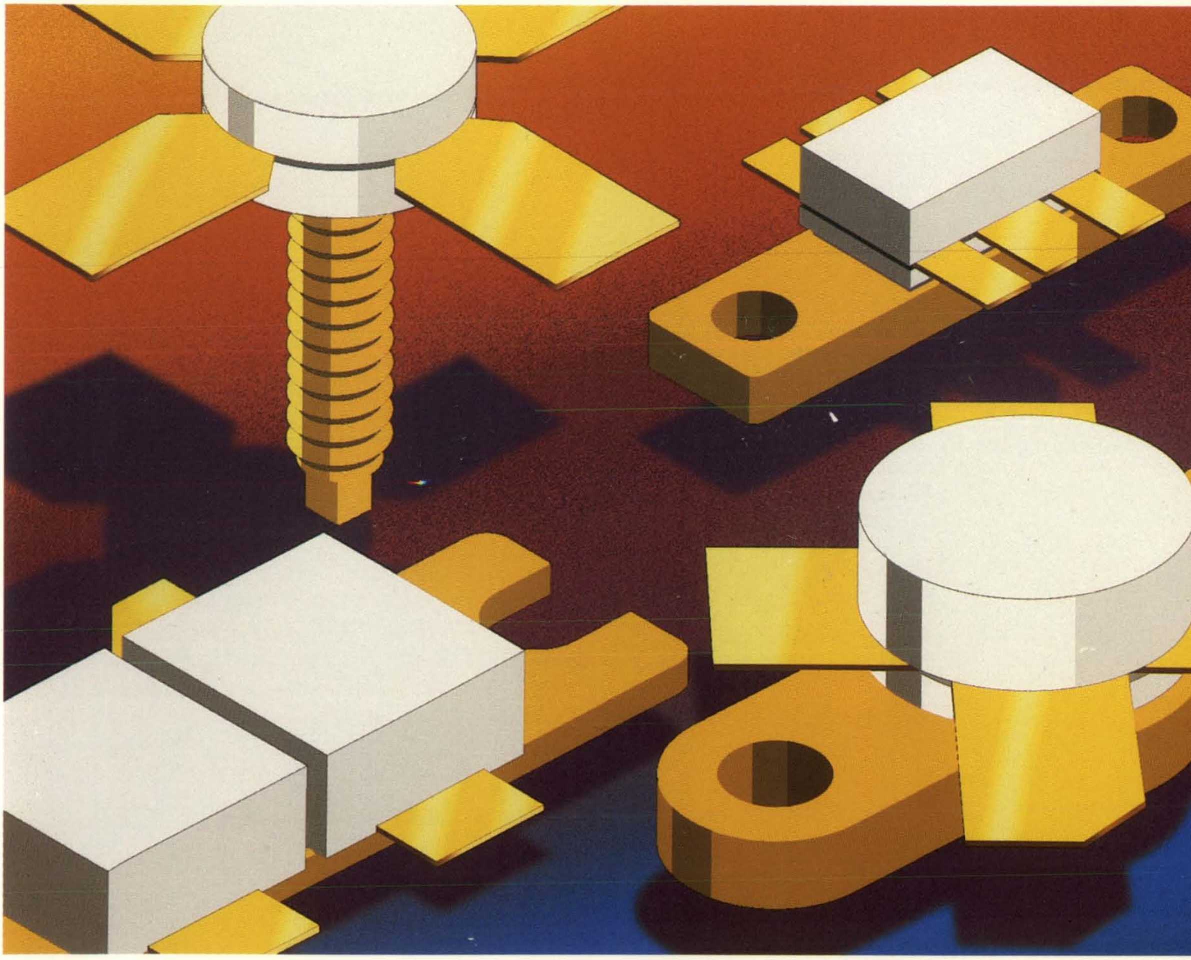
DISCRETE SEMICONDUCTORS

RF Power Transistors for HF and VHF



1996

DATA HANDBOOK SC08a

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All used or obsolete components should be disposed of according to the regulations applying at the disposal location. Depending on the location, electronic components are considered to be ‘chemical’, ‘special’ or sometimes ‘industrial’ waste. Disposal as domestic waste is usually not permitted.

RF Power Transistors for HF and VHF

CONTENTS

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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RF Power Transistors for HF and VHF

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The following products are no longer available:

2N3375, 2N3632
2N3924, 2N3926, 2N3927
BLT90/SL
BLU10/12
BLU15/12
BLU30/28
BLV13
BLV37
BLV38
BLV90/SL
BLV91
BLV94
BLW60
BLX67
BLX69A
BLX91A
BLX91CB
BLX92A
BLX94A
BLX95
BLX96
BLX97
BLY87A
BLY88A
BLY90
BLY91A
BLY92A
BLY93A

SELECTION GUIDE

INTRODUCTION

The following tables represent our complete range of bipolar and MOS transmitting transistors, grouped according to the main RF power application area. The data in each table is subsequently divided into different voltage groups and sorted within each voltage group in order of increasing power.

BIPOLAR RF POWER TRANSISTORS (1.6 to 30 MHz)

TYPE NUMBER	P_L (PEP) (W)	V_{CE} (V)	G_P (dB)	PACKAGE	PAGE
Class-A SSB; intermodulation distortion d_3, d_5 < −40 dB					
BLV10	1	12	18	SOT123	293
BLY87C/01	1	12	18	SOT120	831
BLY87C	1	12	18	SOT120	823
BLV11	2	12	18	SOT123	301
BLY88C	2	12	18	SOT120	839
BLY88C/01	2	12	18	SOT120	847
BLW87	6	12	18	SOT123	681
BLY89C	6	12	18	SOT120	855
BLV20	1.3	26	20	SOT123	317
BLY91C	1.3	26	20	SOT120	863
BLY91C/01	1.3	26	20	SOT120	871
BLV21	2.5	26	20	SOT123	325
BLY92C	2.5	26	20	SOT120	879
BLY92C/01	2.5	26	20	SOT120	887
BLX13C	8	26	>20	SOT120	759
BLW83	10	26	>20	SOT123	637
BLX39	15	26	20	SOT120	799
BLX14	15	26	>13	SOT55	769
BLW86	17	26	22	SOT123	667
BLW78	35	26	19.5	SOT121	599
BLW50F	16	45	19.5	SOT123	549
BLX15	30	40	>14	SOT 55	783
BLW96	50	40	19	SOT121	707
Class-AB SSB; intermodulation distortion d_3, d_5 < −30 dB					
BLV11	10	13.5	18	SOT123	301
BLY88C	10	13.5	20	SOT120	839
BLY88C/01	10	13.5	20	SOT120	847
BLY89C	15	13.5	18	SOT120	855
BLW87	15	13.5	18	SOT123	681
BLW60C	30	12.5	19.5	SOT120	559
BLW85	30	12.5	19.5	SOT123	655
BLW99	80	12.5	14	SOT121	737
BLV21	10	28	20	SOT123	325

TYPE NUMBER	P_L (PEP) (W)	V_{CE} (V)	G_P (dB)	PACKAGE	PAGE
BLY92C	10	28	20	SOT120	879
BLY92C/01	10	28	20	SOT120	887
BLX13C	25	28	>21	SOT120	759
BLW83	30	28	21	SOT123	637
BLX39	42.5	28	19	SOT120	799
BLW86	47.5	28	19	SOT123	667
BLX14	50	28	>13	SOT123	769
BLW76	80	28	>13	SOT121	571
BLW78	100	28	19	SOT121	599
BLW77	130	28	>12	SOT121	585
BLW97	175	28	>11.5	SOT121	719
BLW50F	65	50	18	SOT123	549
BLW95	160	50	>14	SOT121	697
BLW96	200	50	>13.5	SOT121	707

MOS RF POWER TRANSISTORS (1.6 to 30 MHz)

TYPE NUMBER	P_L (PEP) (W)	V_{CE} (V)	G_P (dB)	PACKAGE	PAGE
Class-A SSB; intermodulation distortion d3, d5 < –40 dB					
BLF242	2	28	23	SOT123	143
BLF244	4	28	23	SOT123	151
BLF145	8	28	>24	SOT123	70
BLF246	20	28	23	SOT121	178
BLF175	8	50	>24	SOT123	88
Class-AB SSB; intermodulation distortion d3, d5 < –30 dB					
BLF145	30	28	20	SOT123	70
BLF246	80	28	20	SOT121	178
BLF147	150	28	>17	SOT121	79
BLF248	300	28	13	SOT262A1	205
BLF175	30	50	24	SOT123	88
BLF177	150	50	>20	SOT121	103

BIPOLAR RF POWER TRANSISTORS (25 to 175 MHz)

TYPE NUMBER	P_L (W)	V_{CE} (V)	G_P (dB)	PACKAGE	PAGE
Class-B; 7.5 to 9.6 V portable					
2N4427	0.7	7.5	8	TO-39/1	917
BFQ42	1.5	7.5	8.4	TO-39/1	37
BFQ43	3	7.5	9.4	TO-39/3	47
BLW29	9	7.5	7.4	SOT120	487
Class-B; 12 to 13.5 V car mobile					
2N4427	1	12	>10	TO-39/1	917
BFQ42	2	13.5	>11	TO-39/1	37
BLW79	2	12.5	13.5	SOT122	613
BLW80	4	12.5	15	SOT122	621
BFQ43	4	13.5	>12	TO-39/3	47
BFQ43S	4	13.5	>12	TO-39/3	47
BFS22A	4	13.5	>8	TO-39/1	55
BLV10	8	13.5	>9	SOT123	293
BLY87C	8	13.5	>12	SOT120	823
BLY87C/01	8	13.5	>9	SOT122	831
BLW81	10	12.5	13.5	SOT122	629
BLV11	15	13.5	>8	SOT123	301
BLW29	15	13.5	>10	SOT120	487
BLY88C	15	13.5	8	SOT120	839
BLY88C/01	15	13.5	7.5	SOT122	847
BLW87	25	13.5	>6	SOT123	681
BLY89C	25	13.5	>6	SOT120	855
BLW31	28	13.5	>9	SOT120	503
BLV12	30	12.5	9.8	SOT123	309
BLW30	30	12.5	11	SOT120	495
BLW40	40	12.5	11	SOT120	540
BLV45/12	45	12.5	8	SOT119	409
BLW60C	45	12.5	>5	SOT120	559
BLW85	45	12.5	>4.5	SOT123	655
BLV75/12	75	12.5	7.5	SOT119	459
Class-B; 28 V base stations					
2N3866	1.5	28	>10	TO-39/1	917
2N3553	2.5	28	>10	TO-39/1	911
BFS23A	4	28	>10	TO-39/1	63
BLV20	8	28	>12	SOT123	317
BLY91C	8	28	>12	SOT120	863
BLY91C/01	8	28	>12	SOT122F	871

TYPE NUMBER	P_L (W)	V_{CE} (V)	G_P (dB)	PACKAGE	PAGE
BLY92C	15	28	>10	SOT120	879
BLY92C/01	15	28	>10	SOT122F	887
BLV21	15	28	>10	SOT123	325
BLW84	25	28	>9	SOT123	647
BLY93C	25	28	>9	SOT120	895
BLW86	45	28	>7.5	SOT123	667
BLX39	45	28	>7.5	SOT120	799
BLY94	50	28	>7	SOT55	903
BLV80/28	80	28	>7	SOT121	469
BLW78	100	28	>6	SOT121	599
BLW77	130	28	7.5	SOT121	585

MOS RF POWER TRANSISTORS (25 to 175 MHz)

TYPE NUMBER	P_L (PEP) (W)	V_{DS} (V)	G_P (dB)	PACKAGE	PAGE
Class-B; 12.5 V mobile VHF transmitters					
BLF221	2	12.5	13	SOT5 (TO-39/3)	116
BLF241	2	12.5	12.5	SOT5 (TO-39/1)	134
BLF244	6	12.5	15	SOT123	151
BLF245	12	12.5	12	SOT123	160
BLF245B	–	12.5	–	SOT279	169
BLF225	30	12.5	9.5	SOT123	125
Class-B; 28 V mobile VHF transmitters					
BLF241	3	28	14	SOT5 (TO-39/1)	134
BLF242	5	28	16	SOT123	143
BLF244	15	28	17	SOT123	151
BLF245	30	28	15.5	SOT123	160
BLF245B	30	28	18	SOT279	169
BLF246B	60	28	19	SOT161	187
BLF246	80	28	18	SOT121	178
BLF147	150	28	14	SOT121	79
BLF247B	150	28	13	SOT262A1	196
Class- AB; 28 V mobile VHF transmitters					
BLF248	300	28	13	SOT161	205
Class-B; 50 V mobile VHF transmitters					
BLF175	30	50	20	SOT123	88
BLF276	100	50	22	SOT119D3	215

TYPE NUMBER	P_L (PEP) (W)	V_{DS} (V)	G_P (dB)	PACKAGE	PAGE
Class-B; 12.5 V mobile VHF transmitters					
BLF177	150	50	19	SOT121	103
BLF277	150	50	17	SOT119	225
BLF278	300	50	22	SOT262A1	235

BIPOLAR RF POWER TRANSISTORS FOR FM BROADCAST (87 to 108 MHz)

TYPE NUMBER	P_L (W)	V_{CE} (V)	G_P (dB)	PACKAGE	PAGE
Class-B operation					
2N3866	1.8	28	>10	TO-39/3	917
BLW90	4	28	20	SOT122	689
BLV21	15	28	>10	SOT123	325
BLW86	45	28	>7.5	SOT123	667
BLX39	45	28	>7.5	SOT120	799
BLV80/28	80	28	>7	SOT121	469
BLW76	80	28	7.9	SOT121	571
BLW78	100	28	6	SOT121	599
BLV25	175	28	10	SOT119	333

BIPOLAR RF POWER TRANSISTORS FOR TV TRANSPOSERS/TRANSMITTERS (BANDS I, III, IV and V)

TYPE NUMBER	$P_{o\ sync}$ (W)	V_{CE} (V)	G_P (dB)	d_{im} (dB)	PACKAGE	PAGE
Class-A; bands I (41 to 68 MHz) and III (174 to 230 MHz)						
BLV30	1.7	25	20	−60	SOT122	341
BLV31	7	25	16.5	−58	SOT122	351
BLV32F	12.5	25	17.2	−55	SOT160	361
BLV33F	22	25	14.8	−55	SOT119	383
BLV33	26	25	9.7	−55	SOT147	371
Class-AB; bands I (41 to 68 MHz) and III (174 to 230 MHz)						
BLV30	10	28	15	−	SOT122	341
BLV31	20	28	12	−	SOT122	351
BLV32F	30	28	13	−	SOT160	361
BLV33F	85	28	10.5	−	SOT119	383
BLV33	90	28	6.5	−	SOT147	371
BLV36	115	28	13	−	SOT161	397

TYPE NUMBER	$P_{o\ sync}$ (W)	V_{CE} (V)	G_P (dB)	d_{im} (dB)	PACKAGE	PAGE
Class-A; bands IV and V (470 to 860 MHz)						
BFQ34	0.3	15	11	−60	SOT122	note 1
BFQ68	0.7	15	10	−60	SOT122	note 1
BLW32	0.63	25	12.2	−60	SOT122	511
BLW33	1.15	25	10.5	−60	SOT122	521
BLW34	2.15	25	10.2	−60	SOT122	531
BLX98	4	25	5.5	−60	SOT48/2	813
BLW98	4.4	25	7.0	−60	SOT122	727
BLV57	12	25	9	−60	SOT161	417
BLV58	25	25	11.5	−47	SOT289	431
BLW898	≥3	25	≥9	−60	SOT171A	743
BLV859	≥20	25	≥10	≤−51	SOT262B	481
Class-AB; bands IV and V (470 to 860 MHz)						
BLV59	30(1)	25	8.5	–	SOT171	441
BLV57	38(1)	25	6.5	–	SOT161	417
BLV62	150(1)	28	9.5	–	SOT262A2	450
BLV862	150(1)	28	≥8.5	–	SOT262B	484

Note

1. Refer to *"Data Handbook SC14, RF Wideband Transistors"*.
2. P_L at 1 dB power gain compression.

MOS RF POWER TRANSISTORS FOR TV TRANSPOSERS/TRANSMITTERS (BAND III)

TYPE NUMBER	$P_{o\ sync}$ (W)	V_{CE} (V)	G_P (dB)	d_{im} (dB)	PACKAGE	PAGE
Class-A; band III (174 to 230 MHz)						
BLF346	30	28	16.5	−52	SOT119	253
BLF348	75	28	13	−52	SOT262A1	262
Class-AB; band III (174 to 230 MHz)						
BLF248	300	28	11.5	–	SOT262A1	205
BLF368	300	32	13.5	–	SOT262A1	271
BLF278	250	50	16	–	SOT262A1	235
BLF378	250	50	16	–	SOT262A1	282
Class-B; band III (174 to 230 MHz)						
BLF276	100	50	15	–	SOT119D3	215

LINE-UPS

INTRODUCTION

In this section, we present information on recommended circuit line-ups in the main RF 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 can be found in the application reports book *"Bipolar and MOS Transmitting Transistors"*.

SSB TRANSMITTERS (1.5 to 30 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (PEP) (W)	V_{CE} (V)	S = stud F = flange
30	BLY87C(1)	2 × BLY89C		30	13	S
30	BLY87C/01(1)	2 × BLY89C		30	13	S
50	BLY88C/01(1)	2 × BLW60C		50	13	S
50	BLY91C/01(1)	2 × BLX13C		50	28	S
40	BLY91C/01(2)	2 × BLW78 (2)	8 × BLX15	1 000	50	S/F
30	BLV10(1)	2 × BLW87		30	13	F
50	BLY88C(1)	2 × BLW60C		50	13	S
50	BLV11(1)	2 × BLW85		50	13	F
100	BLY89C(1)	4 × BLW60C		100	13	S
100	BLW87(1)	4 × BLW85		100	13	F
140	2 × BLW87(1)	2 × BLW99		150	13	F
50	BLY91C(1)	2 × BLX13C		50	28	S
50	BLV20(1)	2 × BLW83		50	28	F
150	BLW83(1)	2 × BLW76		150	28	F
250	2 × BLW83(1)	2 × BLW77		250	28	F
220	2 × BLW86(1)	2 × BLW97		300	28	F
500	2 × BLW86	4 × BLW77		450	28	F
680	2 × BLW78(1)	4 × BLW97		600	28	F
300	2 × BLX13C(2)	2 × BLX15		250	50	S
300	2 × BLW83(2)	2 × BLW96		350	50	F
600	2 × BLX39(2)	4 × BLX15		500	50	S
600	2 × BLW50F(1)	4 × BLW95		500	50	F
40	BLY91C(2)	2 × BLW78 (2)	8 × BLX15	1 000	50	S/F
40	BLV20(2)	4 × BLW50F	8 × BLW96	1 200	50	F

Notes

1. Class-A operation.
2. Supply voltage is 28 V in class-A operation.

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (PEP) (W)	V_{CE} (V)
15	BLF244(1)	2 × BLF246		150	28
30	BLF145(1)	2 × BLF147		300	28
60	BLF246(1)	4 × BLF147		550	28
15	BLF244(1)(2)	2 × BLF177		300	50
10	BLF175(1)	4 × BLF177		550	50
20	2 × BLF175(1)	8 × BLF177		1 000	50

Notes

1. Class-A operation.
2. Supply voltage is 28 V in class-A operation.

MOBILE TRANSMITTERS(68 to 87.5 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	P_L (PEP) (W)	V_{CE} (V)	S = stud F = flange
20	2N4427	BLY87C	8	13	S
20	2N4427	BLV10	8	13	F
35	2N4427	BLW29	14	13	S
70	BFQ42	BLW31	28	13	S
160	BFQ43	BLW60C	45	13	S
160	BFQ43	BLW85	45	13	F
190	BLV10	BLV75/12	75	13	F

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	P_L (PEP) (W)	V_{CE} (V)
15	BLF221	BLF245	12	12.5
25	BLF221	BLF225	25	12.5

BASE STATIONS (68 to 87.5 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (PEP) (W)	V_{CE} (V)	S = stud F = flange
65	BFS23A	BLY93C		25	28	S
65	BFS23A	BLW84		25	28	F
125	BLW89	BLX39		50	28	S
15	2N3866	BLV21	BLW78	100	28	F
50	2N3866	BLY93C(1)	BLX15	150	50	S
50	2N3866(1)	BLW84(1)	BLW95	150	50	F

Note

1. Supply voltage is 28 V in class-A operation.

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (PEP) (W)	V_{CE} (V)
30	BLF241	BLF245		30	28
80	BLF242	BLF246		80	28
150	BLF244	BLF147		150	28

FM BROADCAST TRANSMITTERS (87.5 to 108 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (PEP) (W)	V_{CE} (V)	S = stud F = flange
100	BLW90	BLX39		50	28	S
40	2N3866	BLV21	BLW78	100	28	F
100	BLW90	BLW86	2 × BLV25	300	28	F

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (PEP) (W)	V_{CE} (V)
240	BLF244	BLF248		300	28
120	BLF244(1)	BLF278		300	50
240	BLF244(1)	2 × BLF278		550	50
320	BLF175	4 × BLF278		1 000	50

Note

1. Supply voltage is 28 V in class-A operation.

AM AIRCRAFT TRANSMITTERS (118 to 136 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	$P_{L(carr)}$ (W)	V_{CE} (V)	S = stud F = flange
110	BLY92C(1)	BLY93C		6	13 or 28	S
240	BLY91C(2)	BLX39		12	13 or 28	S
240	BLV20	BLW86		12	13 or 28	F
100	BLW89	BLY93C	BLW78	25	13 or 28	S/F

Notes

1. Can be replaced by BLY92C/01.
2. Can be replaced by BLY91C/01.

AM AIRCRAFT TRANSMITTERS (100 to 400 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	$P_{L(carr)}$ (W)	V_{CE} (V)	S = stud F = flange
40	BLW89	2 × BLW90	2 × BLX94C	40	28	S
60	BLW89	2 × BLW91	2 × BLU60/28	60	28	S/F
500	BLW90	2 × BLX94C	2 × BLU60/28	120	28	S/F

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	$P_{L(carr)}$ (W)	V_{CE} (V)
30	BLF521(1)	BLF522(1)	BLF545	40	28
25	BLF521(1)	BLF543	BLF546	80	28
100	BLF521(1)	BLF544	BLF548	150	28
30	BLF521(1)	BLF543	BLF547	100	28

Note

1. V_{DS} = 12.5 V.

PORTABLE and MOBILE TRANSMITTERS (132 to 174 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (W)	V_{CE} (V)	S = stud F = flange
40	2N4427	BFQ43		2	7.5	–
100	2N4427	BLY87C(1)		8	13	S
100	2N4427	BLV10		8	13	F
125	BFQ42	BLW29		14	13	S
150	BGY36			18	13	F
200	BFQ43	BLW30		30	12.5	S
200	BFQ43	BLV12		30	12.5	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

Note

1. Can be replaced by BLY87C/01.

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (W)	V_{CE} (V)
100	BLF221	BLF245		12	12.5
150	BLF522	BLF225		25	12.5

BASE STATIONS (132 to 174 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (W)	V_{CE} (V)	S = stud F = flange
200	BLY91C(1)	BLY93C		25	28	S
200	BLV20	BLW84		25	28	F
25	2N3866	BLY91C(1)	BLX39	50	28	S
25	2N3866	BLV20	BLW86	50	28	F
200	BFS23A	BLY93C	2 × BLX39	100	28	S
200	BFS23A	BLW84	2 × BLW86	100	28	F

Note

1. Can be replaced by BLY91C/01.

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (W)	V_{CE} (V)
120	BLF241	BLF245		30	28
220	BLF242	BLF246		80	28
70	BLF241	BLF245	BLF147	150	28
250	BLF244	BLF247B		150	28

TV TRANSPOSERS (BAND III: 174 to 230 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	4th STAGE	$P_{o(sync)}$ (W)	$P_{o(sat)}$ (W)	V_{CE} (V)
6	BGY85	2 × BLV31			10	10	25
7	BLV30	2 × BLV32F			20	20	25
3	BGY85	2 × BLV31	2 × BLV33		30	40	25
6	BLV30	2 × BLV33F	4 × BLV33		60	75	25
2	BGY85	2 × BLV31	4 × BLV33	8 × BLV33	100	140	25

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	4th STAGE	$P_{o(sync)}$ (W)	$P_{o(sat)}$ (W)	V_{CE} (V)
5	BLF242(1)	2 × BLF244(1)	BLF348		40	60	28
12	BLF244(1)	2 × BLF245(1)	2 × BLF348		75	115	28
20	BLF244(1)	2 × BLF346	4 × BLF348		140	220	28
5	BLF242(1)	2 × BLF245B(1)	BLF348		40	60	28
12	BLF244(1)	2 × BLF246B(1)	2 × BLF348		75	115	28

Note

1. Recommended types based on typical behaviour. Bipolar alternatives are BLV30, BLV31, BLV32F.

TV TRANSMITTERS (BAND III: 174 to 230 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	$P_{o(sync)}$ (W)	V_{CE} (V)
8	BGY85	2 × BLV31	2 × BLV33F	130	28

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	$P_{o(sync)}$ (W)	V_{CE} (V)
25	BLF242	BLF175	2 × BLF276	150	50
50	BLF242(2)	2 × BLF244(2)	BLF368	300	32
50	BLF242(2)	BLF245B(2)	BLF368	300	32
100	BLF242(2)	2 × BLF245(2)	2 × BLF368	550	32
100	BLF242(2)	BLF246B(2)	2 × BLF368	550	32
160	BLF242(2)	2 × BLF346	4 × BLF368	1000	32
50	BLF242(1)(2)	2 × BLF175(2)	6 × BLF378	1250	50

Notes

1. Supply voltage is 28 V in class-A operation.
2. Recommended types based on typical behaviour. Bipolar alternatives are BLV30, BLV31, BLV32F.

