13.5 \text{ V}$; T_{mb} up to 25°C

f(MHz)	PS (W)	PL (W)	IC (A)	G _p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mS)
175	< 6.25	25	< 2.64	> 6	> 70	$1.6 + j1.4$	$213 + j5.5$

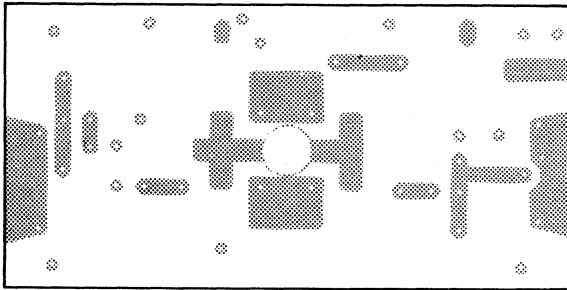
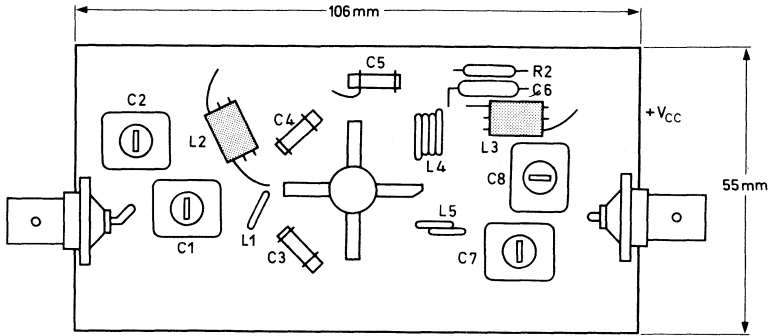
Test circuit



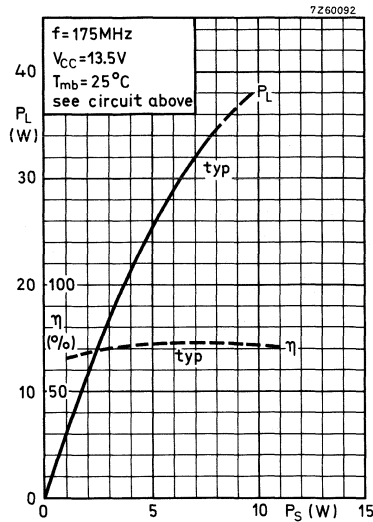
- C1 = 4 to 44 pF film dielectric trimmer (code number 2222 809 07008)
 C2 = 2 to 22 pF film dielectric trimmer (code number 2222 809 07004)
 C3 = C4 = 47 pF ceramic
 C5 = 100 pF ceramic
 C6 = 150 nF polyester
 C7 = 4 to 104 pF film dielectric trimmer (code number 2222 809 07015)
 C8 = 4 to 64 pF film dielectric trimmer (code number 2222 809 07011)
- L1 = 0.5 turn enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2 x 6 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 2 x 6 mm
 L5 = 1 turn enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2 x 6 mm
 R1 = 10 Ω carbon

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.

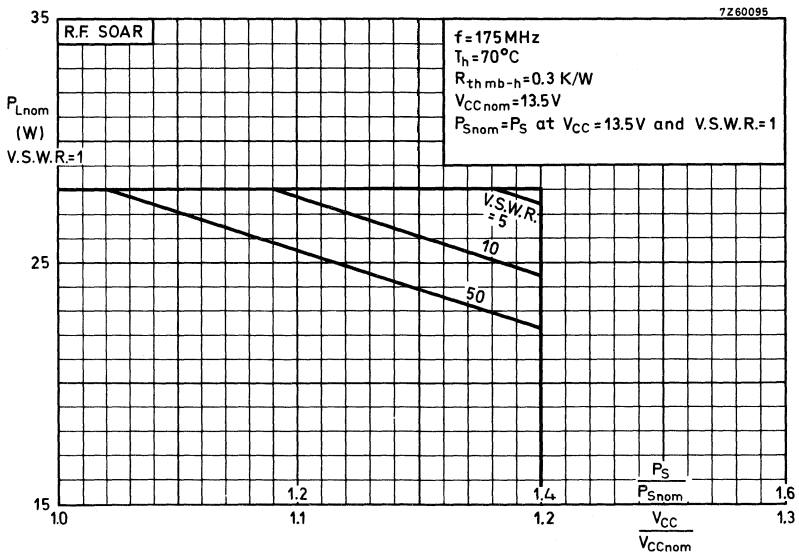
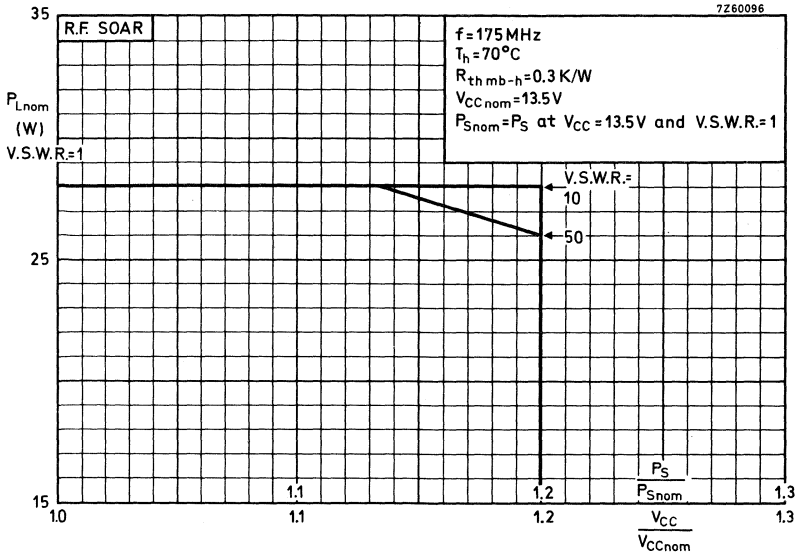


The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs next page for safe operation at supply voltages other than the nominal. The graphs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

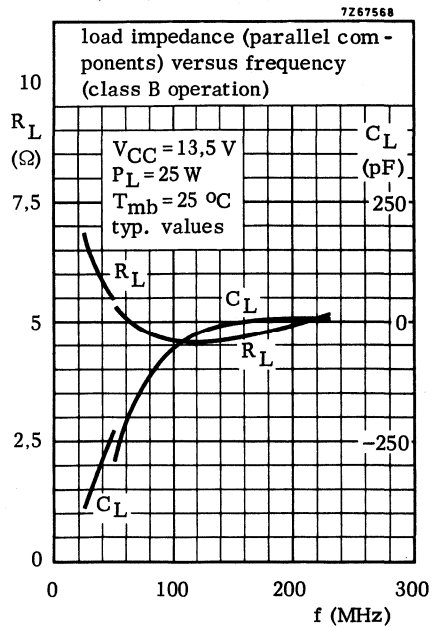
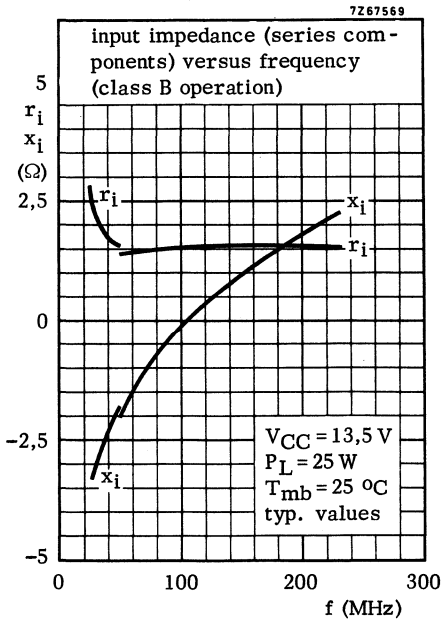
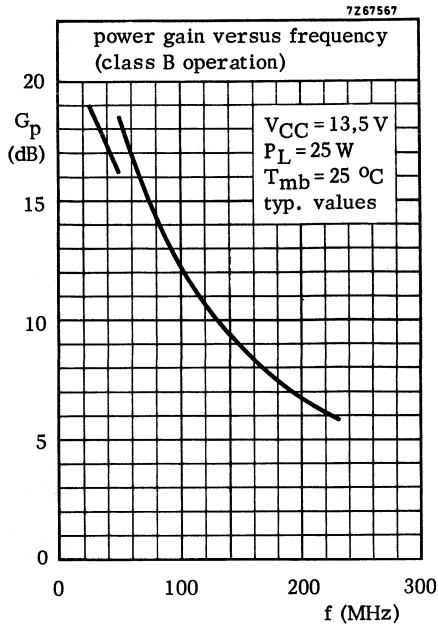
The upper graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.

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.



OPERATING NOTE Below 50 MHz a base-emitter resistor of 10Ω 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

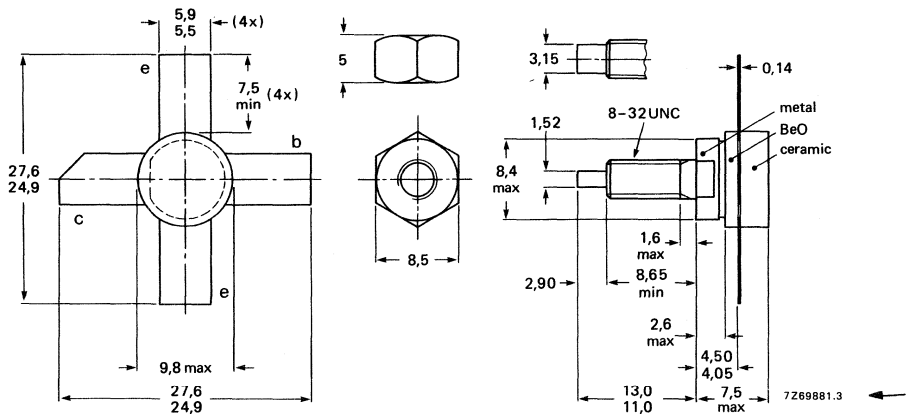
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
c.w.	13,5	175	25	> 6	> 70	$1,6 + j1,4$	$210 + j5,5$

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.

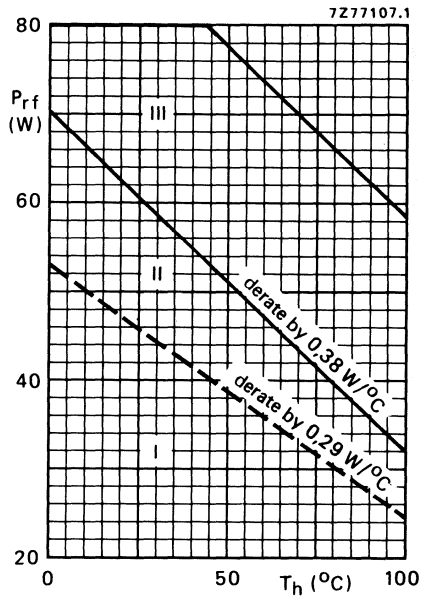
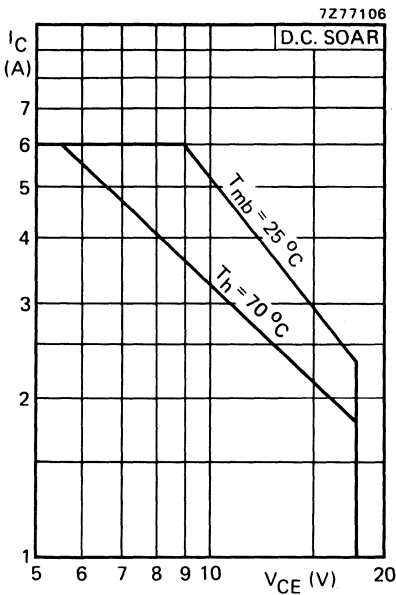
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY 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)

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	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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	2,3 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,45 K/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

 $-V_{BE} = 1,5\text{ V}; R_{BE} = 33\text{ }\Omega$ $E > 8\text{ ms}$ $E > 8\text{ ms}$

D.C. current gain*

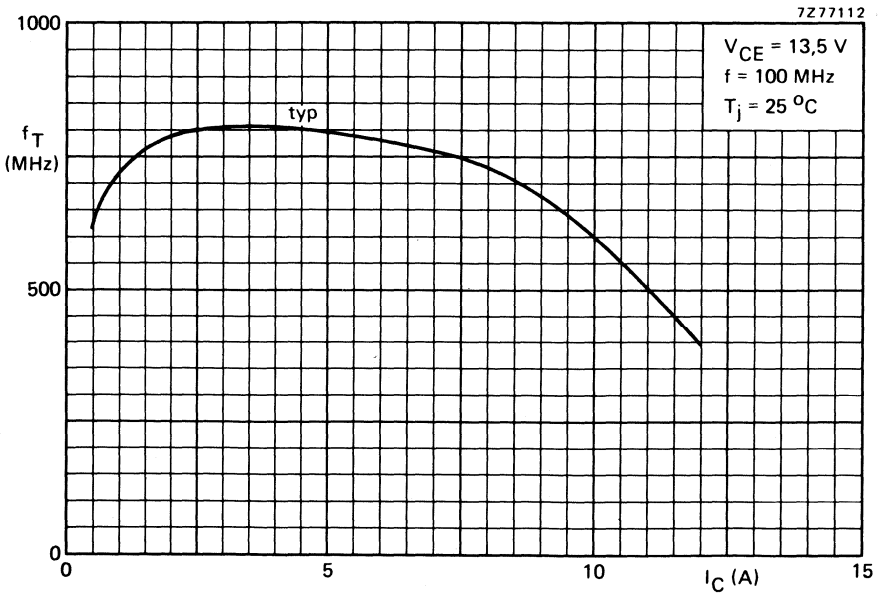
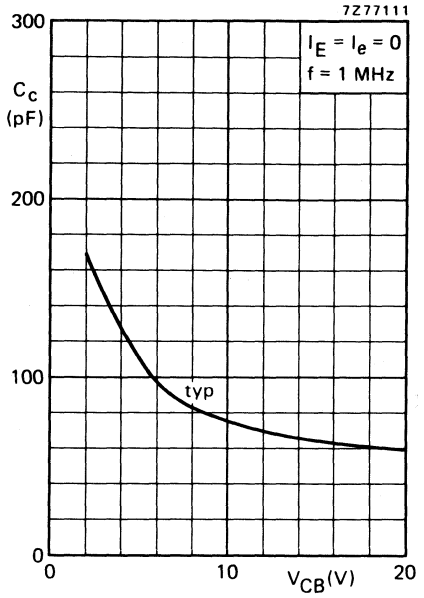
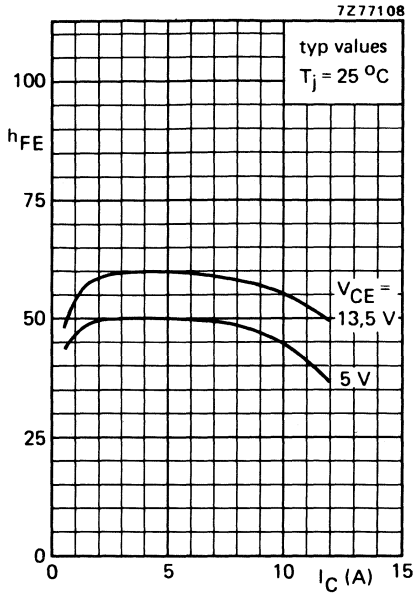
 $I_C = 2,5\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ 50
10 to 80

Collector-emitter saturation voltage*

 $I_C = 7,5\text{ A}; I_B = 1,5\text{ A}$ V_{CEsat} typ 1,7 VTransition frequency at $f = 100\text{ MHz}$ * $I_C = 2,5\text{ A}; V_{CE} = 13,5\text{ V}$ $I_C = 7,5\text{ A}; V_{CE} = 13,5\text{ V}$ f_T typ 800 MHz f_T typ 750 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_c typ 65 pF
< 90 pFFeedback 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: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.



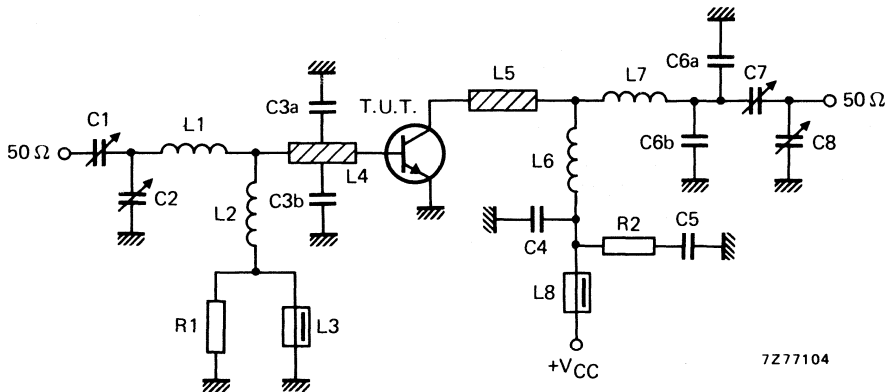
APPLICATION INFORMATION

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

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

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 (mS)
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

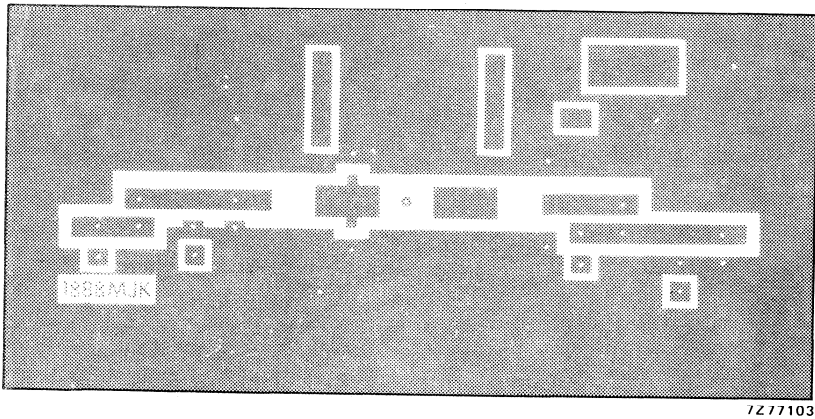
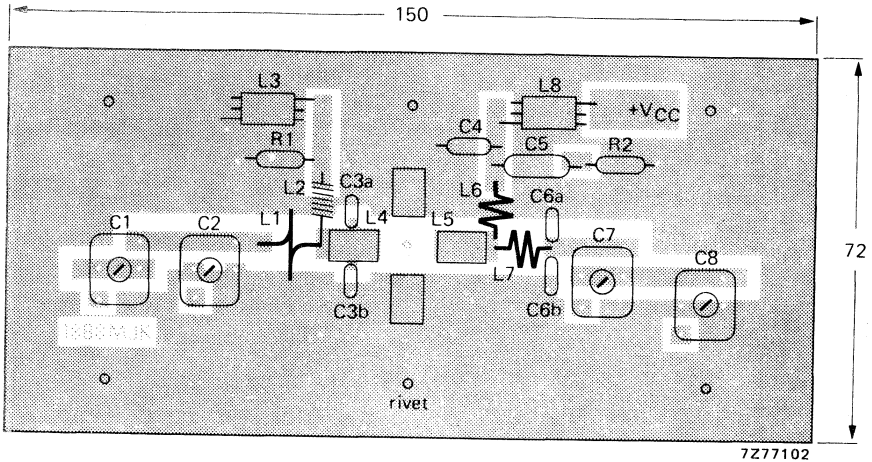
L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

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

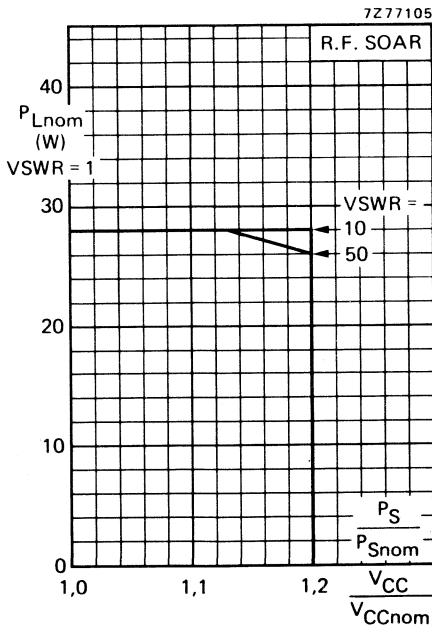
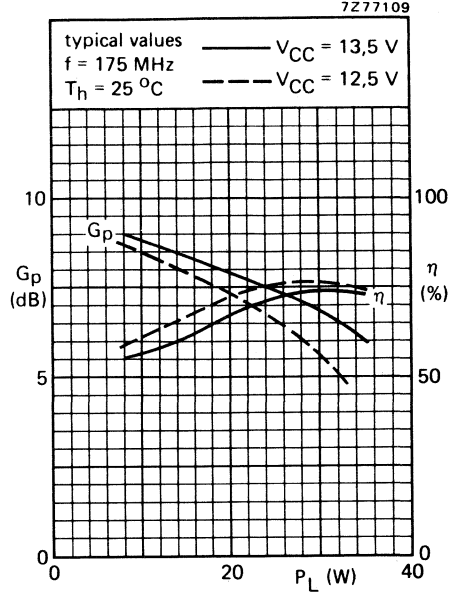
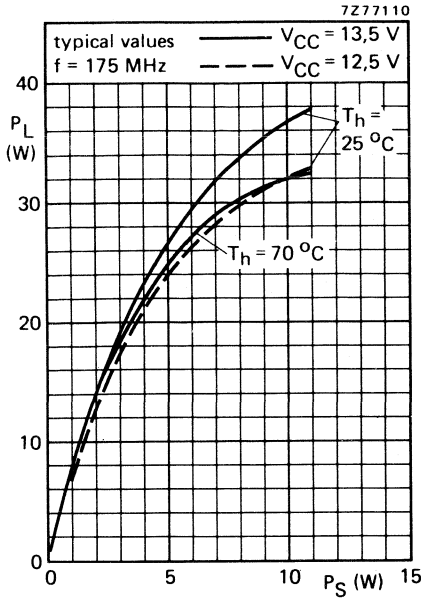
R1 = 10 Ω ($\pm 10\%$) carbon resistorR2 = 4,7 Ω ($\pm 5\%$) carbon resistor

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.



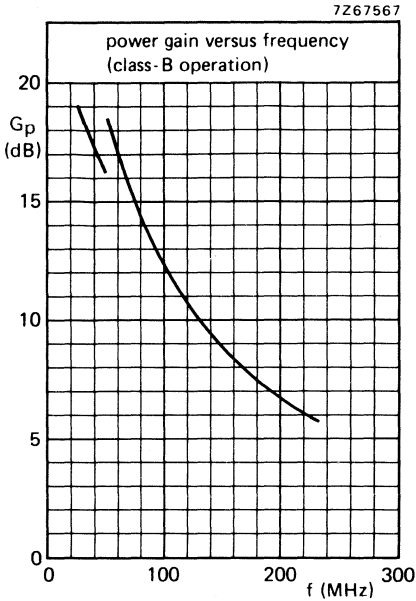
Conditions for R.F. SOAR

$f = 175 \text{ MHz}$
 $T_h = 70 \text{ }^\circ\text{C}$
 $R_{th \text{ mb-h}} = 0,45 \text{ K/W}$
 $V_{CCnom} = 13,5 \text{ V}$
 $P_S = P_{Snom}$ at $V_{CCnom} = 13,5 \text{ V}$ 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.

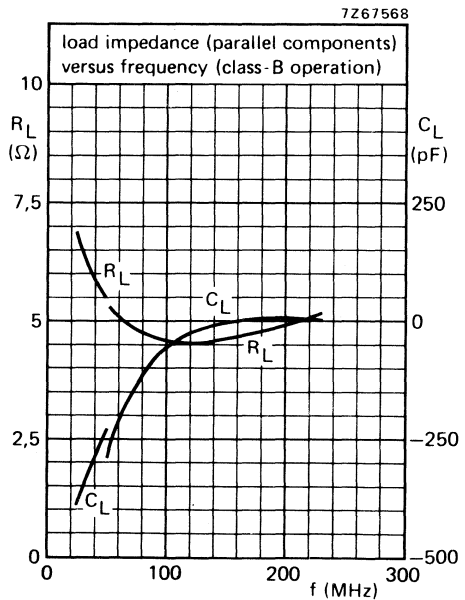
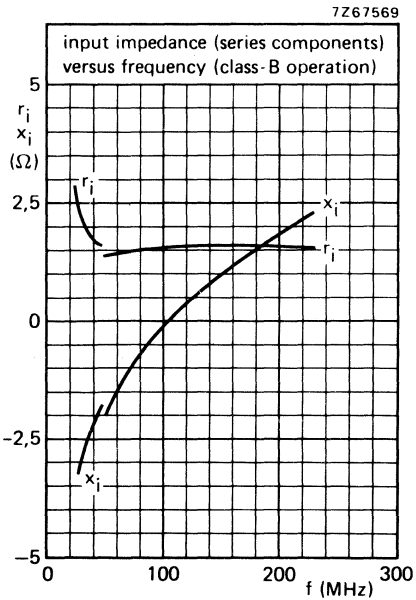
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

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



**Measuring conditions for the graphs
on this page**

$V_{CC} = 13,5$ V
 $P_L = 25$ W
 $T_h = 25$ °C
 typical values



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

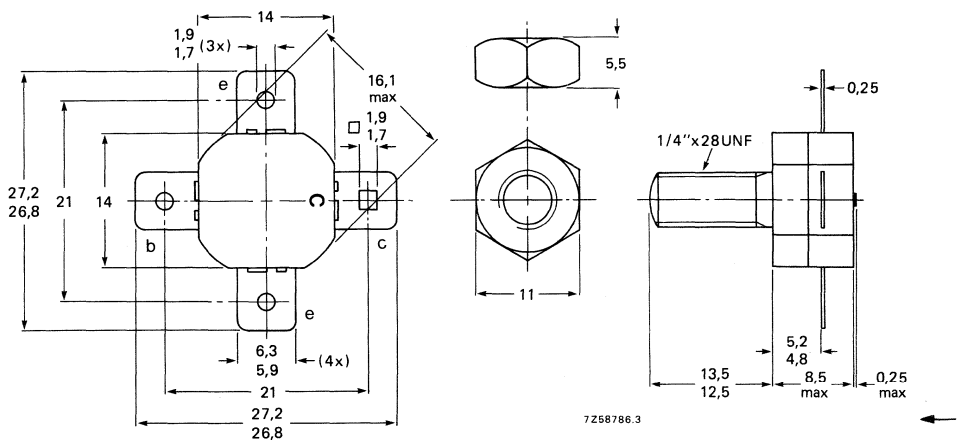
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

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 mS
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.



Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

Diameter of clearance hole in heatsink: max. 6,4 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.

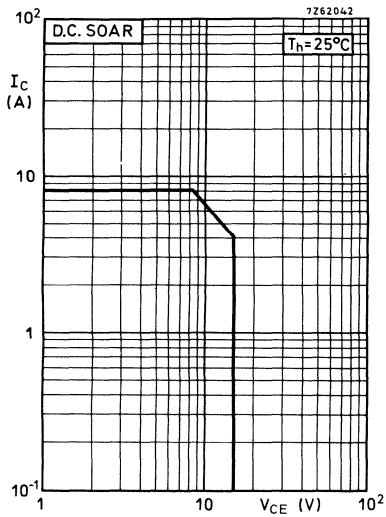
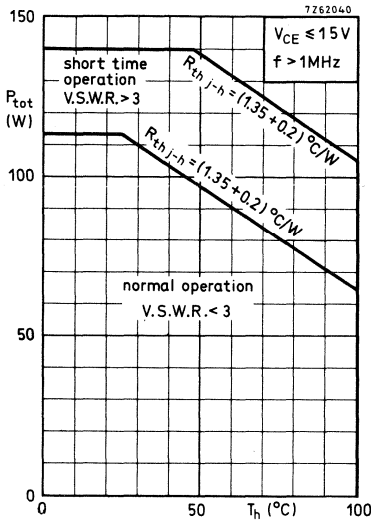
When locking is required an adhesive is preferred instead of a lock washer.

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

BLY90

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

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
Collector current (average)	$I_{C(AV)}$	max.	8	A
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	20	A
Total power dissipation up to $T_{mb} = 25^\circ\text{C}$ $f > 1$ MHz	P_{tot}	max.	130	W



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

$R_{th\ j-mb}$	=	1.35	K/W
$R_{th\ mb-h}$	=	0.2	K/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	ms
$-V_{BE} = 1.5\text{ V}; R_{BE} = 33\ \Omega$	E	>	8	ms

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 $f = 1\text{ MHz}$

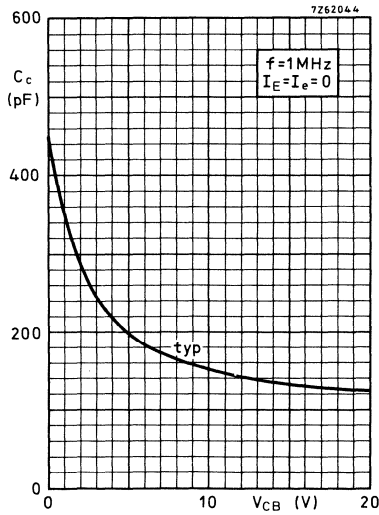
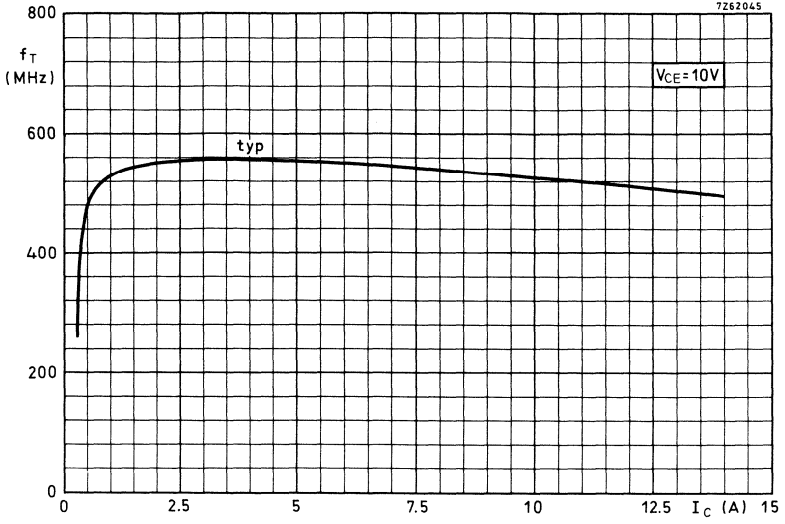
$I_E = I_e = 0; V_{CB} = 15\text{ V}$	C_c	typ.	130	pF
		<	160	pF

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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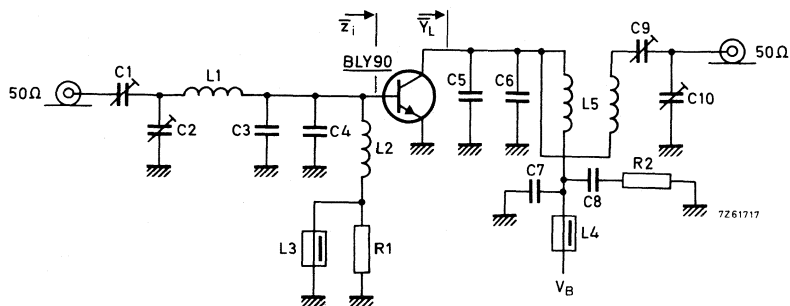
APPLICATION INFORMATION

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}_1 (Ω)	\bar{Y}_L (mS)
12,5	< 15,8	50	< 5,33	> 5,0	> 75	$1,3 + j 1,6$	$270 + j 170$

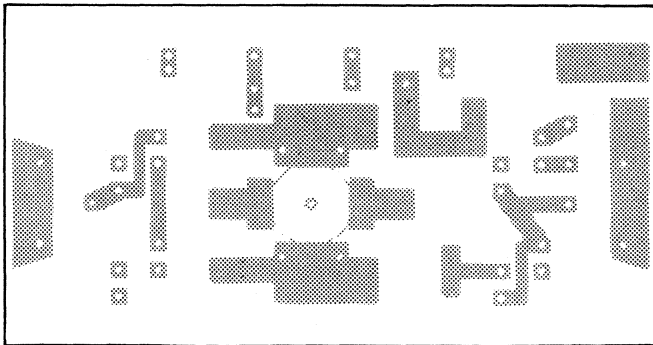
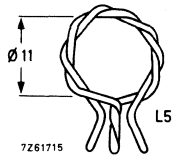
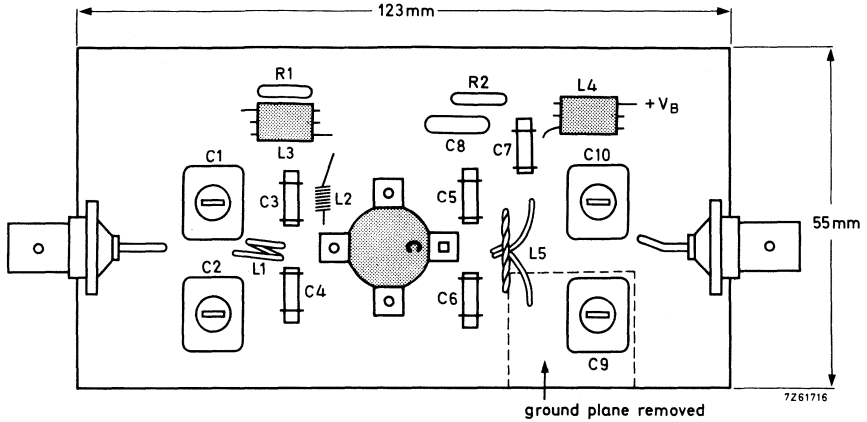
Test circuit for 175 MHz:



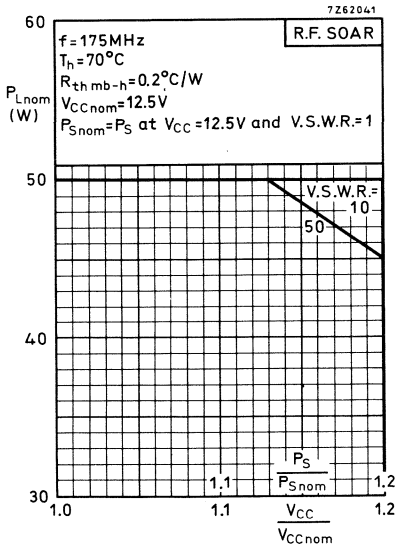
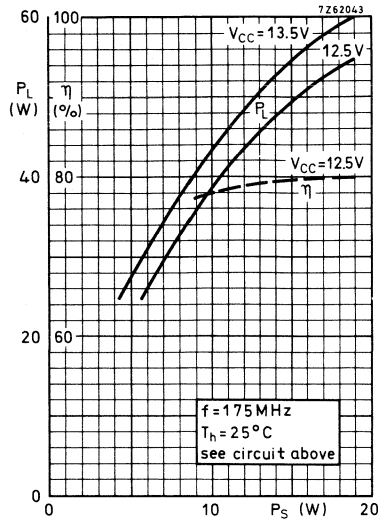
- C1 = 2 to 20 pF film dielectric trimmer
 C2 = 4 to 40 pF film dielectric trimmer
 C3 = C4 = 27 pF ceramic capacitor
 C5 = C6 = 56 pF ceramic capacitor
 C7 = 100 pF ceramic capacitor
 C8 = 100 nF polyester capacitor
 C9 = 4 to 80 pF film dielectric trimmer
 C10 = 4 to 60 pF film dielectric trimmer
 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 next page
 R1 = 10 Ω carbon resistor
 R2 = 4,7 Ω carbon resistor

APPLICATION INFORMATION (continued)

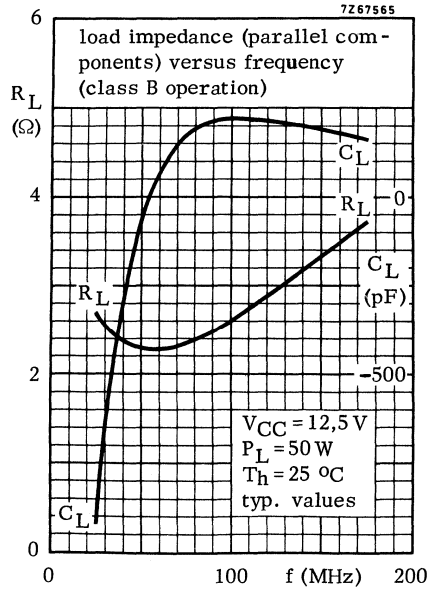
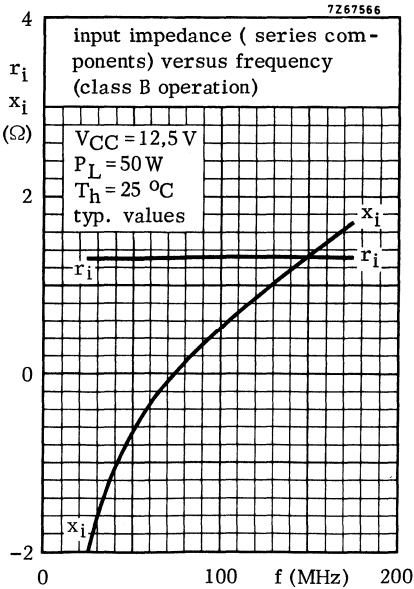
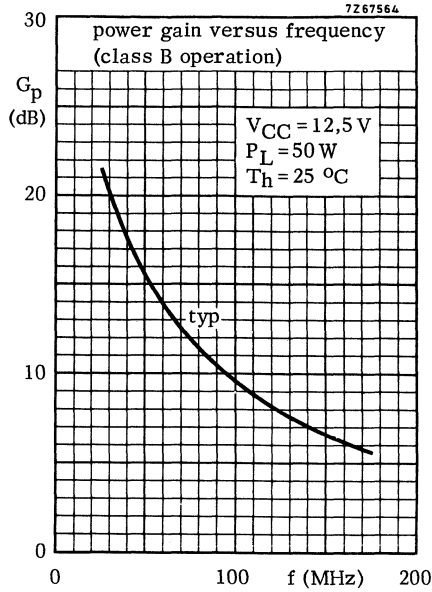
Component lay-out and printed circuit board for 175 MHz test circuit.