TV TRANSPOSERS (BAND IV/V: 470 to 860 MHz)

Bipolar

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 × BFQ68		1.4	1.4	15
6	BLW32	BLW33	2 × BLW34		4.4	5.7	25
2	BLW32	BLW33	2 × BLW34	2 × BLW98	8	8	25
3	BLW32	BLW33	2 × BLW34	2 × BLV57	13	15	25
3	BFQ68	BLW34	BLW98	2 × BLV58	25(1)	30	25
500	2 × BLW898	2 × BLV859			40	–	25

Note

1. 25 W sync, –51 dB (–8, –16, or –7 dB).

TV TRANSMITTERS (BAND IV/V: 470 to 860 MHz)

Bipolar

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	4th STAGE	$P_{o(sync)}$ (W)	V_{CE} (V)
12	BFR96S	BFQ68	2 × BLW34	2 × BLV59	60	28
15	BFQ34	BLW34	BLV58	BLV62	150	28
30	BFQ34	2 × BLW33	2 × BLV58	4 × BLV62	500	28

AM AIRCRAFT TRANSMITTERS (108 to 144 MHz)

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	P_L (W)	V_{CE} (V)
100	BLF242	BLF246	20	28
80	BLF244	BLF147	35	28
120	BLF242(1)	BLF278	75	50

Note

1. Supply is 28 V in Class-A operation.

MILITARY COMMUNICATION TRANSMITTERS (25 to 110 MHz)

PowerMOS

INPUT POWER (mW)	1st STAGE	2nd STAGE	3rd STAGE	P_L (W)	V_{CE} (V)
150	BLF242(1)	2 × BLF244		12	12.5
150	BLF242(1)	BLF245B		12	12.5
500	BLF244(1)	2 × BLF245		60	28
500	BLF244(1)	BLF246B		60	28
100	BLF242(1)	BLF245(1)	2 × BLF246	150	28

Note

1. Class-A operation.

GENERAL

QUALITY

Total Quality Management

Philips Semiconductors is a Quality Company, renowned for the high quality of our products and service. We keep alive this tradition by constantly aiming towards one ultimate standard, that of zero defects. This aim is guided by our Total Quality Management (TQM) system, the basis of which is described in the following paragraphs.

QUALITY ASSURANCE

Based on ISO 9000 standards, customer standards such as Ford TQE and IBM MDQ. Our factories are certified to ISO 9000 by external inspectorates.

PARTNERSHIPS WITH CUSTOMERS

PPM co-operations, design-in agreements, ship-to-stock, just-in-time and self-qualification programmes, and application support.

PARTNERSHIPS WITH SUPPLIERS

Ship-to-stock, statistical process control and ISO 9000 audits.

QUALITY IMPROVEMENT PROGRAMME

Continuous process and system improvement, design improvement, complete use of statistical process control, realization of our final objective of zero defects, and logistics improvement by ship-to-stock and just-in-time agreements.

Advanced quality planning

During the design and development of new products and processes, quality is built-in by advanced quality planning. Through failure-mode-and-effect analysis the critical parameters are detected and measures taken to ensure good performance on these parameters. The capability of process steps is also planned in this phase.

Product conformance

The assurance of product conformance is an integral part of our quality assurance (QA) practice. This is achieved by:

- Incoming material management through partnerships with suppliers.
- In-line quality assurance to monitor process reproducibility during manufacture and initiate any necessary corrective action. Critical process steps are 100% under statistical process control.
- Acceptance tests on finished products to verify conformance with the device specification. The test results are used for quality feedback and corrective actions. The inspection and test requirements are detailed in the general quality specifications.
- Periodic inspections to monitor and measure the conformance of products.

Product reliability

With the increasing complexity of Original Equipment Manufacturer (OEM) equipment, component reliability must be extremely high. Our research laboratories and development departments study the failure mechanisms of semiconductors. Their studies result in design rules and process optimization for the highest built-in product reliability. Highly accelerated tests are applied to the products reliability evaluation. Rejects from reliability tests and from customer complaints are submitted to failure analysis, to result in corrective action.

Customer responses

Our quality improvement depends on joint action with our customer. We need our customer's inputs and we invite constructive comments on all aspects of our performance. Please contact our local sales representative.

Recognition

The high quality of our products and services is demonstrated by many Quality Awards granted by major customers and international organizations.

PRO ELECTRON TYPE NUMBERING

Basic type number

This type designation code applies to discrete semiconductor devices (not integrated circuits), multiples of such devices, semiconductor chips and Darlington transistors.

FIRST LETTER

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

- A Germanium or other material with a band gap of 0.6 to 1 eV
- B Silicon or other material with a band gap of 1 to 1.3 eV
- C Gallium arsenide (GaAs) or other material with a 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. The same letter can be used for multi-chip devices with similar elements.

In the following list low power types are defined by $R_{th\ j\text{-}mb} > 15$ K/W and power types by $R_{th\ j\text{-}mb} \leq 15$ K/W.

- A Diode; signal, low power
- B Diode; variable capacitance
- C Transistor; low power, audio frequency
- D Transistor; power, audio frequency
- E Diode; tunnel
- F Transistor; low power, high frequency
- G multiple of dissimilar devices/miscellaneous devices; e.g. oscillators. Also with special third letter, see under "Serial number/special third letter"
- H Diode; magnetic sensitive
- L Transistor; power, high frequency
- N Photocoupler
- P Radiation detector; e.g. high sensitivity photo-transistor; with special third letter
- Q Radiation generator; e.g. LED, laser; with special third letter
- R Control or switching device; e.g. thyristor, low power; with special third letter
- S Transistor; low power, switching
- T Control and switching device; e.g. thyristor, power; with special third letter
- U Transistor; power, switching
- W Surface acoustic wave device
- X Diode; multiplier, e.g. varactor, step recovery
- Y Diode; rectifying, booster
- Z Diode; voltage reference or regulator, transient suppressor diode; with special third letter.

SERIAL NUMBER

The number comprises three figures running from 100 to 999 for devices primarily intended for consumer equipment, or one letter (Z, Y, X, etc.) and two figures running from 10 to 99 for devices primarily intended for industrial or professional equipment.[1].

(1) When the supply of these serial numbers is exhausted, the serial number may be expanded to three figures for industrial types and four figures for consumer types.

Version letter(s)

One or two letters may be added to the basic type number to indicate minor electrical or mechanical variants of the basic type. The letters never have a fixed meaning, except that the letter 'R' indicates reverse polarity and the letter 'W' indicates a surface mounted device (SMD).

RATING SYSTEMS

The rating systems described are those recommended by the IEC in its publication number 134.

Definitions of terms used

ELECTRONIC DEVICE

An electronic tube or valve, transistor or other semiconductor device. 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 that are directly related to the application.

RATING

A value that 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. Limiting conditions may be either maxima or minima.

RATING SYSTEM

The set of principles upon which ratings are established and which determine their interpretation. 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 the life of the device, 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 the life of the device, no design maximum value for the intended service is exceeded with a bogey electronic 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.

DC CURRENT DRAINING

For RF power MOS transistors, the DC drain current rating is based on the maximum operating junction temperature of the device. The value specified will raise the temperature of the die to its maximum allowable temperature while the case is held at 25 °C. The power dissipation in the die equals $I_D^2 \times R_{DS(on)}$. From the maximum $R_{DS(on)}$ at T_j = 200 °C and the published values of maximum allowable dissipation, the current rating at T_{mb} = 25 °C is $(P_{D(max)}/R_{DS(on)})^{0.5}$.

LETTER SYMBOLS

The letter symbols for transistors detailed in this section are based on IEC publication number 148.

Basic letters

In the representation of currents, voltages and powers, lower-case letter symbols are used to indicate all instantaneous values that vary with time. All other values are represented by upper-case letters.

Electrical parameters[1] of external circuits and of circuits in which the device forms only a part are represented by upper-case letters. Lower-case letters are used for the representation of electrical parameters inherent in the device. Inductances and capacitances are always represented by upper-case letters.

(1) For the purpose of this publication, the term 'electrical parameters' applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

The following is a list of basic letter symbols used with semiconductor devices:

B, b	susceptance (imaginary part of an admittance)
C	capacitance
G, g	conductance (real part of an admittance)
H, h	hybrid parameter
I, i	current
L	inductance
P, p	power
R, r	resistance (real part of an impedance)
V, v	voltage
X, x	reactance (imaginary part of an impedance)
Y, y	admittance
Z, z	impedance.

Subscripts

Upper-case subscripts are used for the indication of:

- continuous (DC) values (without signal), e.g. I_B, I_D
- instantaneous total values, e.g. i_B, i_D
- average total values, e.g. $I_{B(AV)}$, $I_{D(AV)}$
- peak total values, e.g. I_{BM}, I_{DM}
- root-mean-square total values, e.g. $I_{B(RMS)}$, $I_{D(RMS)}$.

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

- instantaneous values, e.g. i_b, i_d
- root-mean-square values, e.g. $I_{b(rms)}$, $i_{d(rms)}$
- peak values, e.g. I_{bm}, i_{dm}
- average values, e.g. $I_{b(av)}$, $i_{d(av)}$.

The following is a list of subscripts used with basic letter symbols for semiconductor devices:

A, a	anode
amb	ambient
(AV), (av)	average value
B, b	base
(BO)	breakover
(BR)	breakdown
case	case
C, c	collector
C	controllable
D, d	drain
E, e	emitter
F, f	fall, forward (or forward transfer)
G, g	gate
H	holding
h	heatsink
I, i	input
j-a	junction to ambient
j-mb	junction to mounting base
K, k	cathode
L	load
M, m	peak value
(min)	minimum
(max)	maximum
mb	mounting base
O, o	as third subscript: the terminal not mentioned is open-circuit
(OV)	overload
P, p	pulse
Q, q	turn-off
R, r	as first subscript: reverse (or reverse transfer), rise. As second subscript: repetitive, recovery. As third subscript: with a specified resistance between the terminal not mentioned and the reference terminal
(RMS), (rms)	root-mean-square value
S, s	as first subscript: series, source, storage, stray, switching. As second subscript: surge (non-repetitive). As third subscript: short circuit between the terminal not mentioned and the reference terminal
stg	storage
th	thermal
TO	threshold
tot	total
W	working
X, x	specified circuit
Z, z	reference or regulator (zener)
1	input (four-pole matrix)
2	output (four-pole matrix).

Applications and examples

TRANSISTOR CURRENTS

The first subscript indicates the terminal carrying the current (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B, I_D, i_B, i_D, i_b, i_d, I_{bm}, I_{dm}.

TRANSISTOR VOLTAGES

A voltage is indicated by the first two subscripts: the first identifies the terminal at which the voltage is measured and the second the reference terminal or the circuit node. The second subscript may be omitted when there is no possibility of confusion.

Examples: V_{BE}, V_{GS}, v_{BE}, v_{GS}, v_{be}, v_{gs}, V_{bem}, V_{gsm}.

SUPPLY VOLTAGES OR CURRENTS

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

Examples: V_{DD}, V_{CC}, I_{EE}, I_{SS}.

A reference terminal is indicated by a third subscript.

Examples: V_{CCE}, V_{DDS}.

DEVICES WITH 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. Hyphens may be used to avoid confusion in multiple subscripts.

Examples:

I_{B2} continuous (DC) current flowing into the second base terminal

I_{G2} continuous (DC) current flowing into the second gate terminal

$V_{B2\text{-}E}$ continuous (DC) voltage between the terminals of second base and emitter terminals

$V_{G2\text{-}S}$ continuous (DC) voltage between the terminals of second gate and source terminals.

MULTIPLE DEVICES

For multiple unit devices, the subscripts are modified by a number preceding the letter subscript. Hyphens may be used to avoid confusion in multiple subscripts.

Examples:

I_{2C} continuous (DC) current flowing into the collector terminal of the second unit

I_{2D} continuous (DC) current flowing into the drain terminal of the second unit

$V_{1C\text{-}2C}$ continuous (DC) voltage between the collector terminals of the first and second units.

$V_{1D\text{-}2D}$ continuous (DC) voltage between the drain terminals of the first and second units.

ELECTRICAL PARAMETERS

The upper-case variant of a subscript is used for the designation of static (DC) values.

Examples:

h_{FE} static value of forward current transfer in common-emitter configuration (DC current gain)

g_{FS} static value of forward transconductance in common-source configuration (DC current gain)

R_E DC value of the external emitter resistance.

R_{DS} DC value of the drain-source resistance.

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 is used for the designation of small-signal values.

Examples:

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

g_{fs} small-signal value of the short-circuit forward transconductance in common-source configuration

$Z_i = R_i + jX_i$ small-signal value of input impedance

If more than one subscript is used, subscripts for which a choice of style is allowed, the subscripts chosen are all upper-case or all lower-case.

Examples: h_{FE}, y_{RE}, h_{fe}, g_{FS}.

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 are 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 are not suitable, the notation shown in the following examples is used.

Examples:

Re (h<6~$_{ib}$) etc. for the real part of h_{ib}

Im (h_{ib}) etc. for the imaginary part of h_{ib}.

MARKING CODES

For the purposes of matched pair applications, RF power MOS transistors are marked with a code that indicates their gate-source voltage range (see Table 1).

Table 1 Marking codes for V_{GS} selection

CODE	V_{GS}	CODE	V_{GS}
0	1.00 to 1.10	J	2.80 to 2.90
1	1.10 to 1.20	K	2.90 to 3.00
2	1.20 to 1.30	L	3.00 to 3.10
3	1.30 to 1.40	M	3.10 to 3.20
4	1.40 to 1.50	N	3.20 to 3.30
5	1.50 to 1.60	O	3.30 to 340
6	1.60 to 1.70	P	3.40 to 3.50
7	1.70 to 1.80	Q	3.50 to 3.60
8	1.80 to 1.90	R	3.60 to 3.70
9	1.90 to 2.00	S	3.70 to 3.80
A	2.00 to 2.10	T	3.80 to 3.90
B	2.10 to 2.20	U	3.90 to 4.00
C	2.20 to 2.30	V	4.00 to 4.10
D	2.30 to 2.40	W	4.10 to 4.20
E	2.40 to 2.50	X	4.20 to 4.30
F	2.50 to 2.60	Y	4.30 to 4.40
G	2.60 to 2.70	Z	4.40 to 4.50
H	2.70 to 2.80		

FLANGE-MOUNTED POWER TRANSISTORS

Mounting recommendations

- Ensure holes in heatsinks are free from burrs.
- Minimum depth of tapped holes in heatsinks is 6 mm.
- Use 4-40 UNC-2A cheese-head screws with a flat washer to spread the joint pressure.
- 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% Al). The thickness of the heatsink should be increased proportionally for transistors dissipating more power.
- The minimum flatness of the mounting area is 0.02 mm.
- Mounting area roughness should be less than 0.5 μm.
- Avoid, as much as possible, use of flux or flux solutions because flux can penetrate even hermetically sealed ceramic-capped transistors. Tin and wash the printed-circuit boards **before** mounting the power transistors, then solder the transistors into place without using flux.
- Transistor leads may be tinned by dipping them full-length into a solder bath at a temperature of about 230 °C. No flux should be used during tinning.
- Recommended heatsink compounds: WPS II (silicone-free) from Austerlitz-Electronics; Comp. Trans. from KF; 340 from Dow Corning; Trans-Heat from E. Friis-Mikkelsen.
- When a transistor is removed from a heatsink, the flange, almost certainly, will have been distorted by the joint pressure. Grinding or lapping of the flange to the required flatness and smoothness is necessary before the transistor is remounted.

Mounting sequence

- Apply a thin layer of evenly-distributed heatsink compound to the flange.
- Position the device with flat washers in place.
- Tighten the screws until finger-tight (0.05 Nm).
- Further tighten the screws until the specified torque is reached (do not lubricate); for torques, refer to the package outlines section of this data handbook.
- To lock mounting screws, allow about 30 minutes for them to bed-down after the specified torque has been applied, re-tighten to the specified torque and apply locking paint.

Thermal behaviour

The coefficients of linear thermal expansion (α) shown in Table 2 can be used to calculate the thermal expansion of the different header parts.

Table 2 Coefficients of linear thermal expansion of flange-mounted packages

SYMBOL	PACKAGE	FLANGE	LEAD FRAME	UNIT
α	SOT119	18.3×10^{-6}	7.5×10^{-6} to 8.5×10^{-6}	K^{-1}
	SOT121			
	SOT123			
	SOT160			
	SOT161			
	SOT171			
	SOT279			
	SOT262	6.5×10^{-6}	7.5×10^{-6} to 8.5×10^{-6}	K^{-1}
	SOT289	6.5×10^{-6}	5.7×10^{-6} to 6.2×10^{-6}	K^{-1}

CAPSTAN HEADERS

Table 3 Mounting data for capstan headers

ITEM	MOUNTING STUD DIAMETER			TOLERANCE	UNIT
	1/4″	3/8″	1/2″		
Thread	8-32 UNC-2A(B)	10-32 UNF-2A(B)	1/4″ × 28 UNF-2A(B)	–	–
Maximum diameter of threaded stud	4.14	4.80	6.33	–	mm
Diameter of heatsink mounting hole	4.15	4.85	6.35	+0.05/–0	mm
Mounting nut thickness	3.5 and 5	5	5.5	–	mm
Mounting nut torque:					
minimum	0.75	1.5	2.3	–	Nm
maximum	0.85	1.7	2.7	–	Nm
Distance from heatsink to printed-circuit board	2.9	3.8	4.8	+0/–0.2	mm

Mounting recommendations

- Avoid, as much as possible, use of flux or flux solutions because flux can penetrate even hermetically sealed ceramic-capped transistors. Tin and wash the printed-circuit boards **before** mounting the power transistors, then solder the transistors into place without using flux.
- Transistor leads may be tinned by dipping them full-length into a solder bath at a temperature of about 230 °C. No flux should be used during tinning.
- Heatsink surfaces at the mounting hole are to be flat, parallel and free of burrs or oxidation.
- Do not use locking washers, their locking action can deteriorate in time due to the comparative softness of most heatsink materials. A flat washer can be used to spread the joint pressure.
- Ensure a positive clearance exists between leads and printed circuit board, this prevents upward lead-bending and consequent damage to the encapsulation
- Recommended heatsink compounds: WPS II (silicone-free) from Austerlitz-Electronics; Comp. Trans. from KF; 340 from Dow Corning; Trans-Heat from E. Friis-Mikkelsen.
- The full mounting nut torque should be applied only once in the life of a transistor. For pre-assembly testing, apply no more than two-thirds of the specified torque.

Mounting sequence

- Apply a thin layer of evenly-distributed heatsink compound to the heatsink.
- Position the device with a flat washer in place.
- Tighten the screws until finger-tight (0.05 Nm).
- Further tighten the screws until the specified torque is reached (do not lubricate); for torques, refer to the package outline section of this data handbook.
- To lock mounting screws, allow about 30 minutes for them to bed-down after the specified torque has been applied, re-tighten to the specified torque and apply locking paint.

HANDLING MOS DEVICES

Electrostatic charges

Electrostatic charges can exist in many things; for example, man-made-fibre clothing, moving machinery, objects with air blowing across them, plastic storage bins, sheets of paper stored in plastic envelopes, paper from electrostatic copying machines, and people. The charges are caused by friction between two surfaces, at least one of which is non-conductive. The magnitude and polarity of the charges depend on the different affinities for electrons of the two materials rubbing together, the friction force and the humidity of the surrounding air.

Electrostatic discharge is the transfer of an electrostatic charge between bodies at different potentials and occurs with direct contact or when induced by an electrostatic field. Our RF Power MOS transistors are sensitive to electrostatic discharge and, to avoid damage, the following precautions must be taken.

Work station

Figure 1 shows a working area suitable for safely handling electrostatic sensitive devices. It has a work bench, the surface of which is conductive or covered by an antistatic sheet. Typical resistivity for the bench surface is between 1 and 500 kΩ per cm^2. The floor should also be covered with antistatic material.

The following precautions should be observed:

- Persons at a work bench should be earthed via a wrist strap and a resistor.
- All mains-powered electrical equipment should be connected via an earth leakage switch.
- Equipment cases should be earthed.
- Relative humidity should be maintained between 50 and 65%.
- An ionizer should be used to neutralize objects with immobile static charges.

Receipt and storage

Our devices are packed for dispatch in antistatic conductive containers, usually boxes, tubes or blister tape. The fact that the contents are sensitive to electrostatic discharge is shown by warning labels on both primary and secondary packing.

The devices should be kept in their original packing whilst in storage. If a bulk container is partially unpacked, the unpacking should be performed at a protected work station. Any devices that are stored temporarily should be packed in conductive or antistatic packing or carriers.

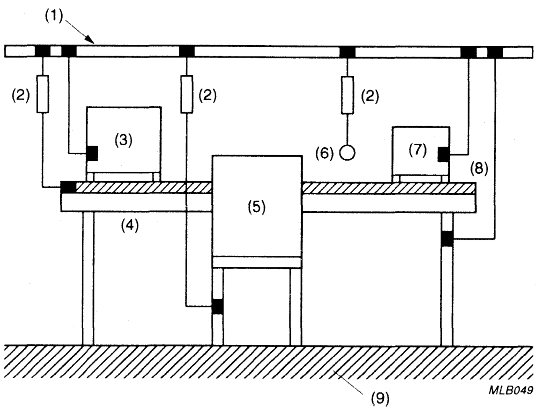
Assembly

The devices must be removed from their protective packing with earthed component pincers or short-circuit clips. Short-circuit clips must remain in place during mounting, soldering and cleansing/drying processes. Do not remove more devices from the storage packing than are needed at any one time. Production/assembly documents should state that the product contains electrostatic sensitive devices and that special precautions need to be taken.

All tools used during assembly, including soldering tools and solder baths, must be earthed. All hand tools should be of conductive or antistatic material and, where possible, should not be insulated.

Measuring and testing of completed circuit boards must be done at a protected work station. Place the soldered side of the circuit board on conductive or antistatic foam and remove the short-circuit clips. Remove the circuit board from the foam, holding the board only at the edges. Make sure the circuit board does not touch the conductive surface of the work bench. After testing, replace the circuit board on the conductive foam to await packing.

Assembled circuit boards should be handled in the same way as unmounted devices. They should also carry warning labels and be packed in conductive or antistatic packing.



(1) Earthing rail.
(2) Resistor (500 kΩ ±10%, 0.5 W).
(3) Ionizer.
(4) Work bench.
(5) Chair.
(6) Wrist strap.
(7) Electrical equipment.
(8) Conductive surface/antistatic sheet.
(9) Antistatic floor.

Fig.1 Protected work station.

DEVICE DATA

in alphanumeric sequence

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

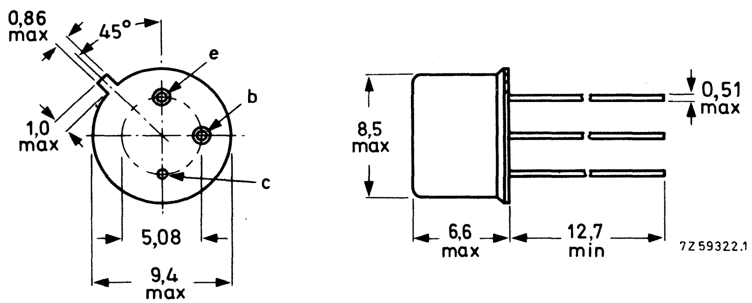
R.F. performance up to T_{amb} = 25 °C; $R_{th\ c\text{-}a}$ = 32 K/W

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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-39/1; collector connected to case.