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.



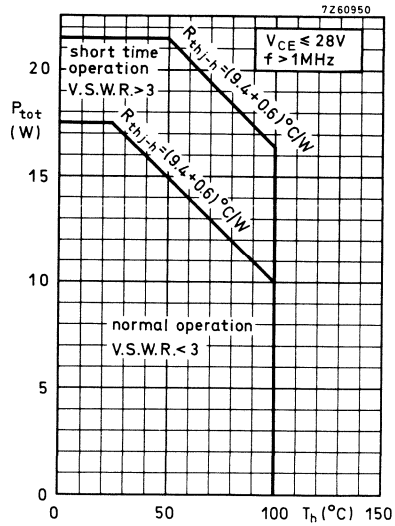
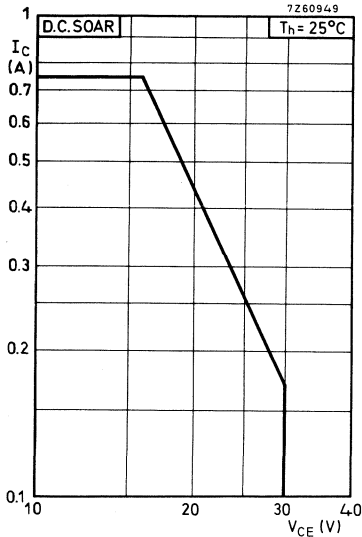
The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power (P_{Lnom}) must be derated in accordance with the adjacent graph for safe operation at supply voltage other than the nominal. The 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}).



BLY91A

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

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
Collector current (average)	$I_{C(AV)}$ max.	0.75	A
Collector current (peak value) $f > 1$ MHz	I_{CM} max.	2.25	A
Total power dissipation up to $T_h = 25^\circ\text{C}$ $f > 1$ MHz	P_{tot} max.	17.5	W



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	K/W
From mounting base to heatsink	$R_{th mb-h}$	= 0.6	K/W

CHARACTERISTICS

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

Collector cut-off current

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

Breakdown voltages

Collector-base voltage

$$\text{open emitter; } I_C = 1\text{ mA} \quad V_{(BR)CBO} > 65\text{ V}$$

Collector-emitter voltage

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

Emitter-base voltage

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

Transient energy

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

$$\begin{array}{ll} \text{open base} & E > 0.5\text{ ms} \\ -V_{BE} = 1.5\text{ V; } R_{BE} = 33\ \Omega & E > 0.5\text{ ms} \end{array}$$

D. C. current gain

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

Transition frequency

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

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

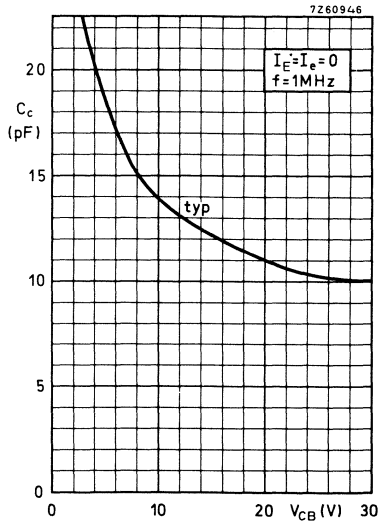
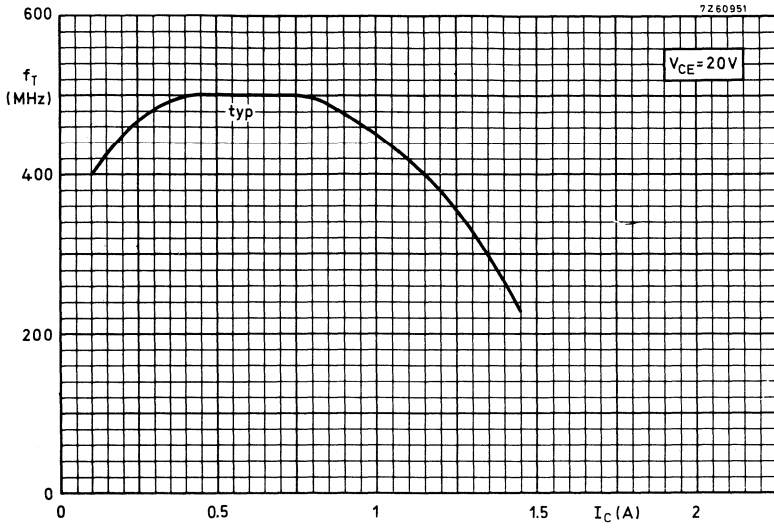
$$I_E = I_e = 0; V_{CB} = 30\text{ V} \quad C_c \begin{array}{l} \text{typ. } 10\text{ pF} \\ < 15\text{ pF} \end{array}$$

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

$$I_C = 50\text{ mA; } V_{CE} = 30\text{ V} \quad C_{re} \text{ typ. } 7.5\text{ pF}$$

Collector-stud capacitance

$$C_{cs} \text{ typ. } 2\text{ pF}$$



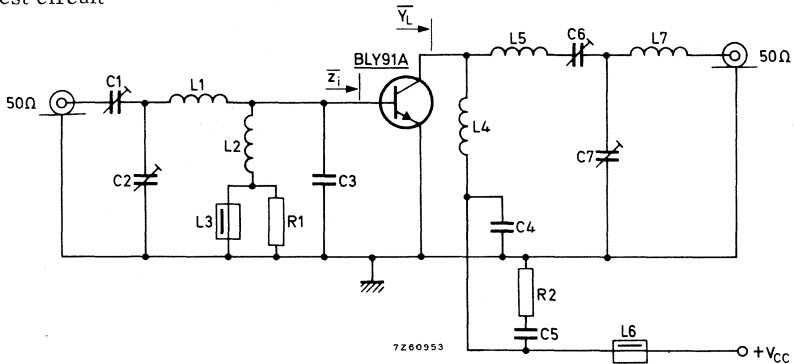
APPLICATION INFORMATION

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

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

f(MHz)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	\bar{Z}_i (Ω)	\bar{Y}_L (mS)
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

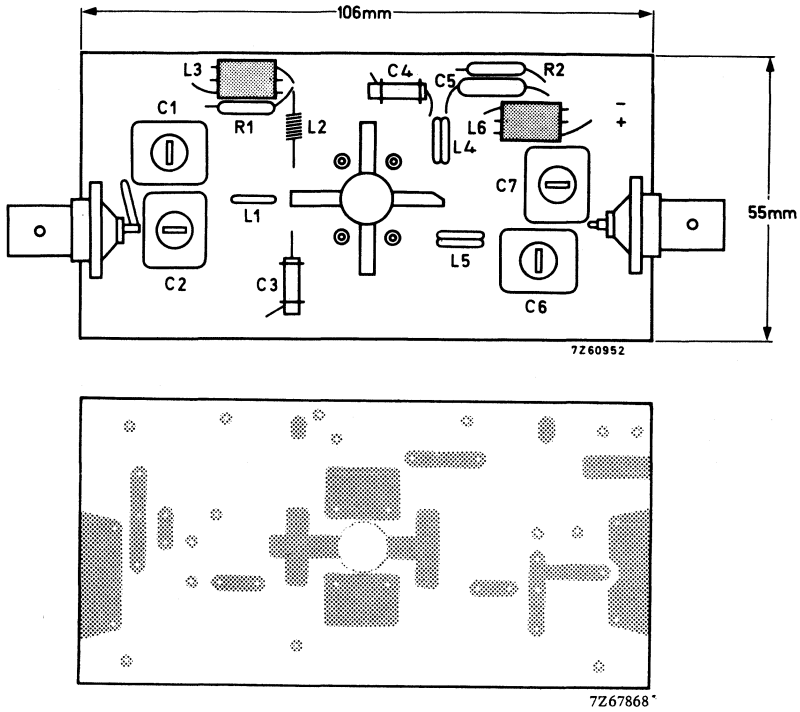
- L3 = L6 = ferroxcube choke (code number 4312 020 36640)
- L4 = 7.5 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 5 mm
- L5 = 4.5 turns enamelled Cu wire (0.7 mm); int. diam. 6 mm; leads 2 x 7 mm
- L7 = 3.5 turns enamelled Cu wire (0.7 mm); int. diam. 6 mm; leads 2 x 7 mm

- R1 = R2 = 10 Ω carbon

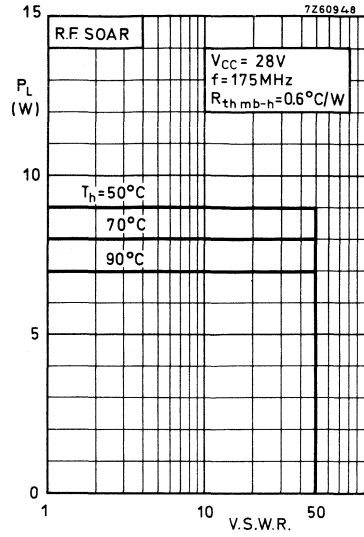
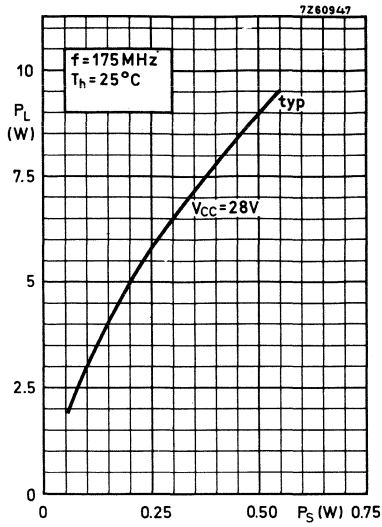
Component lay-out for 175 MHz test circuit see next page.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

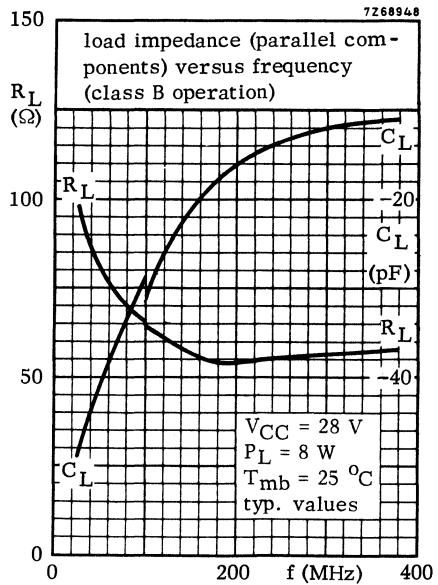
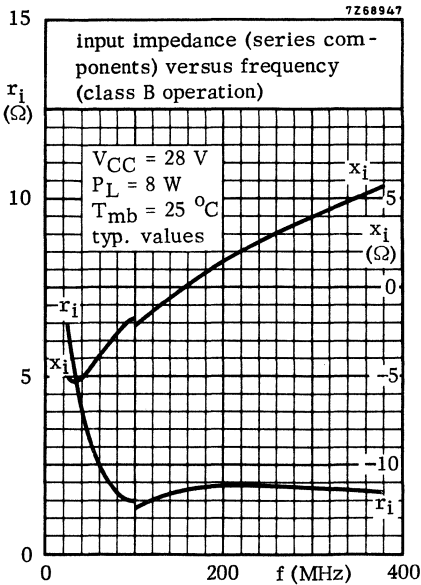
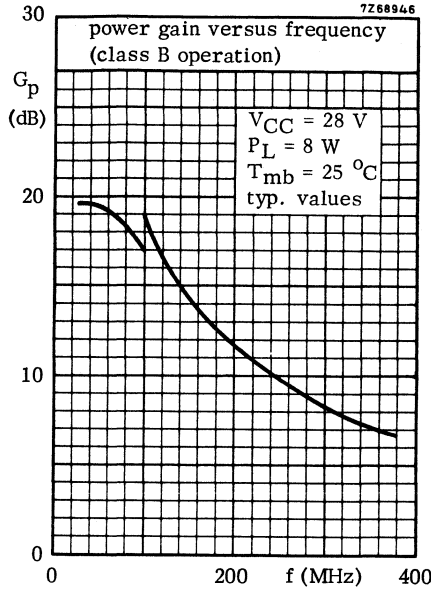


The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



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

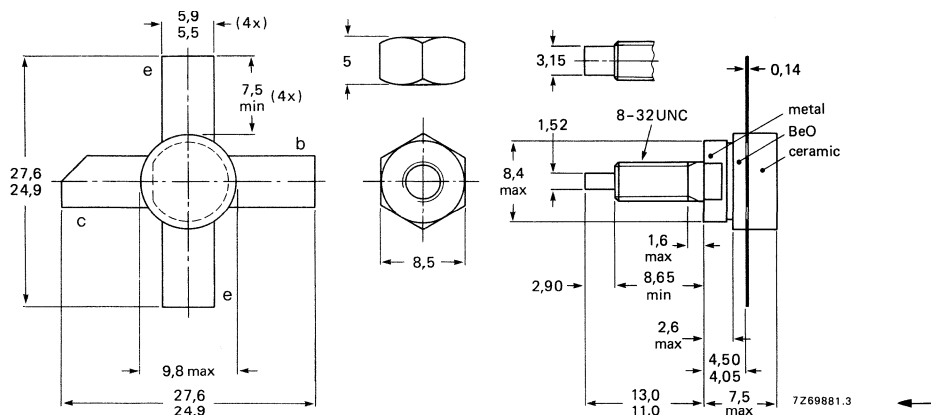
R.F. performance up to $T_H = 25^\circ\text{C}$ in an unneutralized common-emitter class-B circuit.

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

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.

PRODUCT SAFETY 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

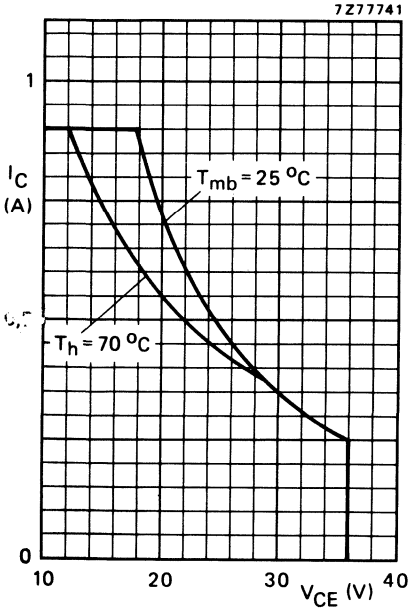


Fig. 2 D.C. SOAR.

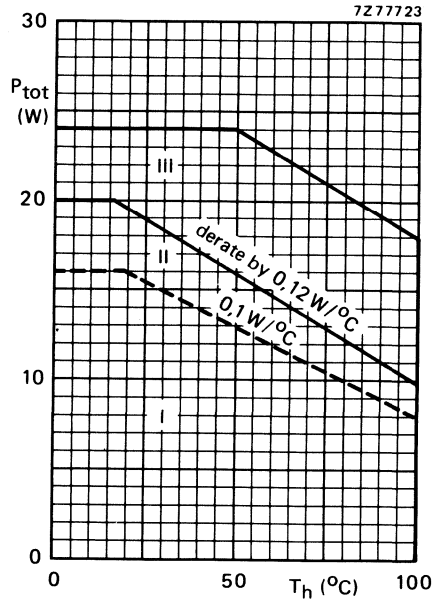


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

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

THERMAL RESISTANCE (dissipation = 8 W; $T_{mb} = 73,6$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{thj-mb(dc)}$	=	10,7 K/W
From junction to mounting base (r.f. dissipation)	$R_{thj-mb(rf)}$	=	8,6 K/W
From mounting base to heatsink	R_{thmb-h}	=	0,45 K/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 f_T 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: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

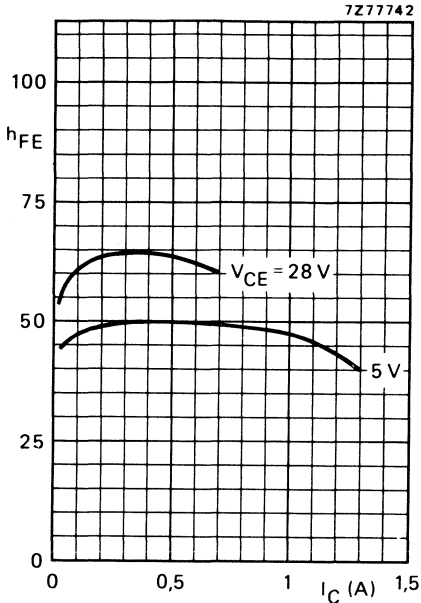


Fig.4 Typical values; $T_j = 25\text{ }^\circ\text{C}$.

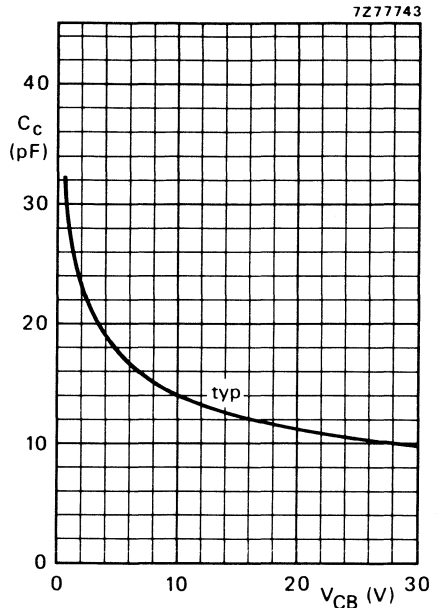


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

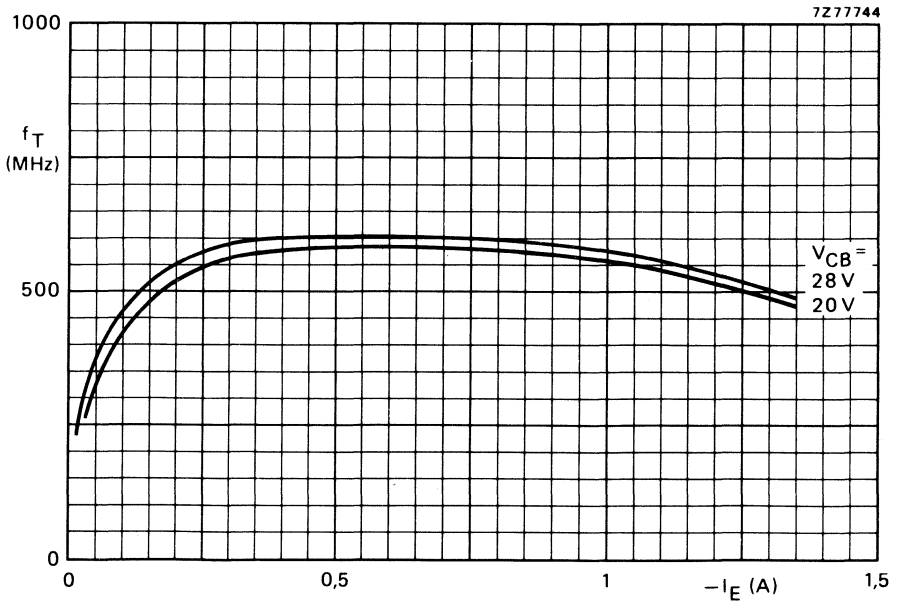


Fig. 6 Typical values; $f = 100\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

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 (mS)
175	28	8	<0,5	> 12	<0,44	> 65	$1,8 + j0,7$	$18 - j20$

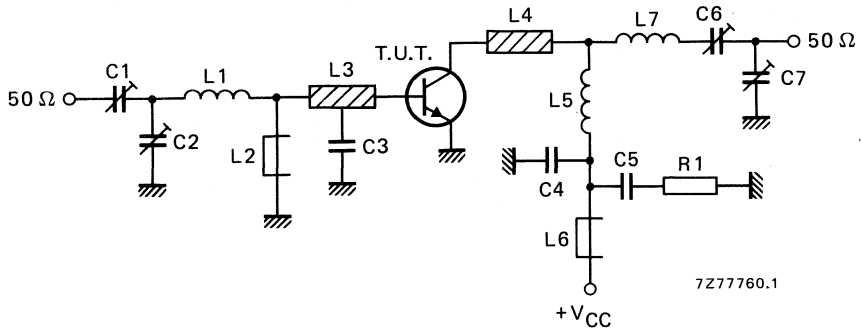


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 27 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 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 = 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 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L7 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 8,2 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. 8.

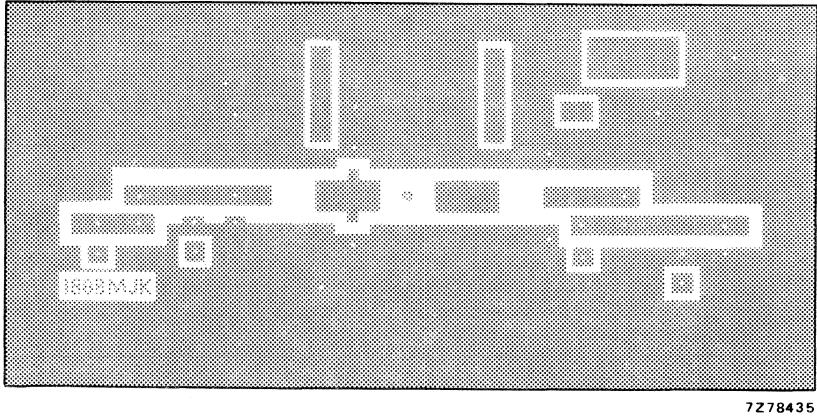
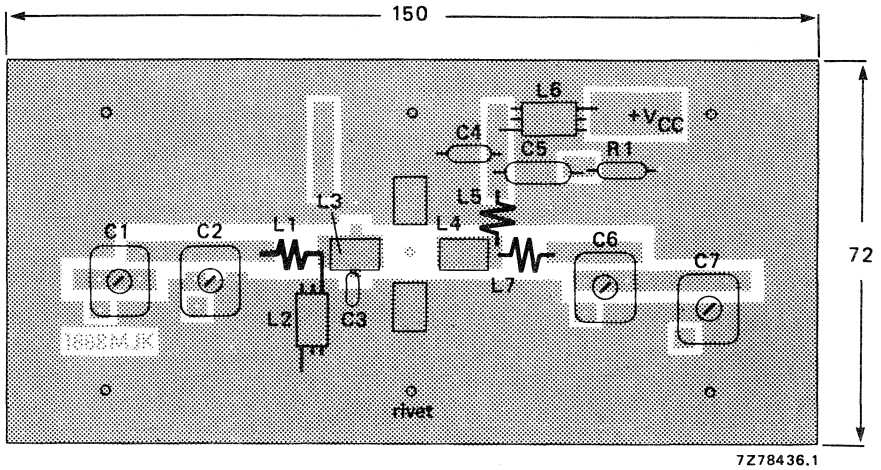


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

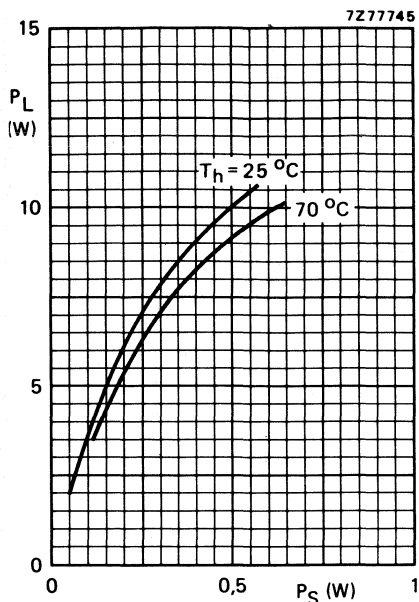


Fig. 9 Typical values; $V_{CE} = 28$ V; $f = 175$ MHz.

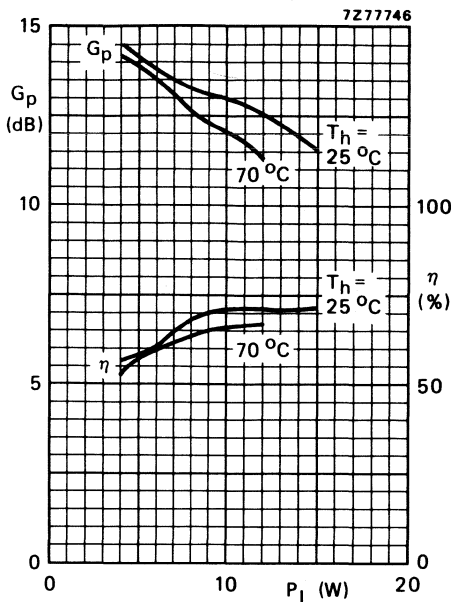


Fig. 10 Typical values; $V_{CE} = 28$ V; $f = 175$ MHz.

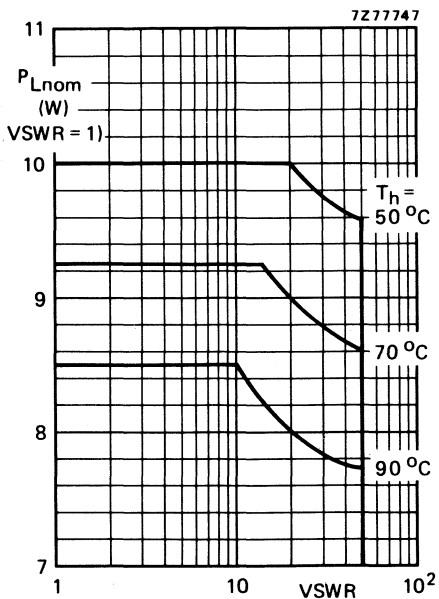


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175$ MHz; $V_{CE} = 28$ V; $R_{th\ mb-h} = 0,45$ K/W. The graph shows the permissible output power under nominal conditions ($V_{SWR} = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

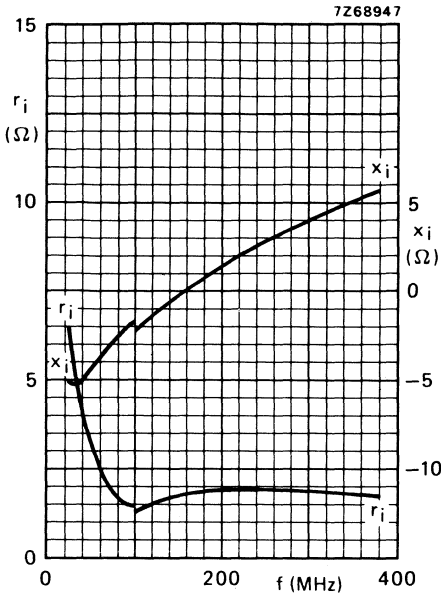


Fig. 12 Input impedance (series components).

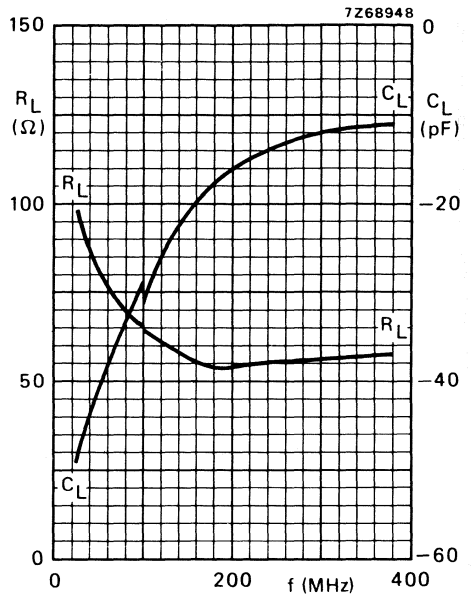


Fig. 13 Load impedance (parallel components).

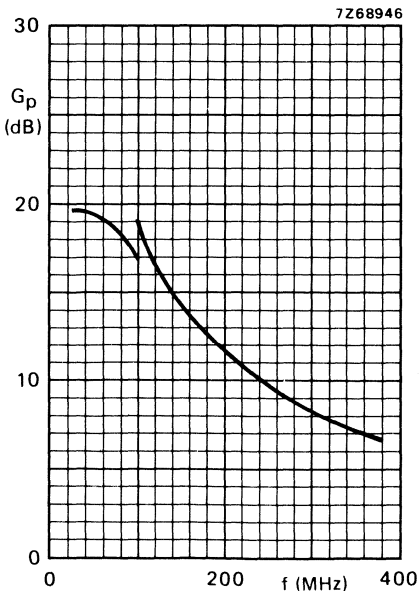


Fig. 14.

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 silicon planar epitaxial transistor for use in class-A, B and C operated mobile, industrial and military 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 1/4" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

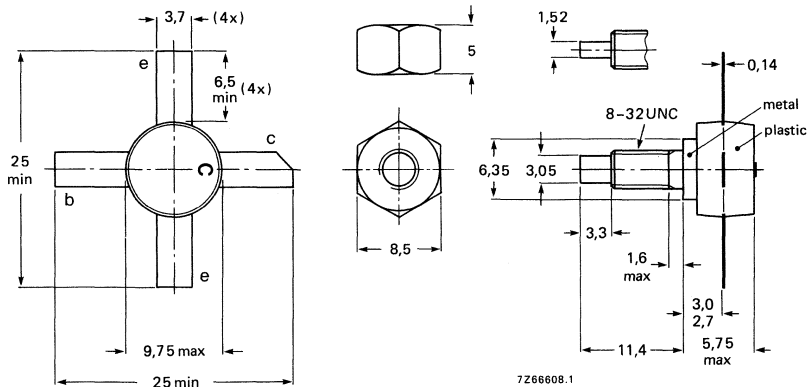
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

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

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



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.

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

BLY92A

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

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

Collector current (average)

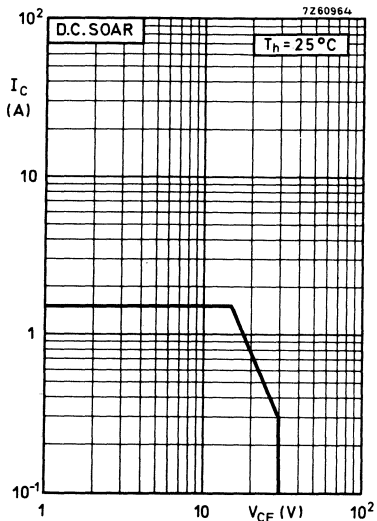
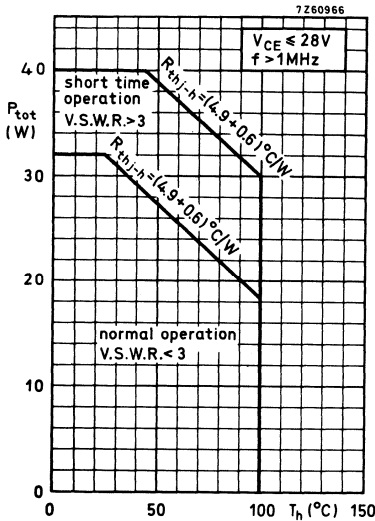
$I_C(AV)$ max. 1.5 A

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

I_{CM} max. 4.5 A

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

P_{tot} max. 32 W



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 K/W

From mounting base to heatsink

$R_{th mb-h}$ = 0.6 K/W

CHARACTERISTICS

 $T_j = 25^\circ\text{C}$ 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 $E > 2.0\text{ ms}$
 $-V_{BE} = 1.5\text{ V}; R_{BE} = 33\Omega$ $E > 4.5\text{ ms}$

D.C. current gain

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

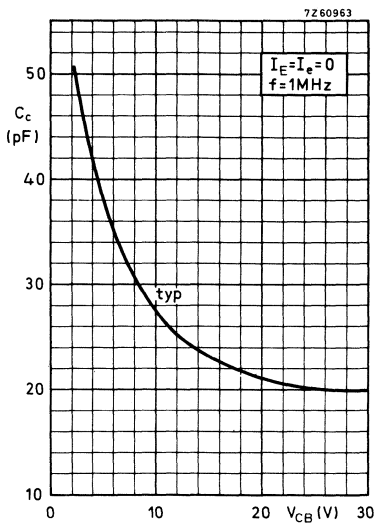
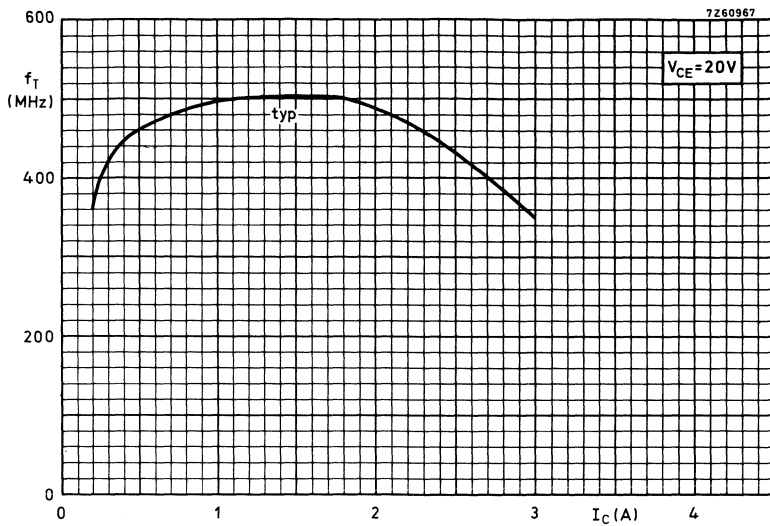
Transition frequency

 $I_C = 600\text{ mA}; V_{CE} = 20\text{ V}$ f_T typ. 500 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 30\text{ V}$ C_c typ. 20 pF
< 30 pFFeedback 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

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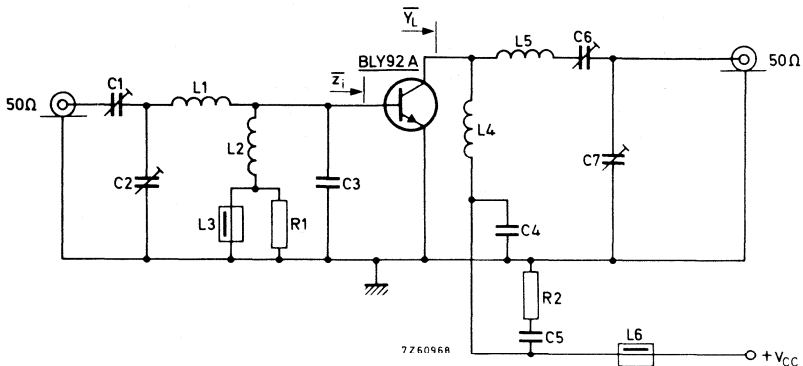
APPLICATION INFORMATION

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

 $V_{CE} = 28 \text{ V}$; T_{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 (mS)
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)

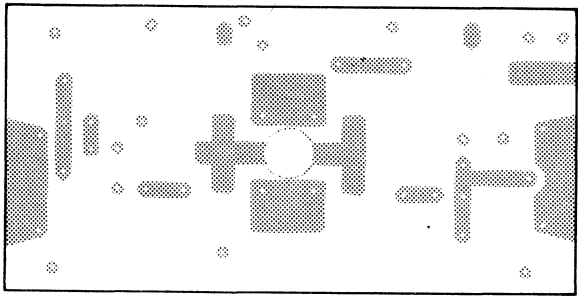
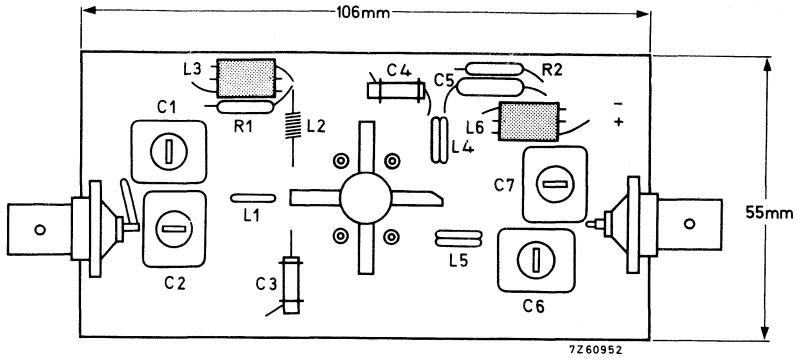
L4 = 2,5 turns enamelled Cu wire (0,7 mm); int. dia. 6 mm; leads 2 x 7 mm

L6 = 4,5 turns enamelled Cu wire (0,7 mm); int. dia. 6 mm; leads 2 x 7 mm

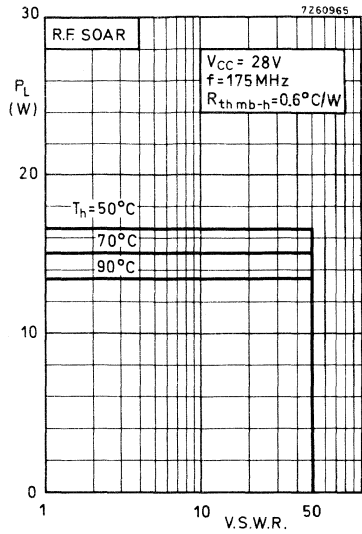
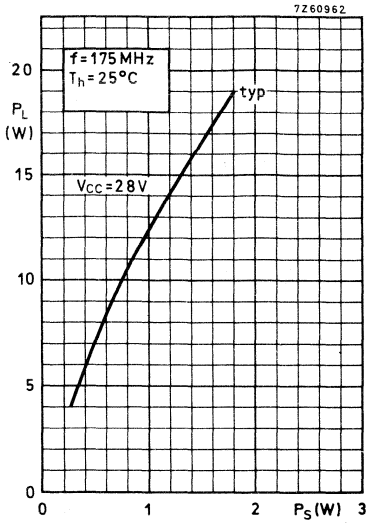
R1 = R2 = 10 Ω carbon resistor

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

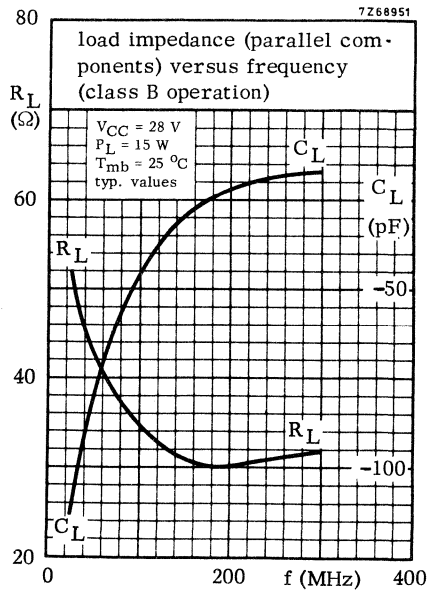
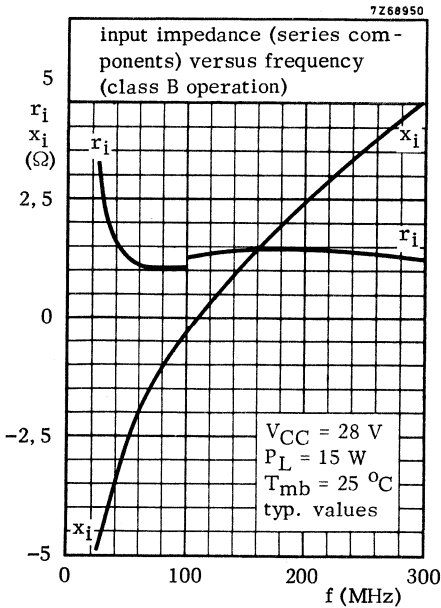
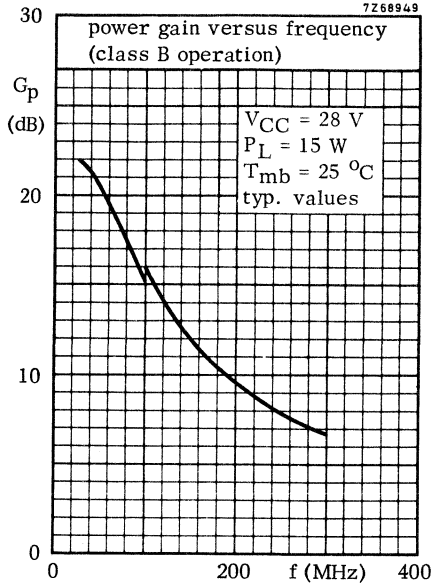


The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



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

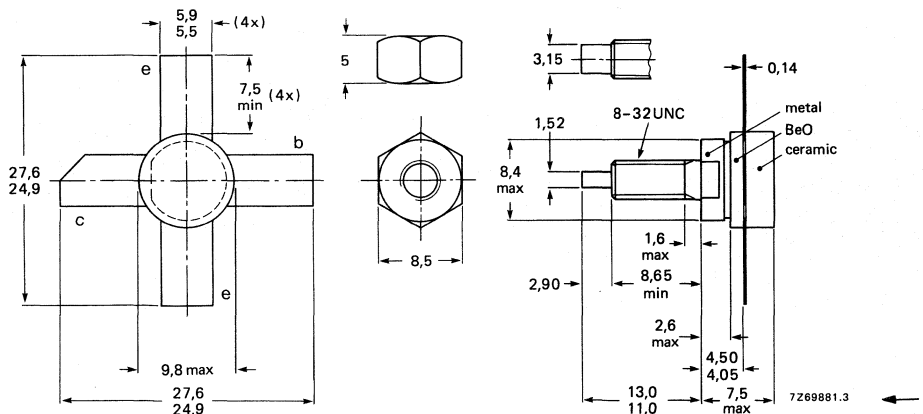
R.F. performance up to $T_h = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.

PRODUCT SAFETY 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_{rff}	max.	36 W
Storage temperature	T_{stg}		-65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

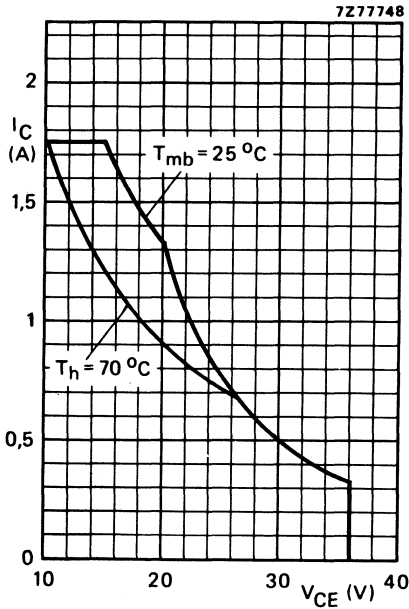


Fig. 2 D.C. SOAR.

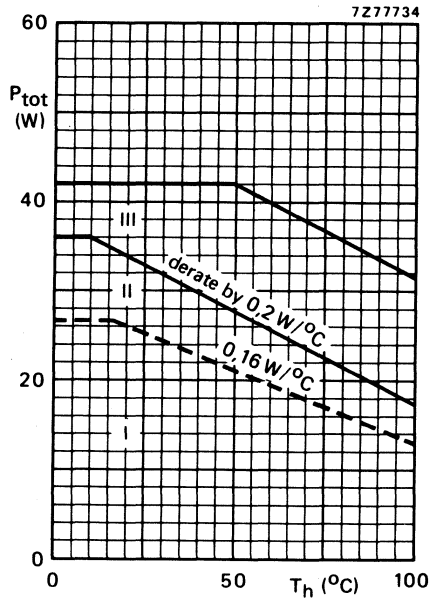


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f > 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	4,95 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,45 K/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

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

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 $f = 100\text{ MHz}$ * $-I_E = 0,7\text{ A}; V_{CB} = 28\text{ V}$ $-I_E = 2\text{ A}; V_{CB} = 28\text{ V}$ 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: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

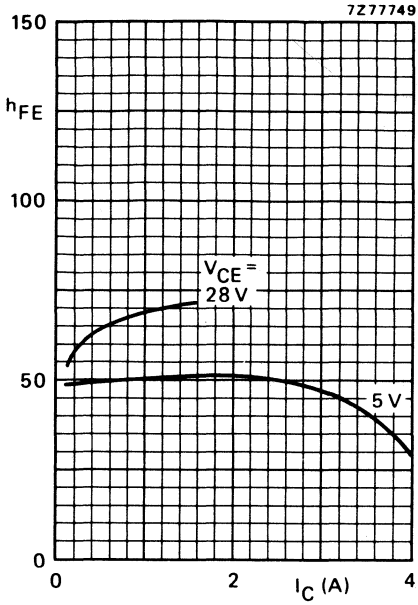


Fig. 4 Typical values; $T_j = 25^\circ C$.

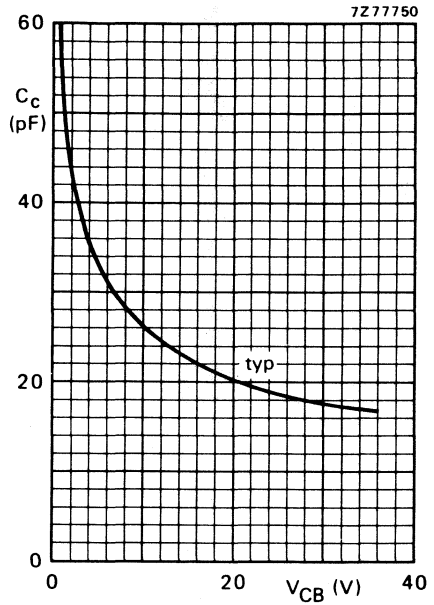


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

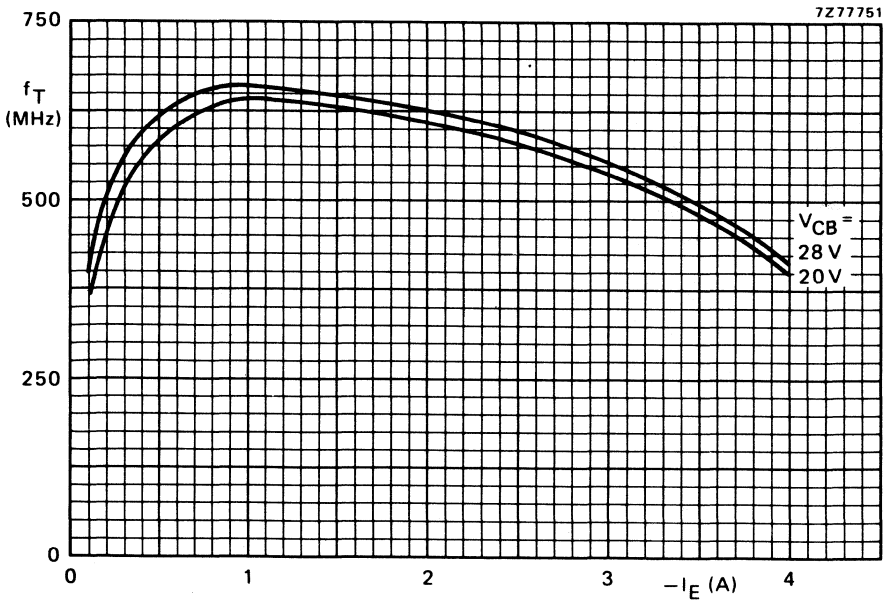


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ C$.

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 (mS)
175	28	15	< 1,5	> 10	< 0,83	> 65	$1,4 + j1,85$	$33 - j27,5$

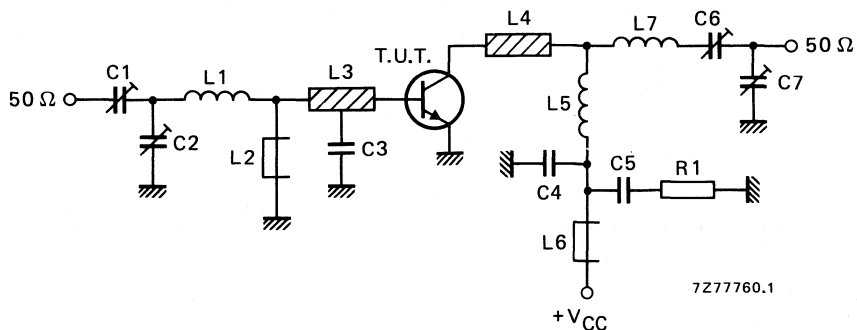


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

C3 = 27 pF ceramic capacitor (500 V)

C4 = 120 pF ceramic capacitor (500 V)

C5 = 100 nF polyester capacitor

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 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 = 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 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm

L7 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 8,2 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. 8.

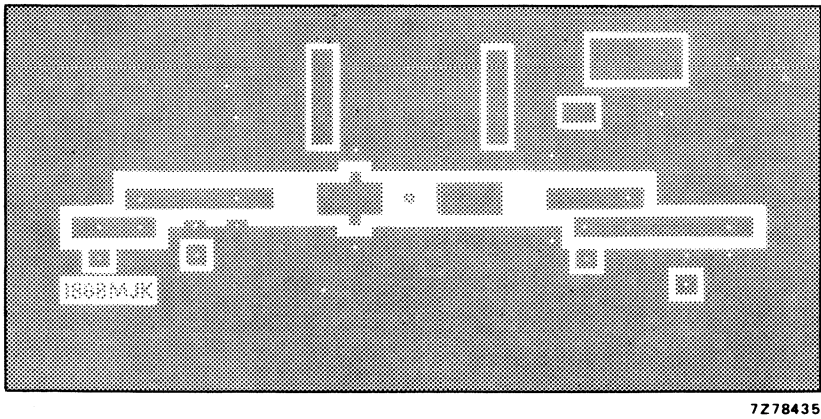
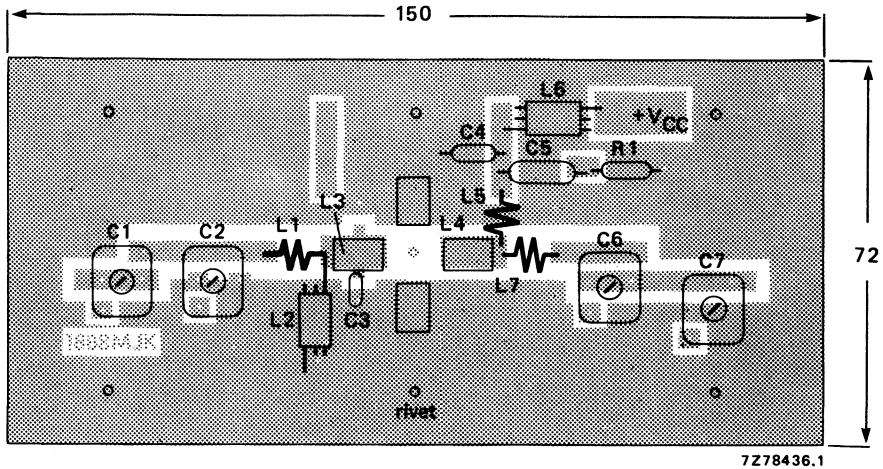


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

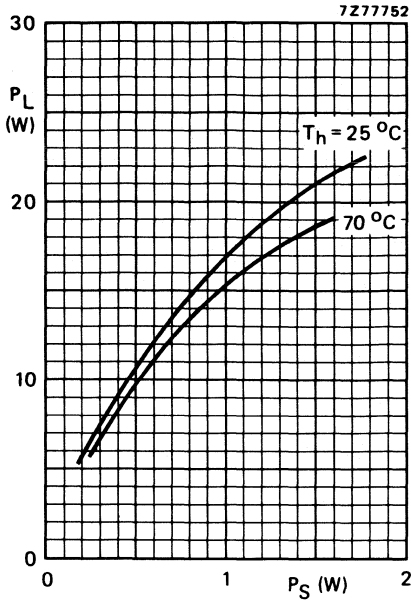


Fig. 9 Typical values; $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$.

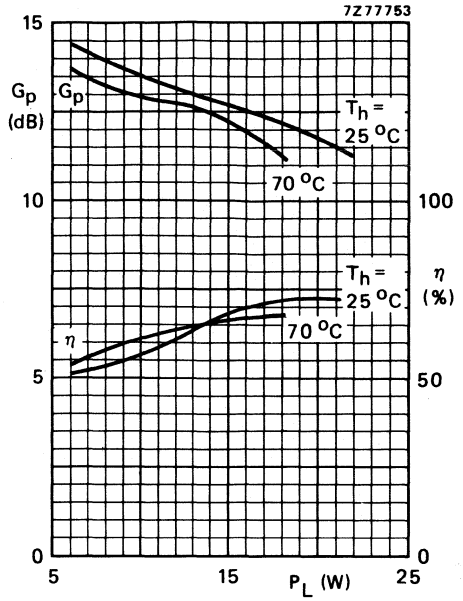


Fig. 10 Typical values; $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$.

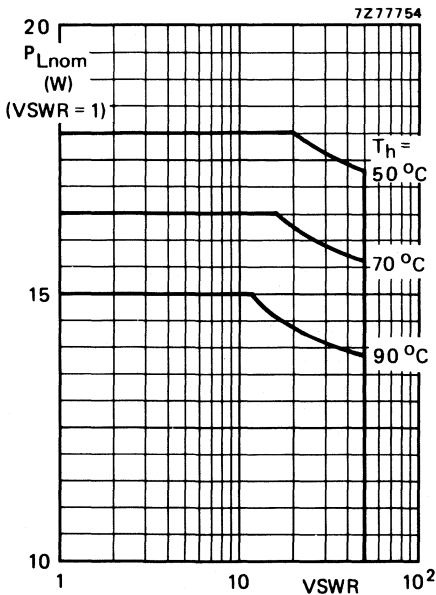


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $R_{th\text{ mb-h}} = 0,45 \text{ K/W}$. The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

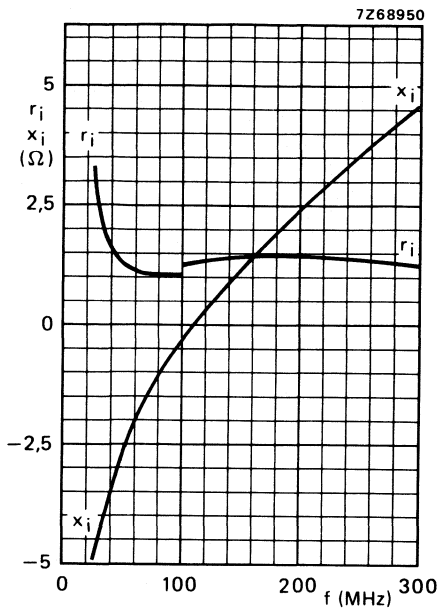


Fig. 12 Input impedance (series components).

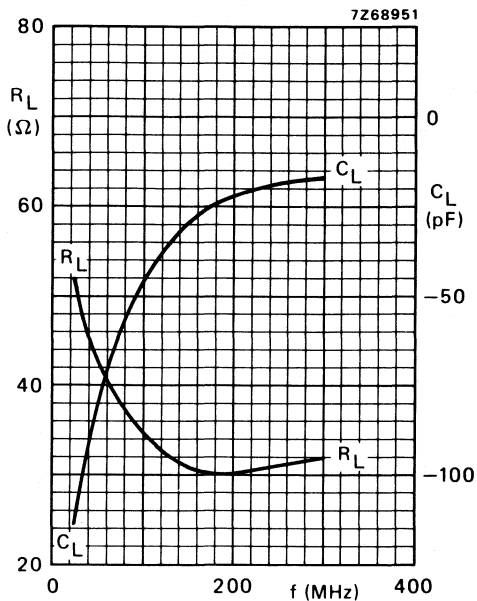


Fig. 13 Load impedance (parallel components).

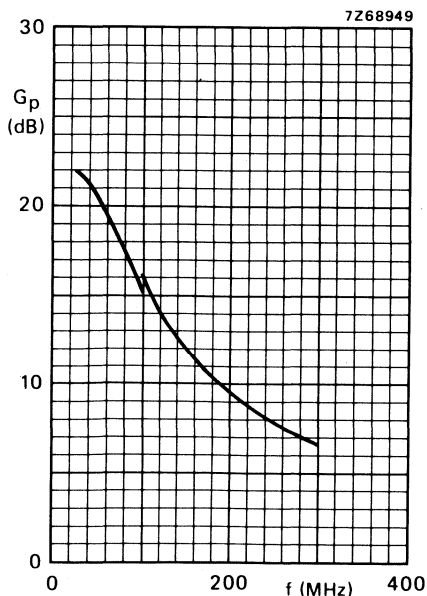


Fig. 14.

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 1/4" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

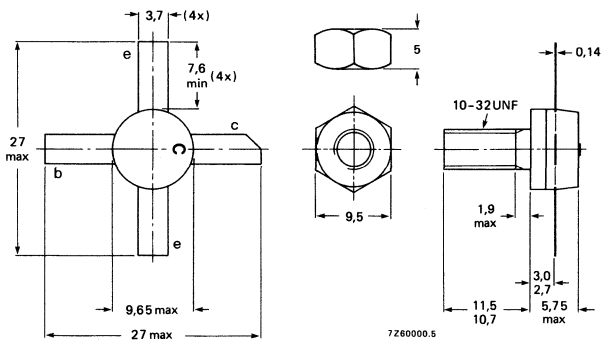
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_D dB	η %	\bar{z}_i Ω	\bar{Y}_L mS
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.



Torque on nut: min. 1,5 Nm
(15 kg cm)
max. 1,7 Nm
(17 kg cm)

Diameter of clearance hole in heatsink: max. 4,9 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.

PRODUCT SAFETY 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)

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

Collector current (average)

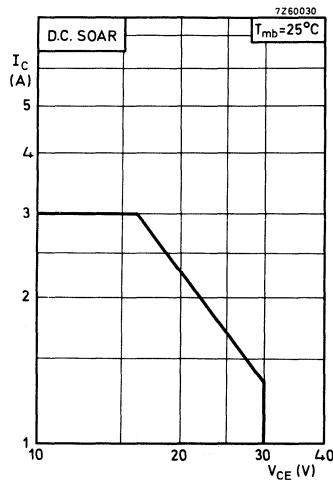
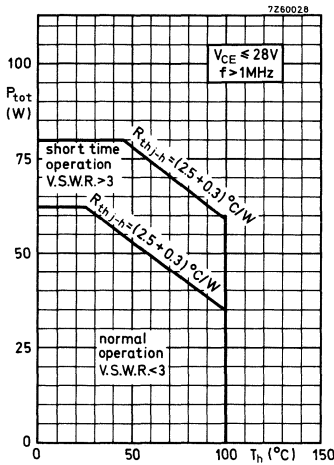
$I_{C(AV)}$ max. 3 A

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

I_{CM} max. 9 A

Total power dissipation up to $T_{mb} = 25$ °C
 $f > 1$ MHz

P_{tot} max. 70 W



Storage temperature

T_{stg} -30 to +200 °C

Operating junction temperature

T_j max. 200 °C

THERMAL RESISTANCE

From junction to mounting base

$R_{th j-mb} = 2.5$ K/W

From mounting base to heatsink

$R_{th mb-h} = 0.3$ K/W

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ 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 ms
$-V_{BE} = 1.5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	8 ms

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
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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

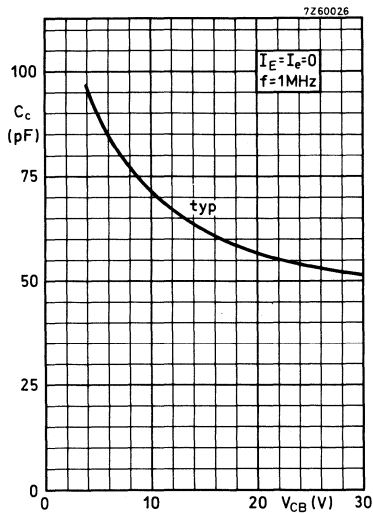
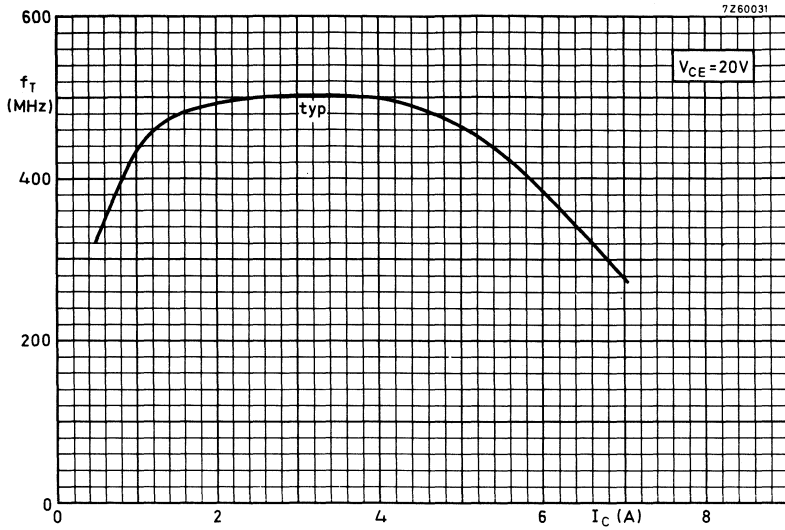
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 100\text{ mA}$; $V_{CE} = 30\text{ V}$

C_{re}	typ. 31 pF
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Collector-stud capacitance

C_{cs}	typ. 2 pF
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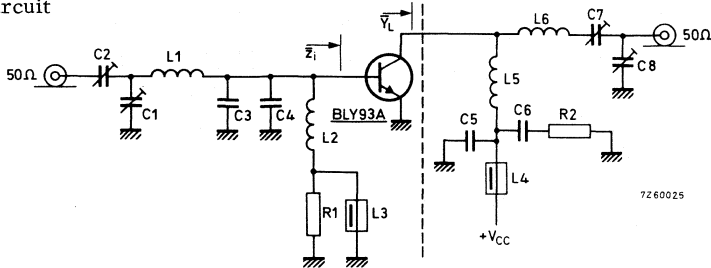
APPLICATION INFORMATION

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

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

f(MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	\bar{z}_i (Ω)	\bar{Y}_L (mS)
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 2 x 6 mm

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

L3 = L4 = ferroxcube choke (code number 4312 020 36640)

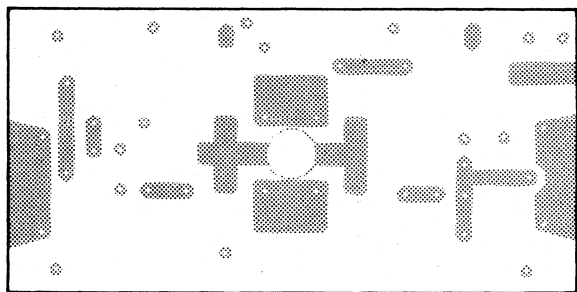
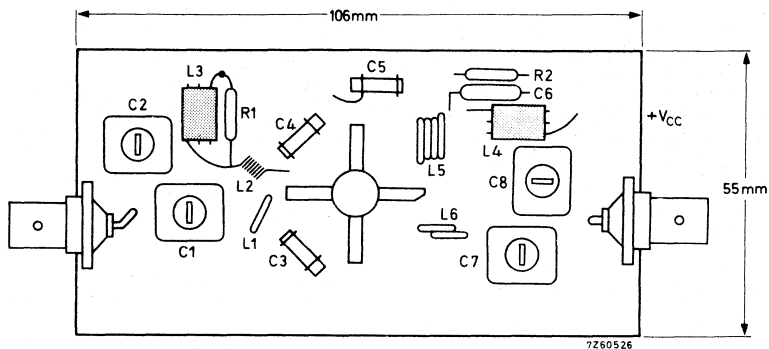
L5 = 3.5 turns enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 6 mm

L6 = 1.5 turns enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 6 mm

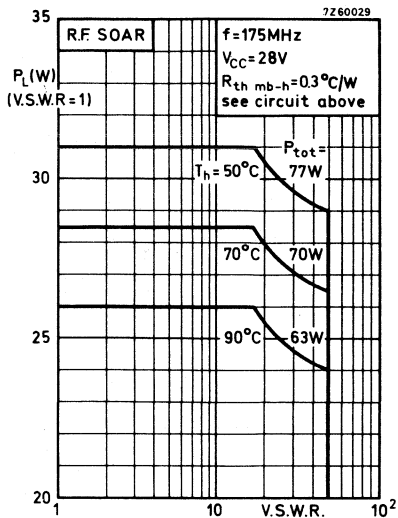
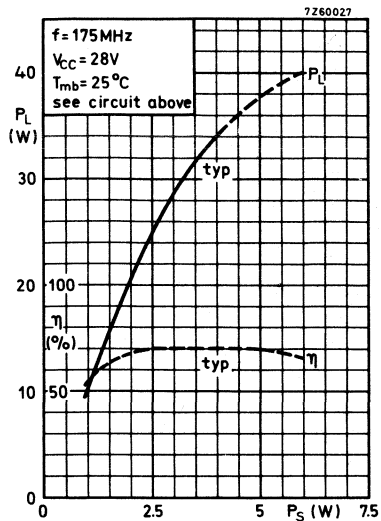
R1 = R2 = 10 Ω carbon

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

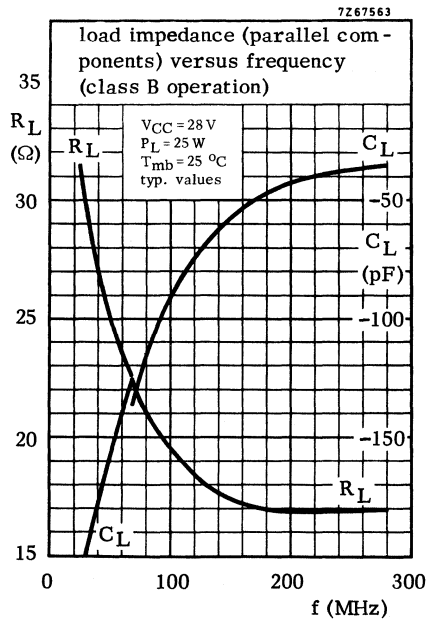
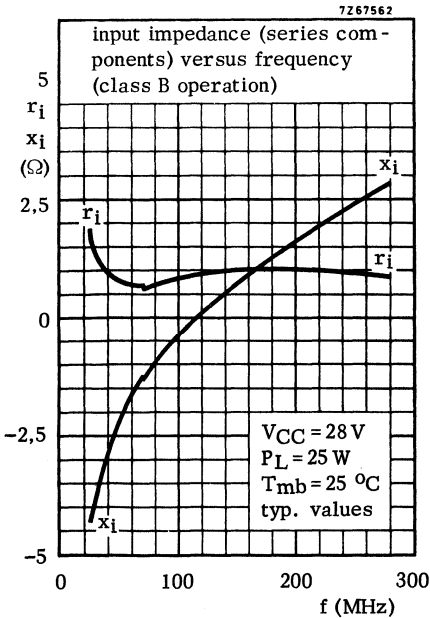
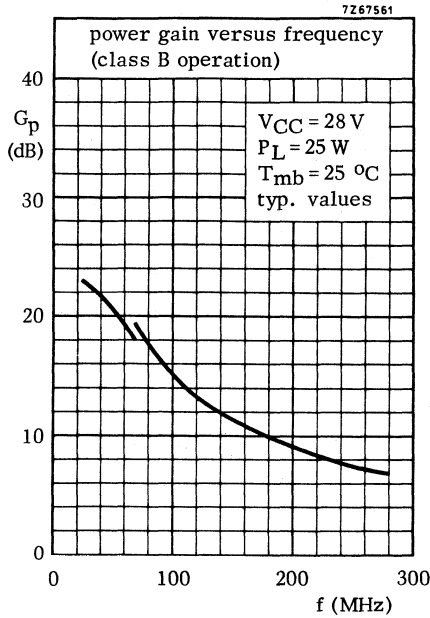


The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



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.



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

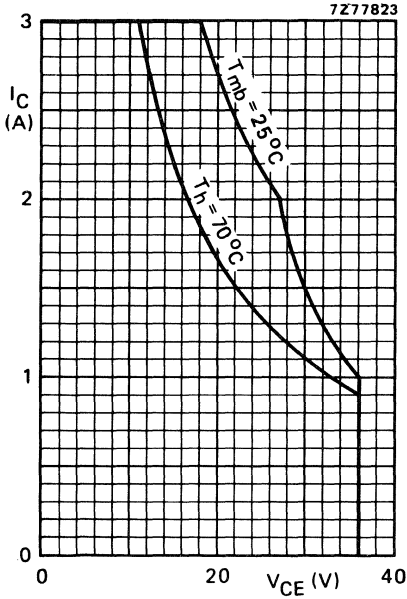


Fig. 2 D.C. SOAR.

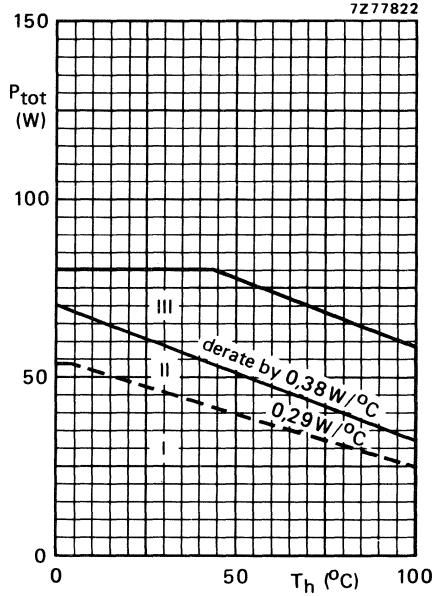


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; $f \geq 1$ MHz.