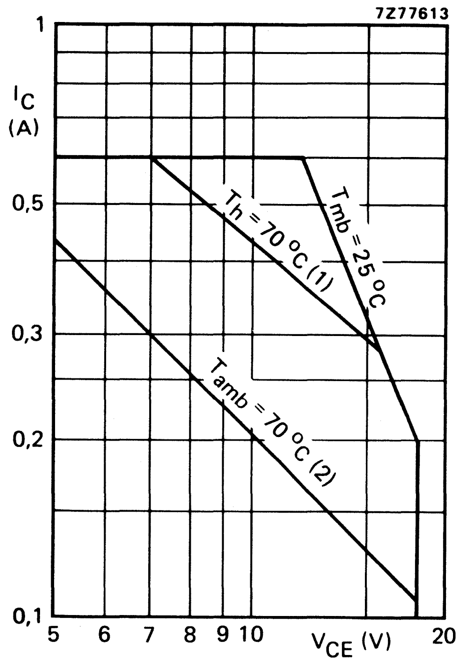


Maximum lead diameter is guaranteed only for 12,7 mm.

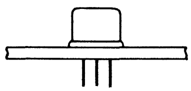
RATINGS

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.

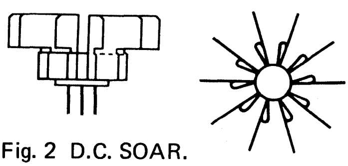
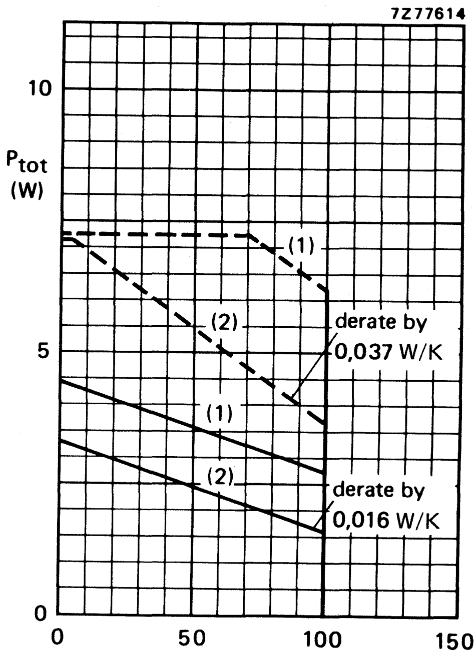


Fig. 2 D.C. SOAR.



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

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

Fig. 3 Total power dissipation; V_{CE} ⩽ 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	$R_{th\ j\text{-}mb}$	=	24 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	29 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	3 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 2$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	1 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	0,5 mJ
D.C. current gain * $I_C = 0,25$ A; $V_{CE} = 5$ V	h_{FE}	typ.	30
			10 to 60
Collector-emitter saturation voltage* $I_C = 0,75$ A; $I_B = 0,15$ A	V_{CEsat}	typ.	0,9 V
Transition frequency at f = 100 MHz * $-I_E = 0,25$ A; $V_{CB} = 13,5$ V	f_T	typ.	750 MHz
$-I_E = 0,75$ A; $V_{CB} = 13,5$ V	f_T	typ.	625 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c	typ.	8,6 pF
Feedback capacitance at f = 1 MHz $I_C = 20$ mA; $V_{CE} = 13,5$ V	C_{re}	typ.	3,8 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

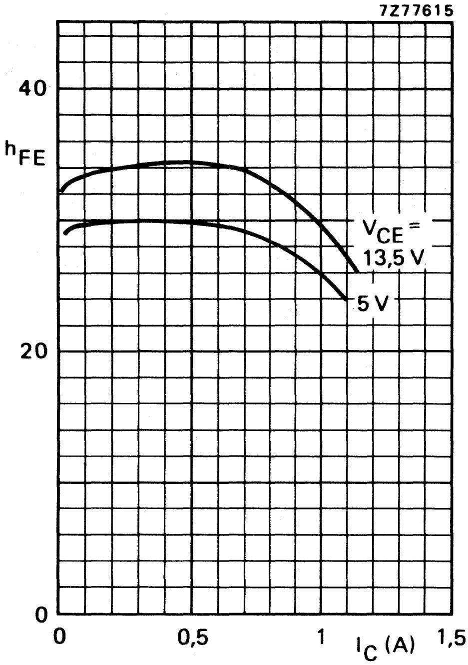


Fig. 4 Typical values; T_j = 25 °C.

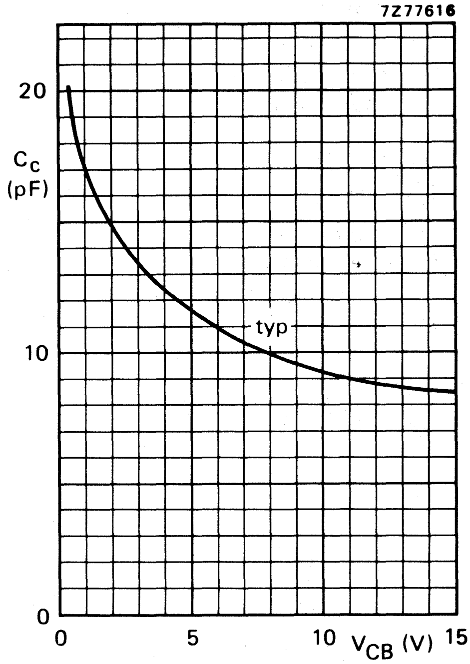


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

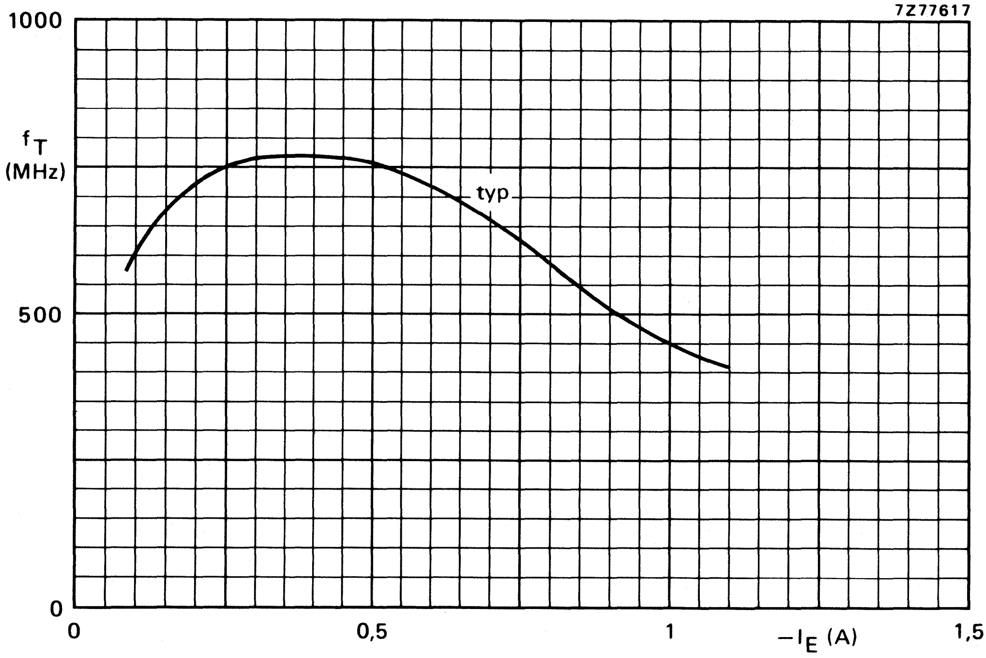


Fig. 6 V_{CB} = 13,5 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

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

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	−	−

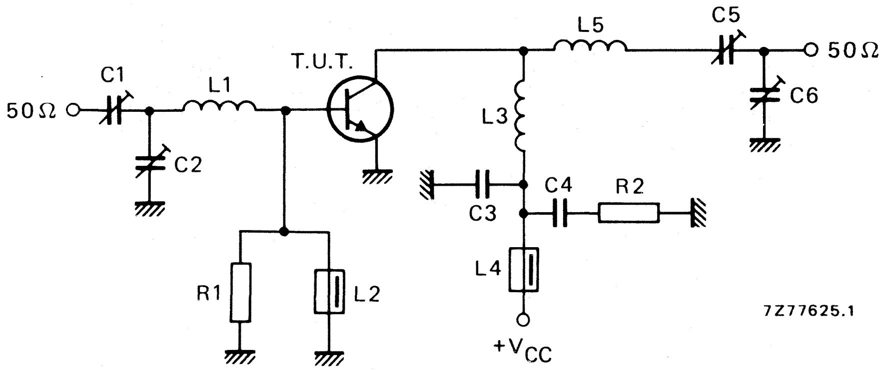


Fig. 7 Test circuit; c.w. class-B.

List of components:

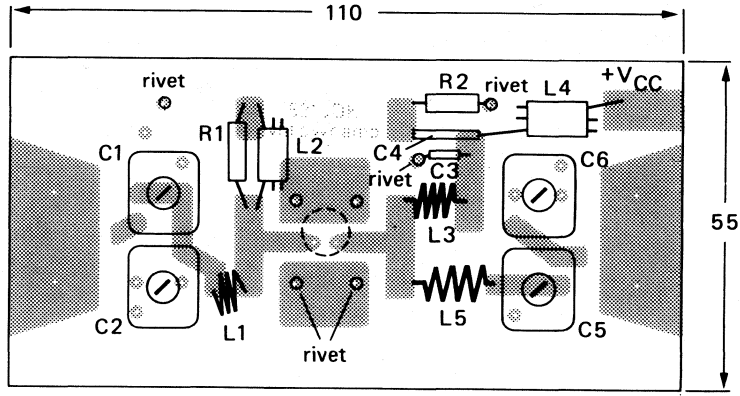
C1 = C2 = C5 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 100 pF ceramic capacitor
C4 = 100 nF polyester capacitor
C6 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

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 resistor
R2 = 10 Ω carbon resistor

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

APPLICATION INFORMATION (continued)



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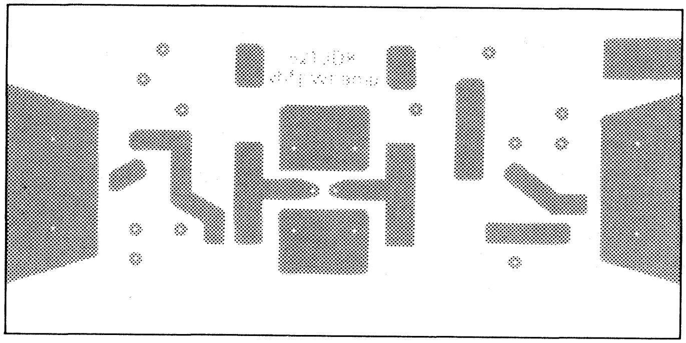


7Z77579

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.

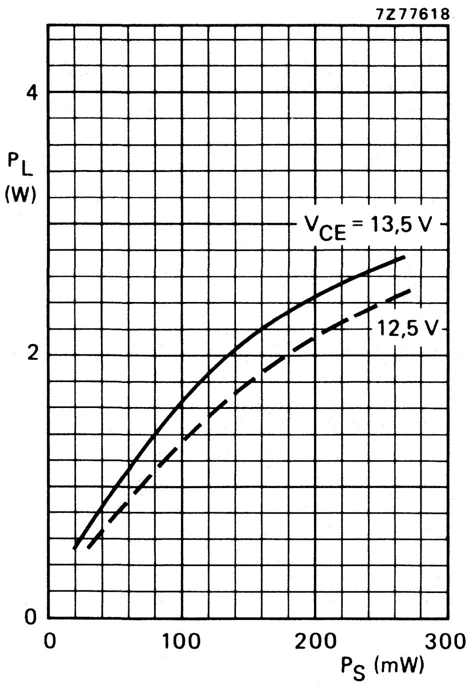


Fig. 9 Typical values; f = 175 MHz;
T_{amb} = 25 °C; $R_{th\ c\text{-}a}$ = 32 K/W.

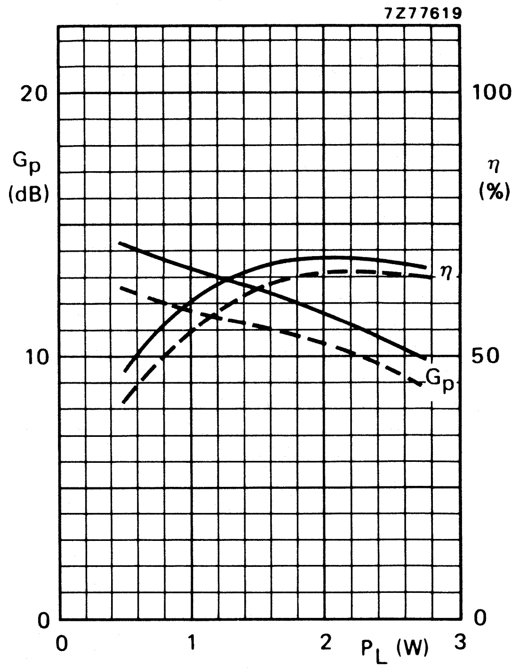


Fig. 10 Typical values; f = 175 MHz;
T_{amb} = 25 °C; —— V_{CE} = 13,5 V;
– – – V_{CE} = 12,5 V; $R_{th\ c\text{-}a}$ = 32 K/W.

APPLICATION INFORMATION (continued)

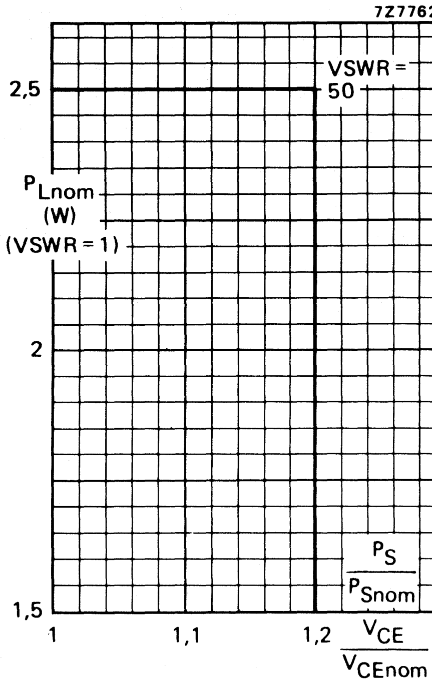


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 3 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

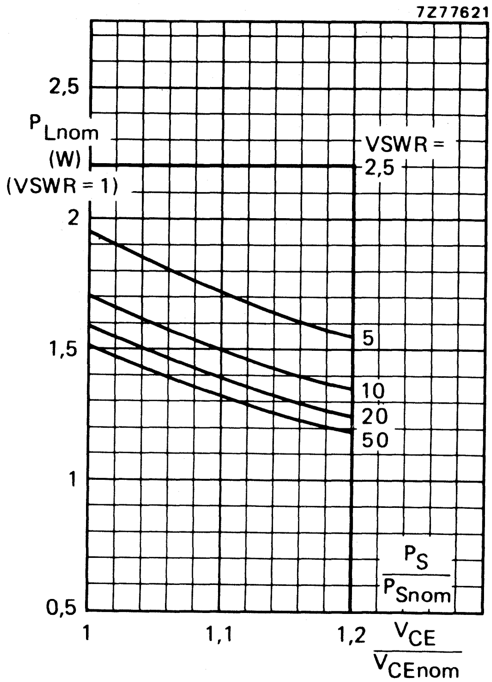


Fig. 12 R.F. SOAR (short-time operation during mismatch); f = 175 °C; T_{amb} = 70 °C; $R_{th\ c\text{-}a}$ = 32 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

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.

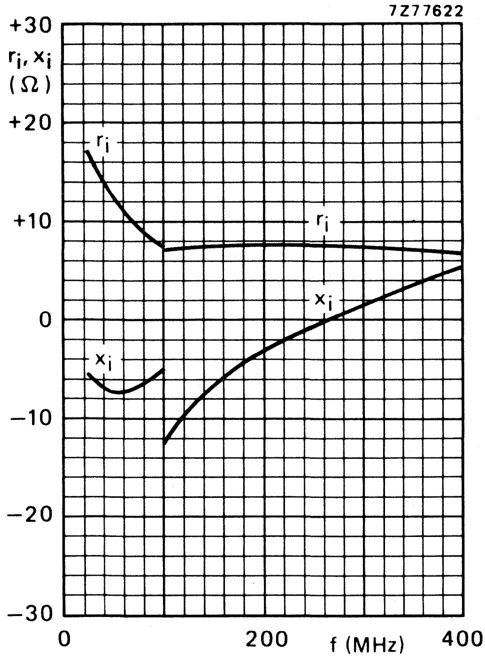


Fig. 13.

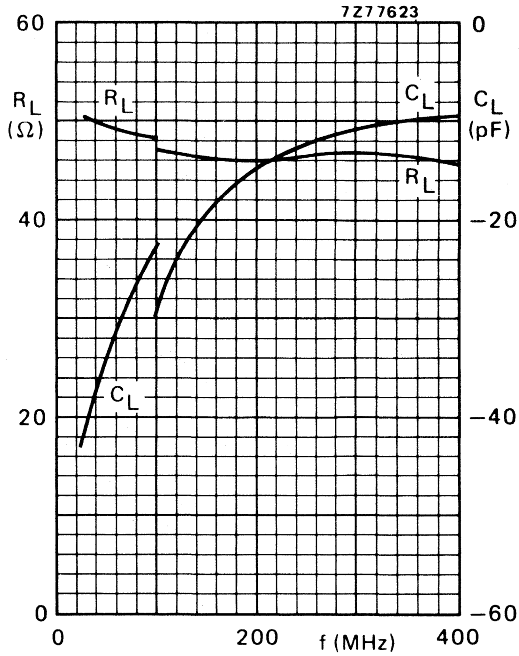
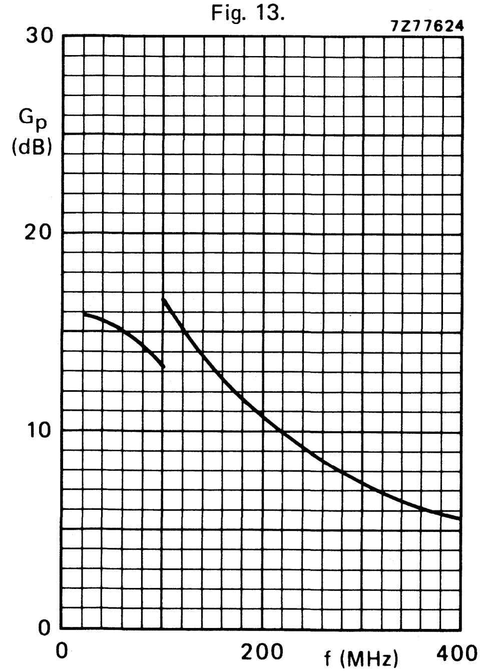


Fig. 14.



Conditions for Figs 13, 14 and 15:

Typical values; V_{CE} = 13,5 V; P_L = 2 W; T_{amb} = 25 °C; $R_{th\ c\text{-}a}$ = 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

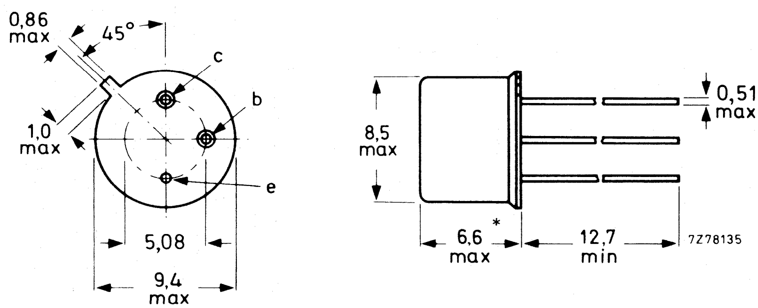
R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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-39/3; emitter connected to case.



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

* Max. 4,9 for BFQ43S.

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.	1,25	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

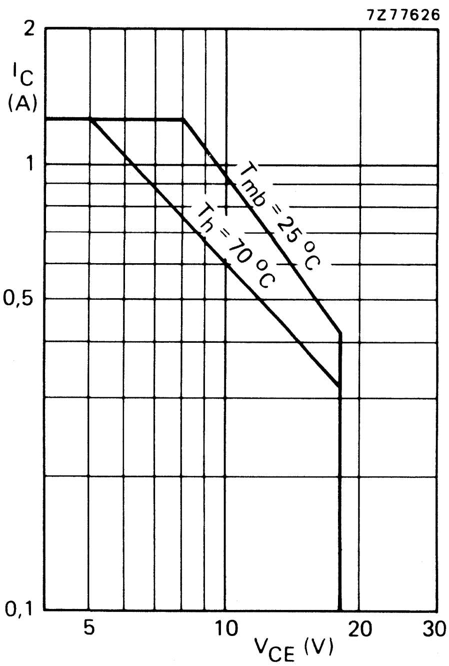
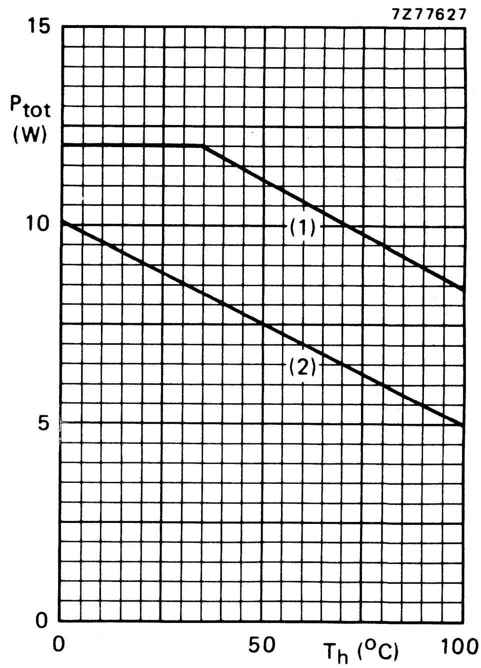


Fig. 2 D.C. SOAR.



(1) Short-time r.f. operation during mismatch; f ⩾ 1 MHz.
(2) Continuous d.c. and r.f. operation; derate by 0,05 W/K.

Fig. 3 Total power dissipation; V_{CE} ⩽ 16,5 V.

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

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	18	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	3	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 5 mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 18 V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	0,5	mJ
D.C. current gain * I_C = 0,5 A; V_{CE} = 5 V	h_{FE}	typ.	40 10 to 80	
Collector-emitter saturation voltage * I_C = 1,5 A; I_B = 0,3 A	V_{CEsat}	typ.	0,9	V
Transition frequency at f = 100 MHz * $-I_E$ = 0,5 A; V_{CB} = 13,5 V	f_T	typ.	750	MHz
$-I_E$ = 1,5 A; V_{CB} = 13,5 V	f_T	typ.	625	MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 13,5 V	C_c	typ.	15	pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 13,5 V	C_{re}	typ.	7,3	pF

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

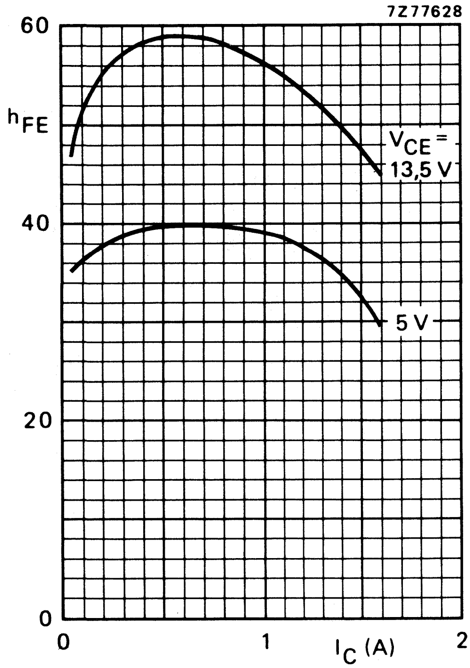


Fig. 4 Typical values; T_j = 25 °C.