- 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 K/W
From junction to mounting base (r.f. dissipation)	$R_{th j-mb (rf)}$	=	2,3 K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,45 K/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 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. 625 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. 45 pFFeedback 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: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0,02$.

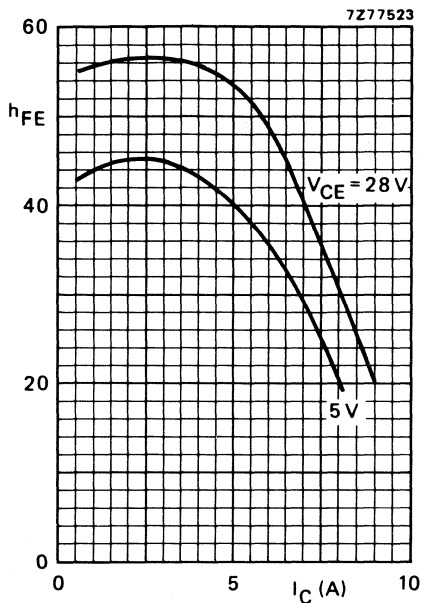


Fig. 4 Typical values; $T_j = 25^\circ C$.

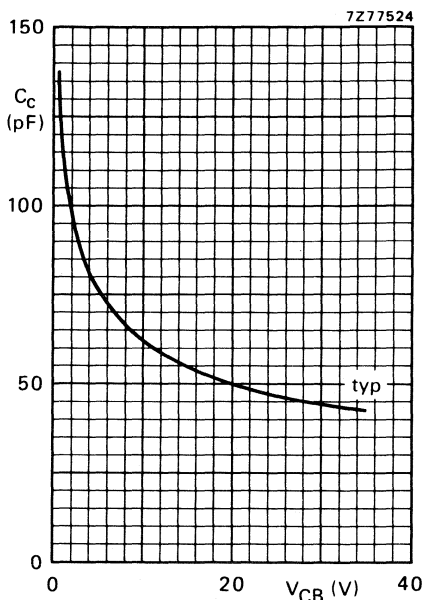


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25^\circ C$.

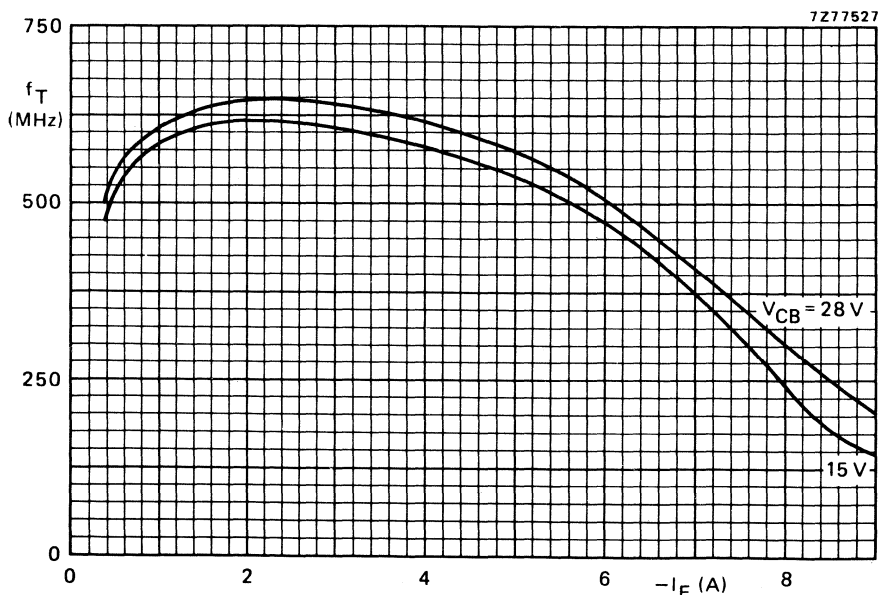


Fig. 6 Typical values; $f = 100$ MHz; $T_j = 25^\circ C$.

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}_1 (Ω)	\bar{Y}_L (mS)
175	28	25	< 3,15	> 9	< 1,5	> 60	$1,0 + j1,2$	$59 - j54$

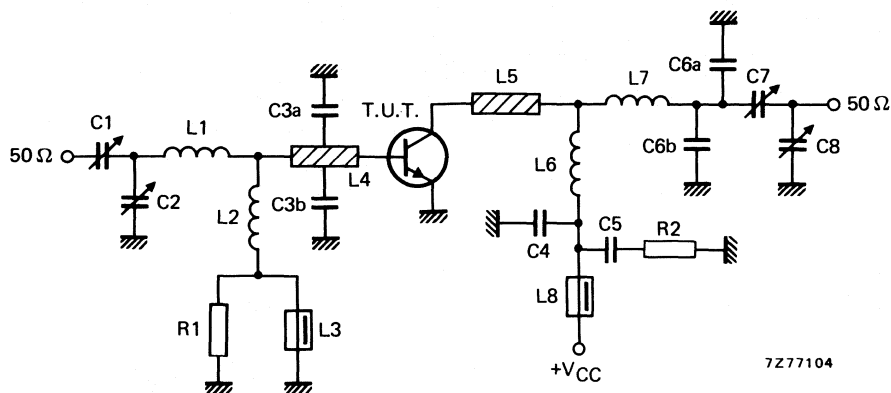


Fig. 7 Test circuit; c.w. class-B.

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.

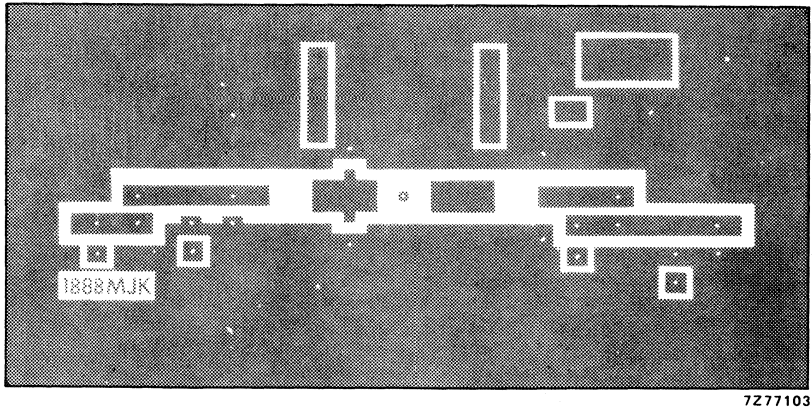
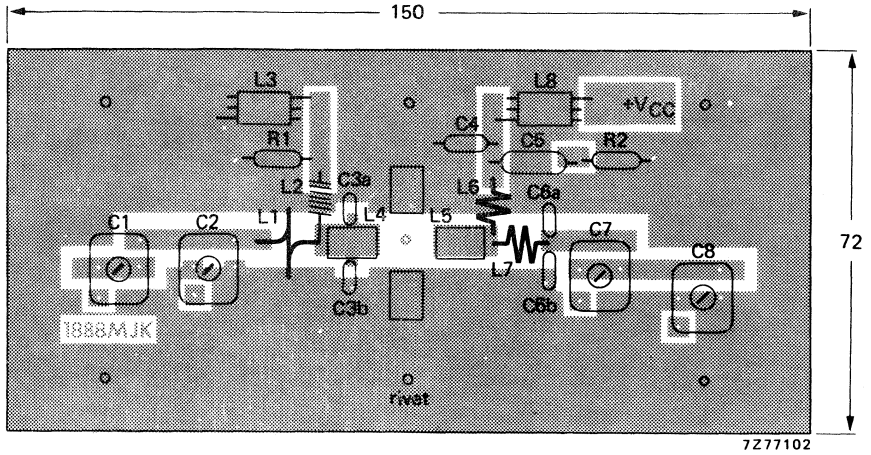


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

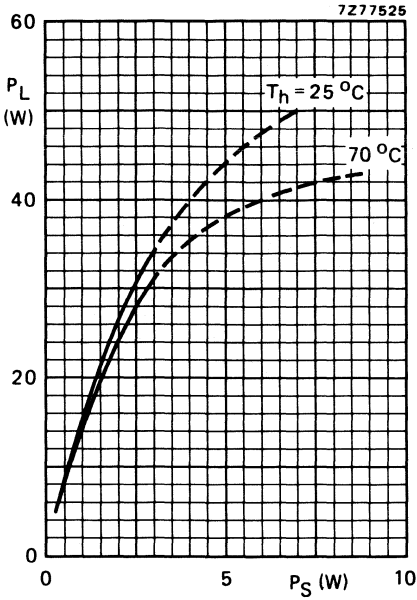


Fig. 9 $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$; typical values.

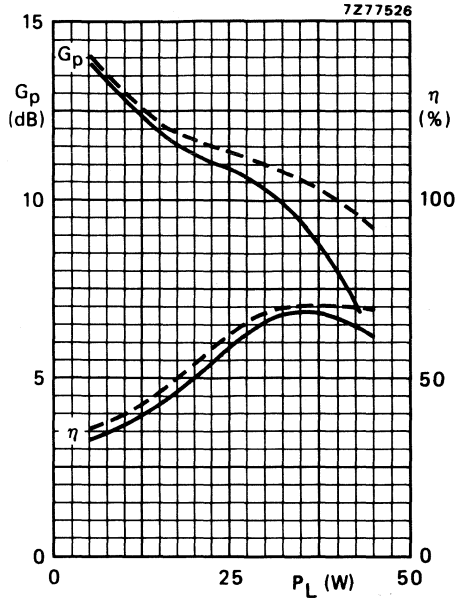


Fig. 10 $V_{CE} = 28 \text{ V}$; $f = 175 \text{ MHz}$; typical values; --- $T_h = 25 \text{ }^\circ\text{C}$; — $T_h = 70 \text{ }^\circ\text{C}$.

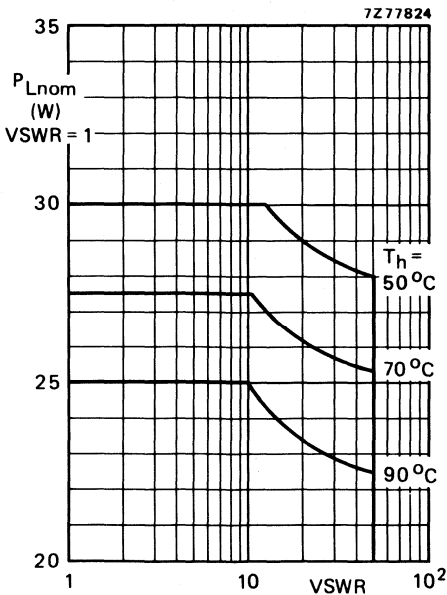


Fig. 11 R.F. SOAR; c.w. class-B operation; $f = 175 \text{ MHz}$; $V_{CE} = 28 \text{ V}$; $R_{th \text{ mb-h}} = 0,45 \text{ K/W}$
The graph shows the permissible output power under nominal conditions ($VSWR = 1$) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

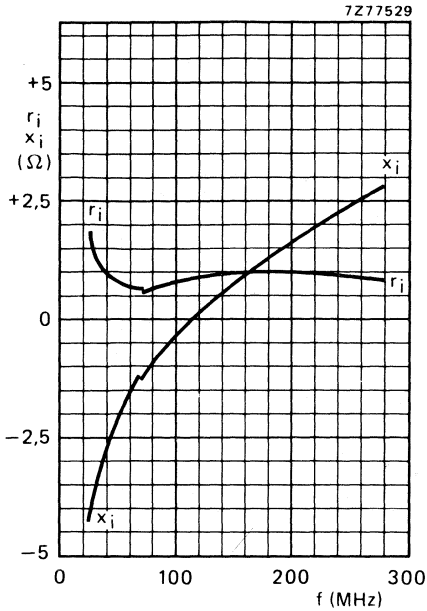


Fig. 12 Input impedance (series components).

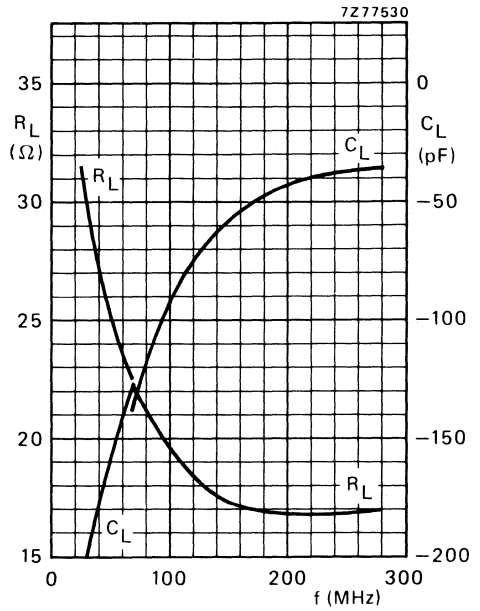


Fig. 13 Load impedance (parallel components).

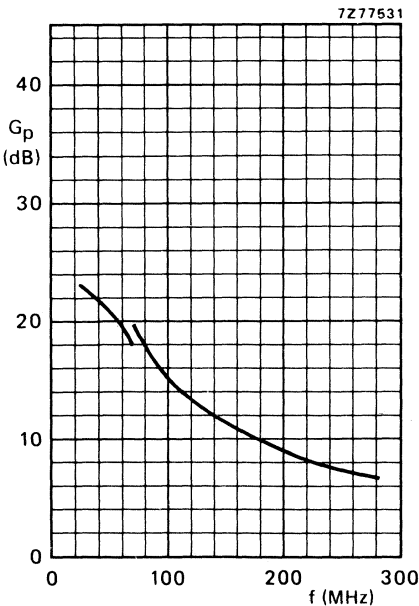


Fig. 14 Power gain versus frequency.

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

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

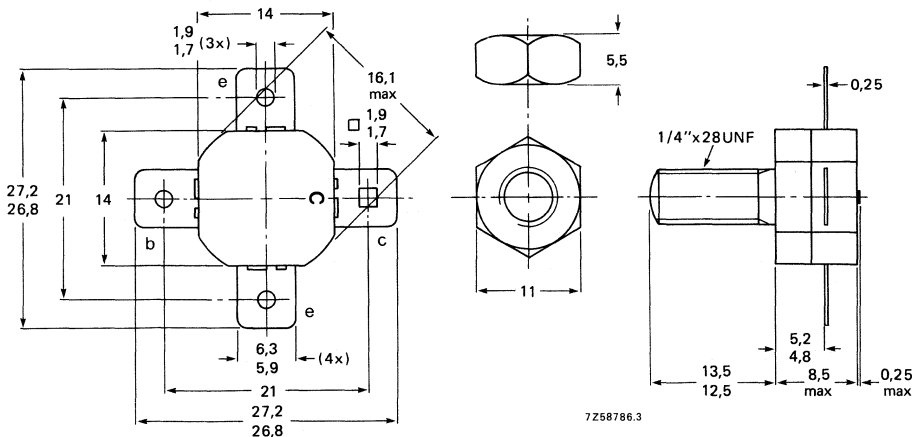
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

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 mS
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.



Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

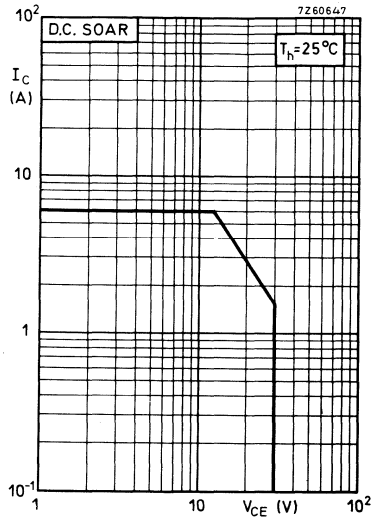
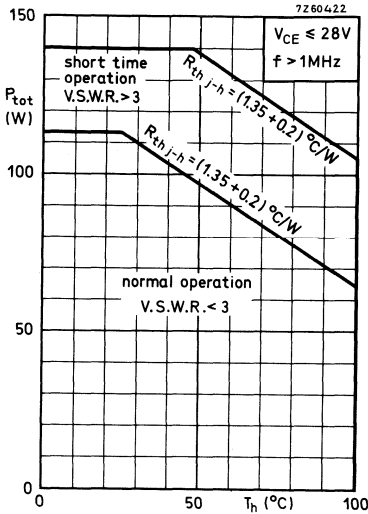
Diameter of clearance hole in heatsink: max. 6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

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

PRODUCT SAFETY 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.	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.	6 A
Collector current (peak value) $f > 1$ MHz	I_{CM} max.	12 A
Total power dissipation up to $T_{mb} = 25^\circ C$ $f > 1$ MHz	P_{tot} max.	130 W



Storage temperature
Operating junction temperature

T_{stg}	-65 to +200 $^\circ C$
T_j	max. 200 $^\circ C$

THERMAL RESISTANCE

From junction to mounting base
From mounting base to heatsink

$R_{th j-mb}$	=	1.35 K/W
$R_{th mb-h}$	=	0.2 K/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	ms
$-V_{BE} = 1.5\text{ V}$; $R_{BE} = 33\ \Omega$	E	>	8	ms

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 $f = 1\text{ MHz}$

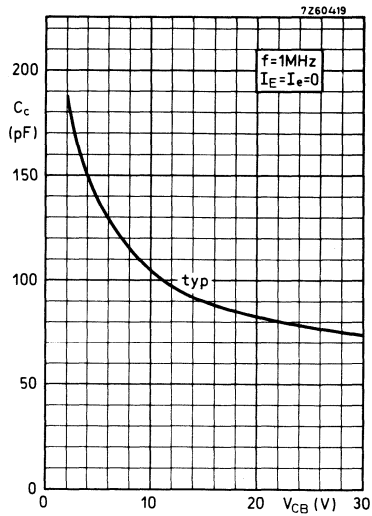
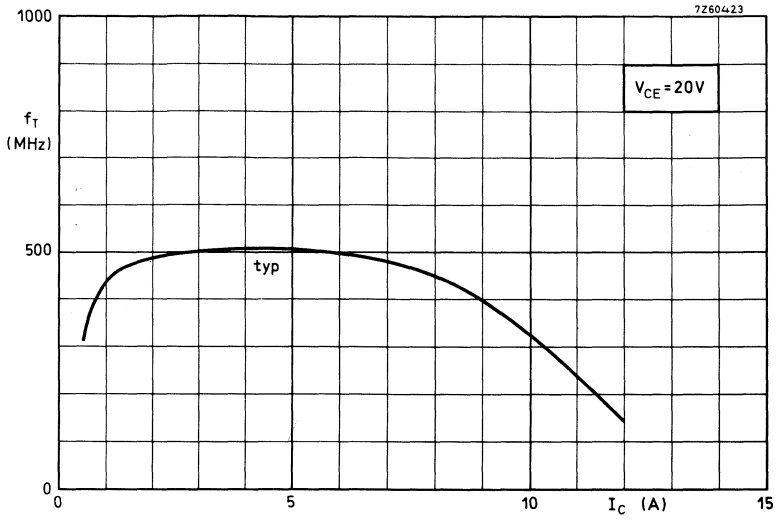
$I_E = I_e = 0$; $V_{CB} = 30\text{ V}$	C_c	typ.	75	pF
		<	130	pF

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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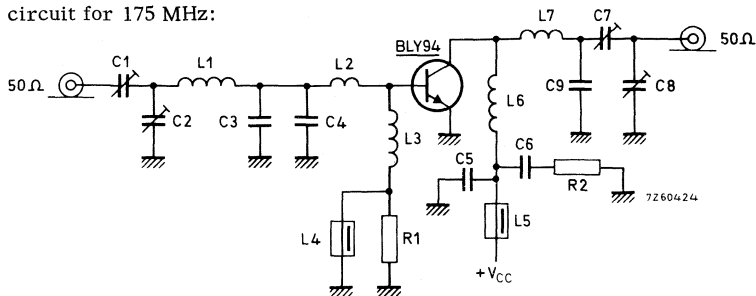
APPLICATION INFORMATION

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 (mS)
28	< 10	50	< 2.75	> 7	> 65	$0.8+j1.45$	$125-j66$

Test circuit for 175 MHz:

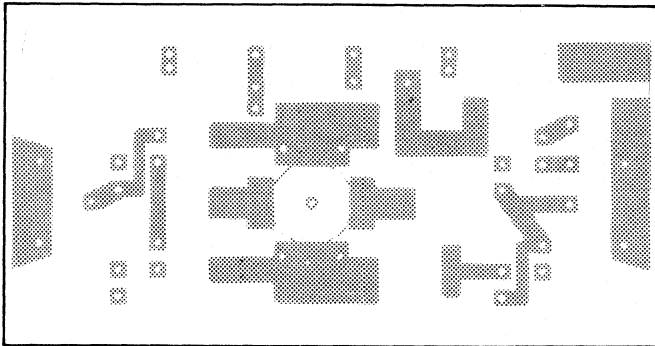
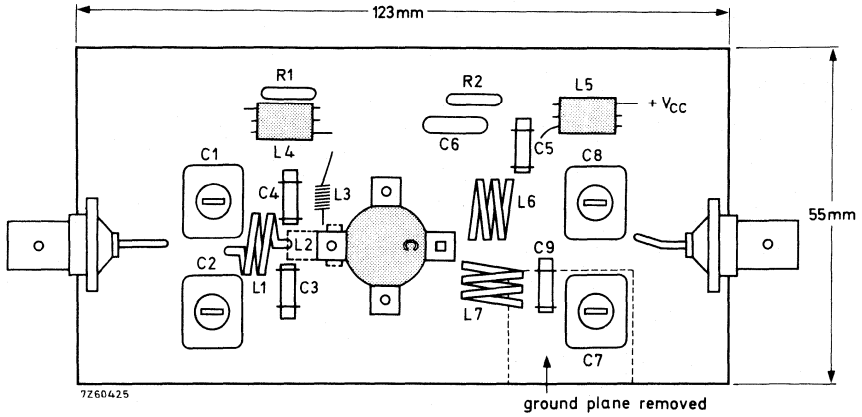


List of components:

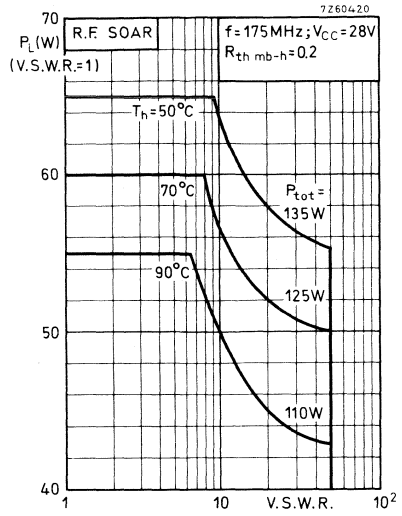
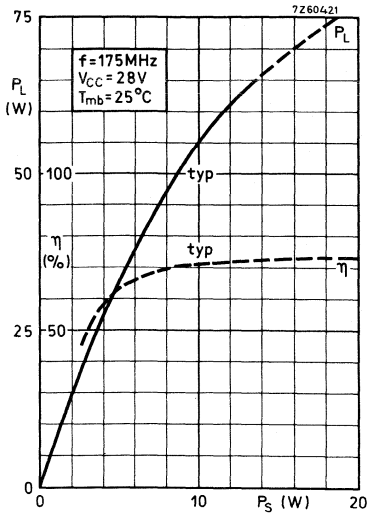
- C1 = 2 to 20 pF film dielectric trimmer (code number 2222 809 07004)
 C2 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
 C3 = C4 = 56 pF ceramic
 C5 = 100 pF ceramic
 C6 = 100 nF polyester
 C7 = 4 to 60 pF film dielectric trimmer (code number 2222 809 07011)
 C8 = 4 to 100 pF film 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 = ferroxube 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

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

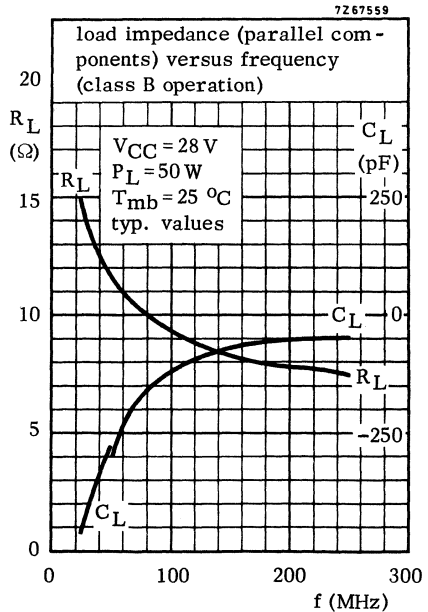
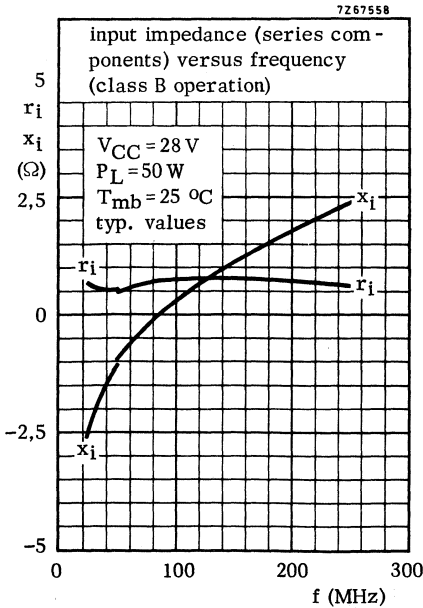
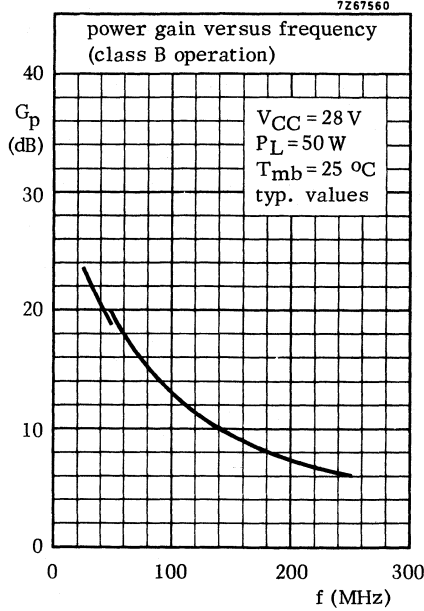


The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



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 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 $-V_{BE} = 1,5 \text{ V}$	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 $T_{mb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	7	11,6	23	W
Junction temperature	T_j	max.	200	200	200	$^\circ\text{C}$
Transition frequency	f_T	typ.	500	500	—	MHz
$I_C = 125 \text{ mA}; V_{CE} = 28 \text{ V}$	f_T	typ.	—	—	400	MHz
$I_C = 250 \text{ mA}; V_{CE} = 28 \text{ V}$						

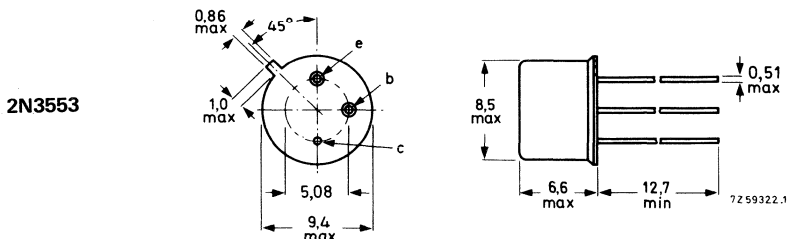
R.F. performance at $V_{CE} = 28 \text{ V}$

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



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

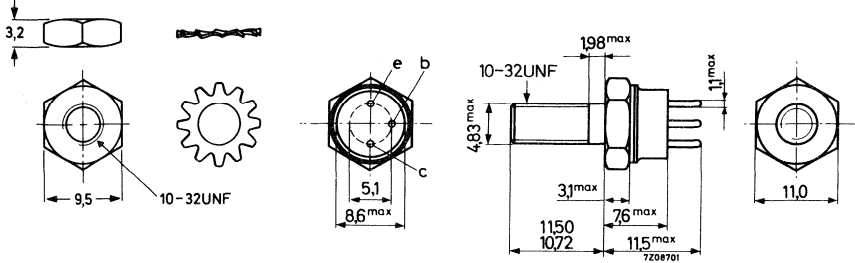
2N3375
2N3553
2N3632

MECHANICAL DATA (continued)

Dimensions in mm

Fig. 1b TO-60 (2N3375 and 2N3632).

The top pins should not be bent.



Torque on nut: min. 0,8 Nm (8 kg cm)
max. 1,7 Nm (17 kg cm)

Diameter of clearance hole in heatsink: 4,8 mm to 5,2 mm.

P.S. 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)	V_{CBO}	max.	65	V	
Collector-emitter voltage	V_{CEX}	max.	65	V	
$I_C \leq 200$ mA; $-V_{BE} = 1,5$ V	V_{CEO}	max.	40	V	
(open base); $I_C \leq 200$ mA	V_{EBO}	max.	4	V	
Emitter-base voltage (open collector)					
Collector current			2N3553	2N3375	2N3632
d.c.	I_C	max.	0,35	0,5	1 A
peak value	I_{CM}	max.	1,0	1,5	3 A
Total power dissipation up to $T_{mb} = 25$ °C	P_{tot}	max.	7	11,6	23 W
Storage temperature	T_{stg}		-65 to +200		°C
Junction temperature	T_j	max.			200 °C

THERMAL RESISTANCE

	2N3553	2N3375	2N3632
From junction to mounting base	$R_{th\ j-mb} = 25$	15	7.5 K/W
From mounting base to heatsink	$R_{th\ mb-h} =$	0.6	0.6 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

	2N3553	2N3375	2N3632
$I_B = 0; V_{CE} = 30\text{ V}$	$I_{CEO} < 100$	100	250 μA

Breakdown voltages

$I_E = 0; I_C = 250\text{ }\mu\text{A}$	$V_{(BR)CBO} > 65$	65	65 V
I_C up to 200 mA	$V_{(BR)CEX} > 65$	65	65 V
$-V_{BE} = 1.5\text{ V}; R_B = 33\text{ }\Omega$ ¹⁾	$V_{(BR)CEO} > 40$	40	40 V
$I_B = 0$ ¹⁾	$V_{(BR)EBO} > 4$	4	4 V
$I_C = 0; I_E = 250\text{ }\mu\text{A}$			

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; $\delta = 0.5$; $f = 50\text{ Hz}$

2N3375
2N3553
2N3632

CHARACTERISTICS (continued)

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

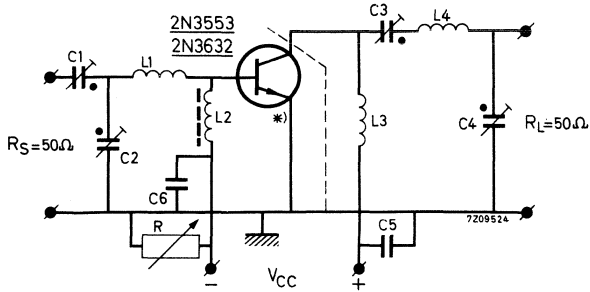
D.C. current gain		2N3553	2N3375	2N3632
$I_C = 125\text{ mA}; V_{CE} = 5\text{ V}$	$h_{FE} >$	15	15	
	$h_{FE} <$	200	200	
$I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$	$h_{FE} >$	10	10	10
	$h_{FE} <$	100	100	150
$I_C = 1000\text{ mA}; V_{CE} = 5\text{ V}$	$h_{FE} >$			5
	$h_{FE} <$			110
Collector capacitance 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
2N3553	175	2.5	< 0.25	< 180	> 50	I
2N3375	100	7.5	< 1	< 410	> 65	II
2N3375	400	> 3	1	270	> 40	III
2N3632	175	> 13.5	3.5	690	> 70	I

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 I (with the 2N3553 or the 2N3632 at $f = 175$ 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 2×10 mm

$L2 =$ Ferroxcube choke coil. Z (at $f = 175$ 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 2×20 mm

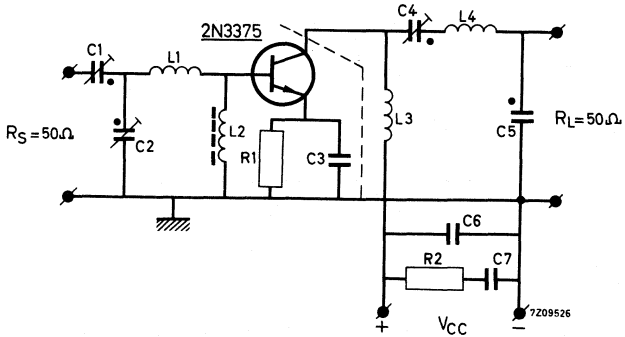
$R = 0$ for the 2N3553

$R = 0$ to 2Ω for the 2N3632

2N3375
2N3553
2N3632

CHARACTERISTICS (continued)

Test circuit II (with the 2N3375 at $f = 100$ MHz)



Components

- C1 = C2 = 3.5 to 61.5 pF air trimmer
 C3 = 10 nF polyester
 C4 = C5 = 4 to 29 pF air trimmer
 C6 = 330 pF ceramic
 C7 = 10 nF polyester

L1 = 2 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 10 mm; leads 2 x 10 mm

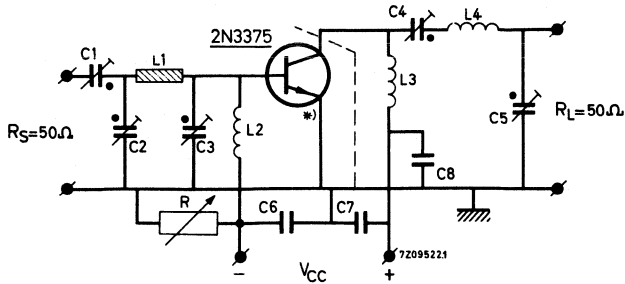
L2 = Ferroxcube choke coil. Z (at $f = 100$ MHz) = $700 \Omega \pm 20\%$
 (code number 4312 020 36640)

L3 = 23 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 6 mm

L4 = 5 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 12 mm; leads 2 x 10 mm

R1 = 1.35 Ω carbon

R2 = 10 Ω carbon

CHARACTERISTICS (continued)Test circuit III (with the 2N3375 at $f = 400$ 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

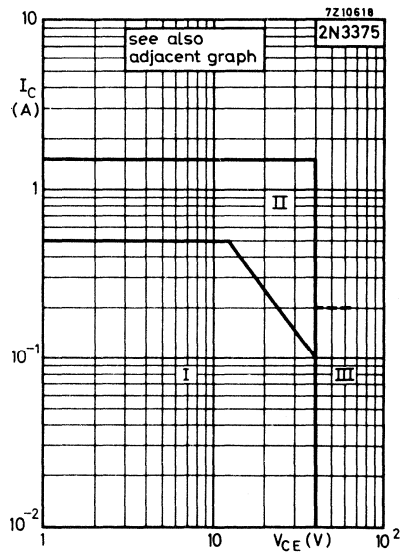
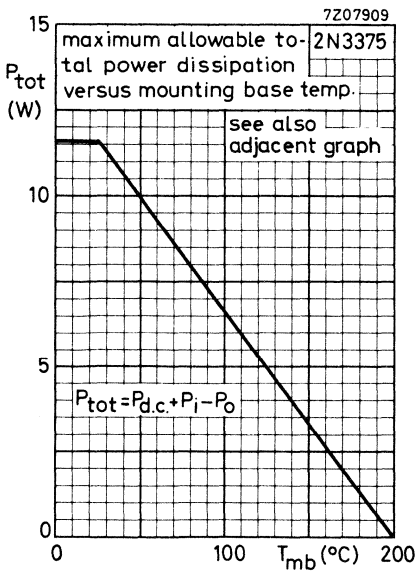
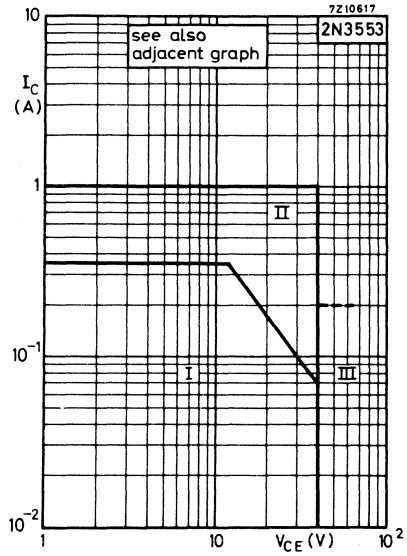
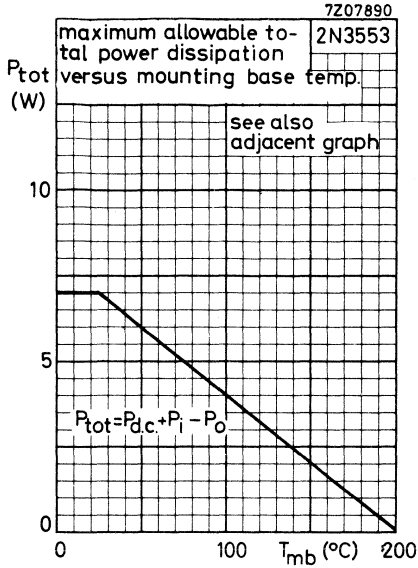
$L2 =$ 17 turns closely wound enamelled Cu wire (0.5 mm); int. diam. 3 mm

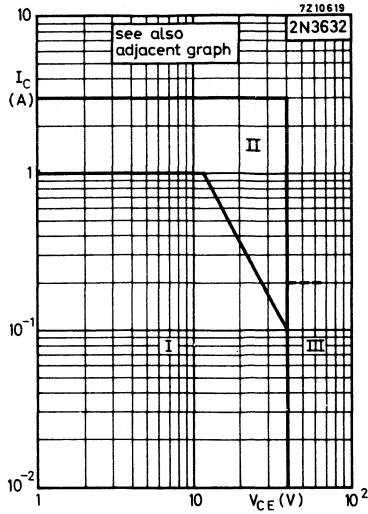
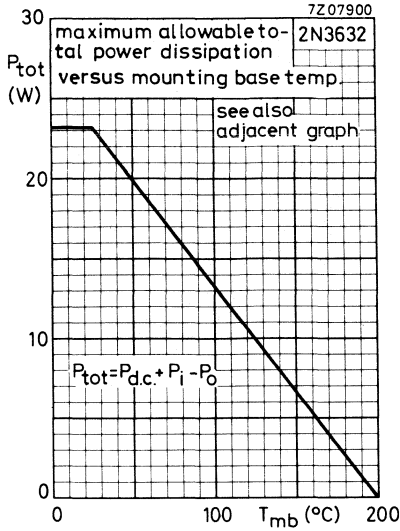
$L3 =$ 7 turns closely wound enamelled Cu wire (0.5 mm); int. diam. 3 mm

$L4 =$ 1 turn Cu wire (1.5 mm); int. diam. 10 mm; leads 2 x 5 mm

$R =$ 0 to 5 Ω

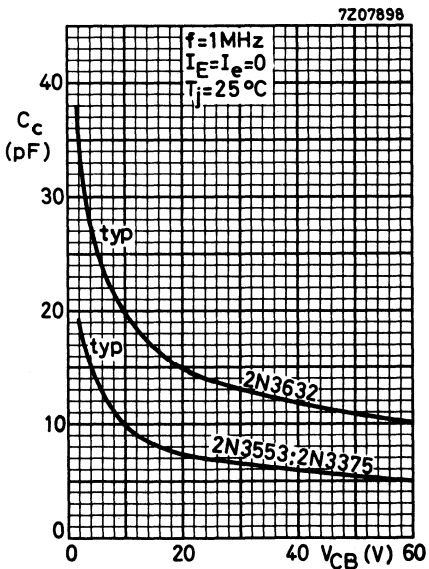
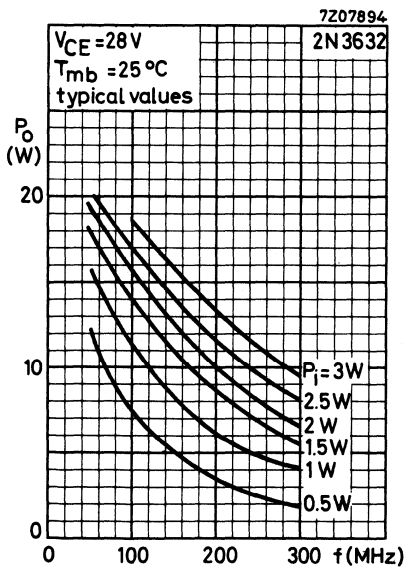
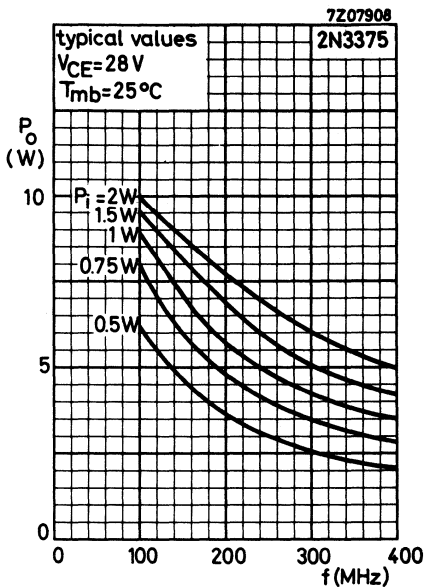
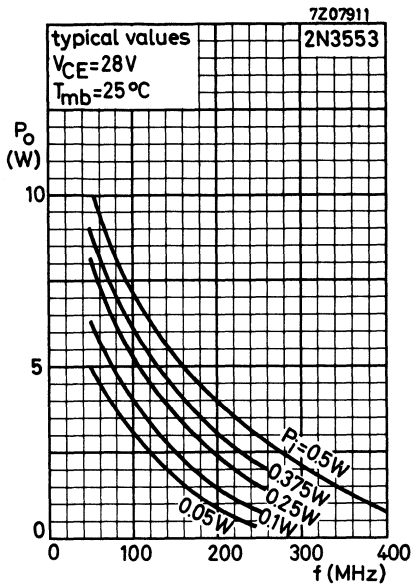
2N3375
 2N3553
 2N3632

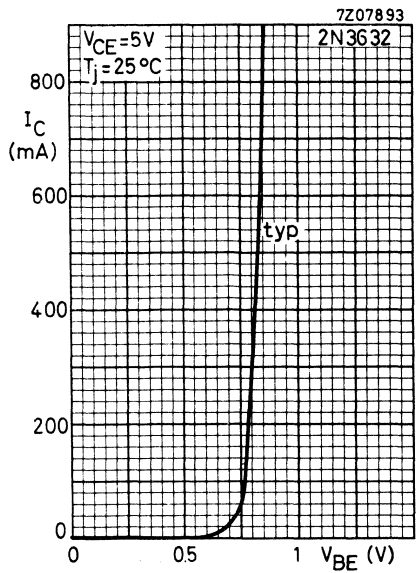
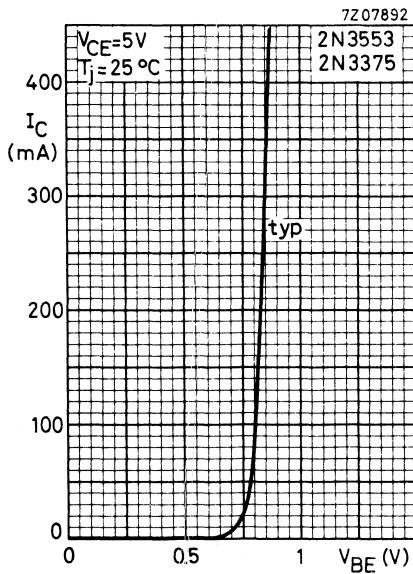
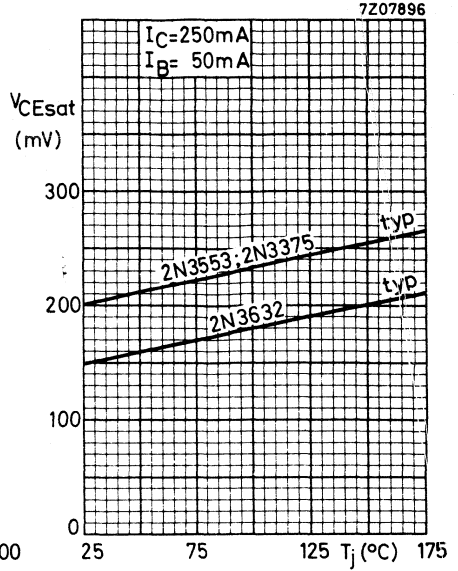
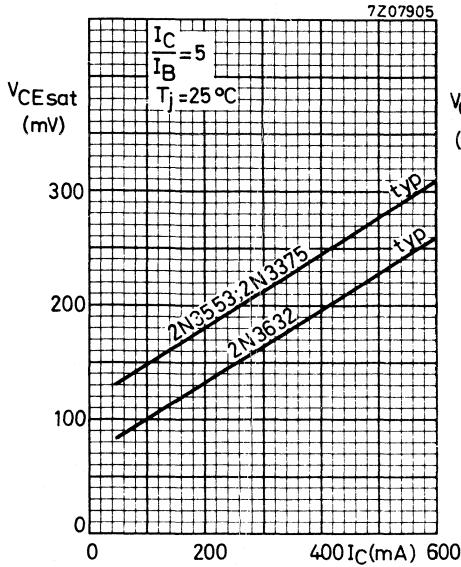




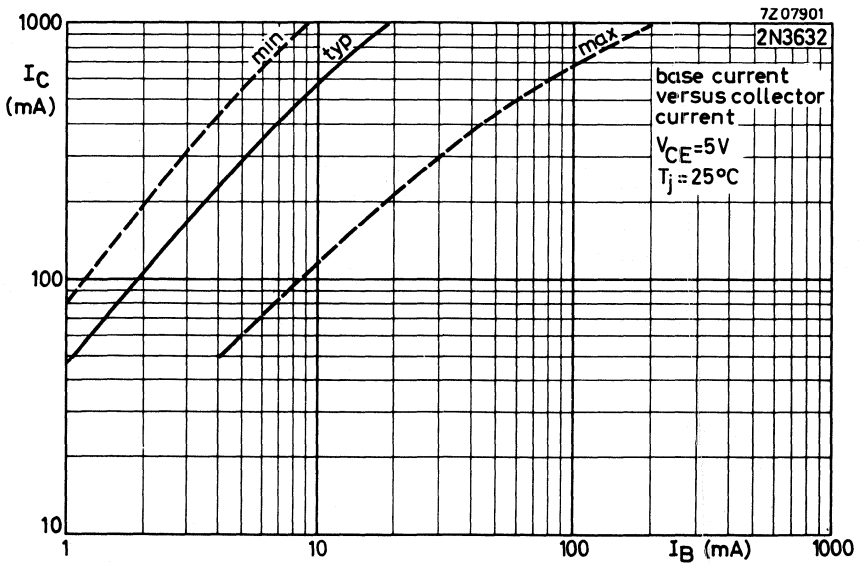
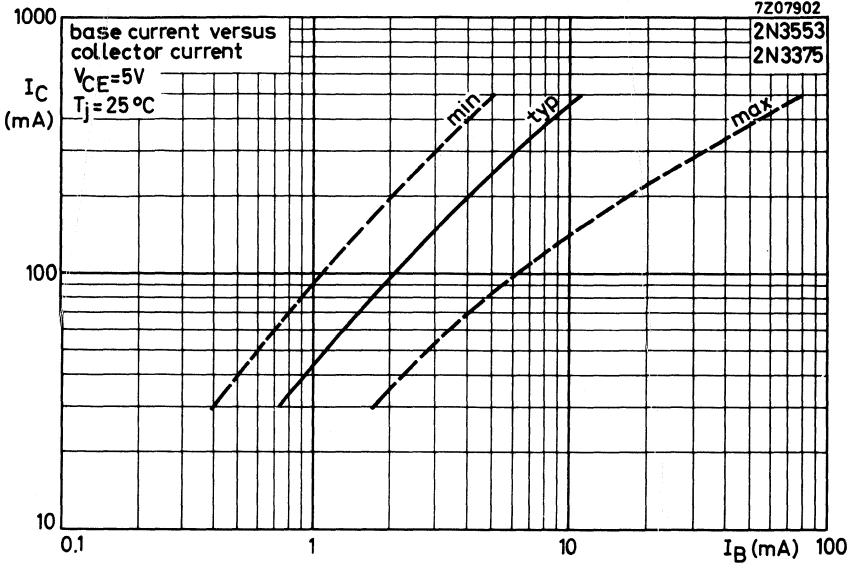
- I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.
- II Additional region of operation at $f \geq 1$ MHz.
Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias 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 $R_{BE} \geq 33 \Omega$, $I_C \leq 200$ mA and the transient energy does not exceed 0.5 mWs.

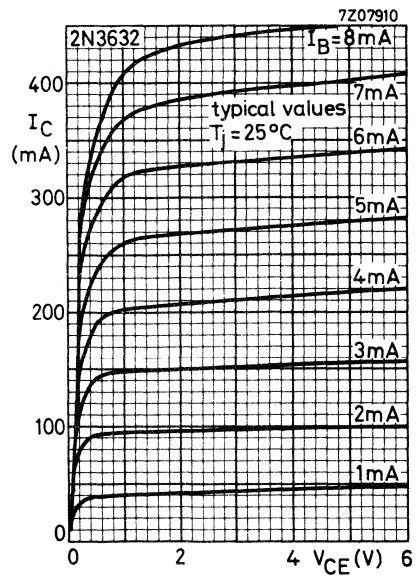
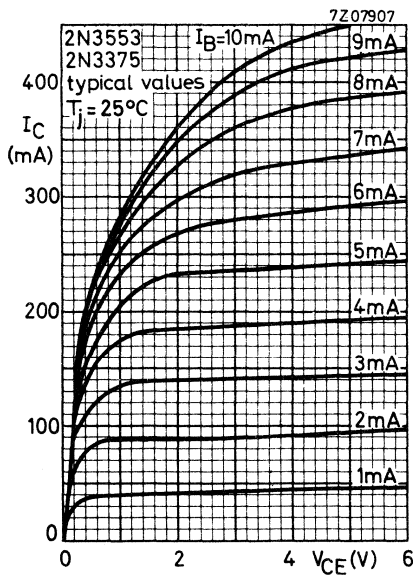
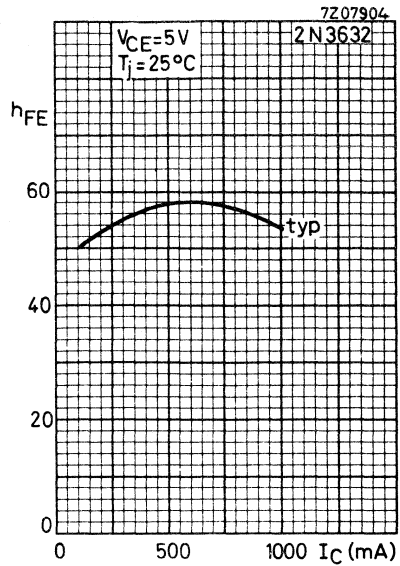
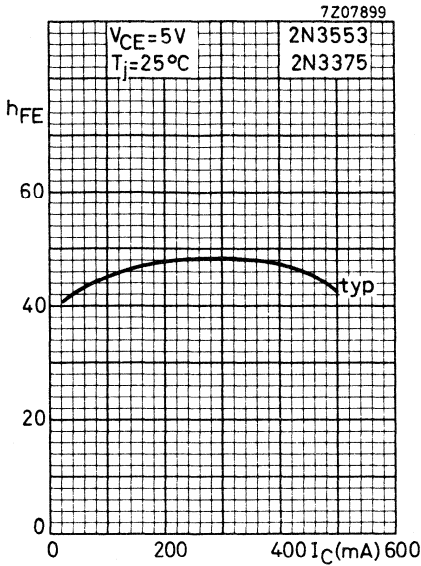
2N3375
 2N3553
 2N3632



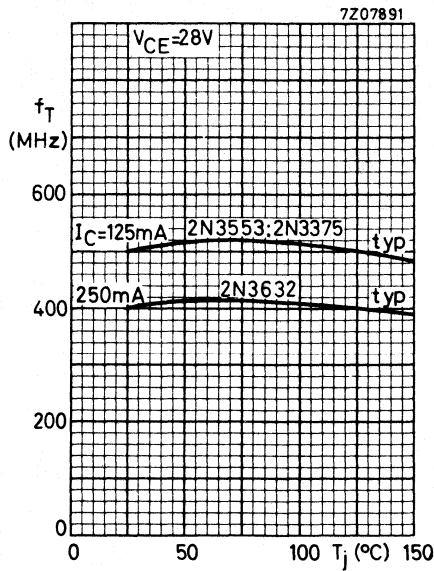
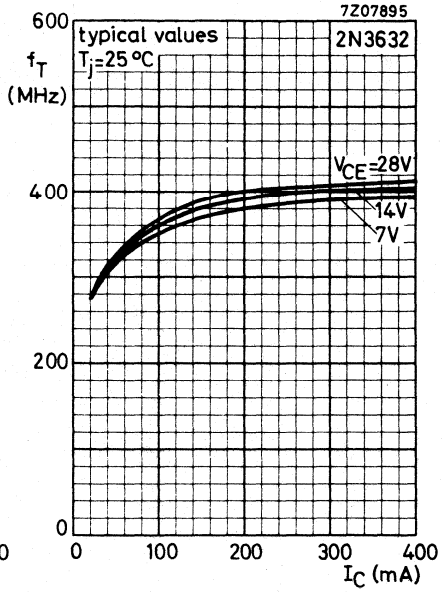
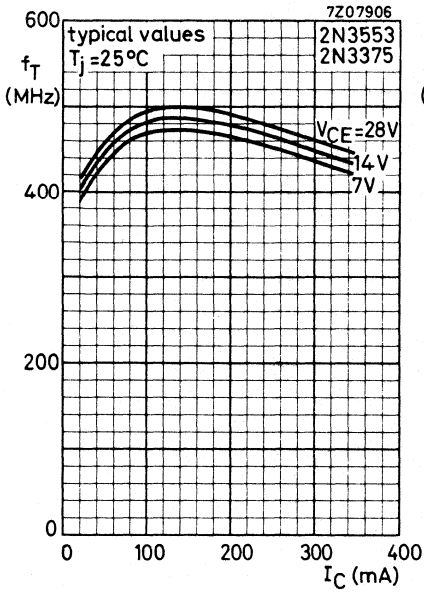


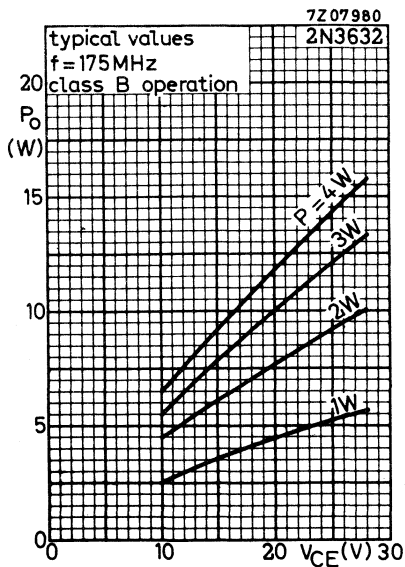
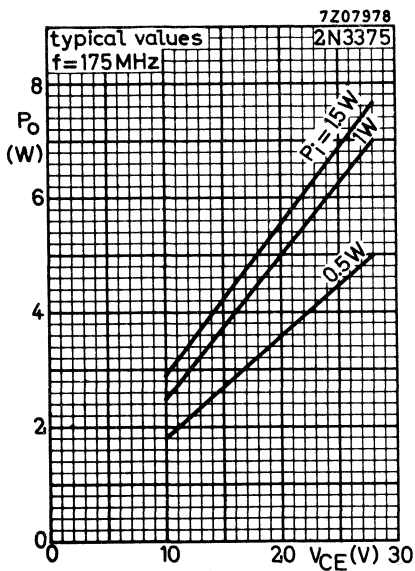
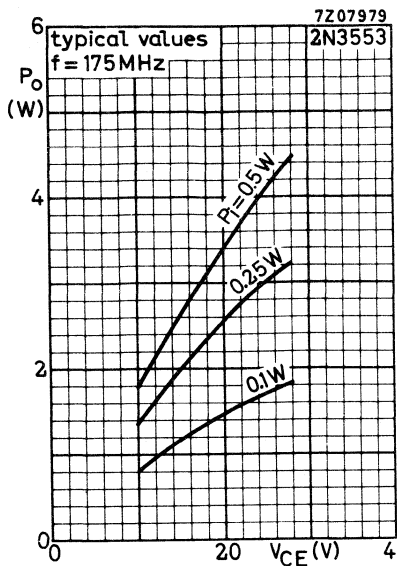
2N3375
2N3553
2N3632





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_{CE0} max.	30	20 V
Emitter-base voltage (open collector)	V_{EB0} max.	3,5	2,0 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 $I_C = 50 \text{ mA}; V_{CE} = 15 \text{ V}; f = 200 \text{ MHz}$	f_T min.	500	500 MHz

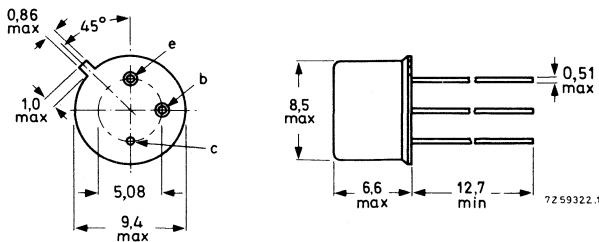
R.F. performance

type number	f (MHz)	V_{CE} (V)	P_o (W)	G_p (dB)	η (%)
2N3866	400	28	1	> 10	> 45
2N4427	175	12	1	> 10	> 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: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

		2N3866	2N4427
Collector-base voltage (open emitter) ¹⁾	V_{CBO}	max. 55	40 V
Collector-emitter voltage ¹⁾ $R_{BE} = 10 \Omega$	V_{CER}	max. 55	40 V
Collector-emitter voltage (open base) ¹⁾	V_{CEO}	max. 30	20 V
Emitter-base voltage (open collector) ¹⁾	V_{EBO}	max. 3.5	2.0 V
Collector current (d.c. or averaged over any 20 ms period) ¹⁾	I_C	max. 0.4	0.4 A
Collector current (peak value) ¹⁾	I_{CM}	max. 0.4	0.4 A
Total power dissipation up to $T_{mb} = 25 \text{ }^\circ\text{C}$ ¹⁾	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	K/W
From junction to mounting base	$R_{th j-mb}$	=	35	K/W
²⁾ From mounting base to heatsink mounted with top clamping washer of 56218	$R_{th mb-h}$	=	1.0	K/W
top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th mb-h}$	=	2.5	K/W

1) See also graphs indicating areas of permissible operation.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

	2N3866	2N4427
Collector cut-off current		
$I_B = 0; V_{CE} = 28\text{ V}$	$I_{CEO} < 20$	μA
$I_B = 0; V_{CE} = 12\text{ V}$	$I_{CEO} <$	$20\ \mu\text{A}$
Breakdown voltages		
$I_E = 0; I_C = 100\ \mu\text{A}$	$V_{(BR)CBO} > 55$	40 V
$I_C = 5\text{ mA}; R_{BE} = 10\ \Omega$	$V_{(BR)CER} > 55$	40 V
$I_B = 0; I_C = 5\text{ mA}$	$V_{(BR)CEO} > 30$	20 V
$I_C = 0; I_E = 100\ \mu\text{A}$	$V_{(BR)EBO} > 3,5$	2 V
Collector-emitter saturation voltage		
$I_C = 100\text{ mA}; I_B = 20\text{ mA}$	$V_{CEsat} < 1,0$	$0,5\text{ V}$
D.C. current gain		
$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$	$h_{FE} 10\text{ to }200$	$10\text{ to }200$
$I_C = 100\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	
$I_C = 360\text{ mA}; V_{CE} = 5\text{ V}$	$h_{FE} > 5$	
Transition frequency		
$I_C = 50\text{ mA}; V_{CE} = 15\text{ V}; f = 200\text{ MHz}$	$f_T \geq 500$	$500\text{ MHz} \leftarrow$
Collector capacitance		
$V_{CB} = 28\text{ V}; I_E = I_e = 0; f = 1\text{ MHz}$	$C_c < 3$	pF
$V_{CB} = 12\text{ V}; I_E = I_e = 0; f = 1\text{ MHz}$	$C_c <$	$4\ \text{pF}$

R.F. performance at $T_{mb} = 25\text{ }^\circ\text{C}$

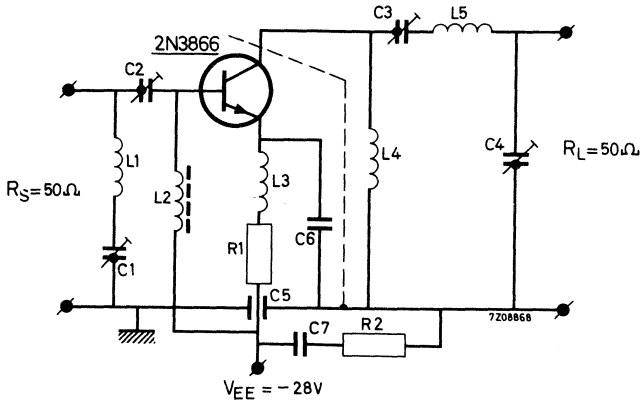
	f (MHz)	V_{CE} (V)	P_o (W)	G_p (dB)	I_C (mA)	η (%)	test circuit
2N3866	100	28	1,8	> 10	< 107	> 60	
2N3866	250	28	1,5	> 10	< 107	> 50	
2N3866	400	28	1,0	> 10	< 79	> 45	
2N4427	175	12	1,0	> 10	< 167	> 50	
2N4427	470	12	0,4	> 10	67	50	

* The transistor can withstand an output V.S.W.R. of 3 : 1 varied through all phases for conditions, mentioned in the table above.

2N3866
2N4427

CHARACTERISTICS (continued)

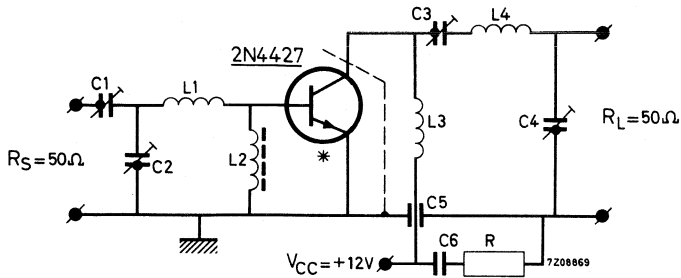
Test circuit I (with the 2N3866 at $f = 400$ MHz)



- 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.

APPLICATION INFORMATION (continued)

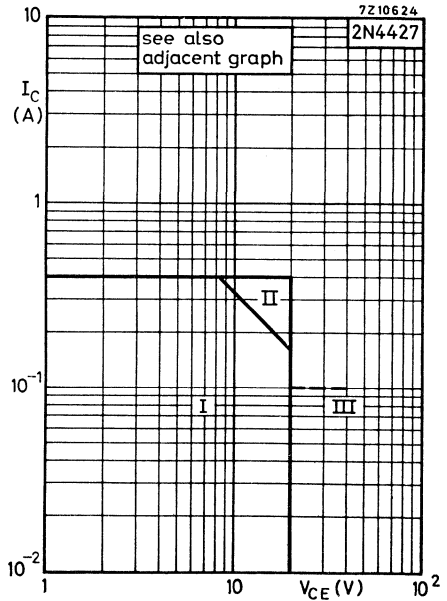
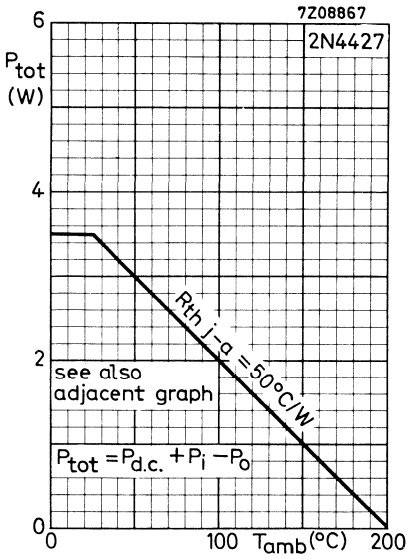
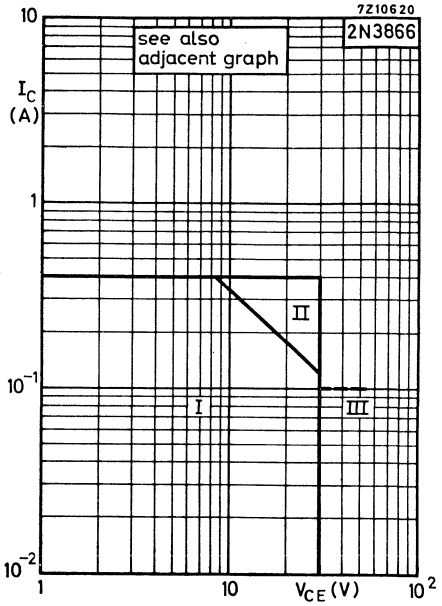
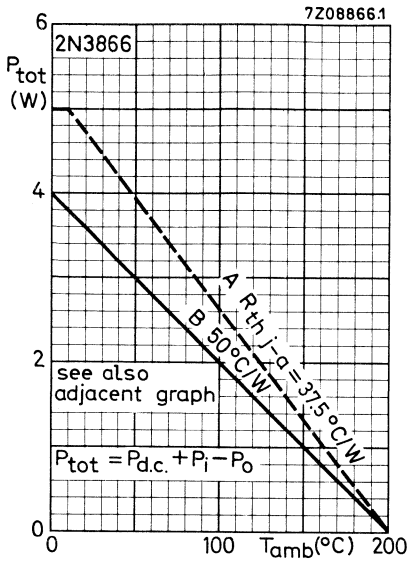
Test circuit II (with the 2N4427 at $f = 175$ MHz)

*) 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 $f = 175$ MHz) = 550Ω (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 $-V_{BB} \leq 1.5$ V and $R_{BE} \geq 33 \Omega$, $I_C \leq 100$ mA and the transient energy does not exceed 0.125 mWs.

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
$I_C = 200 \text{ mA}; V_{CE} = 13,5 \text{ V}$						

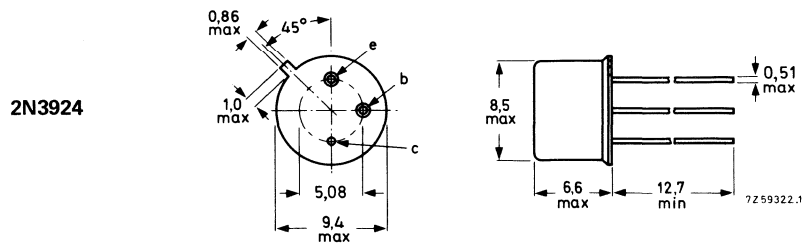
R.F. performance at $V_{CE} = 13,5 \text{ V}; f = 175 \text{ MHz}$

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. 1a TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

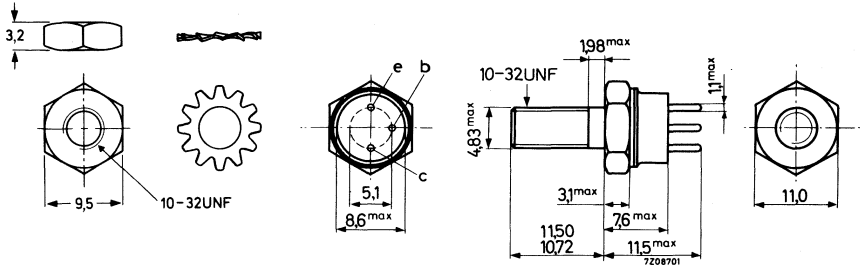
Accessories: 56245 (distance disc).

MECHANICAL DATA (continued)

Dimensions in mm

Fig. 1b TO-60 (2N3926 and 2N3927).

Emitter connected to case.
The top pins should not be bent.



Torque on nut: min. 0,8 Nm (8 kg cm)
max. 1,7 Nm (17 kg cm)

Diameter of clearance hole in heatsink: 4,8 mm to 5,2 mm.

P.S. 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)	V_{CBO}	max.	36	V	
Collector-emitter voltage	V_{CEX}	max.	36	V	
$I_C \leq 400$ mA; $-V_{BE} = 1,5$ V	V_{CEO}	max.	18	V	
(open base); $I_C \leq 400$ mA	V_{EBO}	max.	4	V	
Emitter-base voltage (open collector)					
Collector current			2N3924	2N3926	2N3927
d.c.	I_C	max.	0,5	1,0	1,5 A
peak value	I_{CM}	max.	1,5	3,0	4,5 A
Total power dissipation	P_{tot}	max.	7	11,6	23 W
up to $T_{mb} = 25$ °C	T_{stg}		-65 to +200 °C		
Storage temperature	T_j	max.	200 °C		
Junction temperature					

THERMAL RESISTANCE

		2N3924	2N3926	2N3927
From junction to mounting base	$R_{th\ j-mb}$	= 25	15	7.5 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6	0.6 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

		2N3924	2N3926	2N3927
$I_E = 0; V_{CB} = 15\text{ V}$	I_{CBO}	< 100	100	250 μA
$I_E = 0; V_{CB} = 15\text{ V}; T_j = 150\text{ }^\circ\text{C}$	I_{CBO}	< 5	5	10 mA

Breakdown voltages

$I_E = 0; I_C = 250\text{ }\mu\text{A}$	$V_{(BR)CBO}$	> 36	36	36 V
I_C up to 400 mA $-V_{BE} = 1.5\text{ V}; R_B = 33\text{ }\Omega$ ¹⁾	$V_{(BR)CEX}$	> 36	36	36 V
$I_B = 0$ ¹⁾	$V_{(BR)CEO}$	> 18	18	18 V
$I_C = 0; I_E = 250\text{ }\mu\text{A}$	$V_{(BR)EBO}$	> 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; $\delta = 0.5$; $f = 50\text{ Hz}$

2N3924
2N3926
2N3927

CHARACTERISTICS (continued)

$T_j = 25^\circ\text{C}$ unless otherwise specified

D.C. current gain

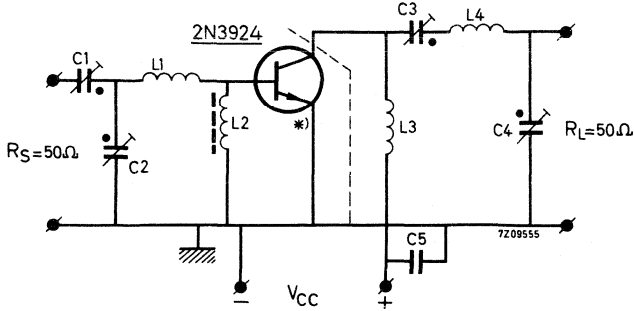
		2N3924	2N3926	2N3927
$I_C = 250 \text{ mA}; V_{CE} = 5 \text{ V}$	$h_{FE} >$	10		
	$h_{FE} <$	150		
$I_C = 500 \text{ mA}; V_{CE} = 5 \text{ V}$	$h_{FE} >$		5	
	$h_{FE} <$		150	
$I_C = 1000 \text{ mA}; V_{CE} = 5 \text{ V}$	$h_{FE} >$			5
	$h_{FE} <$			150
Collector capacitance at $f = 1 \text{ MHz}$				
$I_E = I_e = 0; V_{CB} = 13.5 \text{ V}$	$C_c <$	20	20	45 pF
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
2N3924	4	< 1	< 420	> 70	I
2N3926	7	< 2	< 740	> 70	II
2N3927	12	< 4	< 1100	> 80	II

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 I (with the 2N3924 at $f = 175$ MHz)

*) The length of the external emitter wire of the 2N3924 is 1.6 mm.