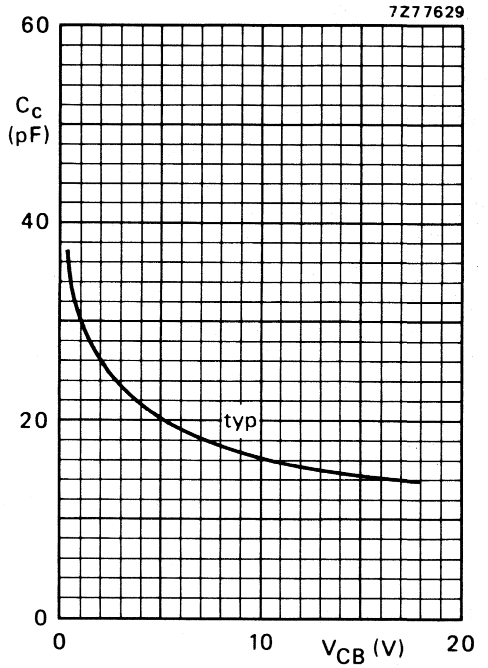


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

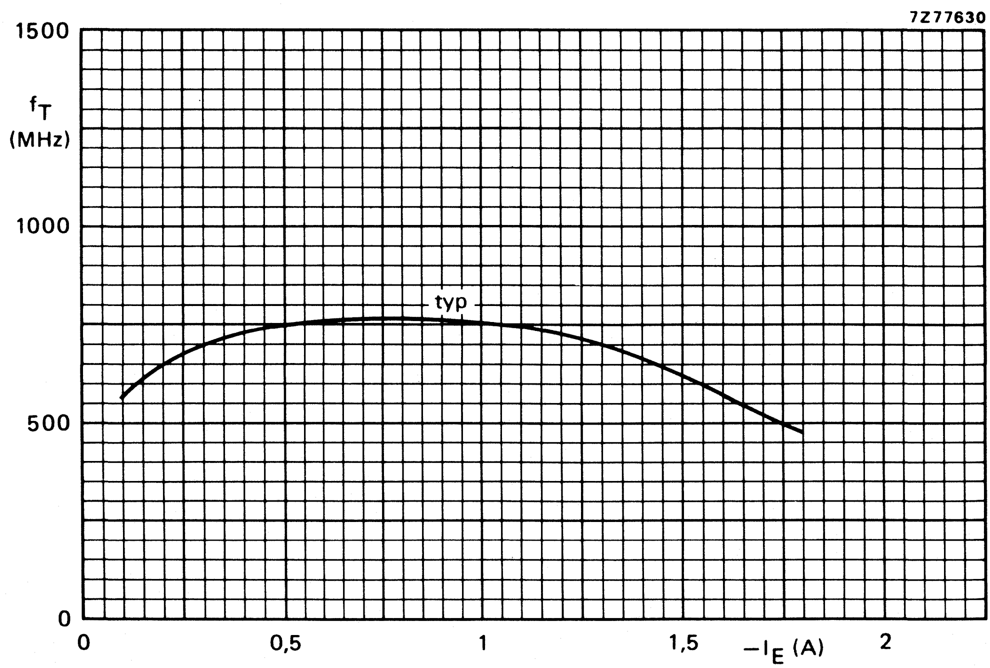


Fig. 6 V_{CB} = 13,5 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	–	–

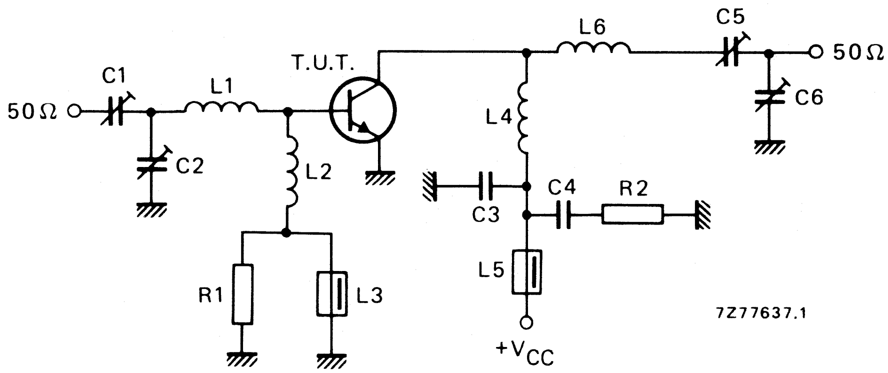


Fig. 7 Test circuit; c.w. class-B.

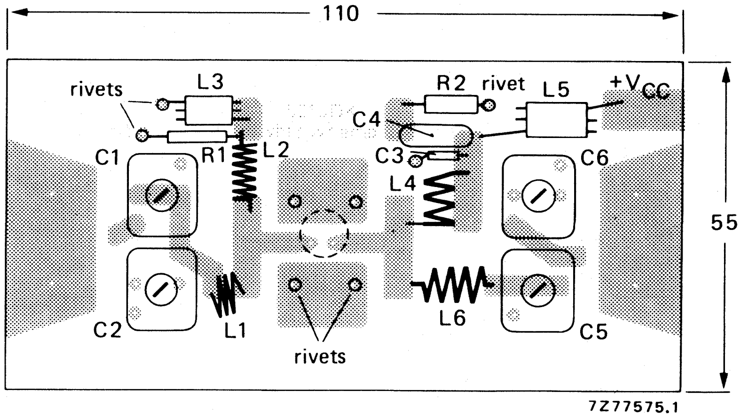
List of components:
C1 = C5 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 100 pF ceramic capacitor
C4 = 100 nF polyester capacitor

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)



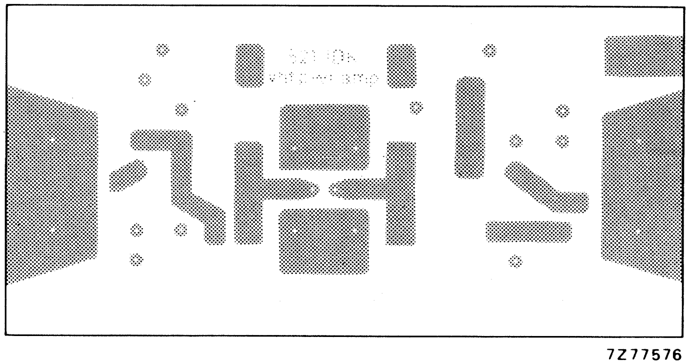


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

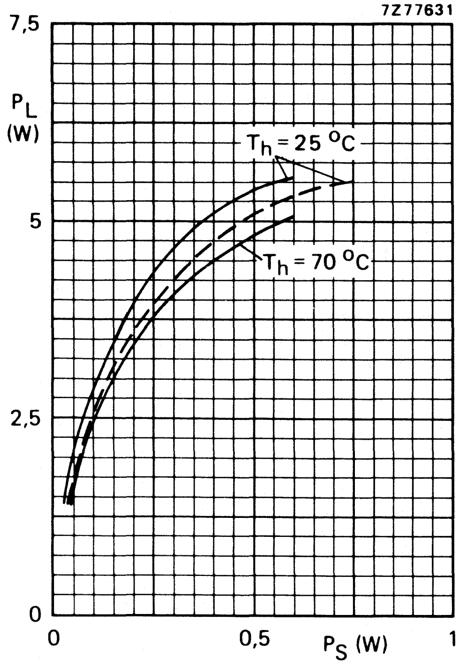


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

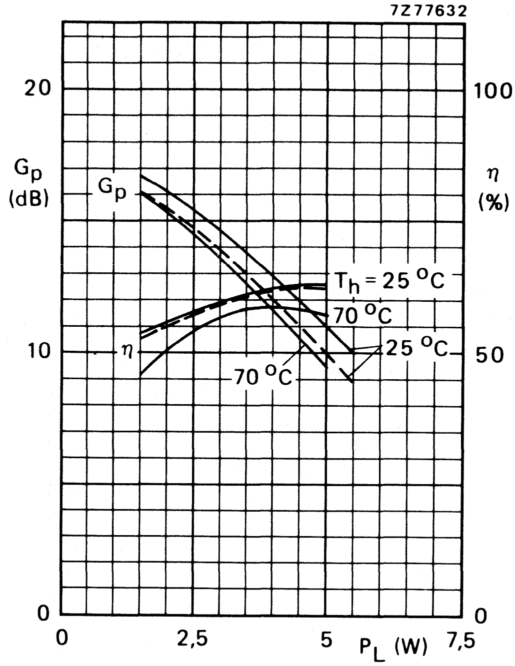


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

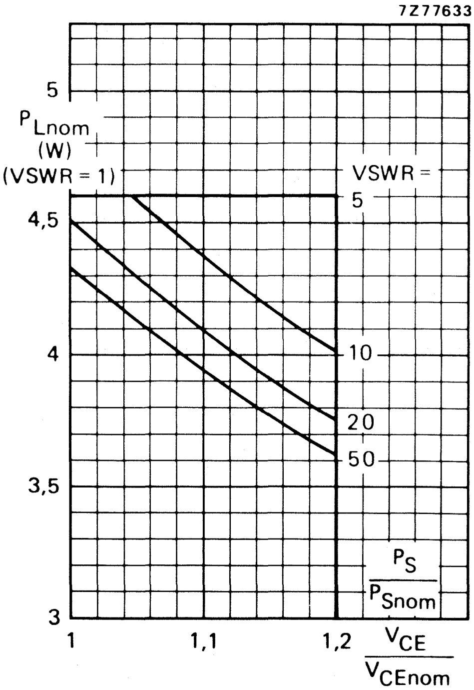


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C.
$R_{th\ mb\text{-}h}$ = 3 K/W; V_{CEnom} = 13,5 or 12,5 V;
$P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

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

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

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

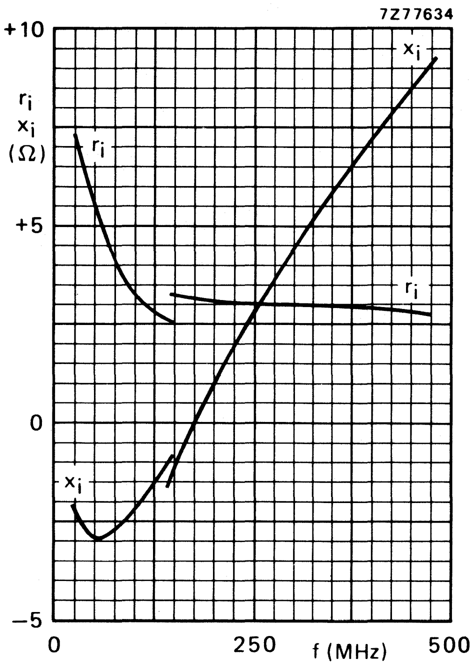


Fig. 12.

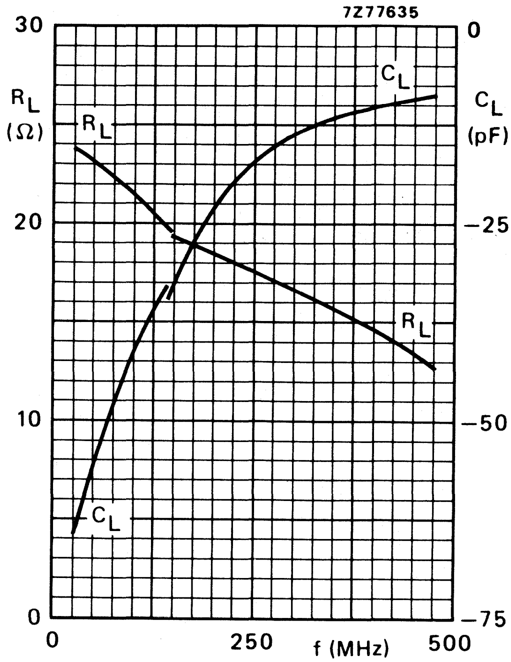
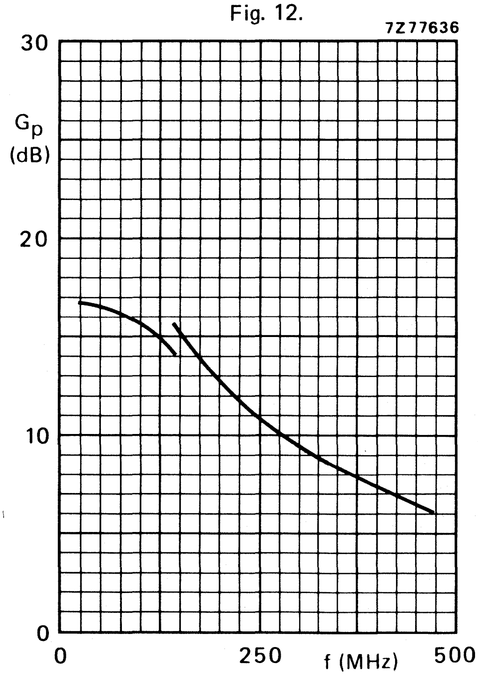


Fig. 13.



Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 13,5 V; P_L = 4 W; T_h = 25 °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

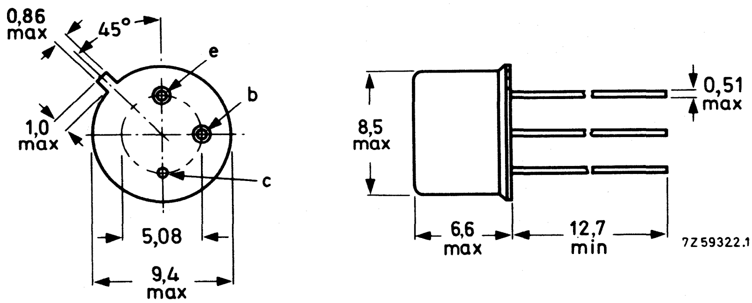
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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-39/1; collector connected to case.

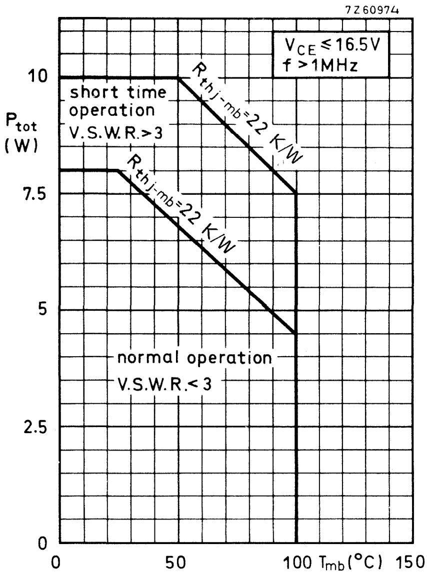


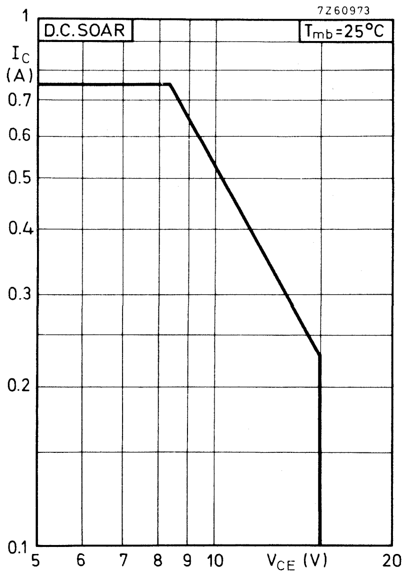
Maximum lead diameter is guaranteed only for 12,7 mm.

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 MHz	I_{CM}	max.	2.25	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

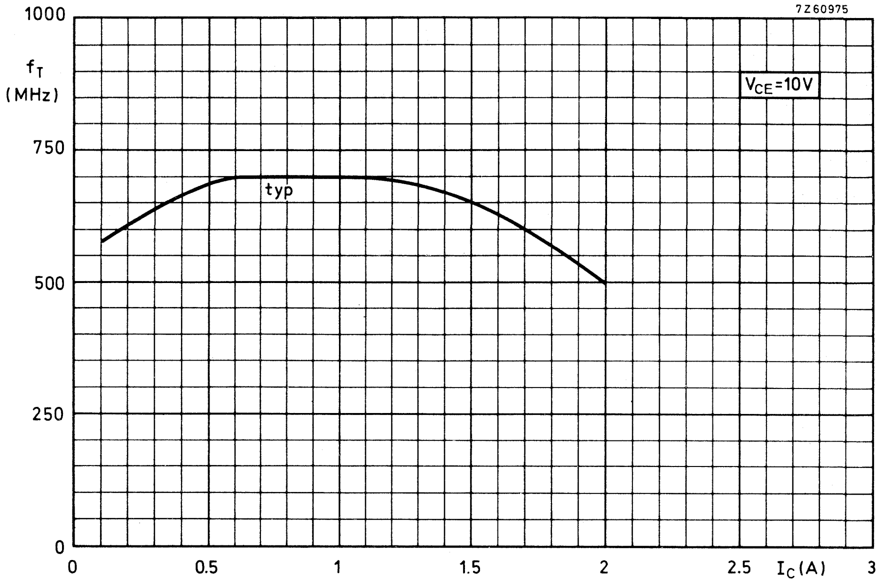
THERMAL RESISTANCE

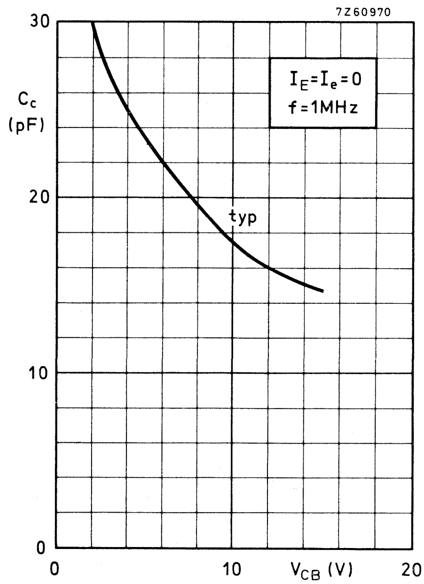
From junction to mounting base	$R_{th\,j-mb}$	=	22	K/W
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{th\,mb-h}$	=	2.5	K/W

CHARACTERISTICS

T_j = 25°C unless otherwise specified

Collector cut-off current				
$I_B = 0$; $V_{CE} = 14$ V	I_{CEO}	<	5	mA
Breakdown voltages				
Collector-base voltage open emitter, $I_C = 1$ mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base, $I_C = 10$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	0.5	mS
$-V_{BE} = 1.5$ V; $R_{BE} = 33\ \Omega$	E	>	0.5	mS
D.C. current gain				
$I_C = 500$ mA; $V_{CE} = 5$ V	h_{FE}	>	5	
Transition frequency				
$I_C = 350$ mA; $V_{CE} = 10$ V	f_T	typ.	700	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ.	15	pF
		<	20	pF
Feedback capacitance at f = 1 MHz				
$I_C = 50$ mA; $V_{CE} = 15$ V	$-C_{re}$	typ.	11	pF


7Z60975
1000
f_T
(MHz)
750
500
250
0
0
0.5
1
1.5
2
2.5
I_C (A)
3
V_{CE}=10V
typ


7Z60970
30
C_c
(pF)
20
10
0
0
10
V_{CB} (V)
20
$I_E=I_e=0$
f=1MHz
typ

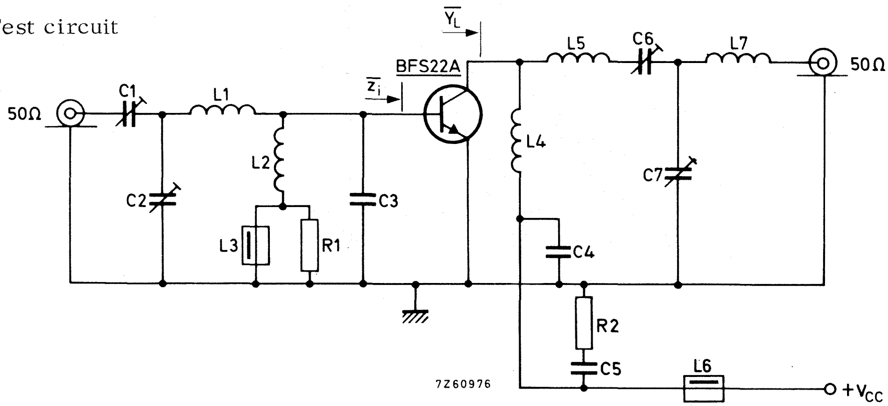
APPLICATION INFORMATION

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

f = 175 MHz; T_{mb} up to 25 °C

V_{CC}(V)	P_S(W)	P_L(W)	I_C(A)	G_p(dB)	η(%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$(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	–	–

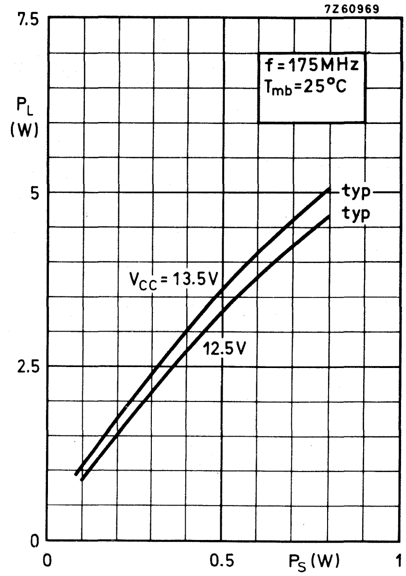
Test circuit

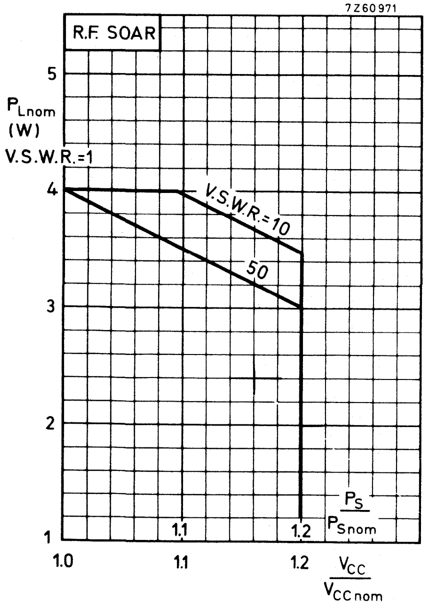


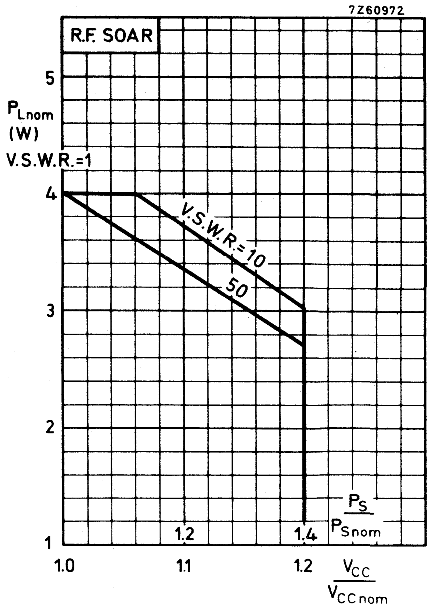
C1 = C6 = 4 to 29 pF air trimmer with insulated rotor
C2 = C7 = 4 to 29 pF air trimmer with non-insulated rotor
C3 = 39 pF ceramic
C4 = 100 pF ceramic
C5 = 15 nF polyester

L1 = 1 turn enamelled Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm
L2 = 6 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm
L3 = L6 = ferroxcube choke (code number 4312 020 36640)
L4 = 8 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm
L5 = 5 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 8 mm; leads 2 x 10 mm
L7 = 7 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 6 mm; leads 2 x 5 mm

R1 = R2 = 10 Ω carbon


7Z60969
7.5
5
2.5
0
P_L
(W)
f = 175 MHz
T_{mb} = 25 °C
typ
typ
V_{CC} = 13.5 V
12.5 V
0
0.5
P_S (W)
1





Conditions for R.F. SOAR:

f = 175 MHz $P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.R. = 1

T_{mb} = 70 °C

V_{CCnom} = 12.5 or 13.5 V

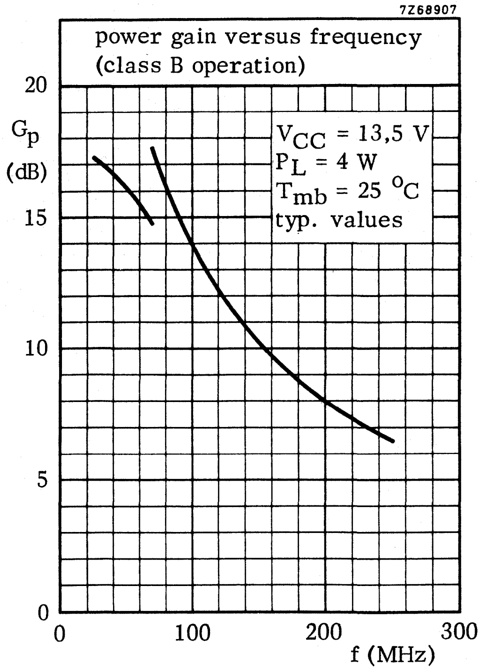
The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs above for safe operation at supply voltages other than the nominal. The graphs show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

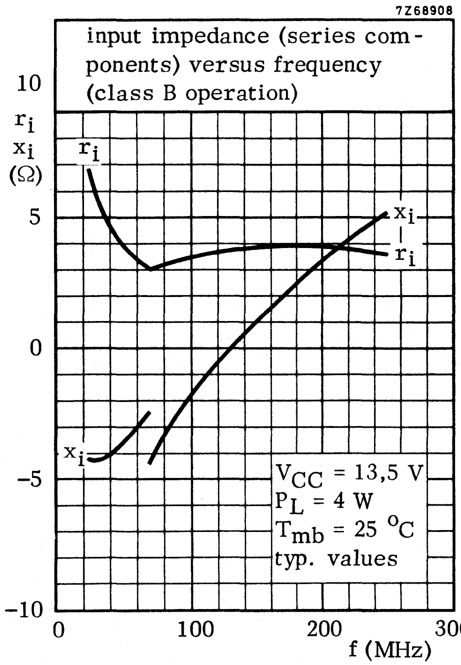
The left hand graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.