Components

$C1 = C2 = C3 = C4 = 4$ to 29 pF air trimmer

$C5 =$ 10 nF polyester

$L1 =$ 1 turn Cu wire (1.0 mm); int. diam. 10 mm; leads 2×10 mm

$L2 =$ Ferroxcube choke coil. Z (at $f = 175$ MHz) = $550 \Omega \pm 20\%$
(code number 4312 020 36640)

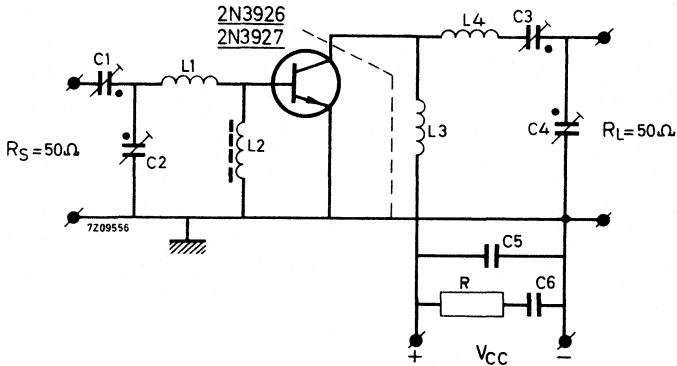
$L3 =$ 15 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm

$L4 =$ 3 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 12 mm; leads 2×20 mm

2N3924
2N3926
2N3927

CHARACTERISTICS (continued)

Test circuit II (with the 2N3926 or 2N3927 at $f = 175 \text{ MHz}$)



Components

C1 = C2 = C3 = C4 = 4 to 29 pF air trimmer

C5 = 100 pF ceramic

C6 = 10 nF polyester

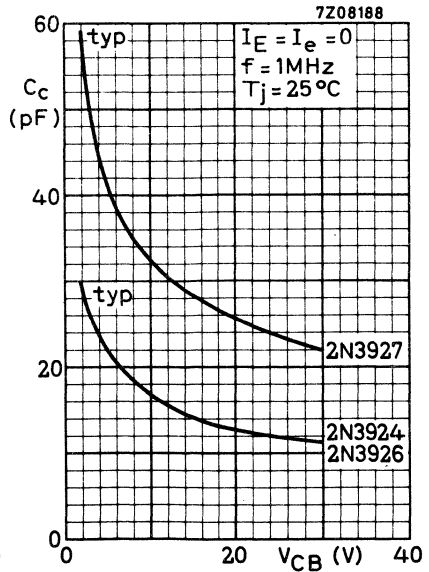
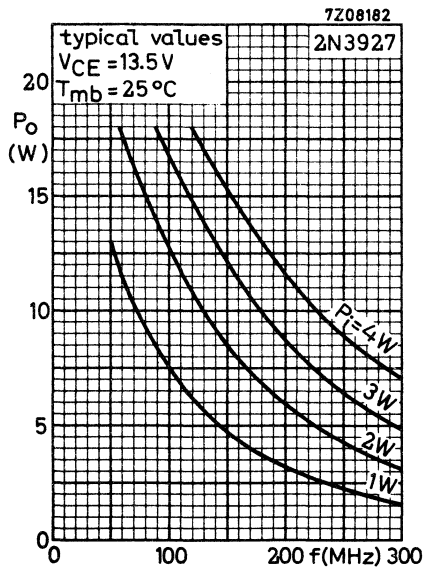
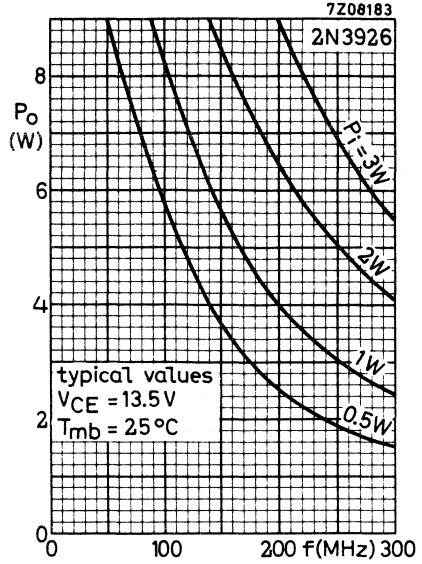
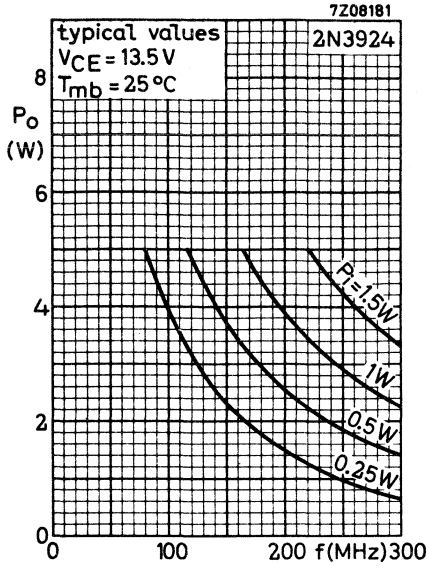
L1 = 1 turn Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm

L2 = Ferroxcube choke coil. Z (at $f = 175 \text{ MHz}$) = $550 \Omega \pm 20\%$
(code number 4312 020 36640)

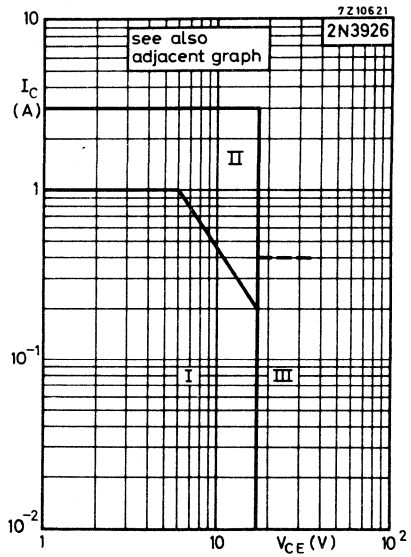
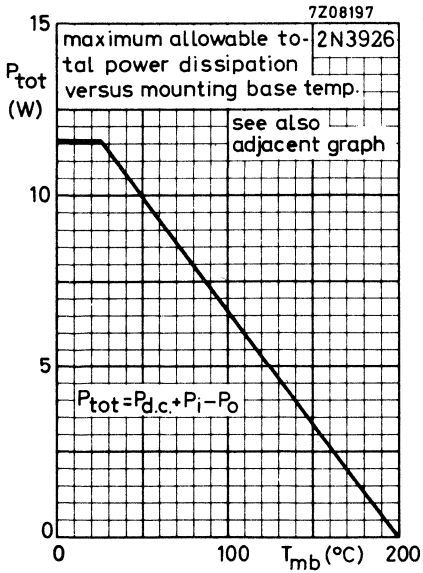
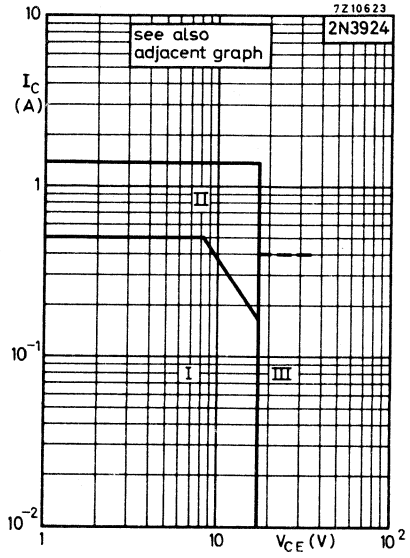
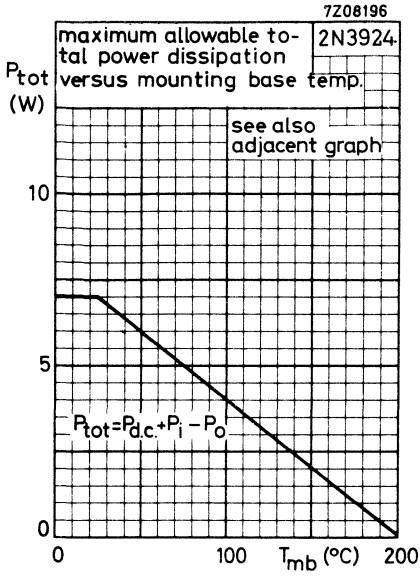
L3 = 15 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm

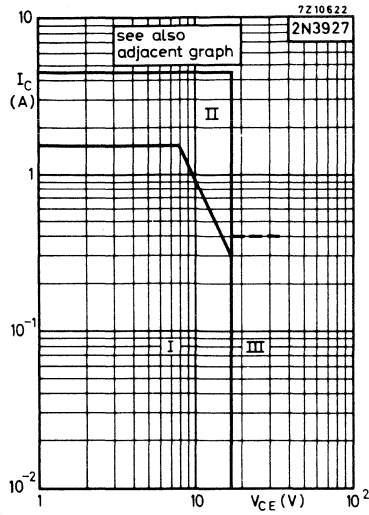
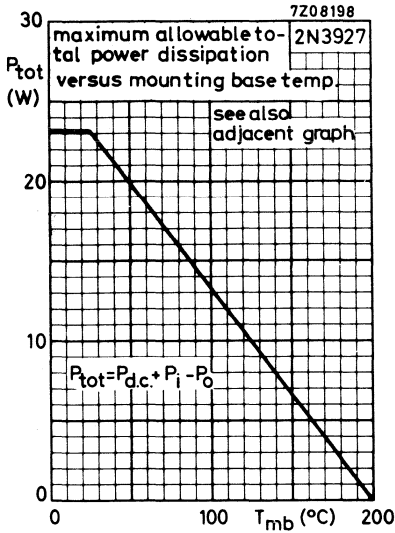
L4 = 2 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 8.5 mm; leads 2 x 20 mm

R = 10 Ω carbon



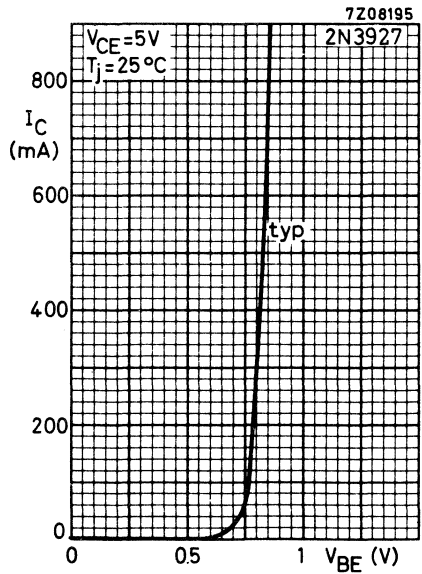
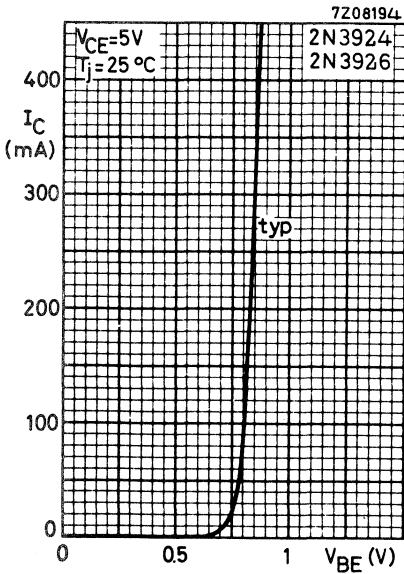
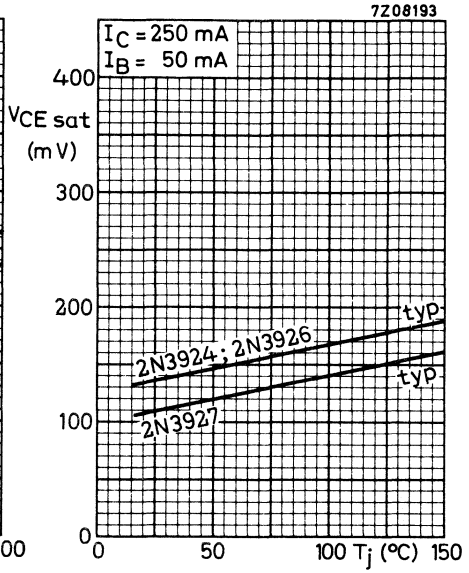
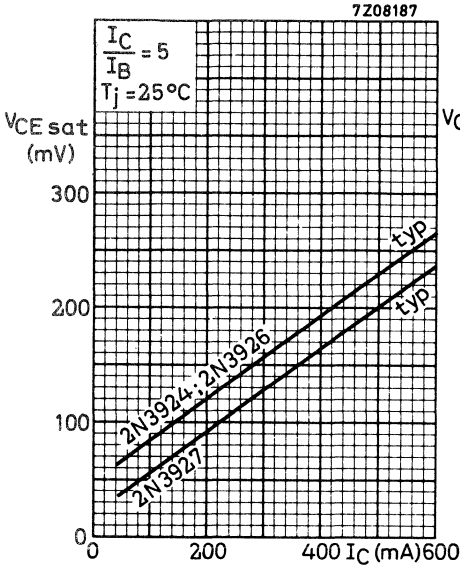
2N3924
 2N3926
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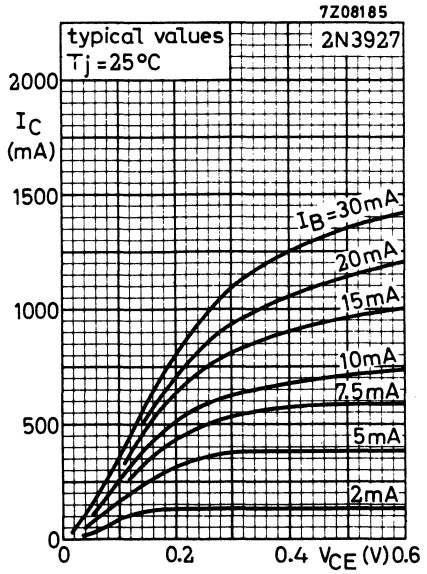
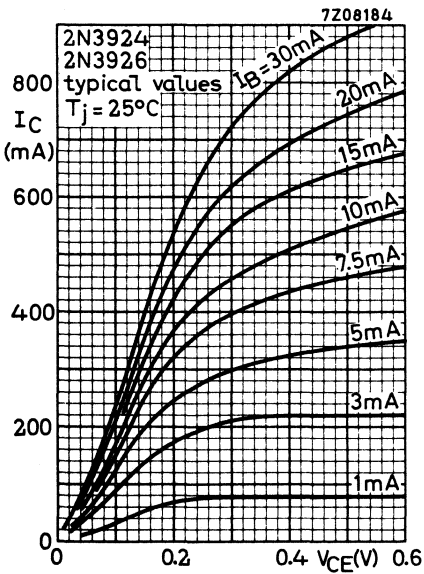
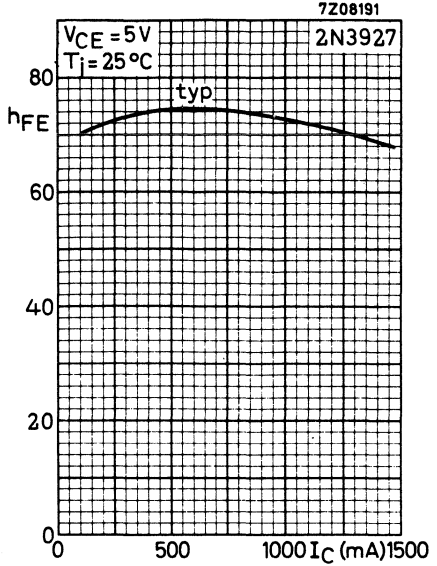
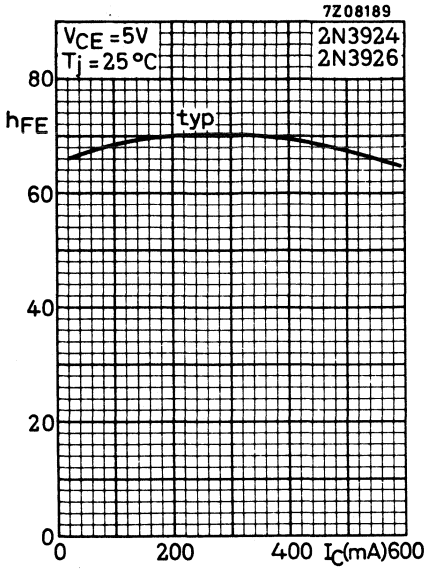




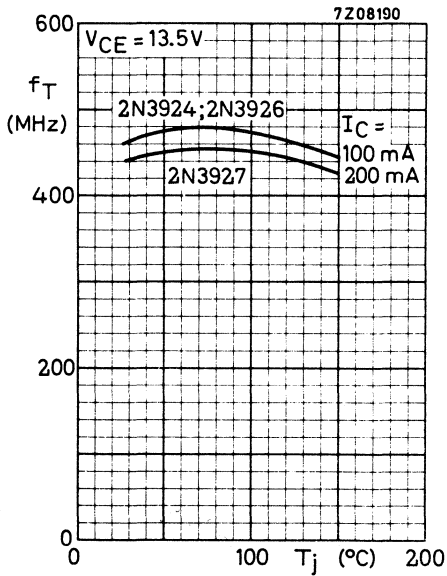
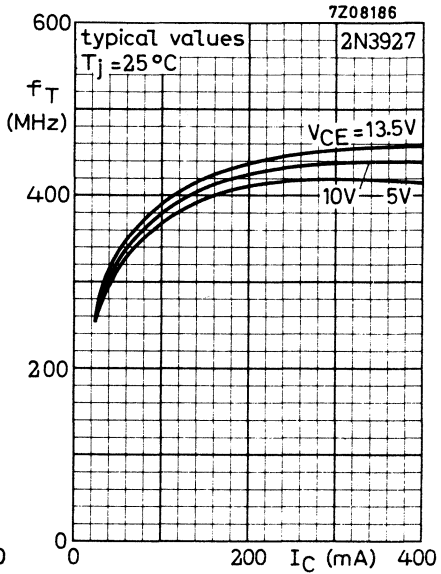
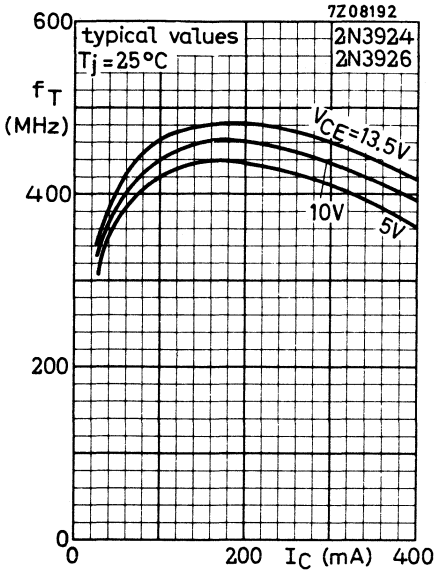
- I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.
- II Additional region of operation at $f \geq 1$ MHz.
Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias 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



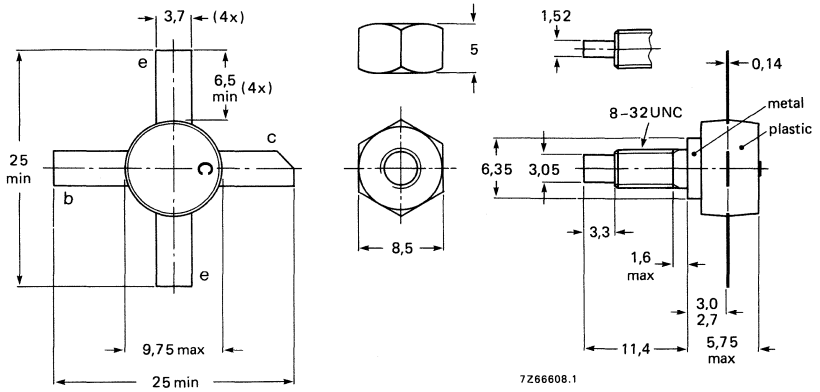
SILICON EPITAXIAL PLANAR OVERLAY TRANSISTOR

For data of this transistor please refer to type 2N3866

SOT-48/2

MECHANICAL DATA

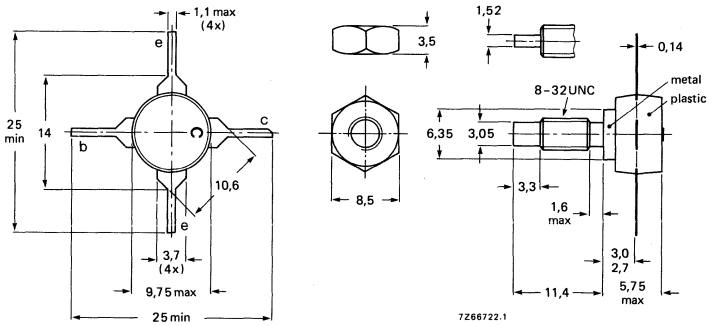
Dimensions in mm



SOT-48/3

MECHANICAL DATA

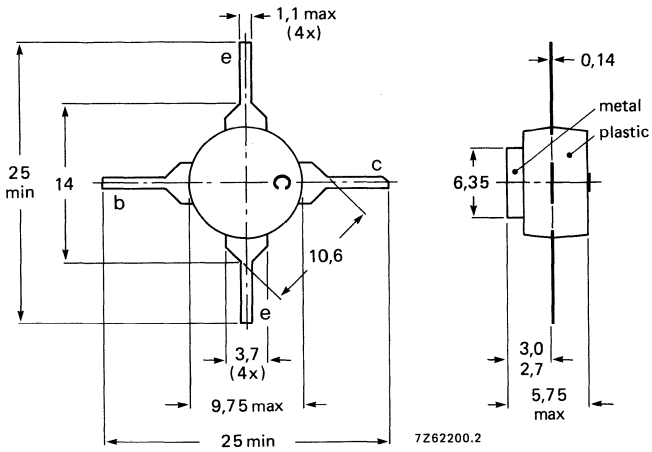
Dimensions in mm



SOT-48/4

MECHANICAL DATA

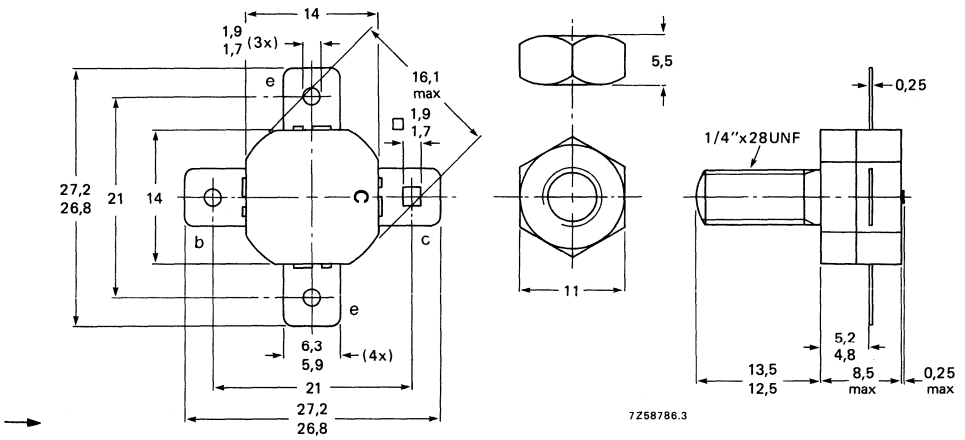
Dimensions in mm



SOT-55

MECHANICAL DATA

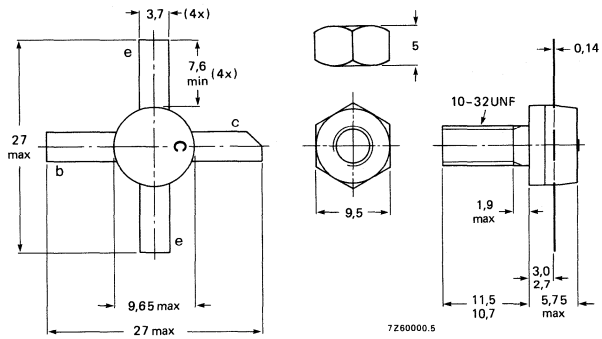
Dimensions in mm



SOT-56

MECHANICAL DATA

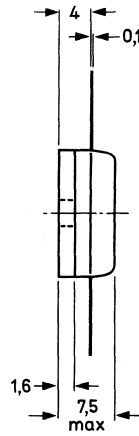
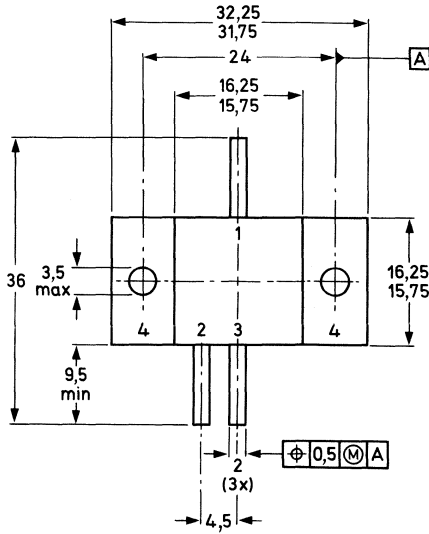
Dimensions in mm



SOT-75A

MECHANICAL DATA

Dimensions in mm

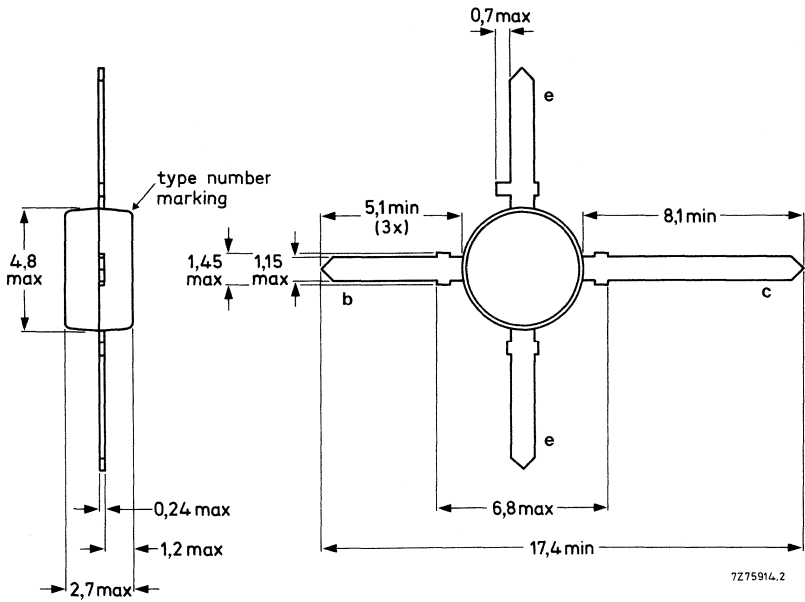


7265901.1

SOT-103

MECHANICAL DATA

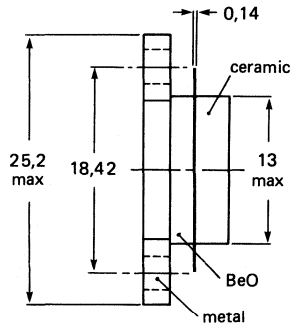
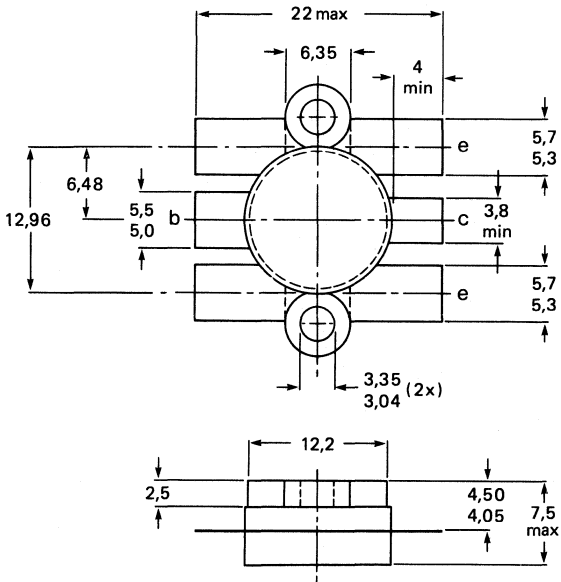
Dimensions in mm



SOT-119

MECHANICAL DATA

Dimensions in mm

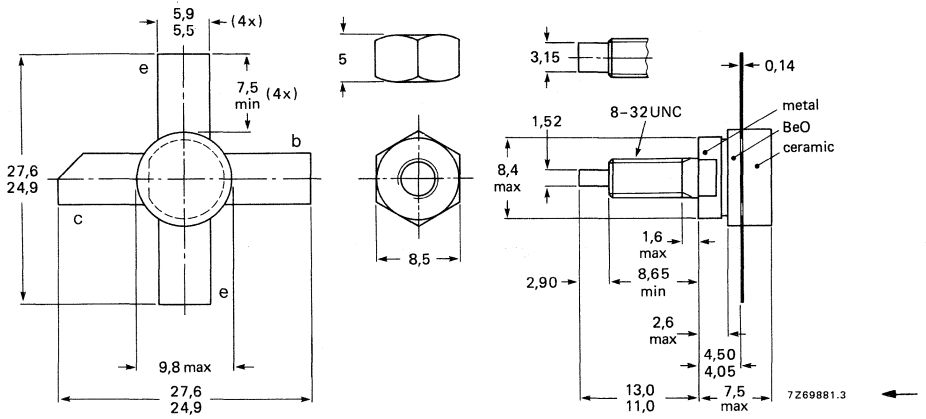


7277385.6

SOT-120

MECHANICAL DATA

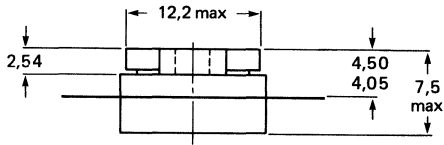
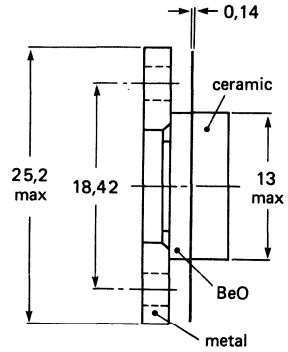
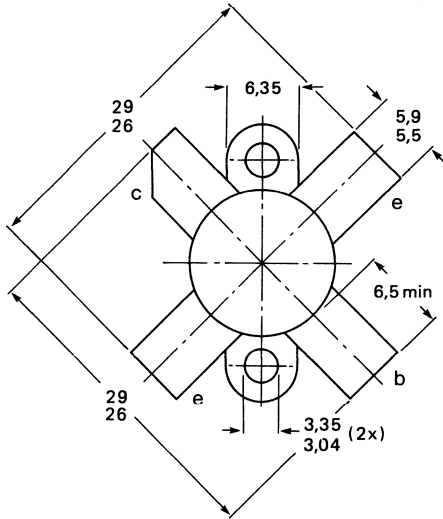
Dimensions in mm



SOT-121

MECHANICAL DATA

Dimensions in mm

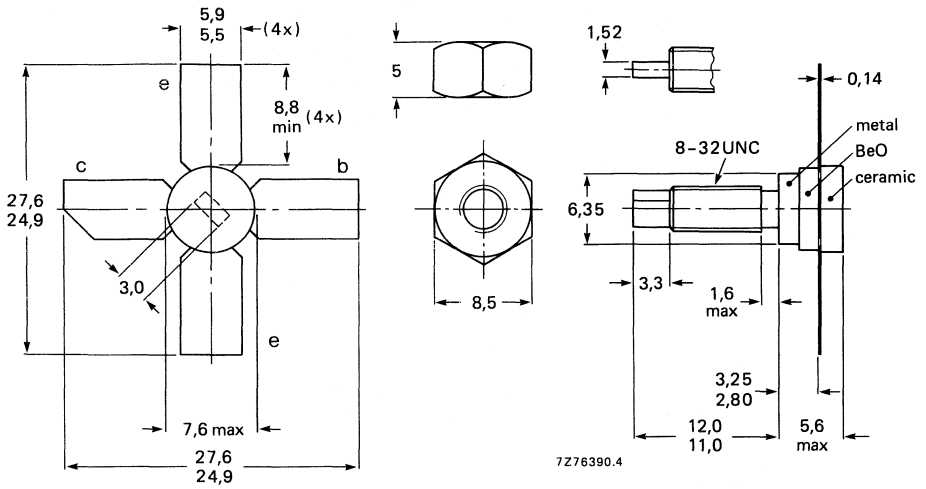


7275334.4

SOT-122

MECHANICAL DATA

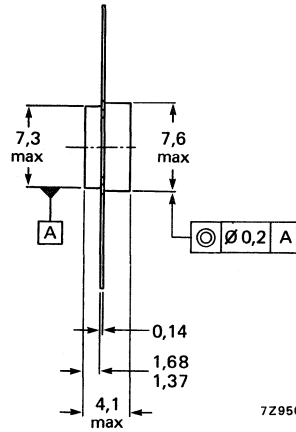
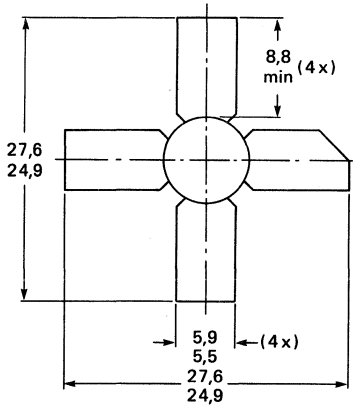
Dimensions in mm



SOT-122D

MECHANICAL DATA

Dimensions in mm

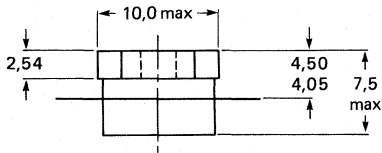
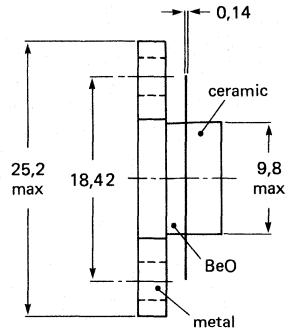
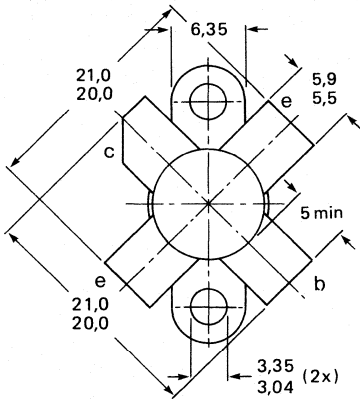