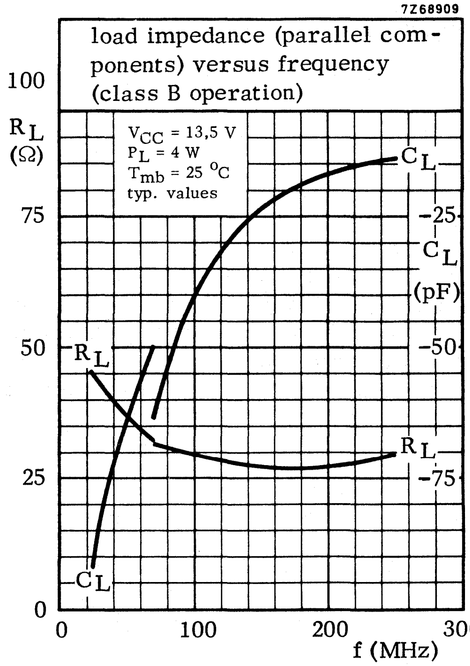
The right hand graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).

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

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







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

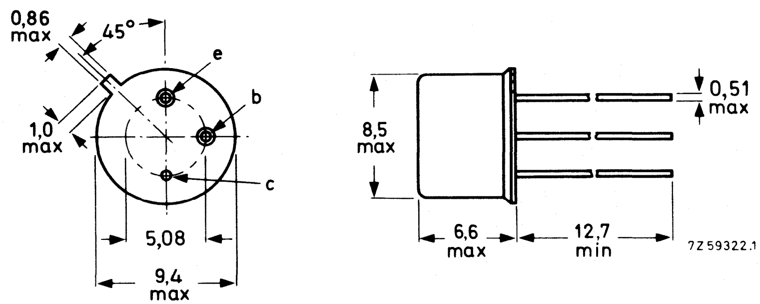
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	4	> 10	> 65	2,3 + j1,6	8,9 − j18,1

MECHANICAL DATA

Dimensions in mm

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

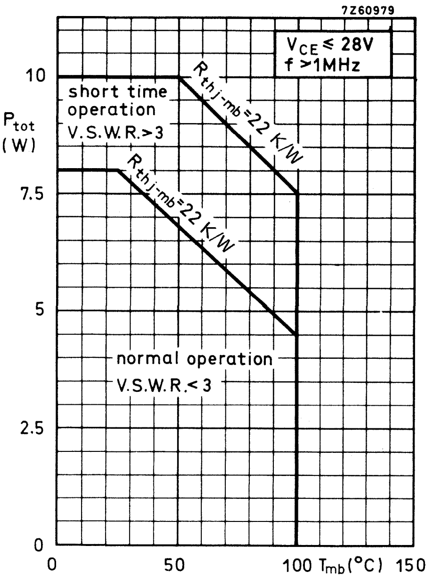


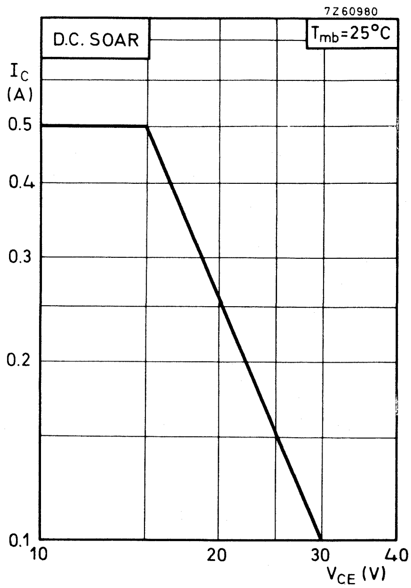
Maximum lead diameter is guaranteed only for 12,7 mm.

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

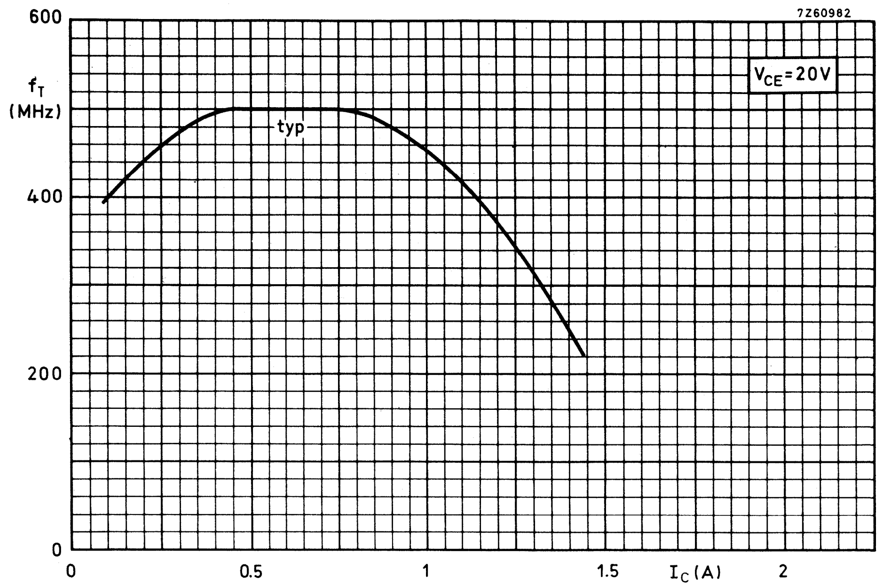
THERMAL RESISTANCE

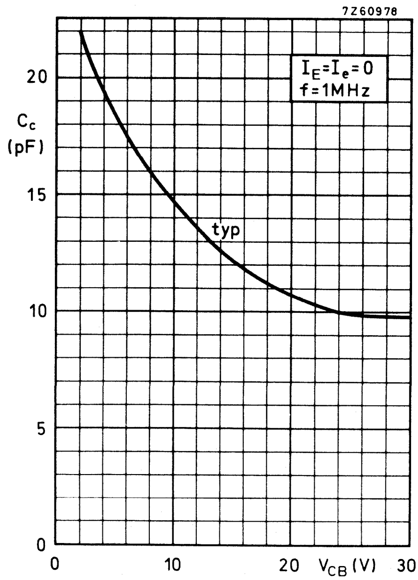
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	22	K/W
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{th\ mb\text{-}h}$	=	2.5	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_B = 0; V_{CE} = 28 V	I_{CEO}	<	5	mA
Breakdown voltages				
Collector-base voltage open emitter, I_C = 1 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, I_C = 10 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	0.5	ms
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	0.5	ms
D.C. current gain				
I_C = 500 mA; V_{CE} = 5 V	h_{FE}	>	5	
Transition frequency				
I_C = 400 mA; V_{CE} = 20 V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 30 V	C_c	typ.	10	pF
		<	15	pF
Feedback capacitance at f = 1 MHz				
I_C = 25 mA; V_{CE} = 30 V	$-C_{re}$	typ.	7.5	pF


7Z60982
600
400
200
0
f_T
(MHz)
V_{CE} = 20V
typ
0
0.5
1
1.5
I_C (A)
2


7Z60978
20
15
10
5
0
C_c
(pF)
$I_E = I_e = 0$
f = 1MHz
typ
0
10
20
V_{CB} (V)
30

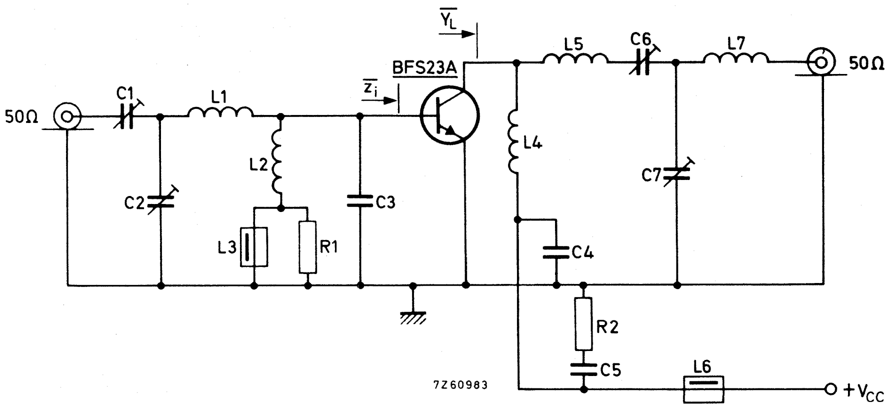
APPLICATION INFORMATION

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

V_{CC} = 28 V; T_{mb} up to 25 °C

f(MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	< 0.40	4	< 0.22	> 10	> 65	2.3+j1.6	8.9 − j18.1

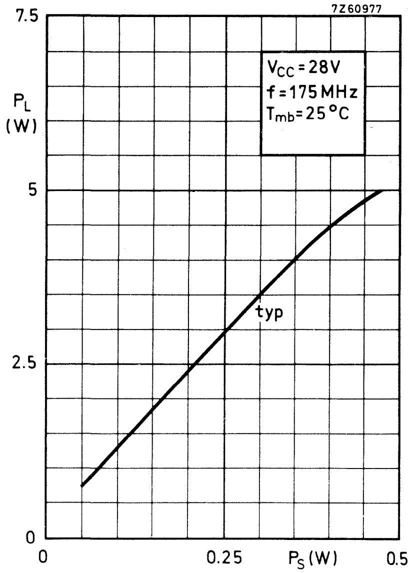
Test circuit

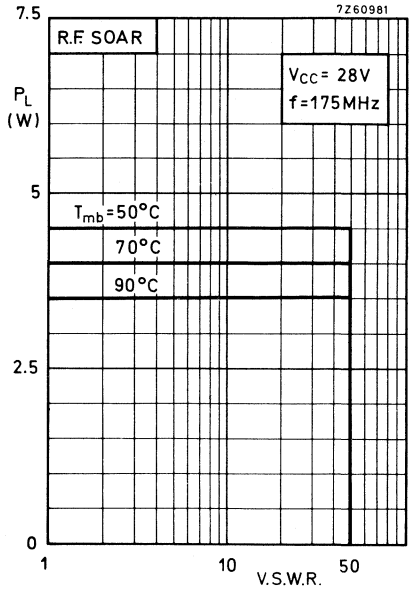


C1 = C6 = 4 to 29 pF air trimmer with insulated rotor
C2 = C7 = 4 to 29 pF air trimmer with non-insulated rotor
C3 = 39 pF ceramic
C4 = 100 pF ceramic
C5 = 15 nF polyester

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

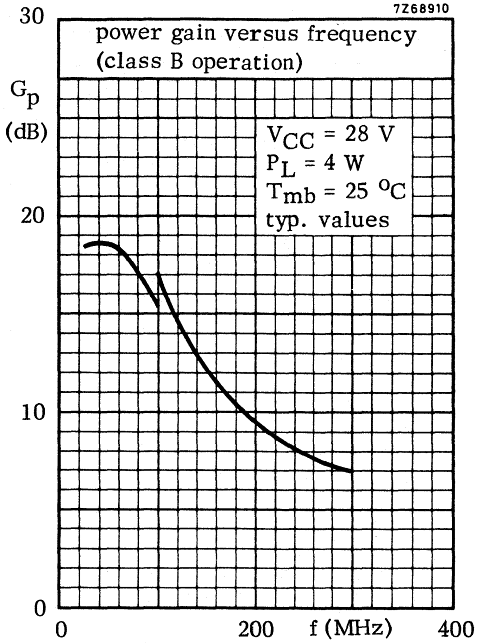
R1 = R2 = 10 Ω carbon

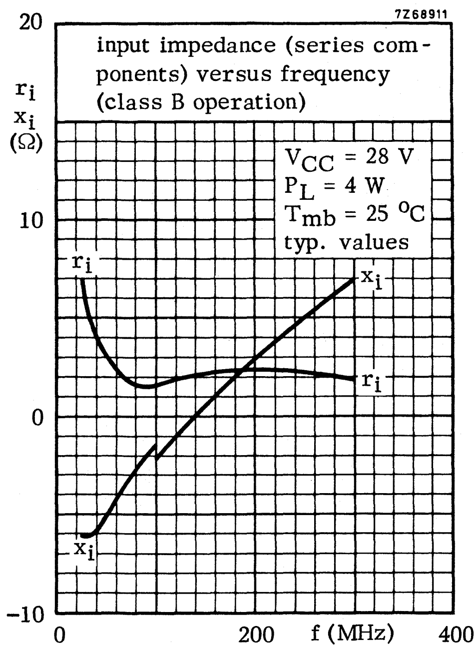


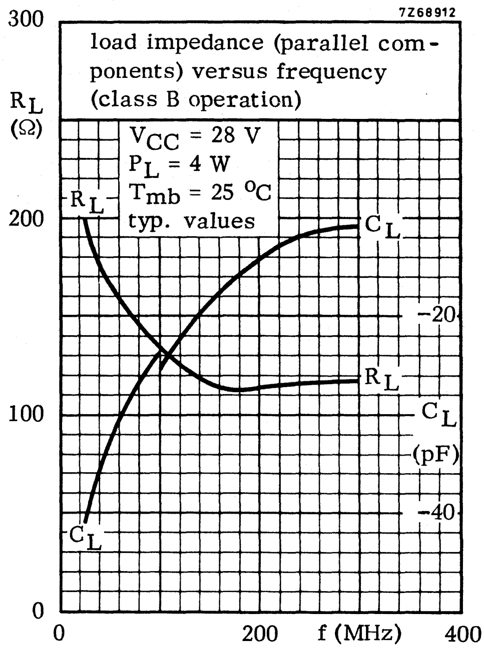


For high voltage operation, a stabilized power supply is generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

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







HF power MOS transistor BLF145

FEATURES

- High power gain
- Low noise figure
- Good thermal stability
- Withstands full load mismatch.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for SSB transmitter applications in the HF frequency range.

The transistor is encapsulated in a 4-lead, SOT123 flange envelope, with a ceramic cap. All leads are isolated from the flange.

Matched gate-source voltage (V_{GS}) groups are available on request.

PINNING - SOT123

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

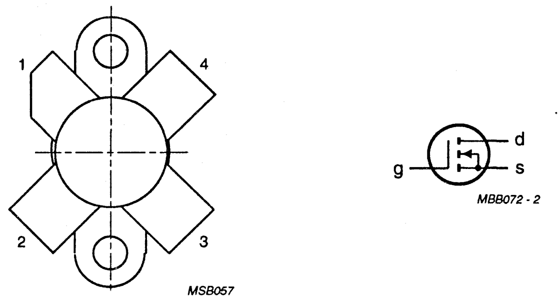


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_D (A)	P_L (W)	G_p (dB)	η_D (%) (note 1)	d_3 (dB)
SSB, class-A	28	28	1.3	8 (PEP)	> 24	–	< –40
SSB, class-AB	28	28	–	30 (PEP)	typ. 20	typ. 40	typ. –35

Note

1. 2-tone efficiency.

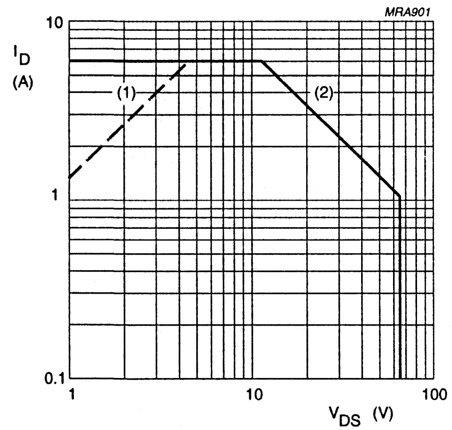
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DSS}	drain-source voltage		–	65	V
$\pm V_{GSS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	6	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	68	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

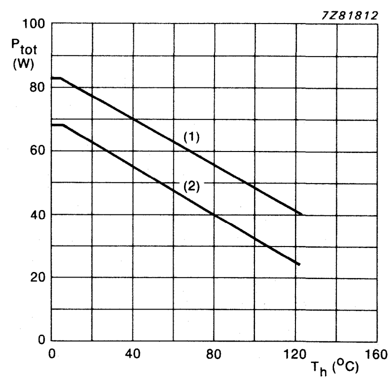
SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	2.6 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	0.3 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Short-time operation during mismatch.

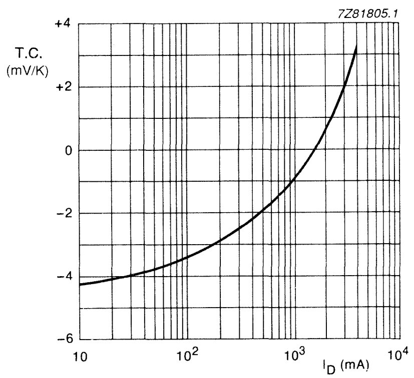
(2) Continuous operation.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

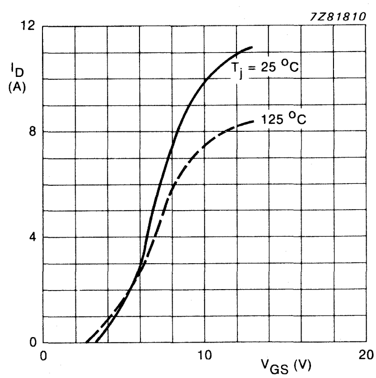
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 10 mA; V_{GS} = 0	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	2	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 10 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched devices	I_D = 10 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 1.5 A; V_{DS} = 10 V	1.2	–	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 1.5 A; V_{GS} = 10 V	–	0.4	0.75	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	10	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	125	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	75	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	7	–	pF



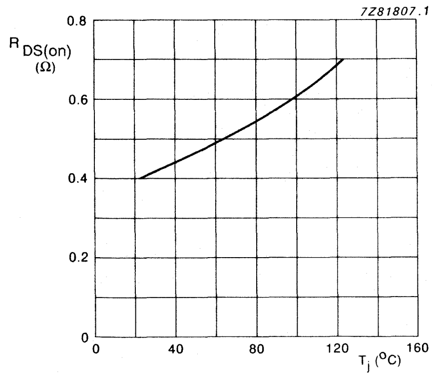
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



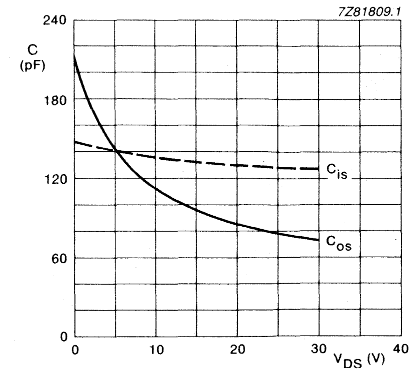
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values.



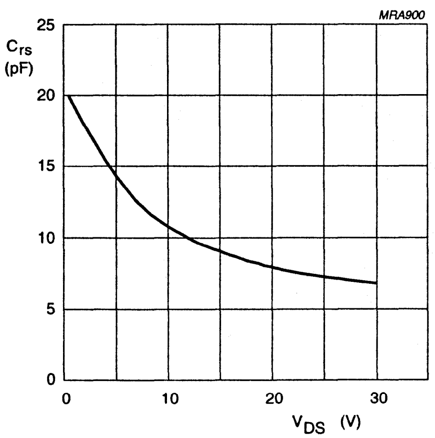
I_D = 1.5 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

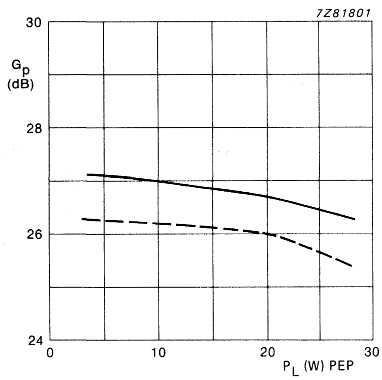
APPLICATION INFORMATION FOR CLASS-A OPERATION

T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W; R1 = 26 Ω; unless otherwise specified.
RF performance in SSB operation in a common source class-A circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_D (A)	P_L (W)	G_p (dB)	d_3 (dB) (note 1)	d_5 (dB) (note 1)	Z_L Ω
SSB, class-A	28	28	1.3	8 (PEP)	> 24 typ. 27	> −40 typ. −43	< −40 typ. −70	18.4 + j5.2

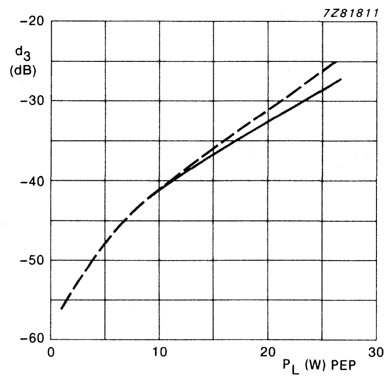
Note

1. Stated figures are maximum values encountered at any driving level between the specified value of PEP and are referred to the according level of either the equal amplified tones. Related to the according peak envelope power these figures should be decreased by 6 dB.



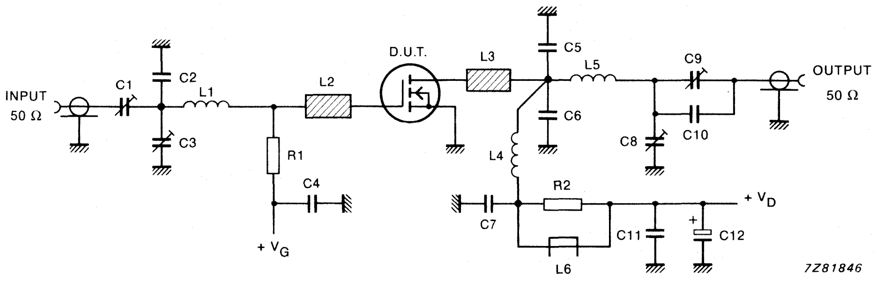
Class-A operation; V_{DS} = 28 V; I_D = 1.3 A;
$R_{th\ mb\text{-}h}$ = 0.3 K/W; f = 28 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.9 Power gain as a function of load power, typical values.



Class-A operation; V_{DS} = 28 V; I_D = 1.3 A;
$R_{th\ mb\text{-}h}$ = 0.3 K/W; f = 28 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.10 Third order intermodulation distortion as a function of load power, typical values.



f = 28 MHz.

Fig.11 Test circuit for class-A operation.

List of components (class-A test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C3, C8, C9	film dielectric trimmer	7 to 100 pF		2222 809 07015
C2, C10	multilayer ceramic chip capacitor (note 1)	39 pF		
C4, C7	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C5, C6	multilayer ceramic chip capacitor (note 1)	27 pF		
C11	multilayer ceramic chip capacitor	3 x 100 nF		2222 852 47104
C12	electrolytic capacitor	2.2 μF, 63 V		2222 030 38228
L1	12 turns enamelled 0.5 mm copper wire	307 nH	length 8 mm; int. dia. 4 mm	
L2, L3	stripline (note 2)	30 Ω	length 15 x 6 mm	
L4	14 turns enamelled 1 mm copper wire	1039 nH	length 14 mm; int. dia. 9 mm	
L5	9 turns enamelled 1 mm copper wire	305 nH	length 10 mm; int. dia. 6 mm	
L6	grade 3B Ferroxcube wideband HF choke			4312 020 36640
R1	0.25 W metal film resistor	26 Ω		
R2	0.25 W metal film resistor	10 Ω		

Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric (ε_r = 4.5), thickness 1⁄16 mm.

APPLICATION INFORMATION FOR CLASS-AB OPERATION

T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W; R1 = 34 Ω; unless otherwise specified.
RF performance in SSB operation in a common source class-AB circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	η_D (%)	d_3 (dB) (note 1)	d_5 (dB) (note 1)	Z_L Ω
SSB, class-AB	28	28	0.25	30 (PEP)	typ. 20	typ. 40	typ. −35	typ. −40	8.9 + j1.0

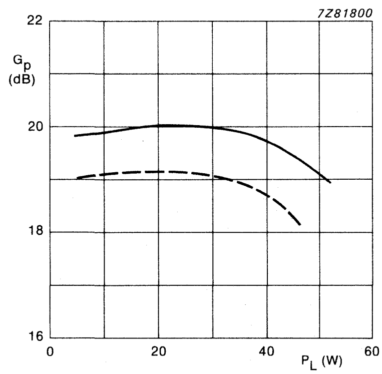
Note

1. Stated figures are maximum values encountered at any driving level between the specified value of PEP and are referred to the according level of either the equal amplified tones. Related to the according peak envelope power these figures should be decreased by 6 dB.