7295608

SOT-123

MECHANICAL DATA

Dimensions in mm



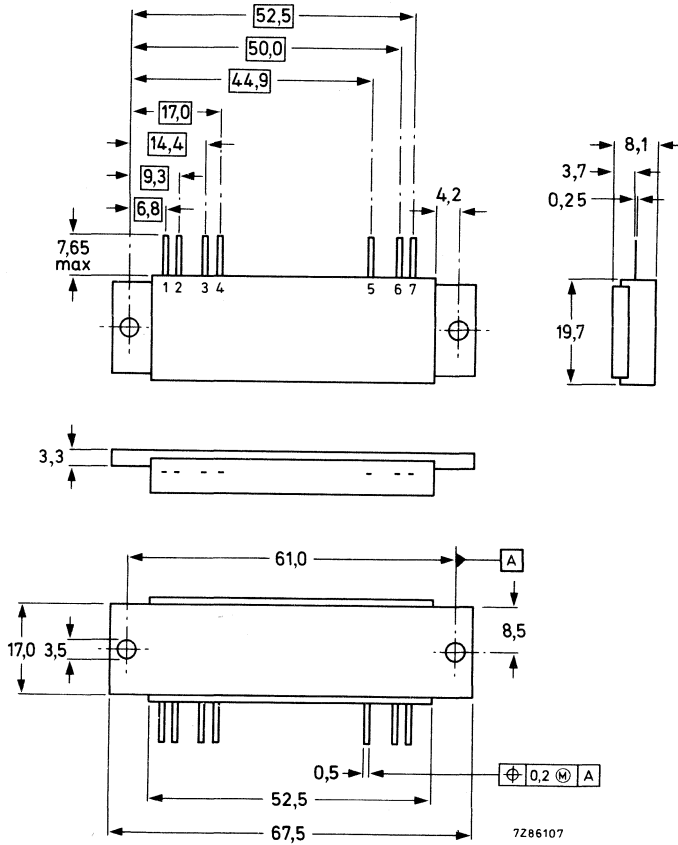
7Z77386.2



SOT-132B

MECHANICAL DATA

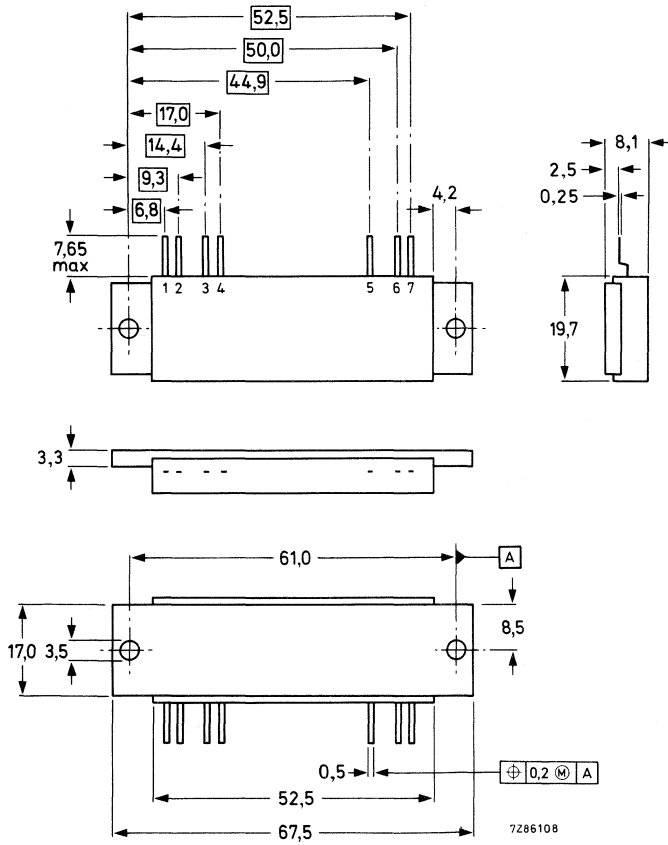
Dimensions in mm



SOT-132C

MECHANICAL DATA

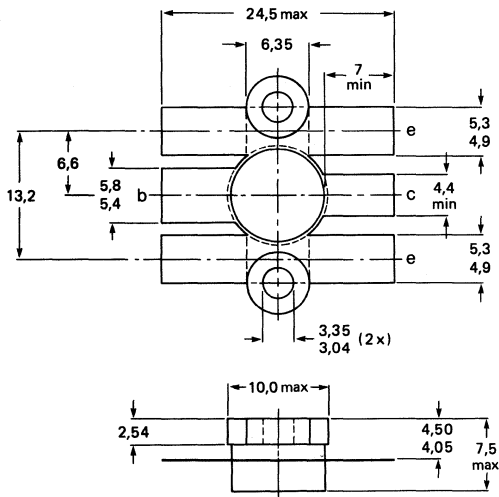
Dimensions in mm



SOT-160

MECHANICAL DATA

Dimensions in mm



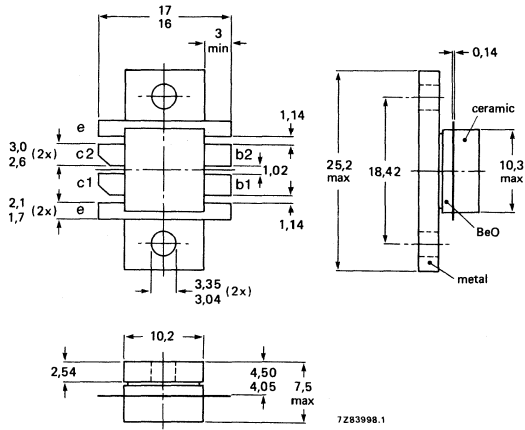
7283984.1



SOT-161

MECHANICAL DATA

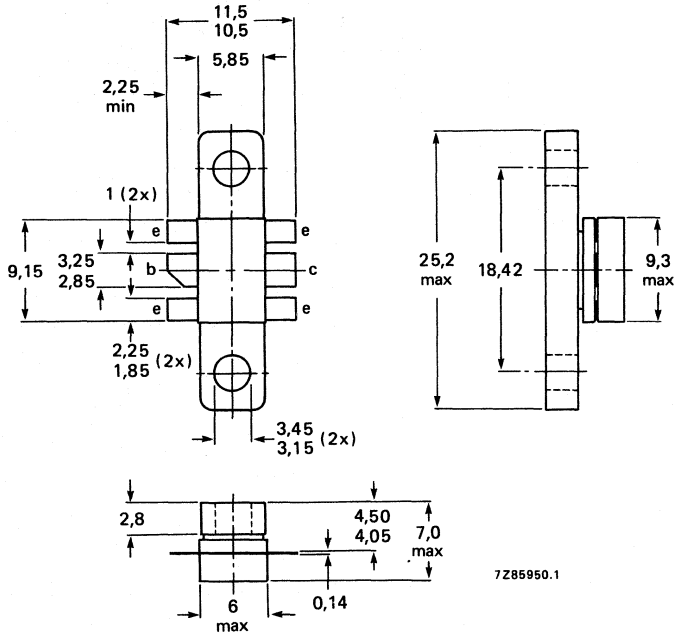
Dimensions in mm



SOT-171

MECHANICAL DATA

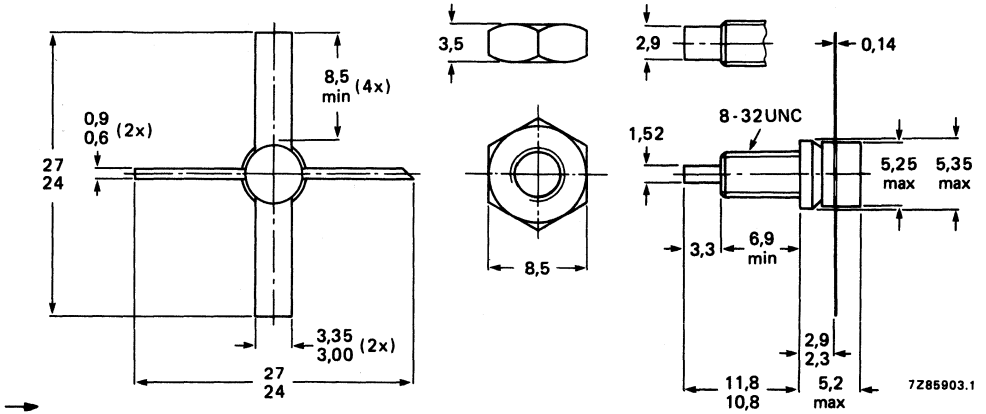
Dimensions in mm



SOT-172A1

MECHANICAL DATA

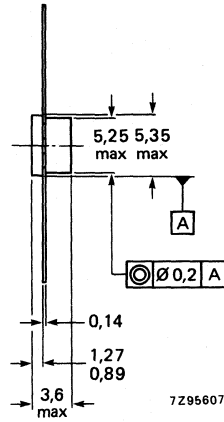
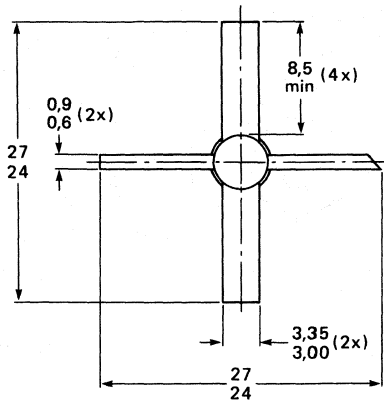
Dimensions in mm



SOT-172D

MECHANICAL DATA

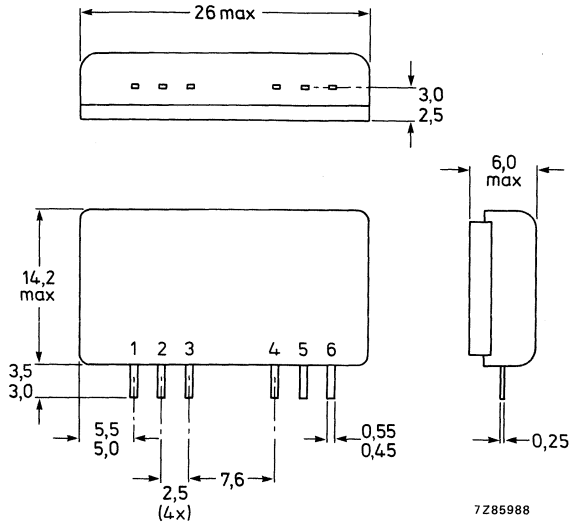
Dimensions in mm



SOT-181

MECHANICAL DATA

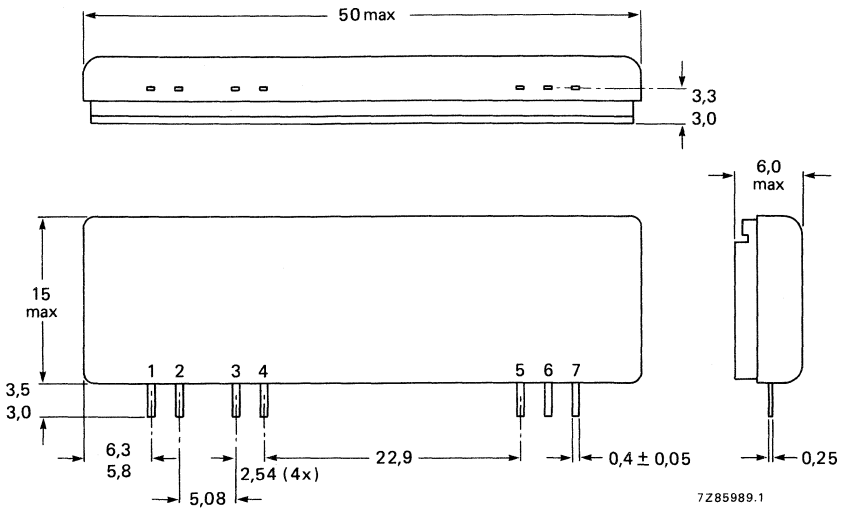
Dimensions in mm



SOT-182

MECHANICAL DATA

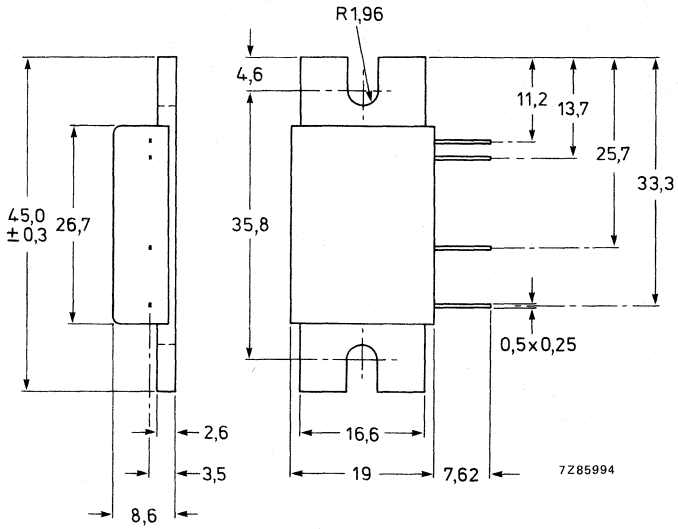
Dimensions in mm



SOT-183

MECHANICAL DATA

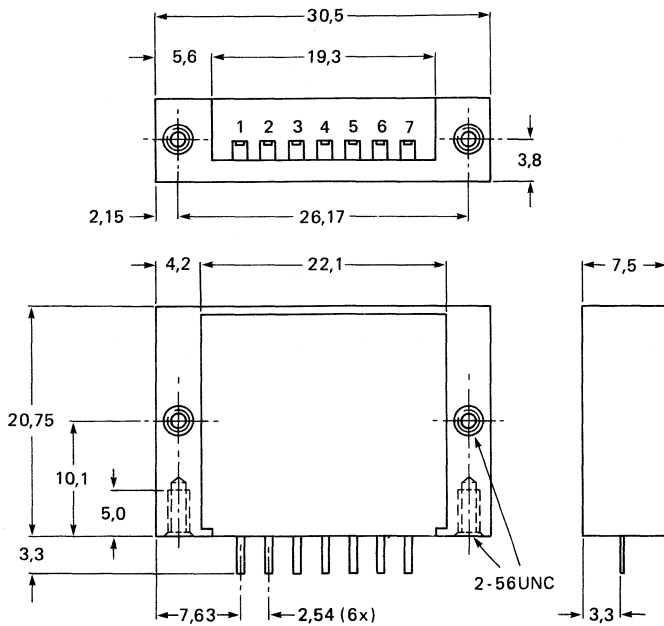
Dimensions in mm



SOT-200

MECHANICAL DATA

Dimensions in mm

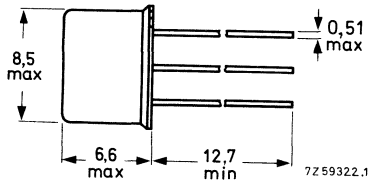
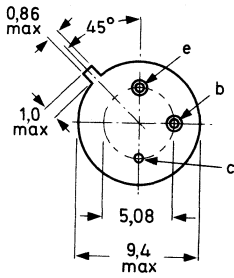


7295470.3

TO-39/1

MECHANICAL DATA

Dimensions in mm



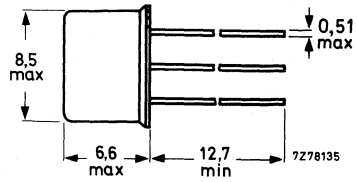
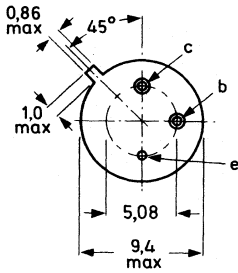
Collector connected to case.
(TO-39/1)

TO-39/3



MECHANICAL DATA

Dimensions in mm

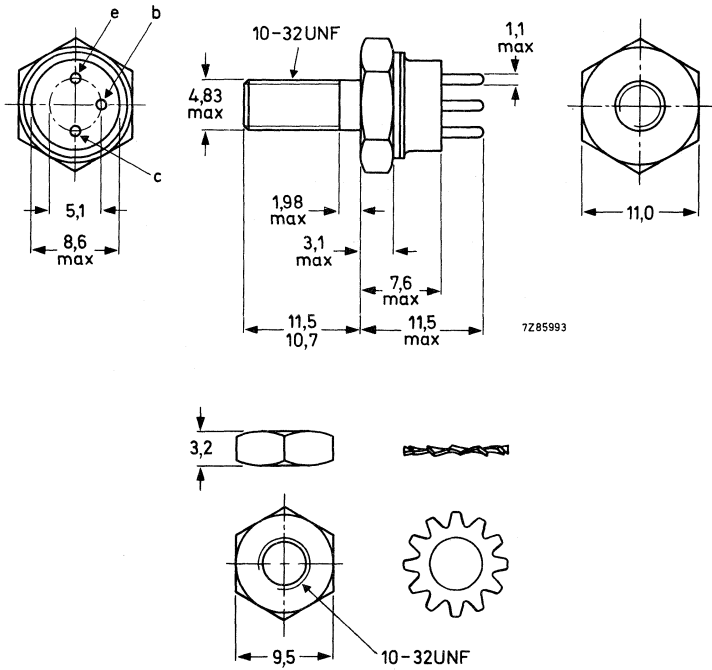


Emitter connected to case.
(TO-39/3)

TO-60

MECHANICAL DATA

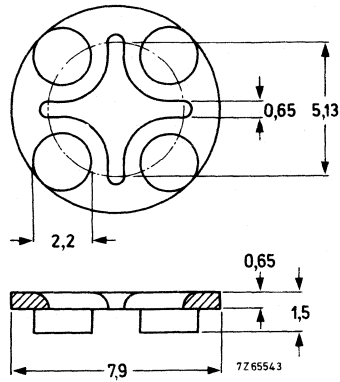
Dimensions in mm



56245

MECHANICAL DATA

Dimensions in mm



(Distance disc) for TO-39.

Insulating material.

Maximum permissible temperature 100 °C.

INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	book	section	type no.	book	section	type no.	book	section
BA220	S1	SD	BAS29	S7/S1	Mm/SD	BAV99	S7/S1	Mm/SD
BA221	S1	SD	BAS31	S7/S1	Mm/SD	BAV100	S7/S1	Mm/SD
BA223	S1	T	BAS32	S7/S1	Mm/SD	BAV101	S7/S1	Mm/SD
BA281	S1	SD	BAS35	S7/S1	Mm/SD	BAV102	S7/S1	Mm/SD
BA314	S1	Vrg	BAS45	S1	SD	BAV103	S7/S1	Mm/SD
BA315	S1	Vrg	BAS56	S1/S7	SD/Mm	BAW56	S7/S1	Mm/SD
BA316	S1	SD	BAT17	S7/S1	Mm/T	BAW62	S1	SD
BA317	S1	SD	BAT18	S7/S1	Mm/T	BAX12	S1	SD
BA318	S1	SD	BAT54	S1/S7	SD/Mm	BAX14	S1	SD
BA423	S1	T	BAT74	S1/S7	SD/Mm	BAX18	S1	SD
BA480	S1	T	BAT81	S1	T	BAY80	S1	SD
BA481	S1	T	BAT82	S1	T	BB112	S1	T
BA482	S1	T	BAT83	S1	T	BB119	S1	T
BA483	S1	T	BAT85	S1	T	BB130	S1	T
BA484	S1	T	BAT86	S1	T	BB204B	S1	T
BA682	S1/S7	T/Mm	BAV10	S1	SD	BB204G	S1	T
BA683	S1/S7	T/Mm	BAV18	S1	SD	BB212	S1	T
BAS11	S1	SD	BAV19	S1	SD	BB215	S7/S1	Mm/SD
BAS15	S1	SD	BAV20	S1	SD	BB219	S7/S1	Mm/SD
BAS16	S7/S1	Mm/SD	BAV21	S1	SD	BB405B	S1	T
BAS17	S7/S1	Mm/Vrg	BAV23	S7/S1	Mm/SD	BB417	S1	T
BAS19	S7/S1	Mm/SD	BAV45	S1	Sp	BB809	S1	T
BAS20	S7/S1	Mm/SD	BAV45A	S1	Sp	BB909A	S1	T
BAS21	S7/S1	Mm/SD	BAV70	S7/S1	Mm/SD	BB909B	S1	T
BAS28	S7/S1	Mm/SD	BAV74	S1	SD	BBY31	S7/S1	Mm/T

Mm = Microminiature semiconductors
for hybrid circuits
SD = Small-signal diodes

Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes

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type no.	book	section	type no.	book	section	type no.	book	section
BBY39	S1	T	BC639	S3	Sm	BCW72;R	S7	Mm
BBY40	S7/S1	Mm/T	BC640	S3	Sm	BCW81;R	S7	Mm
BC107	S3	Sm	BC807	S7	Mm	BCW89;R	S7	Mm
BC108	S3	Sm	BC808	S7	Mm	BCX17;R	S7	Mm
BC109	S3	Sm	BC817	S7	Mm	BCX18;R	S7	Mm
BC140	S3	Sm	BC818	S7	Mm	BCX19;R	S7	Mm
BC141	S3	Sm	BC846	S7	Mm	BCX20;R	S7	Mm
BC146	S3	Sm	BC847	S7	Mm	BCX51	S7	Mm
BC160	S3	Sm	BC848	S7	Mm	BCX52	S7	Mm
BC161	S3	Sm	BC849	S7	Mm	BCX53	S7	Mm
BC177	S3	Sm	BC850	S7	Mm	BCX54	S7	Mm
BC178	S3	Sm	BC856	S7	Mm	BCX55	S7	Mm
BC179	S3	Sm	BC857	S7	Mm	BCX56	S7	Mm
BC200	S3	Sm	BC858	S7	Mm	BCX68	S7	Mm
BC264A	S5	FET	BC859	S7	Mm	BCX69	S7	Mm
BC264B	S5	FET	BC860	S7	Mm	BCX70*	S7	Mm
BC264C	S5	FET	BC868	S7	Mm	BCX71*	S7	Mm
BC264D	S5	FET	BC869	S7	Mm	BCY56	S3	Sm
BC327;A	S3	Sm	BCF29;R	S7	Mm	BCY57	S3	Sm
BC328	S3	Sm	BCF30;R	S7	Mm	BCY58	S3	Sm
BC337;A	S3	Sm	BCF32;R	S7	Mm	BCY59	S3	Sm
BC338	S3	Sm	BCF33;R	S7	Mm	BCY70	S3	Sm
BC368	S3	Sm	BCF70;R	S7	Mm	BCY71	S3	Sm
BC369	S3	Sm	BCF81;R	S7	Mm	BCY72	S3	Sm
BC375	S3	Sm	BCV26	S7	Mm	BCY78	S3	Sm
BC376	S3	Sm	BCV27	S7	Mm	BCY79	S3	Sm
BC546	S3	Sm	BCV61	S7	Mm	BCY87	S3	Sm
BC547	S3	Sm	BCV62	S7	Mm	BCY88	S3	Sm
BC548	S3	Sm	BCV71;R	S7	Mm	BCY89	S3	Sm
BC549	S3	Sm	BCV72;R	S7	Mm	BD131	S4a	P
BC550	S3	Sm	BCW29;R	S7	Mm	BD132	S4a	P
BC556	S3	Sm	BCW30;R	S7	Mm	BD135	S4a	P
BC557	S3	Sm	BCW31;R	S7	Mm	BD136	S4a	P
BC558	S3	Sm	BCW32;R	S7	Mm	BD137	S4a	P
BC559	S3	Sm	BCW33;R	S7	Mm	BD138	S4a	P
BC560	S3	Sm	BCW60*	S7	Mm	BD139	S4a	P
BC635	S3	Sm	BCW61*	S7	Mm	BD140	S4a	P
BC636	S3	Sm	BCW69;R	S7	Mm	BD201	S4a	P
BC637	S3	Sm	BCW70;R	S7	Mm	BD202	S4a	P
BC638	S3	Sm	BCW71;R	S7	Mm	BD203	S4a	P

* = series

FET = Field-effect transistors

Mm = Microminiature semiconductors
for hybrid circuits

P = Low-frequency power transistors

Sm = Small-signal transistors

T = Tuner diodes

type no.	book	section	type no.	book	section	type no.	book	section
BD204	S4a	P	BD332	S4a	P	BD828	S4a	P
BD226	S4a	P	BD333	S4a	P	BD829	S4a	P
BD227	S4a	P	BD334	S4a	P	BD830	S4a	P
BD228	S4a	P	BD335	S4a	P	BD839	S4a	P
BD229	S4a	P	BD336	S4a	P	BD840	S4a	P
BD230	S4a	P	BD337	S4a	P	BD841	S4a	P
BD231	S4a	P	BD338	S4a	P	BD842	S4a	P
BD233	S4a	P	BD433	S4a	P	BD843	S4a	P
BD234	S4a	P	BD434	S4a	P	BD844	S4a	P
BD235	S4a	P	BD435	S4a	P	BD845	S4a	P
BD236	S4a	P	BD436	S4a	P	BD846	S4a	P
BD237	S4a	P	BD437	S4a	P	BD847	S4a	P
BD238	S4a	P	BD438	S4a	P	BD848	S4a	P
BD239	S4a	P	BD645	S4a	P	BD849	S4a	P
BD239A	S4a	P	BD646	S4a	P	BD850	S4a	P
BD239B	S4a	P	BD647	S4a	P	BD933	S4a	P
BD239C	S4a	P	BD648	S4a	P	BD934	S4a	P
BD240	S4a	P	BD649	S4a	P	BD935	S4a	P
BD240A	S4a	P	BD650	S4a	P	BD936	S4a	P
BD240B	S4a	P	BD651	S4a	P	BD937	S4a	P
BD240C	S4a	P	BD652	S4a	P	BD938	S4a	P
BD241	S4a	P	BD675	S4a	P	BD939	S4a	P
BD241A	S4a	P	BD676	S4a	P	BD940	S4a	P
BD241B	S4a	P	BD677	S4a	P	BD941	S4a	P
BD241C	S4a	P	BD678	S4a	P	BD942	S4a	P
BD242	S4a	P	BD679	S4a	P	BD943	S4a	P
BD242A	S4a	P	BD680	S4a	P	BD944	S4a	P
BD242B	S4a	P	BD681	S4a	P	BD945	S4a	P
BD242C	S4a	P	BD682	S4a	P	BD946	S4a	P
BD243	S4a	P	BD683	S4a	P	BD947	S4a	P
BD243A	S4a	P	BD684	S4a	P	BD948	S4a	P
BD243B	S4a	P	BD813	S4a	P	BD949	S4a	P
BD243C	S4a	P	BD814	S4a	P	BD950	S4a	P
BD244	S4a	P	BD815	S4a	P	BD951	S4a	P
BD244A	S4a	P	BD816	S4a	P	BD952	S4a	P
BD244B	S4a	P	BD817	S4a	P	BD953	S4a	P
BD244C	S4a	P	BD818	S4a	P	BD954	S4a	P
BD329	S4a	P	BD825	S4a	P	BD955	S4a	P
BD330	S4a	P	BD826	S4a	P	BD956	S4a	P
BD331	S4a	P	BD827	S4a	P	BdT20	S4a	P

P = Low-frequency power transistors

INDEX

type no.	book	section	type no.	book	section	type no.	book	section
BDT21	S4a	P	BDT61C	S4a	P	BDV66B	S4a	P
BDT29	S4a	P	BDT62	S4a	P	BDV66C	S4a	P
BDT29A	S4a	P	BDT62A	S4a	P	BDV66D	S4a	P
BDT29B	S4a	P	BDT62B	S4a	P	BDV67A	S4a	P
BDT29C	S4a	P	BDT62C	S4a	P	BDV67B	S4a	P
BDT30	S4a	P	BDT63	S4a	P	BDV67C	S4a	P
BDT30A	S4a	P	BDT63A	S4a	P	BDV67D	S4a	P
BDT30B	S4a	P	BDT63B	S4a	P	BDV91	S4a	P
BDT30C	S4a	P	BDT63C	S4a	P	BDV92	S4a	P
BDT31	S4a	P	BDT64	S4a	P	BDV93	S4a	P
BDT31A	S4a	P	BDT64A	S4a	P	BDV94	S4a	P
BDT31B	S4a	P	BDT64B	S4a	P	BDV95	S4a	P
BDT31C	S4a	P	BDT64C	S4a	P	BDV96	S4a	P
BDT32	S4a	P	BDT65	S4a	P	BDW55	S4a	P
BDT32A	S4a	P	BDT65A	S4a	P	BDW56	S4a	P
BDT32B	S4a	P	BDT65B	S4a	P	BDW57	S4a	P
BDT32C	S4a	P	BDT65C	S4a	P	BDW58	S4a	P
BDT41	S4a	P	BDT81	S4a	P	BDW59	S4a	P
BDT41A	S4a	P	BDT82	S4a	P	BDW60	S4a	P
BDT41B	S4a	P	BDT83	S4a	P	BDX35	S4a	P
BDT41C	S4a	P	BDT84	S4a	P	BDX36	S4a	P
BDT42	S4a	P	BDT85	S4a	P	BDX37	S4a	P
BDT42A	S4a	P	BDT86	S4a	P	BDX42	S4a	P
BDT42B	S4a	P	BDT87	S4a	P	BDX43	S4a	P
BDT42C	S4a	P	BDT88	S4a	P	BDX44	S4a	P
BDT51	S4a	P	BDT91	S4a	P	BDX45	S4a	P
BDT52	S4a	P	BDT92	S4a	P	BDX46	S4a	P
BDT53	S4a	P	BDT93	S4a	P	BDX47	S4a	P
BDT54	S4a	P	BDT94	S4a	P	BDX62	S4a	P
BDT55	S4a	P	BDT95	S4a	P	BDX62A	S4a	P
BDT56	S4a	P	BDT96	S4a	P	BDX62B	S4a	P
BDT57	S4a	P	BDV64	S4a	P	BDX62C	S4a	P
BDT58	S4a	P	BDV64A	S4a	P	BDX63	S4a	P
BDT60	S4a	P	BDV64B	S4a	P	BDX63A	S4a	P
BDT60A	S4a	P	BDV64C	S4a	P	BDX63B	S4a	P
BDT60B	S4a	P	BDV65	S4a	P	BDX63C	S4a	P
BDT60C	S4a	P	BDV65A	S4a	P	BDX64	S4a	P
BDT61	S4a	P	BDV65B	S4a	P	BDX64A	S4a	P
BDT61A	S4a	P	BDV65C	S4a	P	BDX64B	S4a	P
BDT61B	S4a	P	BDV66A	S4a	P	BDX64C	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDX65	S4a	P	BF247B	S5	FET	BF585	S4b	HVP
BDX65A	S4a	P	BF247C	S5	FET	BF587	S4b	HVP
BDX65B	S4a	P	BF256A	S5	FET	BF591	S4b	HVP
BDX65C	S4a	P	BF256B	S5	FET	BF593	S4b	HVP
BDX66	S4a	P	BF256C	S5	FET	BF620	S7	Mm
BDX66A	S4a	P	BF324	S3	Sm	BF621	S7	Mm
BDX66B	S4a	P	BF370	S3	Sm	BF622	S7	Mm
BDX66C	S4a	P	BF410A	S5	FET	BF623	S7	Mm
BDX67	S4a	P	BF410B	S5	FET	BF660;R	S7	Mm
BDX67A	S4a	P	BF410C	S5	FET	BF689K	S10	WBT
BDX67B	S4a	P	BF410D	S5	FET	BF763	S10	WBT
BDX67C	S4a	P	BF419	S4b	HVP	BF767	S7	Mm
BDX68	S4a	P	BF420	S3	Sm	BF819	S4b	HVP
BDX68A	S4a	P	BF421	S3	Sm	BF820	S7	Mm
BDX68B	S4a	P	BF422	S3	Sm	BF821	S7	Mm
BDX68C	S4a	P	BF423	S3	Sm	BF822	S7	Mm
BDX69	S4a	P	BF450	S3	Sm	BF823	S7	Mm
BDX69A	S4a	P	BF451	S3	Sm	BF824	S7	Mm
BDX69B	S4a	P	BF457	S4b	HVP	BF840	S7	Mm
BDX69C	S4a	P	BF458	S4b	HVP	BF841	S7	Mm
BDX77	S4a	P	BF459	S4b	HVP	BF857	S4b	HVP
BDX78	S4a	P	BF469	S4b	HVP	BF858	S4b	HVP
BDX91	S4a	P	BF470	S4b	HVP	BF859	S4b	HVP
BDX92	S4a	P	BF471	S4b	HVP	BF869	S4b	HVP
BDX93	S4a	P	BF472	S4b	HVP	BF870	S4b	HVP
BDX94	S4a	P	BF483	S3	Sm	BF871	S4b	HVP
BDX95	S4a	P	BF485	S3	Sm	BF872	S4b	HVP
BDX96	S4a	P	BF487	S3	Sm	BF926	S3	Sm
BDY90	S4a	P	BF494	S3	Sm	BF936	S3	Sm
BDY90A	S4a	P	BF495	S3	Sm	BF939	S3	Sm
BDY91	S4a	P	BF496	S3	Sm	BF960	S5	FET
BDY92	S4a	P	BF510	S7/S5	Mm/FET	BF964	S5	FET
BF198	S3	Sm	BF511	S7/S5	Mm/FET	BF966	S5	FET
BF199	S3	Sm	BF512	S7/S5	Mm/FET	BF967	S3	Sm
BF240	S3	Sm	BF513	S7/S5	Mm/FET	BF970	S3	Sm
BF241	S3	Sm	BF536	S7	Mm	BF979	S3	Sm
BF245A	S5	FET	BF550;R	S7	Mm	BF980	S5	FET
BF245B	S5	FET	BF569	S7	Mm	BF981	S5	FET
BF245C	S5	FET	BF579	S7	Mm	BF982	S5	FET
BF247A	S5	FET	BF583	S4b	HVP	BF989	S7/S5	Mm/FET

FET = Field-effect transistors
HVP = High-voltage power transistors
Mm = Micronature semiconductors
for hybrid circuits

P = Low-frequency power transistors
Sm = Small-signal transistors
WBT = Wideband transistors

INDEX

type no.	book	section	type no.	book	section	type no.	book	section
BF990	S7/S5	Mm/FET	BFQ51	S10	WBT	BFT24	S10	WBT
BF991	S7/S5	Mm/FET	BFQ51C	S10	WBT	BFT25;R	S7	Mm
BF992	S7/S5	Mm/FET	BFQ52	S10	WBT	BFT44	S3	Sm
BF994	S7/S5	Mm/FET	BFQ53	S10	WBT	BFT45	S3	Sm
BF996	S7/S5	Mm/FET	BFQ63	S10	WBT	BFT46	S7/S5	Mm/FET
BFG23	S10	WBT	BFQ65	S10	WBT	BFT92;R	S7	Mm
BFG32	S10	WBT	BFQ66	S10	WBT	BFT93;R	S7	Mm
BFG34	S10	WBT	BFQ67	S7	Mm	BFW10	S5	FET
BFG51	S10	WBT	BFQ68	S10	WBT	BFW11	S5	FET
BFG65	S10	WBT	BFQ136	S10	WBT	BFW12	S5	FET
BFG67	S7	Mm	BFR29	S5	FET	BFW13	S5	FET
BFG90A	S10	WBT	BFR30	S7/S5	Mm/FET	BFW16A	S10	WBT
BFG91A	S10	WBT	BFR31	S7/S5	Mm/FET	BFW17A	S10	WBT
BFG96	S10	WBT	BFR49	S10	WBT	BFW30	S10	WBT
BFP90A	S10	WBT	BFR53;R	S7	Mm	BFW61	S5	FET
BFP91A	S10	WBT	BFR54	S3	Sm	BFW92	S10	WBT
BFP96	S10	WBT	BFR64	S10	WBT	BFW92A	S10	WBT
BFQ10	S5	FET	BFR65	S10	WBT	BFW93	S10	WBT
BFQ11	S5	FET	BFR84	S5	FET	BFX29	S3	Sm
BFQ12	S5	FET	BFR90	S10	WBT	BFX30	S3	Sm
BFQ13	S5	FET	BFR90A	S10	WBT	BFX34	S3	Sm
BFQ14	S5	FET	BFR91	S10	WBT	BFX84	S3	Sm
BFQ15	S5	FET	BFR91A	S10	WBT	BFX85	S3	Sm
BFQ16	S5	FET	BFR92;R	S7	Mm	BFX86	S3	Sm
BFQ17	S7	Mm	BFR92A;R	S7	Mm	BFX87	S3	Sm
BFQ18A	S7	Mm	BFR93;R	S7	Mm	BFX88	S3	Sm
BFQ19	S7	Mm	BFR93A;R	S7	Mm	BFX89	S10	WBT
BFQ22S	S10	WBT	BFR94	S10	WBT	BFY50	S3	Sm
BFQ23	S10	WBT	BFR95	S10	WBT	BFY51	S3	Sm
BFQ23C	S10	WBT	BFR96	S10	WBT	BFY52	S3	Sm
BFQ24	S10	WBT	BFR96S	S10	WBT	BFY55	S3	Sm
BFQ32	S10	WBT	BFR101A;BS7/S5		Mm/FET	BFY90	S10	WBT
BFQ32C	S10	WBT	BFS17;R	S7	Mm	BG2000	S1	RT
BFQ32S	S10	WBT	BFS18;R	S7	Mm	BG2097	S1	RT
BFQ33	S10	WBT	BFS19;R	S7	Mm	BGD102	S10	WBM
BFQ34	S10	WBT	BFS20;R	S7	Mm	BGD102E	S10	WBM
BFQ34T	S10	WBT	BFS21	S5	FET	BGD104	S10	WBM
BFQ42	S6	RFP	BFS21A	S5	FET	BGD104E	S10	WBM
BFQ43	S6	RFP	BFS22A	S6	RFP	BGX11*	S2b	ThM
BFQ43S	S6	RFP	BFS23A	S6	RFP	BGX12*	S2b	ThM