Ruggedness in class-AB operation

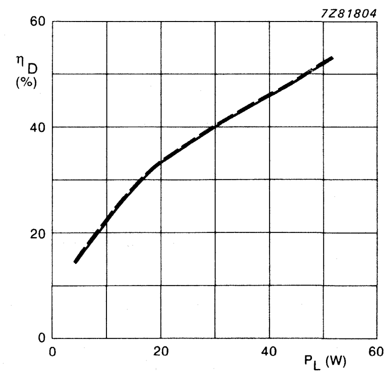
The BLF145 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases at P_L = 30 W single tone under the following conditions:

V_{DS} = 28 V; f = 28 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W at rated load power.



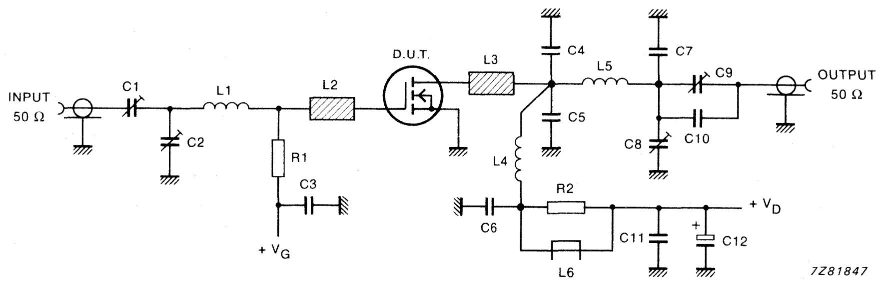
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 0.25 A; $R_{th\ mb\text{-}h}$ = 0.3 K/W; f = 28 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.12 Power gain as a function of load power, typical values.



Class-AB operation; V_{DS} = 28 V; I_{DQ} = 0.25 A; $R_{th\ mb\text{-}h}$ = 0.3 K/W; f = 28 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.13 Two tone efficiency as a function of load power, typical values.



f = 28 MHz.

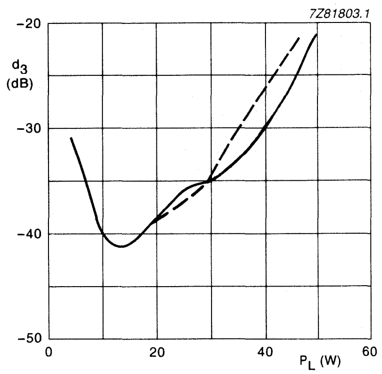
Fig.14 Test circuit for class-AB operation.

List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	film dielectric trimmer	5 to 60 pF		2222 809 07011
C3, C6	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C4, C5	multilayer ceramic chip capacitor (note 1)	27 pF		
C7, C10	multilayer ceramic chip capacitor (note 1)	39 pF		
C8, C9	film dielectric trimmer	7 to 100 pF		2222 809 07015
C11	multilayer ceramic chip capacitor	3 x 100 nF		2222 852 47104
C12	electrolytic capacitor	2.2 µF, 63 V		2222 030 38228
L1	13 turns enamelled 0.5 mm copper wire	415 nH	length 10 mm; int. dia. 5 mm	
L2, L3	stripline (note 2)	30 Ω	length 15 x 6 mm	
L4	10 turns enamelled 1 mm copper wire	390 nH	length 13 mm; int. dia. 7 mm	
L5	9 turns enamelled 1 mm copper wire	245 nH	length 10 mm; int. dia. 5 mm	
L6	grade 3B Ferroxcube wideband HF choke			4312 020 36640
R1	0.5 W metal film resistor	34 Ω		
R2	0.25 W metal film resistor	10 Ω		

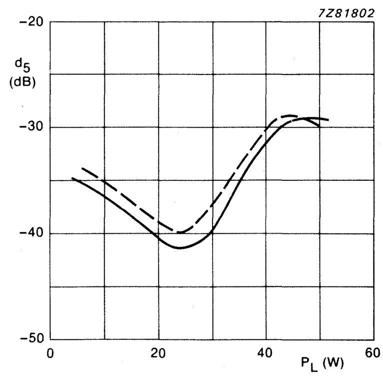
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric (ε_r = 4.5), thickness 1/16 mm.



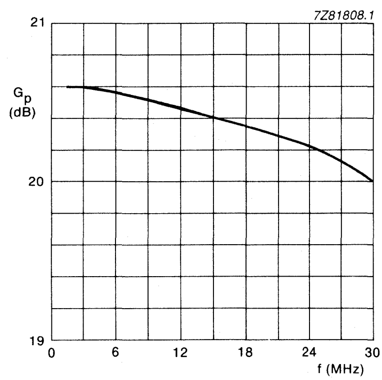
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 0.25 A;
$R_{th\ mb\text{-}h}$ = 0.3 K/W; f = 28 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.15 Third order intermodulation distortion as a function of load power, typical values.



Class-AB operation; V_{DS} = 28 V; I_{DQ} = 0.25 A;
$R_{th\ mb\text{-}h}$ = 0.3 K/W; f = 28 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.16 Fifth order intermodulation distortion as a function of load power, typical values.



Class-AB operation; V_{DS} = 28 V; I_{DQ} = 0.25 A;
P_L = 30 W; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W;
R1 = 34 Ω; Z_L = 8.9 + j1 Ω.

Fig.17 Power gain as a function of frequency, typical values.

Table 1 Input impedance as a function of frequency
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 0.25 A; P_L = 30 W;
T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W; R1 = 34 Ω;
Z_L = 8.9 + j1 Ω.

f (MHz)	**Z_i (Ω)**
1.5	32.9 – j2.2
3.0	32.4 – j4.3
6.0	30.7 – j8.1
10	27.4 – j11.9
15	32.9 – j14.6
20	18.5 – j15.4
25	15.1 – j15.3
30	12.5 – j14.6

VHF power MOS transistor BLF147

FEATURES

- High power gain
- Low intermodulation distortion
- Easy power control
- Good thermal stability
- Withstands full load mismatch.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for industrial and military applications in the HF/VHF frequency range.

The transistor is encapsulated in a 4-lead, SOT121 flange envelope, with a ceramic cap. All leads are isolated from the flange.

A marking code, showing gate-source voltage (V_{GS}) information is provided for matched pair applications. Refer to 'General' section for further information.

PINNING - SOT121

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

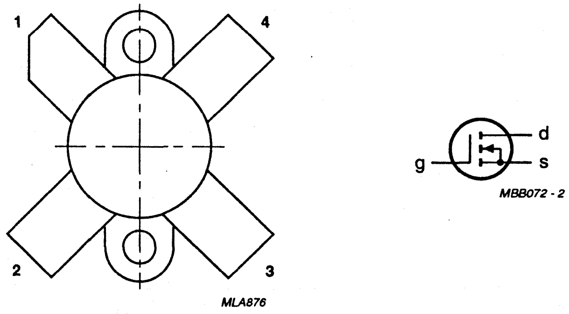


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)	d_3 (dB)	d_5 (dB)
SSB, class-AB	28	28	150 (PEP)	> 17	> 35	< −30	< −30
CW, class-B	108	28	150	typ. 70	typ. 70	−	−

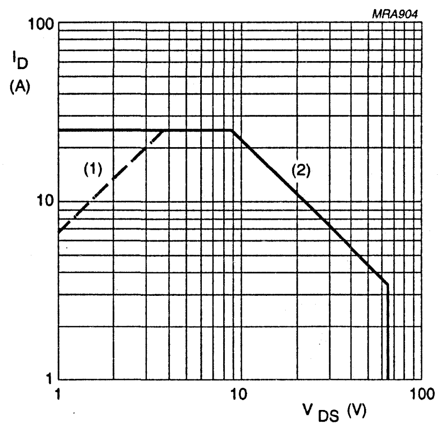
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	25	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	220	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

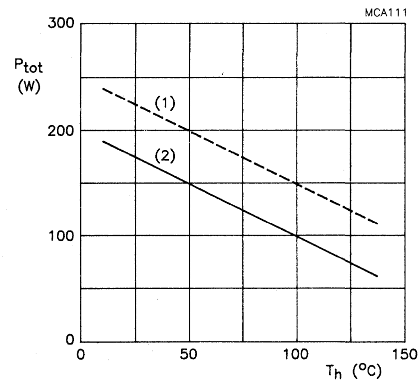
THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	0.8 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	0.2 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



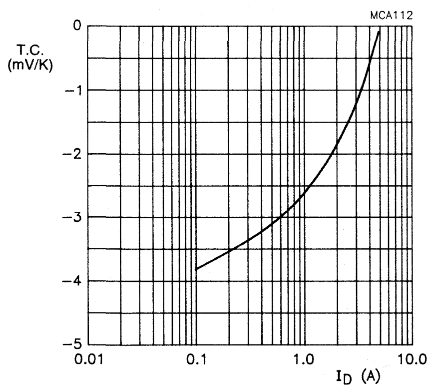
(1) Short-time operation during mismatch.
(2) Continuous operation.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

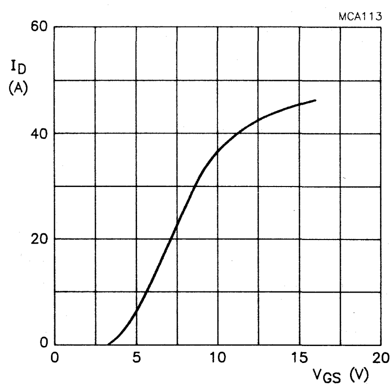
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 100 mA; V_{GS} = 0	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	µA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 200 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched pairs	I_D = 100 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 8 A; V_{DS} = 10 V	5	7.5	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 8 A; V_{GS} = 10 V	–	0.1	0.15	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	37	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	450	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	360	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	55	–	pF



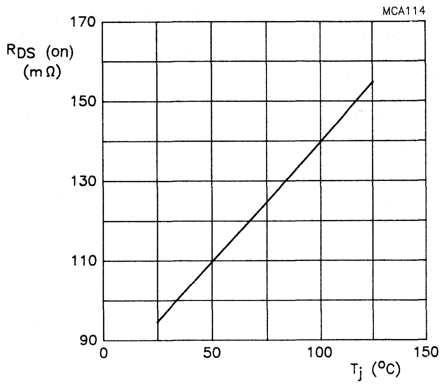
V_{DS} = 28 V; valid for T_h = 25 to 70 °C.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



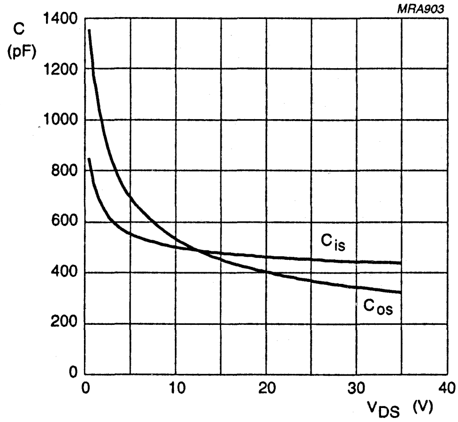
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values.



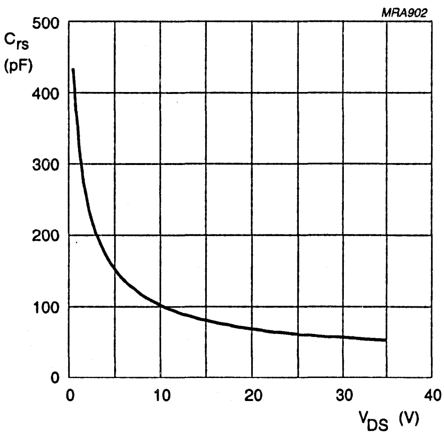
I_D = 8 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-AB OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.2 K/W; R_{GS} = 9.8 Ω; unless otherwise specified.
RF performance in SSB operation in a common source class-AB circuit.
f_1 = 28.000 MHz; f_2 = 28.001 MHz.

P_L (W)	f (MHz)	V_{DS} (V)	I_{DQ} (A)	G_p (dB)	η_D (%)	d_3 (dB) (note 2)	d_5 (dB) (note 2)
20 to 150 (PEP)	28	28	1	> 17 typ. 19	> 35 typ. 40	< −30 typ. −34	< −30 typ. −40

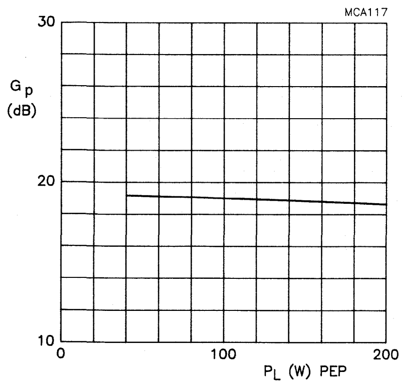
Notes

1. Optimum load impedance: 2.1 + j0 Ω.
2. Stated figures are maximum values encountered at any driving level between the specified value of PEP and are referred to the according level of either the equal amplified tones. Related to the according peak envelope power these figures should be decreased by 6 dB.

Ruggedness in class-AB operation

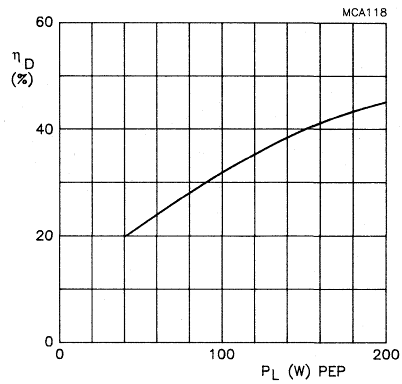
The BLF147 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 28 V; f = 28 MHz at rated load power.



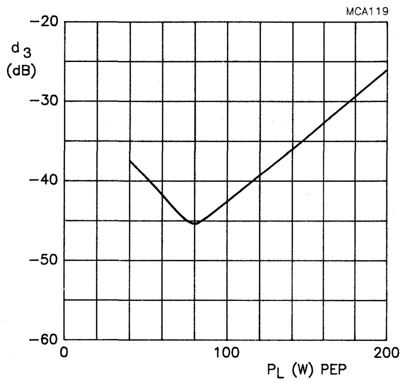
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 1 A;
R_{GS} = 9.8 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.9 Gain as a function of load power, typical values.



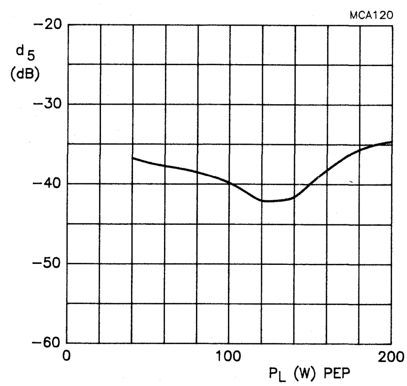
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 1 A;
R_{GS} = 9.8 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.10 Efficiency as a function of load power, typical values.



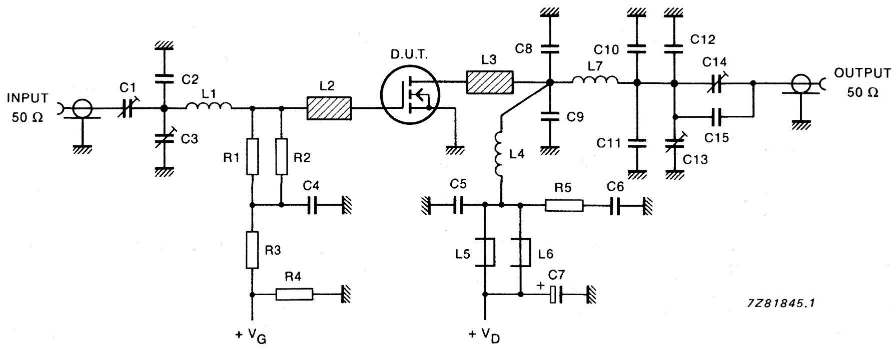
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 1 A;
R_{GS} = 9.8 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.11 Third order intermodulation distortion as a function of load power, typical values.



Class-AB operation; V_{DS} = 28 V; I_{DQ} = 1 A;
R_{GS} = 9.8 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.12 Fifth order intermodulation distortion as a function of load power, typical values.



f = 28 MHz.

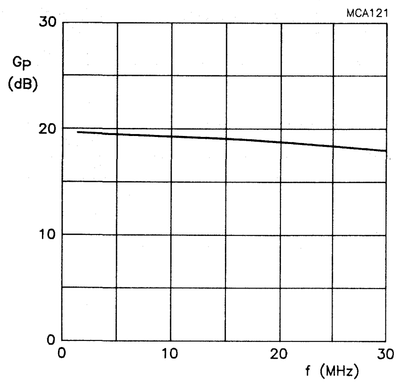
Fig.13 Test circuit for class-AB operation.

List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C3, C13, C14	film dielectric trimmer	7 to 100 pF		2222 809 07015
C2, C8, C9	multilayer ceramic chip capacitor (note 1)	75 pF		
C4, C5	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C6	multilayer ceramic chip capacitors in parallel	3 x 100 nF		2222 852 47104
C7	electrolytic capacitor	2.2 μF, 63 V		
C10	multilayer ceramic chip capacitor (note 1)	100 pF		
C11, C12	multilayer ceramic chip capacitor (note 1)	150 nF		
C15	multilayer ceramic chip capacitor (note 1)	240 pF		
L1	6 turns enamelled 0.7 mm copper wire	145 nH	length 5 mm; int. dia. 6 mm; leads 2 x 5 mm	
L2, L3	stripline (note 2)	41.1 Ω	length 13 x 6 mm	
L4	4 turns enamelled 1.5 mm copper wire	148 nH	length 8 mm; int. dia. 10 mm; leads 2 x 5 mm	
L5, L6	grade 3B Ferroxcube wideband HF choke			4312 020 36642
L7	3 turns enamelled 2.2 mm copper wire	79 nH	length 8 mm; int. dia. 8 mm; leads 2 x 5 mm	
R1, R2	1 W metal film resistor	19.6 Ω		2322 153 51969
R3	0.4 W metal film resistor	10 kΩ		2322 151 71003
R4	0.4 W metal film resistor	1 MΩ		2322 151 71005
R5	1 W metal film resistor	10 Ω		2322 153 51009

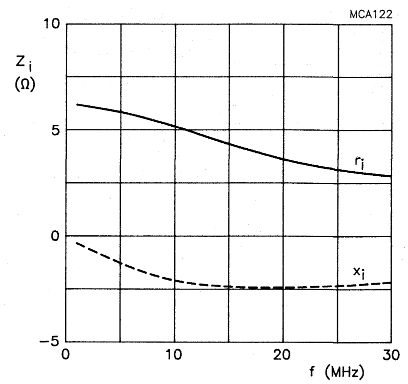
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric (ε_r = 2.2), thickness 1.6 mm.



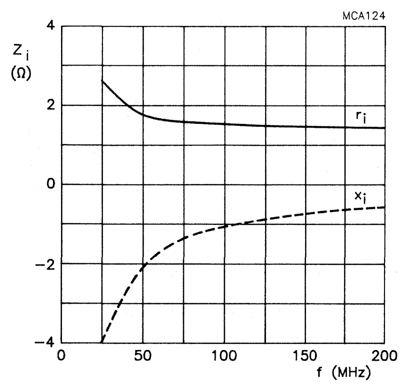
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 1 A;
R_{GS} = 6.25 Ω; P_L = 150 W (PEP); R_L = 2.1 Ω.

Fig.14 Gain as a function of frequency, typical values.



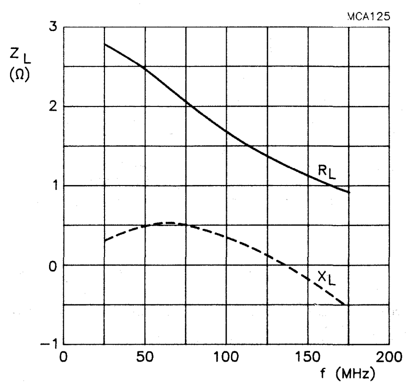
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 1 A;
R_{GS} = 6.25 Ω; P_L = 150 W (PEP); R_L = 2.1 Ω.

Fig.15 Input impedance as a function of frequency (series components), typical values.



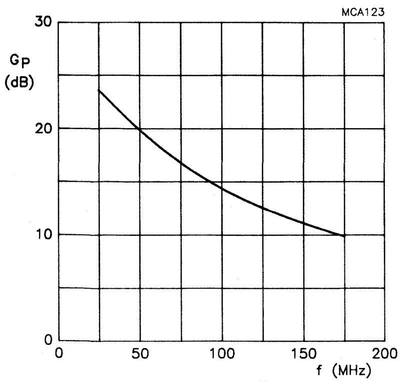
Class-B operation; V_{DS} = 28 V; I_{DQ} = 0.2 A;
R_{GS} = 15 Ω; P_L = 150 W.

Fig.16 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 0.2 A;
R_{GS} = 15 Ω; P_L = 150 W.

Fig.17 Load impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 0.2 A;
R_{GS} = 15 Ω; P_L = 150 W.

Fig.18 Power gain as a function of frequency, typical values.

HF/VHF power MOS transistor BLF175

FEATURES

- High power gain
- Low intermodulation distortion
- Easy power control
- Good thermal stability
- Withstands full load mismatch
- Gold metallization ensures excellent reliability.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for large signal amplifier applications in the HF/VHF frequency range.

The transistor has a 4-lead, SOT123 flange envelope, with a ceramic cap. All leads are isolated from the flange.

A marking code, showing gate-source voltage (V_{GS}) information is provided for matched pair applications. Refer to the 'General' section for further information.

PINNING - SOT123

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

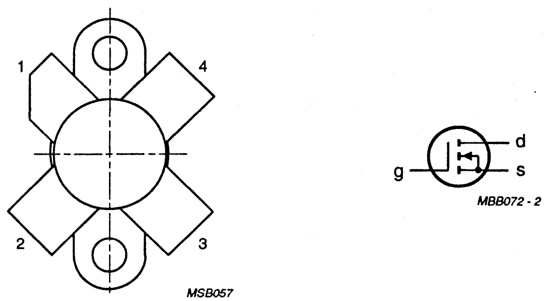


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	d_3 (dB)
class-A	28	50	800	8 (PEP)	> 24	–	< –40
class-AB	28	50	150	30 (PEP)	typ. 24	typ. 40 (note 1)	typ. –35
CW, class-B	108	50	30	30	typ. 20	typ. 65	–

Note

1. 2-tone efficiency.

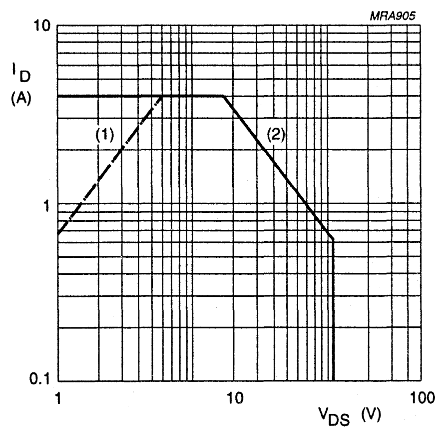
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	110	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	4	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	68	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

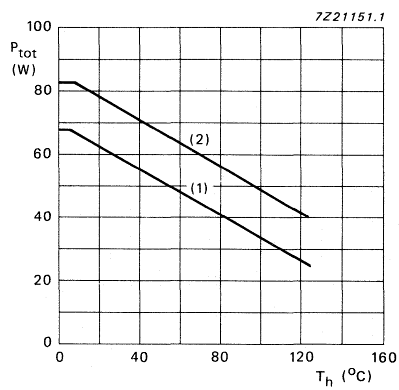
SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	T_{mb} = 25 °C; P_{tot} = 68 W	2.6 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	T_{mb} = 25 °C; P_{tot} = 68 W	0.3 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Continuous operation.

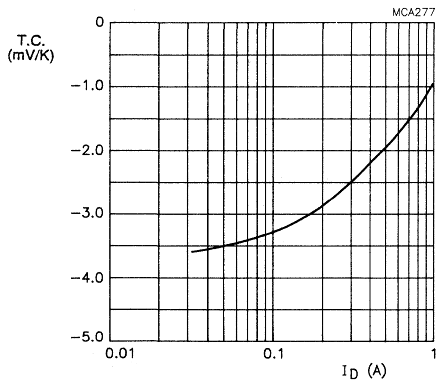
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

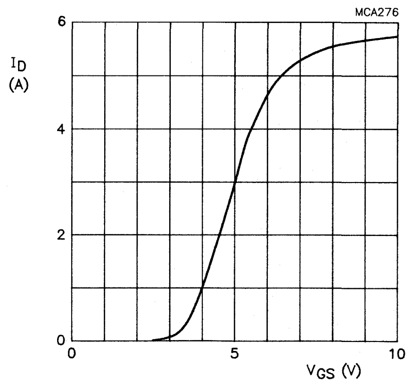
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 10 mA; V_{GS} = 0	110	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 50 V	–	–	100	μA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 10 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched pairs	I_D = 10 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 1 A; V_{DS} = 10 V	1.1	1.6	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 1 A; V_{GS} = 10 V	–	0.75	1.5	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	5.5	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	130	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	36	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	3.7	–	pF



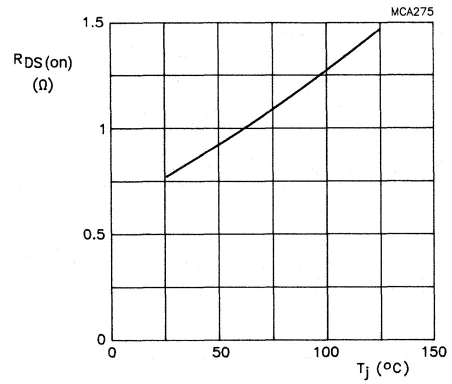
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



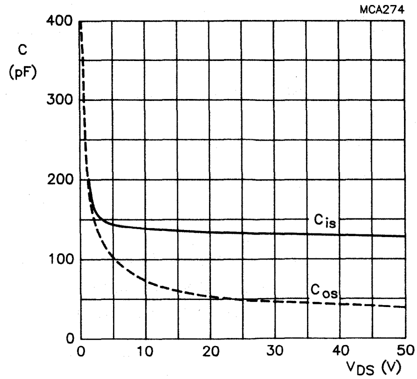
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values.



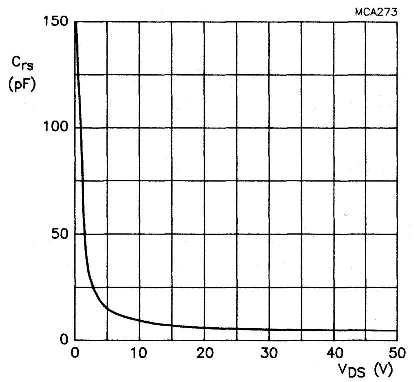
I_D = 1 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

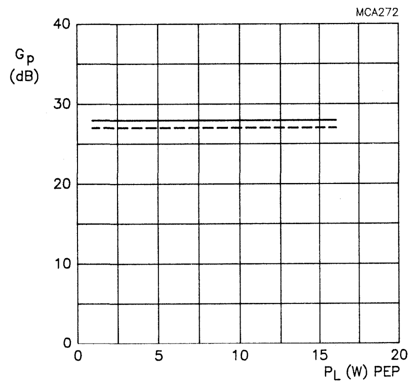
APPLICATION INFORMATION FOR CLASS-A OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W; unless otherwise specified.
RF performance in SSB operation in a common source circuit.
f_1 = 28.000 MHz; f_2 = 28.001 MHz.

P_L (W)	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	G_p (dB)	d_3 (dB) (note 1)	d_5 (dB) (note 1)	R_{GS} (Ω)
0 to 8 (PEP)	28	50	800	> 24 typ. 28	> −40 typ. −44	< −40 typ. −64	24 24

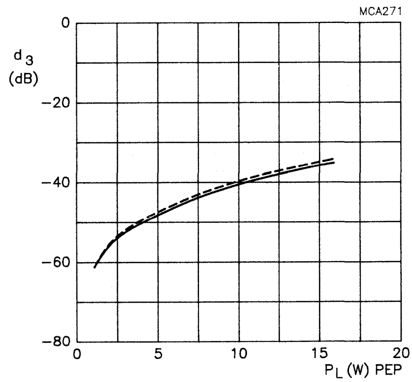
Note

1. Stated figures are maximum values encountered at any driving level between the specified value of PEP and are referred to the according level of either the equal amplified tones. Related to the according peak envelope power these figures should be decreased by 6 dB.



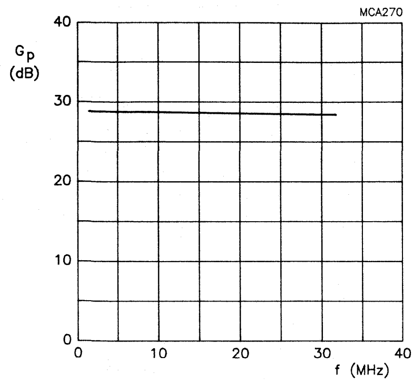
Class-A operation; V_{DS} = 50 V; I_{DQ} = 0.8 A;
R_{GS} = 24 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.9 Power gain as a function of load power, typical values.



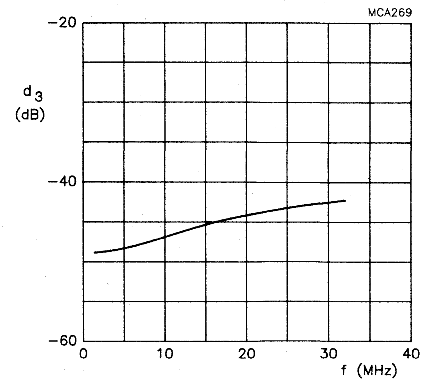
Class-A operation; V_{DS} = 50 V; I_{DQ} = 0.8 A;
R_{GS} = 24 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.10 Third order intermodulation distortion as a function of load power, typical values.



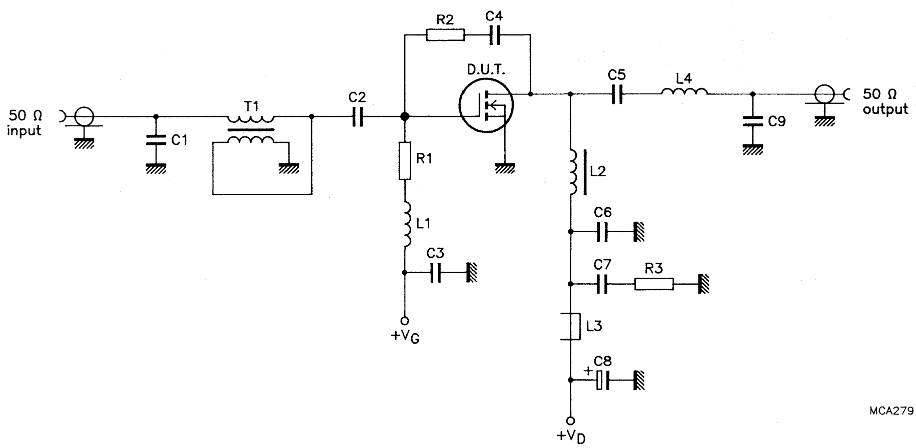
Class-A operation; V_{DS} = 50 V; I_{DQ} = 0.8 A;
P_L = 8 W (PEP); R_{GS} = 24 Ω; $f_1 - f_2$ = 1 MHz.

Fig.11 Power gain as a function of frequency, typical values.



Class-A operation; V_{DS} = 50 V; I_{DQ} = 0.8 A;
P_L = 8 W (PEP); R_{GS} = 24 Ω; $f_1 - f_2$ = 1 MHz.

Fig.12 Third order intermodulation distortion as a function of frequency, typical values.



f = 28 MHz.

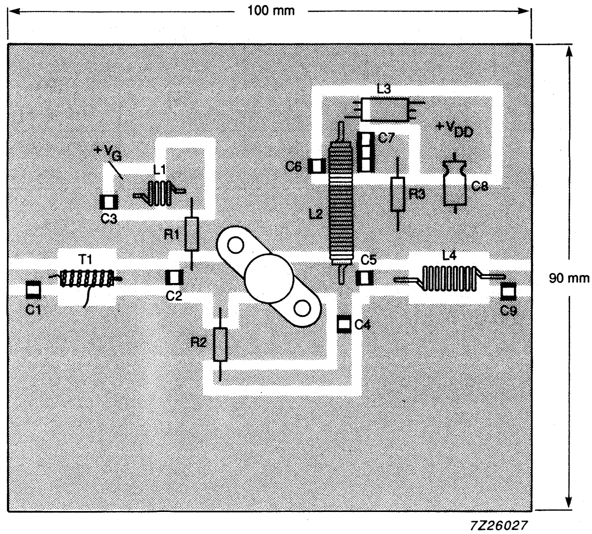
Fig.13 Test circuit for class-A operation.

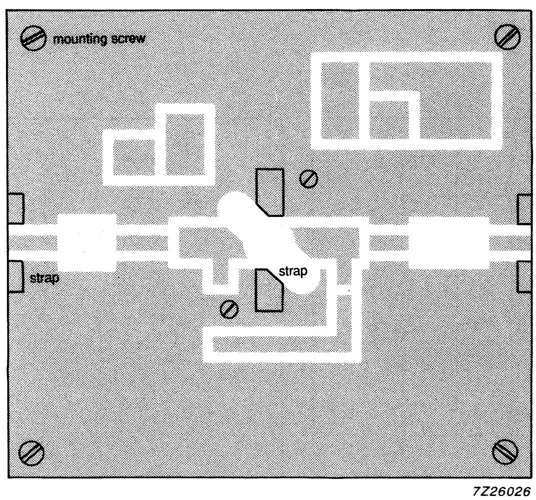
List of components (class-A test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	multilayer ceramic chip capacitor (note 1)	39 pF		
C2	multilayer ceramic chip capacitor	3 x 10 nF		2222 852 47103
C3, C4, C6	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C5	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C7	multilayer ceramic chip capacitor	3 x 100 nF		2222 852 47104
C8	aluminium electrolytic capacitor	10 µF, 63 V		2222 030 28109
C9	multilayer ceramic chip capacitor (note 1)	24 pF		
L1	4 turns enamelled 0.6 mm copper wire	86 nH	length 3.3 mm; int. dia. 5 mm; leads 2 x 2 mm	
L2	36 turns enamelled 0.7 mm copper wire wound on a rod grade 4B1 Ferroxcube drain choke	20 µH	length 30 mm; int. dia. 5 mm	4330 030 30031
L3	grade 3B Ferroxcube wideband RF choke			4312 020 36640
L4	8 turns enamelled 1 mm copper wire	189 nH	length 9.5 mm; int. dia. 5 mm; leads 2 x 3 mm	
R1	0.4 W metal film resistor	24 Ω		
R2	0.4 W metal film resistor	1500 Ω		
R3	0.4 W metal film resistor	10 Ω		
T1	4 : 1 transformer; 18 turns twisted pair of 0.25 mm copper wire with 10 twists per cm, wound on a grade 4C6 toroidal core		dimensions 9 x 6 x 3 mm	4322 020 97171

Note

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.





Note: The circuit and 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 and straps at the two edges and under the source contacts.

Fig.14 Component layout for 28 MHz class-A test circuit.

APPLICATION INFORMATION FOR CLASS-AB OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W; unless otherwise specified.
RF performance in SSB operation in a common source circuit.
f_1 = 28.000 MHz; f_2 = 28.001 MHz.

P_L (W)	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	G_p (dB)	η_D (%)	d_3 (dB) (note 1)	d_5 (dB) (note 1)	R_{GS} (Ω)
30 (PEP)	28	50	150	typ. 24	typ. 40 (note 2)	typ. −35	typ. −40	22

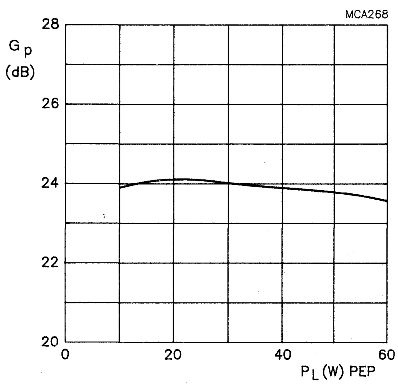
Notes

1. Stated figures are maximum values encountered at any driving level between the specified value of PEP and are referred to the according level of either the equal amplified tones. Related to the according peak envelope power these figures should be decreased by 6 dB.
2. 2-tone efficiency.

Ruggedness in class-AB operation

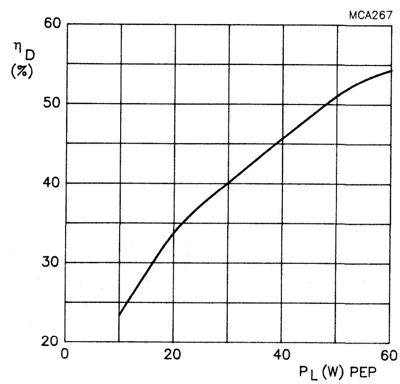
The BLF175 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases at P_L = 30 W single tone under the following conditions:

V_{DS} = 50 V; f = 28 MHz.



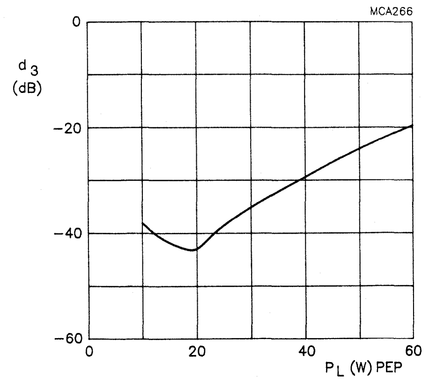
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.15 A; R_{GS} = 22 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.15 Power gain as a function of load power, typical values.



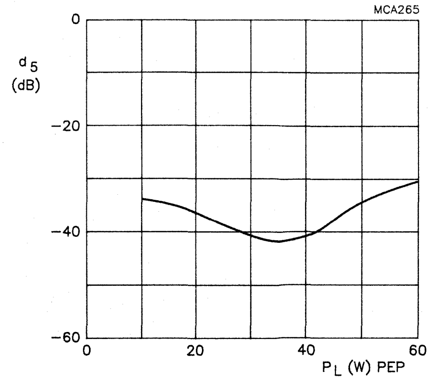
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.15 A; R_{GS} = 22 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.16 Two tone efficiency as a function of load power, typical values.



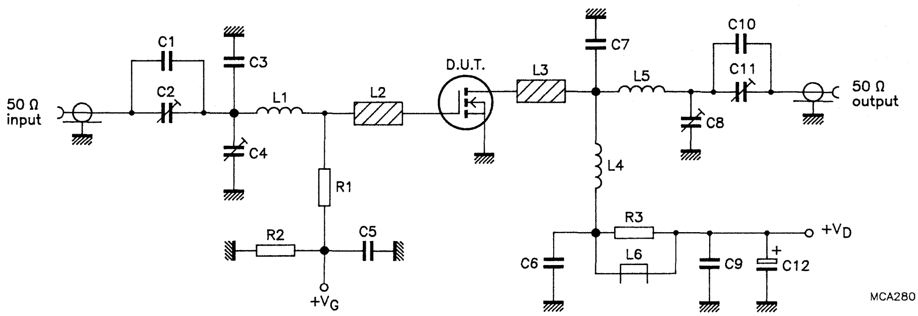
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.15 A; R_{GS} = 22 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.17 Third order intermodulation distortion as a function of load power, typical values.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.15 A; R_{GS} = 22 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.18 Fifth order intermodulation distortion as a function of load power, typical values.



f = 28 MHz.

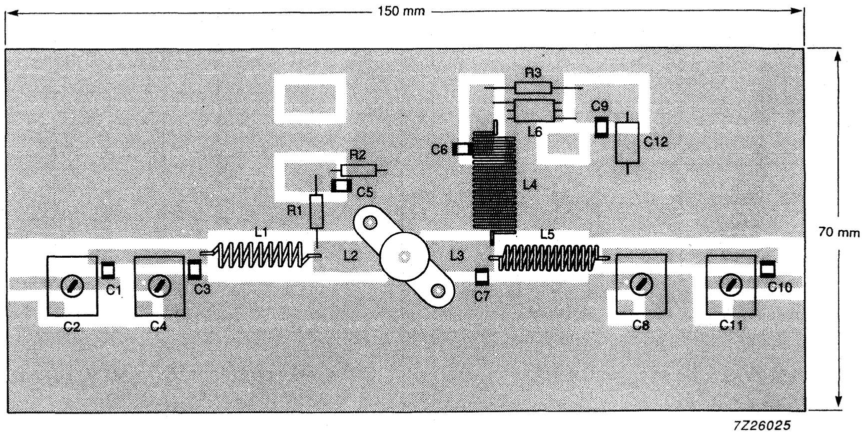
Fig.19 Test circuit for class-AB operation.

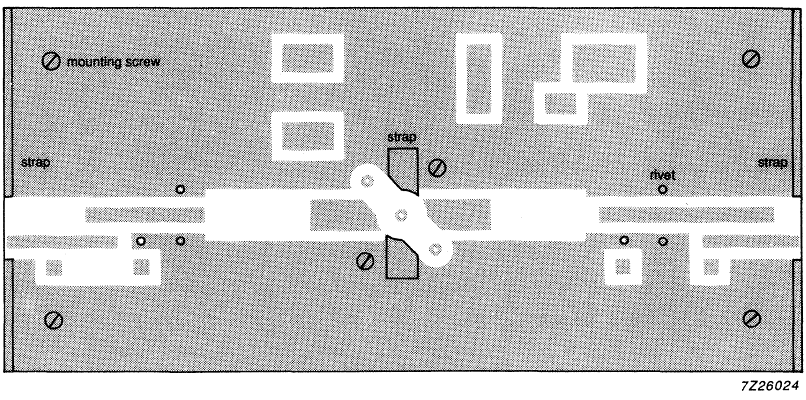
List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C10	multilayer ceramic chip capacitor (note 1)	62 pF		
C2, C4, C8, C11	film dielectric trimmer	5 to 60 pF		2222 809 07011
C3	multilayer ceramic chip capacitor (note 1)	51 pF		
C5, C6, C9	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C7	multilayer ceramic chip capacitor (note 1)	10 pF		
C12	aluminium electrolytic capacitor	10 μF, 63 V		2222 030 28109
L1	9 turns enamelled 1 mm copper wire	280 nH	length 11 mm; int. dia. 6 mm; leads 2 x 4 mm	
L2, L3	stripline (note 2)	30 Ω	length 10 mm; width 6 mm	
L4	14 turns enamelled 1 mm copper wire	1650 nH	length 20 mm; int. dia. 12 mm; leads 2 x 2 mm	
L5	10 turns enamelled 1 mm copper wire	380 nH	length 13 mm; int. dia. 7 mm; leads 2 x 3 mm	
L6	grade 3B Ferroxcube wideband RF choke			4312 020 36640
R1	0.4 W metal film resistor	22 Ω		
R2	0.4 W metal film resistor	1 MΩ		
R3	0.4 W metal film resistor	10 Ω		

Notes

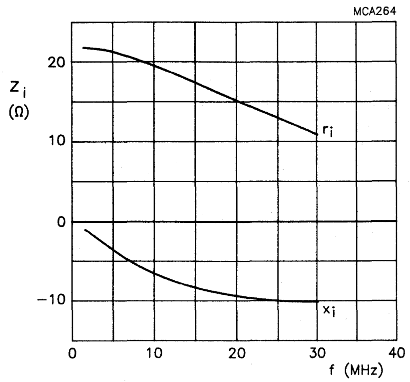
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric ($\varepsilon_r = 4.5$), thickness 1.6 mm.





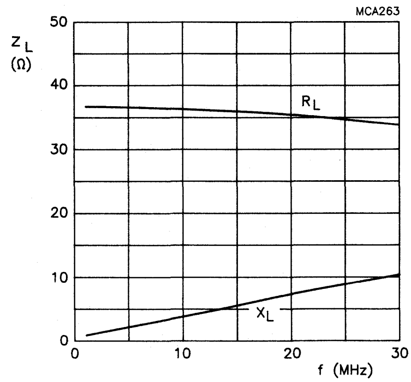
Note: The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets and straps at the two edges and under the source contacts.

Fig.20 Component layout for 28 MHz class-AB test circuit.



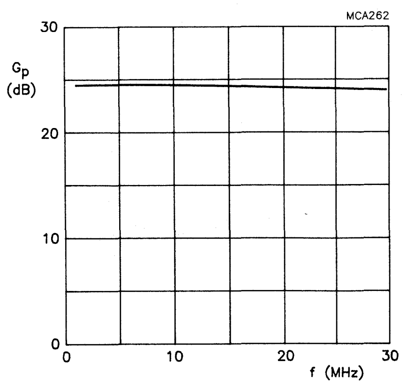
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.15 A;
P_L = 30 W (PEP); R_{GS} = 22 Ω.

Fig.21 Input impedance as a function of frequency (series components), typical values.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.15 A;
P_L = 30 W (PEP); R_{GS} = 22 Ω.

Fig.22 Load impedance as a function of frequency (series components), typical values.



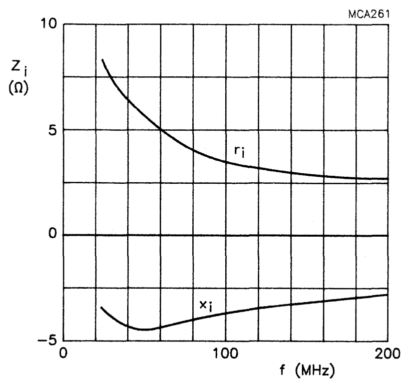
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.15 A;
P_L = 30 W (PEP); R_{GS} = 22 Ω.

Fig.23 Power gain as a function of frequency, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

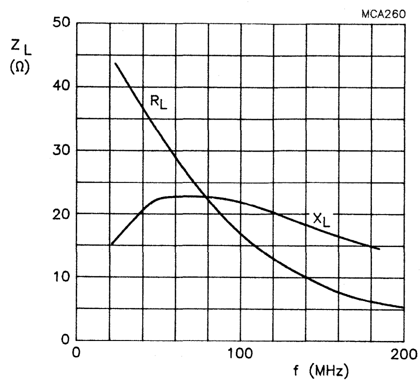
RF performance in SSB operation in a common source circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	R_{GS} Ω
CW, class-B	108	50	30	30	typ. 20	typ. 65	10



Class-B operation; V_{DS} = 50 V; I_{DQ} = 30 mA; P_L = 30 W; R_{GS} = 10 Ω.

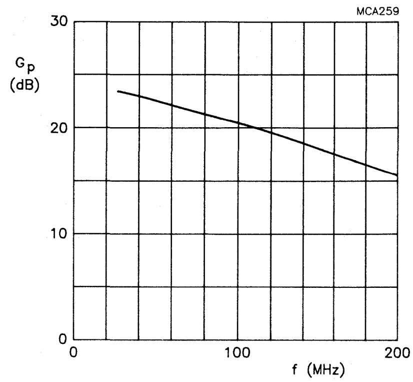
Fig.24 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 30 mA; P_L = 30 W; R_{GS} = 10 Ω.

Fig.25 Load impedance as a function of frequency (series components), typical values.

HF/VHF power MOS transistor BLF175



Class-B operation; V_{DS} = 50 V; I_{DQ} = 30 mA;
P_L = 30 W; R_{GS} = 10 Ω.

Fig.26 Power gain as a function of frequency, typical values.

FEATURES

- High power gain
- Low intermodulation distortion
- Easy power control
- Good thermal stability
- Withstands full load mismatch.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for industrial and military applications in the HF/VHF frequency range.

The transistor is encapsulated in a 4-lead, SOT121 flange envelope, with a ceramic cap. All leads are isolated from the flange.

A marking code, showing gate-source voltage (V_{GS}) information is provided for matched pair applications. Refer to the 'General' section for further information.