* = series

FET = Field-effect transistors

Mm = Microminiature semiconductors
for hybrid circuits

RFP = R.F. power transistors and modules

RT = Tripler

Sm = Small-signal transistors

ThM = Thyristor modules

WBM = Wideband hybrid IC modules

WBT = Wideband transistors

type no.	book	section	type no.	book	section	type no.	book	section
BGX13*	S2b	ThM	BGY70	S10	WBM	BLV30/12	S6	RFP
BGX14*	S2b	ThM	BGY71	S10	WBM	BLV31	S6	RFP
BGX15*	S2b	ThM	BGY74	S10	WBM	BLV32F	S6	RFP
BGX17*	S2b	ThM	BGY75	S10	WBM	BLV33	S6	RFP
BGX25	S2a	ThM	BGY84	S10	WBM	BLV33F	S6	RFP
BGY22	S6	RFP	BGY84A	S10	WBM	BLV36	S6	RFP
BGY22A	S6	RFP	BGY85	S10	WBM	BLV45/12	S6	RFP
BGY23	S6	RFP	BGY85A	S10	WBM	BLV57	S6	RFP
BGY23A	S6	RFP	BGY90A	S6	RFP	BLV59	S6	RFP
BGY32	S6	RFP	BGY90B	S6	RFP	BLV75/12	S6	RFP
BGY33	S6	RFP	BGY93*	S6	RFP	BLV80/28	S6	RFP
BGY35	S6	RFP	BGY94*	S6	RFP	BLV90	S6	RFP
BGY36	S6	RFP	BGY95A	S6	RFP	BLV90/SL	S6	RFP
BGY40A	S6	RFP	BGY95B	S6	RFP	BLV91	S6	RFP
BGY40B	S6	RFP	BGY96A	S6	RFP	BLV91/SL	S6	RFP
BGY41A	S6	RFP	BGY96B	S6	RFP	BLV92	S6	RFP
BGY41B	S6	RFP	BLF146	S6	RFP/FET	BLV93	S6	RFP
BGY43	S6	RFP	BLF242	S6	RFP/FET	BLV94	S6	RFP
BGY45A	S6	RFP	BLF244	S6	RFP/FET	BLV95	S6	RFP
BGY45B	S6	RFP	BLF245	S6	RFP/FET	BLV97	S6	RFP
BGY46A	S6	RFP	BLT90/SL	S6	RFP	BLV98	S6	RFP
BGY46B	S6	RFP	BLT91/SL	S6	RFP	BLV99	S6	RFP
BGY47*	S6	RFP	BLT92/SL	S6	RFP	BLW29	S6	RFP
BGY48*	S6	RFP	BLU20/12	S6	RFP	BLW31	S6	RFP
BGY50	S10	WBM	BLU30/12	S6	RFP	BLW32	S6	RFP
BGY51	S10	WBM	BLU45/12	S6	RFP	BLW33	S6	RFP
BGY52	S10	WBM	BLU50	S6	RFP	BLW34	S6	RFP
BGY53	S10	WBM	BLU51	S6	RFP	BLW50F	S6	RFP
BGY54	S10	WBM	BLU52	S6	RFP	BLW60	S6	RFP
BGY55	S10	WBM	BLU53	S6	RFP	BLW60C	S6	RFP
BGY56	S10	WBM	BLU60/12	S6	RFP	BLW76	S6	RFP
BGY57	S10	WBM	BLU97	S6	RFP	BLW77	S6	RFP
BGY58	S10	WBM	BLU98	S6	RFP	BLW78	S6	RFP
BGY58A	S10	WBM	BLU99	S6	RFP	BLW79	S6	RFP
BGY59	S10	WBM	BLV10	S6	RFP	BLW80	S6	RFP
BGY60	S10	WBM	BLV11	S6	RFP	BLW81	S6	RFP
BGY61	S10	WBM	BLV20	S6	RFP	BLW83	S6	RFP
BGY65	S10	WBM	BLV21	S6	RFP	BLW84	S6	RFP
BGY67	S10	WBM	BLV25	S6	RFP	BLW85	S6	RFP
BGY67A	S10	WBM	BLV30	S6	RFP	BLW86	S6	RFP

* = series

FET = Field-effect transistors

RFP = R.F. power transistors and modules

ThM = Thyristor modules

WBM = Wideband hybrid IC modules

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type no.	book	section	type no.	book	section	type no.	book	section
BLW87	S6	RFP	BLY92C	S6	RFP	BSR18;R	S7	Mm
BLW89	S6	RFP	BLY93A	S6	RFP	BSR18A;R	S7	Mm
BLW90	S6	RFP	BLY93C	S6	RFP	BSR19; A	S7	Mm
BLW91	S6	RFP	BLY94	S6	RFP	BSR20; A	S7	Mm
BLW95	S6	RFP	BPF24	S8b	PDT	BSR30	S7	Mm
BLW96	S6	RFP	BPW22A	S8a/b	PDT	BSR31	S7	Mm
BLW97	S6	RFP	BPW50	S8a/b	PDT	BSR32	S7	Mm
BLW98	S6	RFP	BPW71	S8b	PDT	BSR33	S7	Mm
BLW99	S6	RFP	BPX25	S8b	PDT	BSR40	S7	Mm
BLX13	S6	RFP	BPX29	S8b	PDT	BSR41	S7	Mm
BLX13C	S6	RFP	BPX40	S8b	PDT	BSR42	S7	Mm
BLX14	S6	RFP	BPX41	S8b	PDT	BSR43	S7	Mm
BLX15	S6	RFP	BPX42	S8b	PDT	BSR50	S3	Sm
BLX39	S6	RFP	BPX61	S8b	PDT	BSR51	S3	Sm
BLX65	S6	RFP	BPX61P	S8b	PDT	BSR52	S3	Sm
BLX65E	S6	RFP	BPX71	S8b	PDT	BSR56	S7/S5	Mm/FET
BLX65ES	S6	RFP	BPX72	S8b	PDT	BSR57	S7/S5	Mm/FET
BLX67	S6	RFP	BR100/03	S2b	Th	BSR58	S7/S5	Mm/FET
BLX68	S6	RFP	BR101	S3	Sm	BSR60	S3	Sm
BLX69A	S6	RFP	BRY39	S3	Sm	BSR61	S3	Sm
BLX91A	S6	RFP	BRY56	S3	Sm	BSR62	S3	Sm
BLX91CB	S6	RFP	BRY61	S7	Mm	BSS38	S3	Sm
BLX92A	S6	RFP	BRY62	S7	Mm	BSS50	S3	Sm
BLX93A	S6	RFP	BS107	S5	FET	BSS51	S3	Sm
BLX94A	S6	RFP	BS170	S5	FET	BSS52	S3	Sm
BLX94C	S6	RFP	BSD10	S5	FET	BSS60	S3	Sm
BLX95	S6	RFP	BSD12	S5	FET	BSS61	S3	Sm
BLX96	S6	RFP	BSD20	S5/7	FET	BSS62	S3	Sm
BLX97	S6	RFP	BSD22	S5/7	FET	BSS63;R	S7	Mm
BLX98	S6	RFP	BSD212	S5	FET	BSS64;R	S7	Mm
BLY87A	S6	RFP	BSD213	S5	FET	BSS68	S3	Sm
BLY87C	S6	RFP	BSD214	S5	FET	BSS83	S5/7	FET/Mm
BLY88A	S6	RFP	BSD215	S5	FET	BST15	S7	Mm
BLY88C	S6	RFP	BSR12;R	S7	Mm	BST16	S7	Mm
BLY89A	S6	RFP	BSR13;R	S7	Mm	BST39	S7	Mm
BLY89C	S6	RFP	BSR14;R	S7	Mm	BST40	S7	Mm
BLY90	S6	RFP	BSR15;R	S7	Mm	BST50	S7	Mm
BLY91A	S6	RFP	BSR16;R	S7	Mm	BST51	S7	Mm
BLY91C	S6	RFP	BSR17;R	S7	Mm	BST52	S7	Mm
BLY92A	S6	RFP	BSR17A;R	S7	Mm	BST60	S7	Mm

FET = Field-effect transistors
Mm = Microminiature semiconductors
for hybrid circuits
PDT = Photodiodes or transistors

RFP = R.F. power transistors and modules
Sm = Small-signal transistors
Th = Thyristors

type no.	book	section	type no.	book	section	type no.	book	section
BST61	S7	Mm	BT138*	S2b	Tri	BU808	S4b	SP
BST62	S7	Mm	BT139*	S2b	Tri	BU824	S4b	SP
BST70A	S5	FET	BT149*	S2b	Th	BU826	S4b	SP
BST72A	S5	FET	BT151*	S2b	Th	BUP22*	S4b	SP
BST74A	S5	FET	BT152*	S2b	Th	BUP23*	S4b	SP
BST76A	S5	FET	BT153	S2b	Th	BUS11;A	S4b	SP
BST78	S5	FET	BT155*	S2b	Th	BUS12;A	S4b	SP
BST80	S5/S7	FET/Mm	BT157*	S2b	Th	BUS13;A	S4b	SP
BST82	S5/S7	FET/Mm	BTV24*	S2b	Th	BUS14;A	S4b	SP
BST84	S5/S7	FET/Mm	BTV34*	S2b	Tri	BUS21*	S4b	SP
BST86	S5/S7	FET/Mm	BTV58*	S2b	Th	BUS22*	S4b	SP
BST90	S5	FET	BTV59*	S2b	Th	BUS23*	S4b	SP
BST97	S5	FET	BTV60*	S2b	Th	BUT11;A	S4b	SP
BST100	S5	FET	BTW23*	S2b	Th	BUT11A	S4b	SP
BST110	S5	FET	BTW38*	S2b	Th	BUT11AF	S4b	SP
BST120	S5/S7	FET/Mm	BTW40*	S2b	Th	BUV82	S4b	SP
BST122	S5/S7	FET/Mm	BTW42*	S2b	Th	BUV83	S4b	SP
BSV15	S3	Sm	BTW43*	S2b	Tri	BUV89	S4b	SP
BSV16	S3	Sm	BTW45*	S2b	Th	BUV90;A	S4b	SP
BSV17	S3	Sm	BTW58*	S2b	Th	BUW11;A	S4b	SP
BSV52;R	S7	Mm	BTW59*	S2b	Th	BUW12;A	S4b	SP
BSV64	S3	Sm	BTW63*	S2b	Th	BUW13;A	S4b	SP
BSV78	S5	FET	BTW92*	S2b	Th	BUW84	S4b	SP
BSV79	S5	FET	BTX18*	S2b	Th	BUW85	S4b	SP
BSV80	S5	FET	BTX94*	S2b	Tri	BUX46;A	S4b	SP
BSV81	S5	FET	BTY79*	S2b	Th	BUX47;A	S4b	SP
BSW66A	S3	Sm	BTY91*	S2b	Th	BUX48;A	S4b	SP
BSW67A	S3	Sm	BU426	S4b	SP	BUX80	S4b	SP
BSW68A	S3	Sm	BU426A	S4b	SP	BUX81	S4b	SP
BSX19	S3	Sm	BU433	S4b	SP	BUX82	S4b	SP
BSX20	S3	Sm	BU505	S4b	SP	BUX83	S4b	SP
BSX45	S3	Sm	BU506	S4b	SP	BUX84	S4b	SP
BSX46	S3	Sm	BU506D	S4b	SP	BUX84F	S4b	SP
BSX47	S3	Sm	BU508A	S4b	SP	BUX85	S4b	SP
BSX59	S3	Sm	BU508D	S4b	SP	BUX85F	S4b	SP
BSX60	S3	Sm	BU705	S4b	SP	BUX86	S4b	SP
BSX61	S3	Sm	BU706	S4b	SP	BUX87	S4b	SP
BSY95A	S3	Sm	BU706D	S4b	SP	BUX88	S4b	SP
BT136*	S2b	Tri	BU806	S4b	SP	BUX90	S4b	SP
BT137*	S2b	Tri	BU807	S4b	SP	BUX98	S4b	SP

* = series

FET = Field-effect transistors

Mm = Microminiature semiconductors

for hybrid circuits

Sm = Small-signal transistors

SP = Low-frequency switching power transistors

Th = Thyristors

Tri = Triacs

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type no.	book	section	type no.	book	section	type no.	book	section
BUX98A	S4b	SP	BUZ64	S9	PM	BY710	S1	R
BUX99	S4b	SP	BUZ71	S9	PM	BY711	S1	R
BUY89	S4b	SP	BUZ71A	S9	PM	BY712	S1	R
BUZ10	S9	PM	BUZ72	S9	PM	BY713	S1	R
BUZ10A	S9	PM	BUZ72A	S9	PM	BY714	S1	R
BUZ11	S9	PM	BUZ73A	S9	PM	BYD13*	S1	R
BUZ11A	S9	PM	BUZ74	S9	PM	BYD14*	S1	R
BUZ14	S9	PM	BUZ74A	S9	PM	BYD17*	S1	R
BUZ15	S9	PM	BUZ76	S9	PM	BYD33*	S1	R
BUZ20	S9	PM	BUZ76A	S9	PM	BYD37*	S1	R
BUZ21	S9	PM	BUZ80	S9	PM	BYD73*	S1	R
BUZ23	S9	PM	BUZ80A	S9	PM	BYD74*	S1	R
BUZ24	S9	PM	BUZ83	S9	PM	BYD77*	S1	R
BUZ25	S9	PM	BUZ83A	S9	PM	BYM26*	S1	R
BUZ30	S9	PM	BUZ84	S9	PM	BYM36*	S1	R
BUZ31	S9	PM	BUZ84A	S9	PM	BYM56*	S1	R
BUZ32	S9	PM	BY228	S1	R	BYQ28*	S2a	R
BUZ33	S9	PM	BY229*	S2a	R	BYR29*	S2a	R
BUZ34	S9	PM	BY249*	S2a	R	BYT79*	S2a	R
BUZ35	S9	PM	BY260*	S2a	R	BYV10	S1	R
BUZ36	S9	PM	BY261*	S2a	R	BYV19*	S2a	R
BUZ40	S9	PM	BY329*	S2a	R	BYV20*	S2a	R
BUZ41A	S9	PM	BY359*	S2a	R	BYV21*	S2a	R
BUZ42	S9	PM	BY438	S1	R	BYV22*	S2a	R
BUZ43	S9	PM	BY448	S1	R	BYV23*	S2a	R
BUZ44A	S9	PM	BY458	S1	R	BYV24*	S2a	R
BUZ45	S9	PM	BY505	S1	R	BYV26*	S1	R
BUZ45A	S9	PM	BY509	S1	R	BYV27*	S1/S2a	R
BUZ45B	S9	PM	BY527	S1	R	BYV28*	S1/S2a	R
BUZ45C	S9	PM	BY584	S1	R	BYV29*	S2a	R
BUZ46	S9	PM	BY588	S1	R	BYV30*	S2a	R
BUZ50A	S9	PM	BY609	S1	R	BYV32*	S2a	R
BUZ50B	S9	PM	BY610	S1	R	BYV33*	S2a	R
BUZ53A	S9	PM	BY614	S1	R	BYV34*	S2a	R
BUZ54	S9	PM	BY619	S1	R	BYV36*	S1	R
BUZ54A	S9	PM	BY620	S1	R	BYV39*	S2a	R
BUZ60	S9	PM	BY627	S1	R	BYV42*	S2a	R
BUZ60B	S9	PM	BY707	S1	R	BYV43*	S2a	R
BUZ63	S9	PM	BY708	S1	R	BYV72*	S2a	R
BUZ63B	S9	PM	BY709	S1	R	BYV73*	S2a	R

* = series

PM = Power MOS transistors

R = Rectifier diodes

SP = Low-frequency switching power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BYV79*	S2a	R	BZT03	S1	Vrg	CNX36U	S8b	PhC
BYV92*	S2a	R	BZV10	S1	Vrf	CNX38	S8b	PhC
BYV95A	S1	R	BZV11	S1	Vrf	CNX38U	S8b	PhC
BYV95B	S1	R	BZV12	S1	Vrf	CNX39	S8b	PhC
BYV95C	S1	R	BZV13	S1	Vrf	CNX39U	S8b	PhC
BYV96D	S1	R	BZV14	S1	Vrf	CNX44	S8b	PhC
BYV96E	S1	R	BZV37	S1	Vrf	CNX44A	S8b	PhC
BYW25*	S2a	R	BZV46	S1	Vrg	CNX46	S8b	PhC
BYW29*	S2a	R	BZV49*	S1/S7	Vrg/Mm	CNX48	S8b	PhC
BYW30*	S2a	R	BZV55*	S7	Mm	CNX48U	S8b	PhC
BYW31*	S2a	R	BZV80	S1	Vrf	CNX62	S8b	PhC
BYW54	S1	R	BZV81	S1	Vrf	CNX72	S8b	PhC
BYW55	S1	R	BZV85*	S1	Vrg	CNX82	S8b	PhC
BYW56	S1	R	BZW03*	S1	Vrg	CNX91	S8b	PhC
BYW92*	S2a	R	BZW14	S1	Vrg	CNX92	S8b	PhC
BYW93*	S2a	R	BZW70*	S2a	TS	CNY17-1	S8b	PhC
BYW94*	S2a	R	BZW86*	S2a	TS	CNY17-2	S8b	PhC
BYW95A	S1	R	BZW91*	S2a	TS	CNY17-3	S8b	PhC
BYW95B	S1	R	BZX55*	S1	Vrg	CNY50	S8b	PhC
BYW95C	S1	R	BZX70*	S2a	Vrg	CNY57	S8b	PhC
BYW96D	S1	R	BZX75*	S1	Vrg	CNY57A	S8b	PhC
BYW96E	S1	R	BZX79*	S1	Vrg	CNY57AU	S8b	PhC
BYX25*	S2a	R	BZX84*	S7/S1	Mm/Vrg	CNY57U	S8b	PhC
BYX30*	S2a	R	BZY91*	S2a	Vrg	CNY62	S8b	PhC
BYX32*	S2a	R	BZY93*	S2a	Vrg	CNY63	S8b	PhC
BYX38*	S2a	R	BZY95*	S2a	Vrg	CQF24	S8b	Ph
BYX39*	S2a	R	BZY96*	S2a	Vrg	CQL10A	S8b	Ph
BYX42*	S2a	R	CFX13	S11	M	CQL13A	S8b	Ph
BYX46*	S2a	R	CFX21	S11	M	CQL16	S8b	Ph
BYX50*	S2a	R	CFX30	S11	M	CQ551L	S8a	LED
BYX52*	S2a	R	CFX31	S11	M	CQ554	S8a	LED
BYX56*	S2a	R	CFX32	S11	M	CQ582L	S8a	LED
BYX10G	S1	R	CFX33	S11	M	CQ582AL	S8a	LED
BYX90G	S1	R	CNG35	S8b	PhC	CQ584L	S8a	LED
BYX96*	S2a	R	CNG36	S8b	PhC	CQ586L	S8a	LED
BYX97*	S2a	R	CNR36	S8b	PhC	CQ593	S8a	LED
BYX98*	S2a	R	CNX21	S8b	PhC	CQ593E	S8a	LED
BYX99*	S2a	R	CNX35	S8b	PhC	CQ593L	S8a	LED
BZD23	S1	Vrg	CNX35U	S8b	PhC	CQ595	S8a	LED
BZD27	S1	Vrg	CNX36	S8b	PhC	CQ595E	S8a	LED

* = series

LED = Light-emitting diodes

M = Microwave transistors

Mm = Microminiature semiconductors
for hybrid circuits

Ph = Photoconductive devices

PhC = Photocouplers

R = Rectifier diodes

TS = Transient suppressor diodes

Vrf = Voltage reference diodes

Vrg = Voltage regulator diodes

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type no.	book	section	type no.	book	section	type no.	book	section
CQS95L	S8a	LED	CQX54(L)	S8a	LED	KTY83*	S13	SEN
CQS97	S8a	LED	CQX54D	S8a	LED	KTY84*	S13	SEN
CQS97E	S8a	LED	CQX64(L)	S8a	LED	LAE2001R	S11	M
CQS97L	S8a	LED	CQX64D	S8a	LED	LAE4001Q	S11	M
CQT10B	S8a	LED	CQX74(L)	S8a	LED	LAE4001R	S11	M
CQT24	S8a	LED	CQX74D	S8a	LED	LAE4002S	S11	M
CQT60	S8a	LED	CQY11B	S8b	LED	LAE6000Q	S11	M
CQT70	S8a	LED	CQY11C	S8b	LED	LBE1004R	S11	M
CQT80L	S8a	LED	CQY24B(L)	S8a	LED	LBE1010R	S11	M
CQV70(L)	S8a	LED	CQY49B	S8b	LED	LBE2003S	S11	M
CQV70A(L)	S8a	LED	CQY49C	S8b	LED	LBE2005Q	S11	M
CQV70U(L)	S8a	LED	CQY50	S8b	LED	LBE2008T	S11	M
CQV71A(L)	S8a	LED	CQY52	S8b	LED	LBE2009S	S11	M
CQV72(L)	S8a	LED	CQY53S	S8b	LED	LCE1010R	S11	M
CQV80L	S8a	LED	CQY54A	S8a	LED	LCE2003S	S11	M
CQV80AL	S8a	LED	CQY58A	S8a/b	I	LCE2005Q	S11	M
CQV80UL	S8a	LED	CQY89A	S8a/b	I	LCE2008T	S11	M
CQV81L	S8a	LED	CQY94B(L)	S8a	LED	LCE2009S	S11	M
CQV82L	S8a	LED	CQY95B	S8a	LED	LJE42002T	S11	M
CQW10A(L)	S8a	LED	CQY96(L)	S8a	LED	LKE1004R	S11	M
CQW10B(L)	S8a	LED	CQY97A	S8a	LED	LKE2002T	S11	M
CQW10U(L)	S8a	LED	Fresnel-	S8b	A	LKE2004T	S11	M
CQW11B(L)	S8a	LED	lens			LKE2015T	S11	M
CQW12B(L)	S8a	LED	H11A1	S8b	PhC	LKE21004R	S11	M
CQW20A	S8a	LED	H11A2	S8b	PhC	LKE21015T	S11	M
CQW21	S8a	LED	H11A3	S8b	PhC	LKE21050T	S11	M
CQW22	S8a	LED	H11A4	S8b	PhC	LKE27010R	S11	M
CQW24(L)	S8a	LED	H11A5	S8b	PhC	LKE27025R	S11	M
CQW54	S8a	LED	H11B1	S8b	PhC	LKE32002T	S11	M
CQW60(L)	S8a	LED	H11B2	S8b	PhC	LKE32004T	S11	M
CQW60A(L)	S8a	LED	H11B3	S8b	PhC	LTE42005S	S11	M
CQW60U(L)	S8a	LED	H11B255	S8b	PhC	LTE42008R	S11	M
CQW61(L)	S8a	LED	KMZ10A	S13	SEN	LTE42012R	S11	M
CQW62(L)	S8a	LED	KMZ10B	S13	SEN	LV1721E50R	S11	M
CQW89A	S8a/b	I	KMZ10C	S13	SEN	LV2024E45R	S11	M
CQW93	S8a	LED	KP100A	S13	SEN	LV2327E40R	S11	M
CQW95	S8a	LED	KP101A	S13	SEN	LV3742E16R	S11	M
CQW97	S8a	LED	KPZ20G	S13	SEN	LV3742E24R	S11	M
CQX24(L)	S8a	LED	KPZ21G	S13	SEN	LWE2015R	S11	M
CQX51(L)	S8a	LED	KTY81*	S13	SEN	LWE2025R	S11	M

* = series

A = Accessories

I = Infrared devices

LED = Light-emitting diodes

M = Microwave transistors

PhC = Photocouplers

SEN = Sensors

type no.	book	section	type no.	book	section	type no.	book	section
LZ1418E100RS11		M	OM389B	S13	SEN	PH2907A;R	S3	Sm
MCA230	S8b	PhC	OM931	S4a	P	PH2955T	S4a	P
MCA231	S8b	PhC	OM961	S4a	P	PH3055T	S4a	P
MCA255	S8b	PhC	OSB9110	S2a	St	PH5415	S3	Sm
MCT2	S8b	PhC	OSB9115	S2a	St	PH5416	S3	Sm
MCT26	S8b	PhC	OSB9210	S2a	St	PH13002	S4b	SP
MKB12040WS	S11	M	OSB9215	S2a	St	PH13003	S4b	SP
MKB12100WS	S11	M	OSB9410	S2a	St	PHSD51	S2a	R
MKB12140W	S11	M	OSB9415	S2a	St	PKB3001U	S11	M
M06075B200ZS11	M		OSM9110	S2a	St	PKB3003U	S11	M
M06075B400ZS11	M		OSM9115	S2a	St	PKB3005U	S11	M
MRB12175YR	S11	M	OSM9210	S2a	St	PKB12005U	S11	M
MRB12350YR	S11	M	OSM9215	S2a	St	PKB20010U	S11	M
MS1011B700YS11	M		OSM9410	S2a	St	PKB23001U	S11	M
MS6075B800ZS11	M		OSM9415	S2a	St	PKB23003U	S11	M
MSB12900Y	S11	M	OSM9510	S2a	St	PKB23005U	S11	M
MZ0912B75Y	S11	M	OSM9511	S2a	St	PKB25006T	S11	M
MZ0912B150YS11	M		OSM9512	S2a	St	PKB32001U	S11	M
OM286; M	S13	SEN	OSS9110	S2a	St	PKB32003U	S11	M
OM287; M	S13	SEN	OSS9115	S2a	St	PKB32005U	S11	M
OM320	S10	WBM	OSS9210	S2a	St	PMBF4391	S7	Mm
OM321	S10	WBM	OSS9215	S2a	St	PMBF4392	S7	Mm
OM322	S10	WBM	OSS9410	S2a	St	PMBF4392	S7	Mm
OM323	S10	WBM	OSS9415	S2a	St	PMLL4148	S1	SD
OM323A	S10	WBM	P2105	S8b	I	PMLL4150	S1	SD
OM335	S10	WBM	PBMF4391	S5	FET	PMLL4151	S1	SD
OM336	S10	WBM	PBMF4392	S5	FET	PMLL4153	S1	SD
OM337	S10	WBM	PBMF4393	S5	FET	PMLL4446	S1	SD
OM337A	S10	WBM	PDE1001U	S11	M	PMLL4448	S1	SD
OM339	S10	WBM	PDE1003U	S11	M	PMLL5225B		
OM345	S10	WBM	PDE1005U	S11	M	to	S1	SD
OM350	S10	WBM	PDE1010U	S11	M	PMLL5267B		
OM360	S10	WBM	PEE1001U	S11	M	PO44	S8b	PhC
OM361	S10	WBM	PEE1003U	S11	M	PO44A	S8b	PhC
OM370	S10	WBM	PEE1005U	S11	M	PPC5001T	S11	M
OM386B	S13	SEN	PEE1010U	S11	M	PQC5001T	S11	M
OM386M	S13	SEN	PH2222;R	S3	Sm	PTB23001X	S11	M
OM387B	S13	SEN	PH2222A;R	S3	Sm	PTB23003X	S11	M
OM387M	S13	SEN	PH2369	S3	Sm	PTB23005X	S11	M
OM388B	S13	SEN	PH2907;R	S3	Sm	PTB32001X	S11	M

FET = Field-effect transistors
 I = Infrared devices
 M = Microwave transistors
 Mm = Microminiature semiconductors
 for hybrid circuits
 P = Low-frequency power transistors
 PhC = Photocouplers

R = Rectifier diodes
 SD = Small-signal diodes
 SEN = Sensors
 Sm = Small-signal transistors
 SP = Low-frequency switching power transistors
 St = Rectifier stacks
 WBM = Wideband hybrid IC modules

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type no.	book	section	type no.	book	section	type no.	book	section
PTB32003X	S11	M	SL5501	S8b	PhC	TIP147	S4a	P
PTB32005X	S11	M	SL5502R	S8b	PhC	TIP2955	S4a	P
PTB42001X	S11	M	SL5504	S8b	PhC	TIP3055	S4a	P
PTB42002X	S11	M	SL5504S	S8b	PhC	1N821;A	S1	Vrf
PTB42003X	S11	M	SL5505S	S8b	PhC	1N823;A	S1	Vrf
PV3742B4X	S11	M	SL5511	S8b	PhC	1N825;A	S1	Vrf
PVB42004X	S11	M	TIP29*	S4a	P	1N827;A	S1	Vrf
PZ1418B15U	S11	M	TIP30*	S4a	P	1N829;A	S1	Vrf
PZ1418B30U	S11	M	TIP31*	S4a	P	1N914	S1	SD
PZ1721B12U	S11	M	TIP32*	S4a	P	1N916	S1	SD
PZ1721B25U	S11	M	TIP33*	S4a	P	1N3879	S2a	R
PZ2024B10U	S11	M	TIP34*	S4a	P	1N3880	S2a	R
PZ2024B20U	S11	M	TIP41*	S4a	P	1N3881	S2a	R
PZB16035U	S11	M	TIP42*	S4a	P	1N3882	S2a	R
PZB27020U	S11	M	TIP47	S4a	P	1N3883	S2a	R
RPY97	S8b	I	TIP48	S4a	P	1N3889	S2a	R
RPY100	S8b	I	TIP49	S4a	P	1N3890	S2a	R
RPY101	S8b	I	TIP50	S4a	P	1N3891	S2a	R
RPY102	S8b	I	TIP110	S4a	P	1N3892	S2a	R
RPY103	S8b	I	TIP111	S4a	P	1N3893	S2a	R
RPY107	S8b	I	TIP112	S4a	P	1N3909	S2a	R
RPY109	S8b	I	TIP115	S4a	P	1N3910	S2a	R
RV3135B5X	S11	M	TIP116	S4a	P	1N3911	S2a	R
RX1214B300YS11	M		TIP117	S4a	P	1N3912	S2a	R
RXB12350Y	S11	M	TIP120	S4a	P	1N3913	S2a	R
RZ1214B35Y	S11	M	TIP121	S4a	P	1N4001G	S1	R
RZ1214B60W	S11	M	TIP122	S4a	P	1N4002G	S1	R
RZ1214B65Y	S11	M	TIP125	S4a	P	1N4003G	S1	R
RZ1214B125WS11	M		TIP126	S4a	P	1N4004G	S1	R
RZ1214B125YS11	M		TIP127	S4a	P	1N4005G	S1	R
RZ1214B150YS11	M		TIP130	S4a	P	1N4006G	S1	R
RZ2833B45W	S11	M	TIP131	S4a	P	1N4007G	S1	R
RZ3135B15U	S11	M	TIP132	S4a	P	1N4148	S1	SD
RZ3135B15W	S11	M	TIP135	S4a	P	1N4150	S1	SD
RZ3135B25U	S11	M	TIP136	S4a	P	1N4151	S1	SD
RZ3135B30W	S11	M	TIP137	S4a	P	1N4153	S1	SD
RZB12100Y	S11	M	TIP140	S4a	P	1N4446	S1	SD
RZB12350Y	S11	M	TIP141	S4a	P	1N4448	S1	SD
RZZ1214B300YS11	M		TIP145	S4a	P	1N4531	S1	SD
SL5500	S8b	PhC	TIP146	S4a	P	1N4532	S1	SD

* = series

I = Infrared devices

M = Microwave transistors

P = Low-frequency power transistors

PhC = Photocouplers

R = Rectifier diodes

SD = Small-signal diodes

Vrf = Voltage reference diodes

type no.	book	section	type no.	book	section	type no.	book	section
1N5059	S1	R	2N3553	S6	RFP	2N6659	S5	FET
1N5060	S1	R	2N3632	S6	RFP	2N6660	S5	FET
1N5061	S1	R	2N3822	S5	FET	2N6661	S5	FET
1N5062	S1	R	2N3823	S5	FET	4N25	S8b	PhC
			2N3866	S6	RFP	4N25A	S8b	PhC
1N5225B			2N3903	S3	Sm	4N26	S8b	PhC
to	S1	SD	2N3904	S3	Sm	4N27	S8b	PhC
1N5267B			2N3905	S3	Sm	4N28	S8b	PhC
1N5832	S2a	R	2N3906	S3	Sm	4N35	S8b	PhC
1N5833	S2a	R	2N3924	S6	RFP	4N36	S8b	PhC
1N5834	S2a	R						
1N6097	S2a	R	2N3926	S6	RFP	4N37	S8b	PhC
1N6098	S2a	R	2N3927	S6	RFP	4N38	S8b	PhC
2N918	S10	WBT	2N3966	S5	FET	4N38A	S8b	PhC
2N929	S3	Sm	2N4030	S3	Sm	502CQF	S8b	Ph
2N930	S3	Sm	2N4031	S3	Sm	503CQF	S8b	Ph
2N1613	S3	Sm	2N4032	S3	Sm	504CQL	S8b	Ph
2N1711	S3	Sm	2N4033	S3	Sm	516CQF-B	S8b	Ph
2N1893	S3	Sm	2N4091	S5	FET	56201d	S4b	A
2N2219	S3	Sm	2N4092	S5	FET	56201j	S4b	A
2N2219A	S3	Sm	2N4093	S5	FET	56245	S3, 10	A
2N2222	S3	Sm	2N4123	S3	Sm	56246	S3, 10	A
2N2222A	S3	Sm	2N4124	S3	Sm	56261a	S4b	A
2N2297	S3	Sm	2N4125	S3	Sm	56264a, b	S2a/b	A
2N2368	S3	Sm	2N4126	S3	Sm	56295	S2a/b	A
2N2369	S3	Sm	2N4391	S5	FET	56326	S4b	A
2N2369A	S3	Sm	2N4392	S5	FET	56339	S4b	A
2N2483	S3	Sm	2N4393	S5	FET	56352	S4b	A
2N2484	S3	Sm	2N4427	S6	RFP	56353	S4b	A
2N2904	S3	Sm	2N4856	S5	FET	56354	S4b	A
2N2904A	S3	Sm	2N4857	S5	FET	56359b	S2, 4b	A
2N2905	S3	Sm	2N4858	S5	FET	56359c	S2, 4b	A
2N2905A	S3	Sm	2N4859	S5	FET	56359d	S2, 4b	A
2N2906	S3	Sm	2N4860	S5	FET	56360a	S2, 4b	A
2N2906A	S3	Sm	2N4861	S5	FET	56363	S2, 4b	A
2N2907	S3	Sm	2N5400	S3	Sm	56364	S2, 4b	A
2N2907A	S3	Sm	2N5401	S3	Sm	56367	S2a/b	A
2N3019	S3	Sm	2N5415	S3	Sm	56368a	S2, 4b	A
2N3020	S3	Sm	2N5416	S3	Sm	56368b	S2, 4b	A
2N3053	S3	Sm	2N5550	S3	Sm	56369	S2, 4b	A
2N3375	S6	RFP	2N5551	S3	Sm	56378	S2, 4b	A

A = Accessories
 FET = Field-effect transistors
 Ph = Photoconductive devices
 PhC = Photocouplers
 R = Rectifier diodes

RFP = R.F. power transistors and modules
 SD = Small-signal diodes
 Sm = Small-signal transistors
 WBT = Wideband transistors

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type no.	book	section
56379	S2, 4b	A
56387a, b	S4b	A
56397	S8b	A

A = Accessories

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