PINNING - SOT121

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

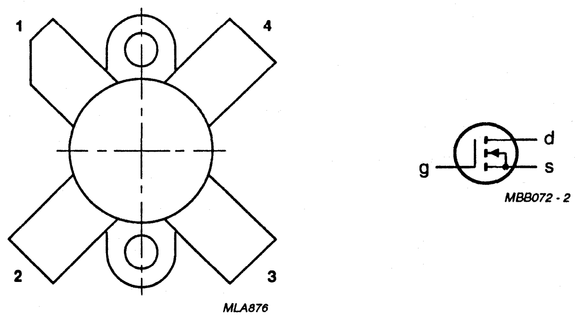


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)	d_3 (dB)	d_5 (dB)
SSB class-AB	28	50	150 (PEP)	> 20	> 35	< −30	< −30
CW class-B	108	50	150	typ. 19	typ. 70	–	–

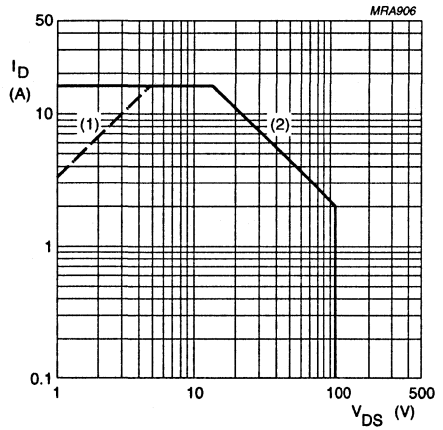
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	110	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	16	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	220	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

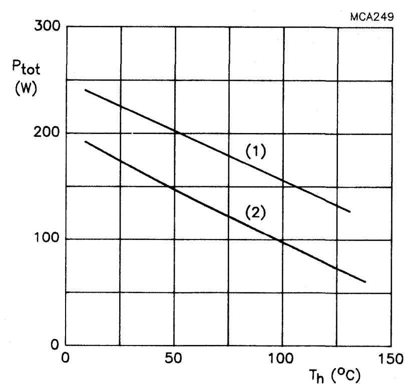
THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	max. 0.8 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	max. 0.2 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



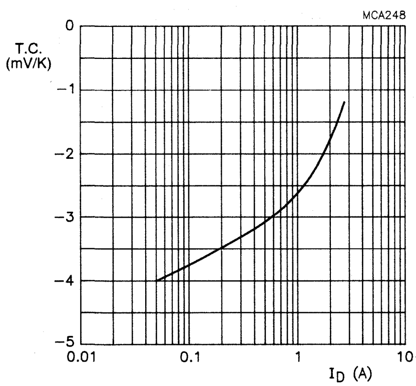
(1) Short-time operation during mismatch.
(2) Continuous operation.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

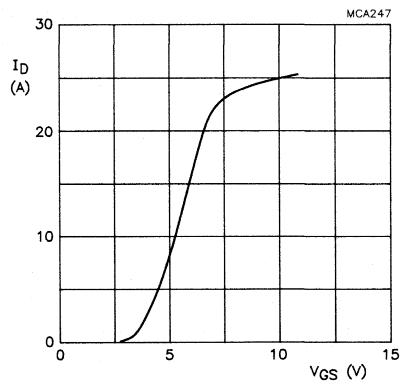
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 50 mA; V_{GS} = 0	110	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 50 V	–	–	2.5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 50 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched pairs	I_D = 50 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 5 A; V_{DS} = 10 V	4.5	6.2	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 5 A; V_{GS} = 10 V	–	0.2	0.3	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	25	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	480	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	190	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	14	–	pF



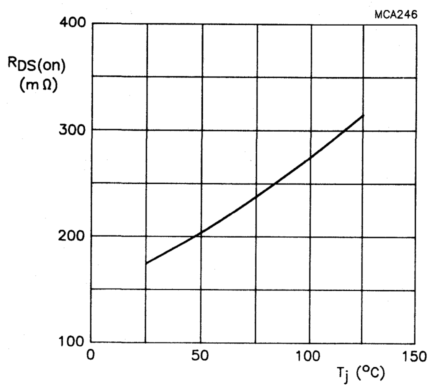
V_{DS} = 10 V; valid for T_h = 25 to 70 °C.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



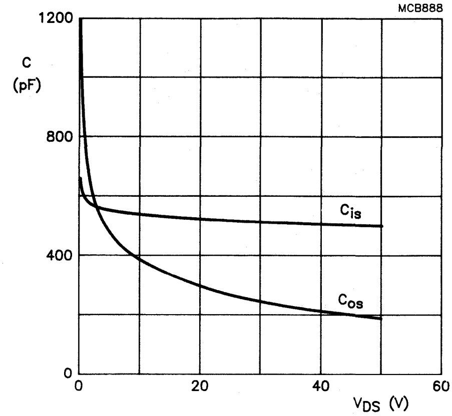
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values.



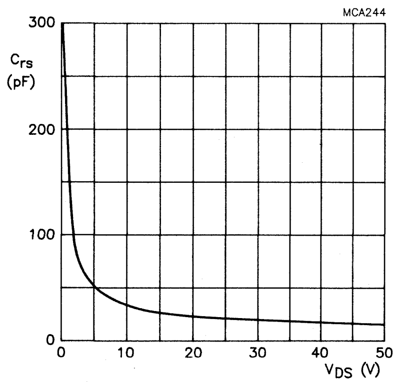
I_D = 5 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-AB OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.2 K/W; Z_L = 6.25 + j0 Ω unless otherwise specified.
RF performance in SSB operation in a common source class-AB circuit.
f_1 = 28.000 MHz; f_2 = 28.001 MHz.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	η_D (%)	d_3 (dB) (note 1)	d_5 (dB) (note 1)
SSB, class-AB	28	50	0.7	20 to 150 (PEP)	> 20 typ. 35	> 35 typ. 40	< −30 typ. −35	< −30 typ. −38

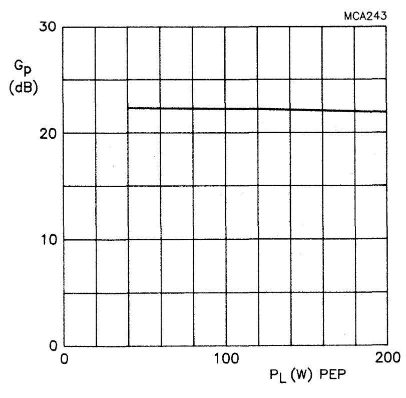
Note

1. Stated figures are maximum values encountered at any driving level between the specified value of PEP and are referred to the according level of either the equal amplified tones. Related to the according peak envelope power these figures should be decreased by 6 dB.

Ruggedness in class-AB operation

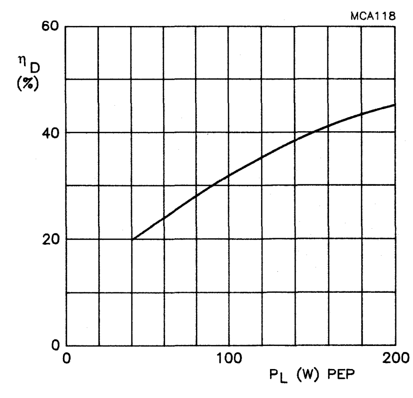
The BLF177 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 50 V; f = 28 MHz at rated output power.



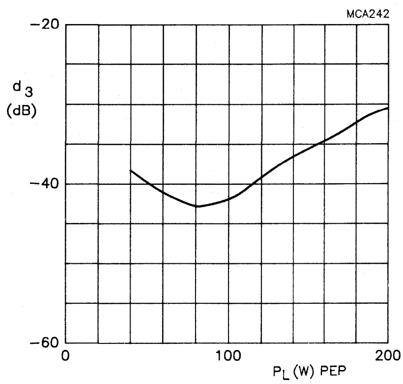
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.7 A; R_{GS} = 5 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.9 Power gain as a function of load power, typical values.



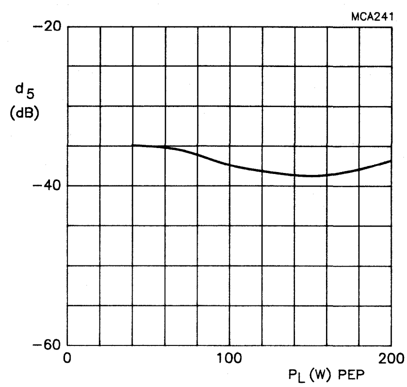
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.7 A; R_{GS} = 5 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.10 Two tone efficiency as a function of load power, typical values.



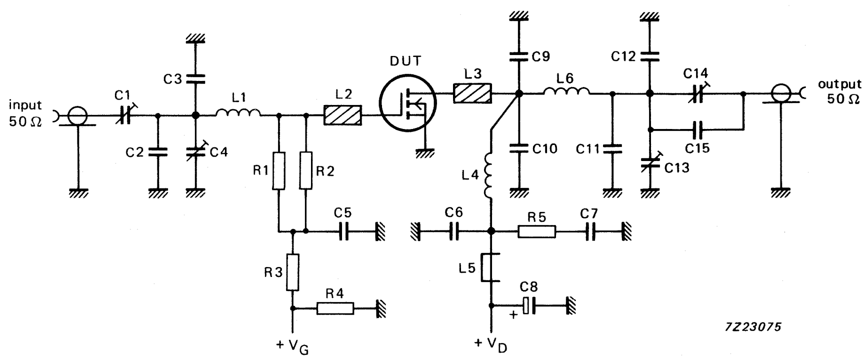
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.7 A;
R_{GS} = 5 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.11 Third order intermodulation distortion as a function of load power, typical values.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.7 A;
R_{GS} = 5 Ω; f_1 = 28.000 MHz; f_2 = 28.001 MHz.

Fig.12 Fifth order intermodulation distortion as a function of load power, typical values.



f = 28 MHz.

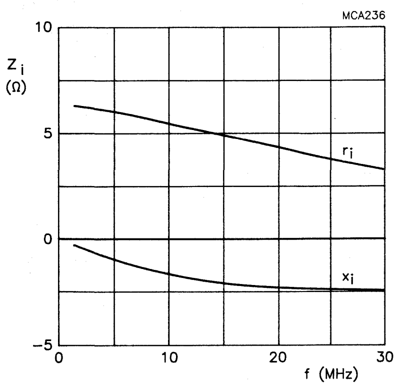
Fig.13 Test circuit for class-AB operation.

List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C4, C13, C14	film dielectric trimmer	7 to 100 pF		2222 809 07015
C2	multilayer ceramic chip capacitor (note 1)	56 pF		
C3, C11	multilayer ceramic chip capacitor (note 1)	62 pF		
C5, C6	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C7	multilayer ceramic chip capacitor	3 x 100 nF		2222 852 47104
C5	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C7	multilayer ceramic chip capacitor	3 x 100 nF		2222 852 47104
C8	electrolytic capacitor	2.2 µF, 63 V		
C9, C10	multilayer ceramic chip capacitor (note 1)	20 pF		
C12	multilayer ceramic chip capacitor (note 1)	100 pF		
C15	multilayer ceramic chip capacitor (note 1)	150 pF		
L1	5 turns enamelled 0.7 mm copper wire	133 nH	length 4.5 mm; int. dia. 6 mm; leads 2 x 5 mm	
L2, L3	stripline (note 2)	41.1 Ω	length 13 x 6 mm	
L4	7 turns enamelled 1.5 mm copper wire	236 nH	length 12.5 mm; int. dia. 8 mm; leads 2 x 5 mm	
L5	grade 3B Ferroxcube wideband HF choke			4312 020 36642
L6	5 turns enamelled 2 mm copper wire	170 nH	length 11.5 mm; int. dia. 8 mm; leads 2 x 5 mm	
R1, R2	1 W metal film resistor	10 Ω		
R2	0.4 W metal film resistor	10 kΩ		
R3	0.4 W metal film resistor	1 MΩ		
R5	1 W metal film resistor	10 kΩ		

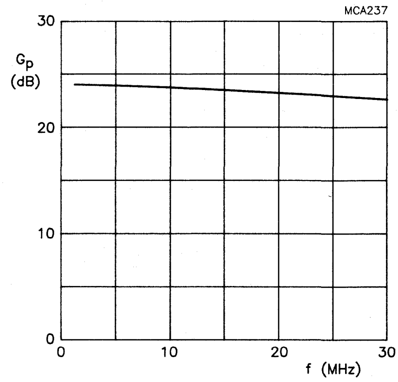
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric (ε_r = 2.2), thickness 1.6 mm.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.7 A;
P_L = 150 W (PEP); R_{GS} = 6.25 Ω; R_L = 6.25 Ω.

Fig.14 Input impedance as a function of frequency (series components), typical values.



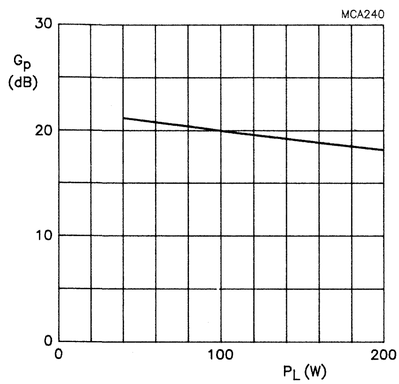
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 0.7 A;
P_L = 150 W (PEP); R_{GS} = 6.25 Ω; R_L = 6.25 Ω.

Fig.15 Power gain as a function of frequency, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

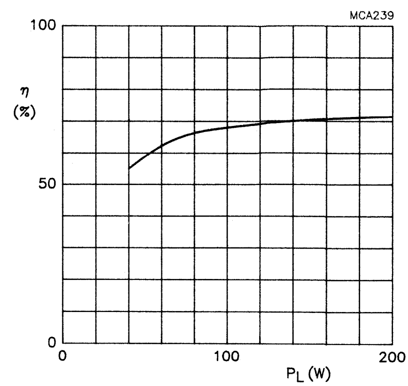
T_h = 25 °C; $R_{th\ mb-h}$ = 0.2 K/W; R_{GS} = 15.8 Ω; unless otherwise specified.
RF performance in CW operation in a common source class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	108	50	0.1	150	typ. 19	typ. 70



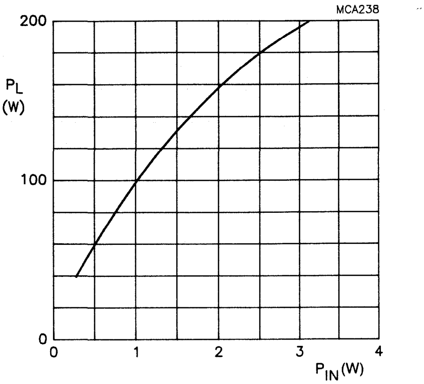
Class-B operation; V_{DS} = 50 V; I_{DQ} = 100 mA;
R_{GS} = 15.8 Ω; f = 108 MHz.

Fig.16 Power gain as a function of load power, typical values.



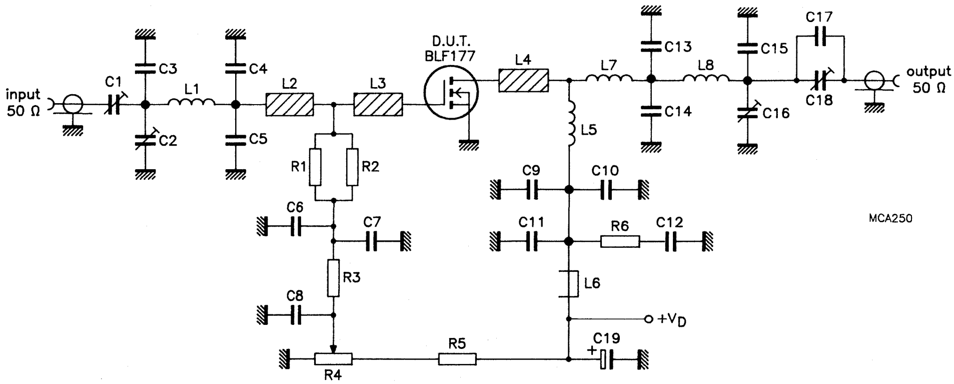
Class-B operation; V_{DS} = 50 V; I_{DQ} = 100 mA;
R_{GS} = 15.8 Ω; f = 108 MHz.

Fig.17 Two tone efficiency as a function of load power, typical values.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 100 mA;
R_{GS} = 15.8 Ω; f = 108 MHz.

Fig.18 Load power as a function of input power, typical values.



f = 108 MHz.

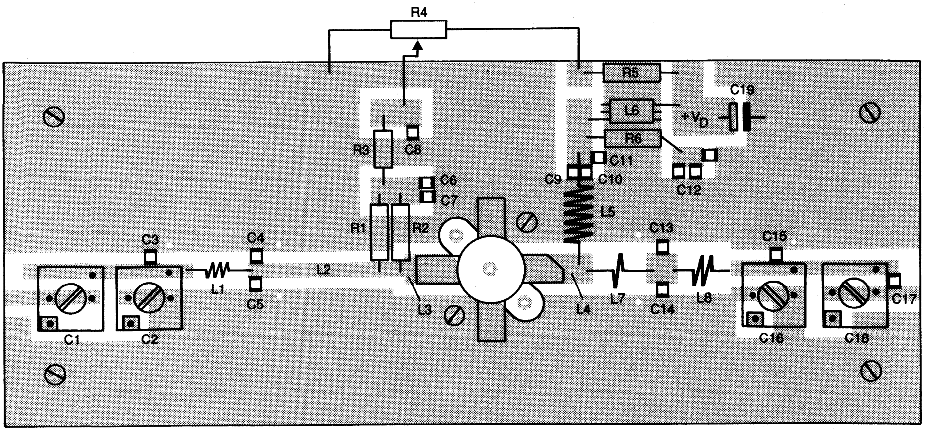
Fig.19 Test circuit for class-B operation.

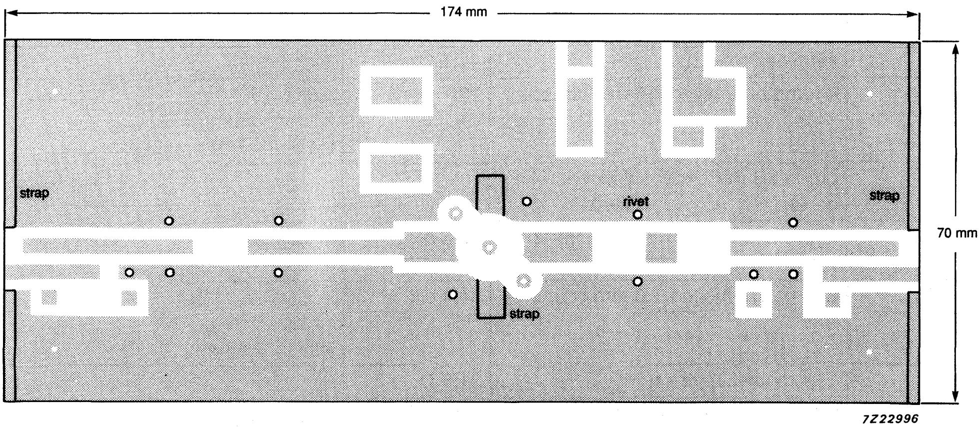
List of components (class-B test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C16, C18	film dielectric trimmer	2.5 to 20 pF		2222 809 07004
C3	multilayer ceramic chip capacitor (note 1)	20 pF		
C4, C5	multilayer ceramic chip capacitor (note 1)	62 pF		
C6, C7, C9, C10	multilayer ceramic chip capacitor (note 1)	1 nF		
C8	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C11	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C12	multilayer ceramic chip capacitor	3 x 100 nF		2222 852 47104
C13, C14	multilayer ceramic chip capacitor (note 1)	36 pF		
C15	multilayer ceramic chip capacitor (note 1)	12 pF		
C17	multilayer ceramic chip capacitor (note 1)	5.6 pF		
C19	electrolytic capacitor	4.4 μF, 63 V		2222 030 28478
L1	3 turns enamelled 0.8 mm copper wire	22 nH	length 5.5 mm; int. dia. 3 mm; leads 2 x 5 mm	
L2	stripline (note 2)	64.7 Ω	31 x 3 mm	
L3, L4	stripline (note 2)	41.1 Ω	10 x 6 mm	
L5	6 turns enamelled 1.6 mm copper wire	122 nH	length 13.8 mm; int. dia. 6 mm; leads 2 x 5 mm	
L6	grade 3B Ferroxcube wideband HF choke			4312 020 36642
L7	1 turn enamelled 1.6 mm copper wire	16.5 nH	int. dia. 9 mm; leads 2 x 5 mm	
L8	2 turns enamelled 1.6 mm copper wire	34.4 nH	length 3.9 mm; int. dia. 6 mm; leads 2 x 5 mm	
R1, R2	1 W metal film resistor	31.6 Ω		
R3	0.4 W metal film resistor	1 kΩ		
R4	cermet potentiometer	5 kΩ		
R5	0.4 W metal film resistor	44.2 Ω		
R6	1 W metal film resistor	10 Ω		

Notes

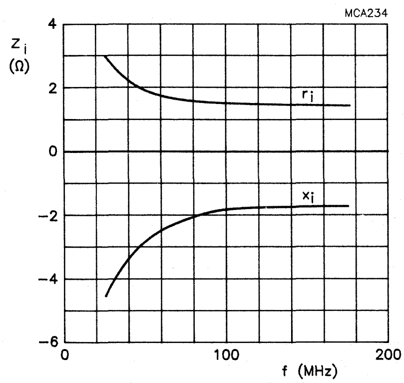
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric (ε_r = 2.2), thickness 1.6 mm.





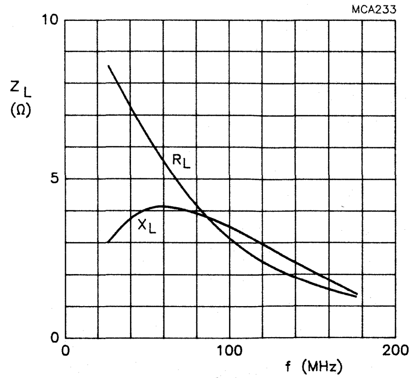
The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the source leads and at the input and output copper straps are used for a direct contact between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

Fig.20 Component layout for 108 MHz class-B test circuit.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 0.1 A;
P_L = 150 W; R_{GS} = 15 Ω.

Fig.21 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 0.1 A;
P_L = 150 W; R_{GS} = 15 Ω.

Fig.22 Load impedance as a function of frequency (series components), typical values.

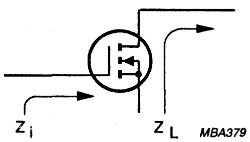
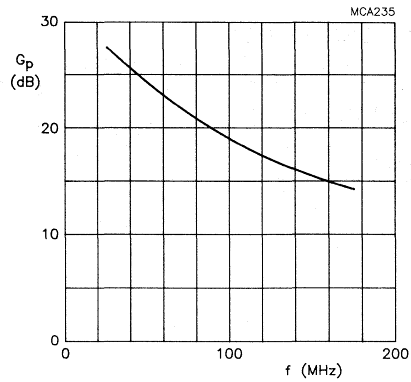


Fig.23 Definition of MOS impedance.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 0.1 A;
P_L = 150 W; R_{GS} = 15 Ω.

Fig.24 Power gain as a function of frequency, typical values.

HF/VHF power MOS transistor | BLF221

FEATURES

- High power gain
- Easy power control
- Gold metallization
- Good thermal stability
- Withstands full load mismatch.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for communications transmitter applications in the HF/VHF frequency range.

This transistor is encapsulated in a 3-lead, SOT5 (TO-39/3) metal envelope, with the source connected to the case.

PINNING - TO-39/3

PIN	DESCRIPTION
1	drain
2	gate
3	source

PIN CONFIGURATION

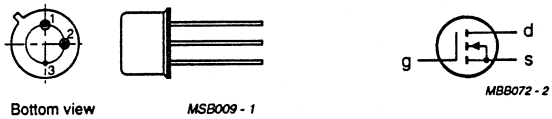


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	12.5	2	> 10	> 50

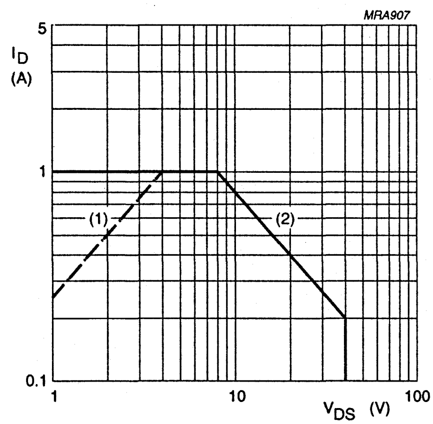
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	40	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	1	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	8	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

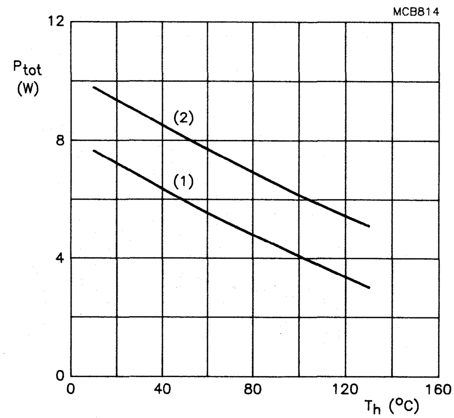
SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	22 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	3 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Continuous operation.

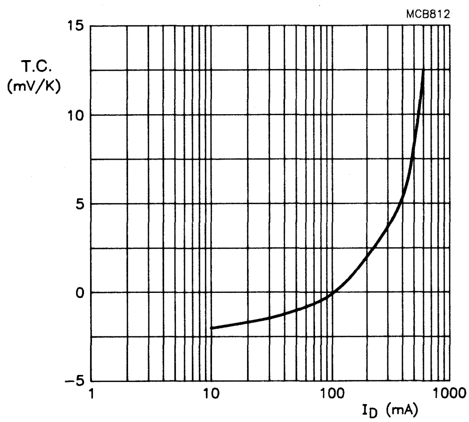
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

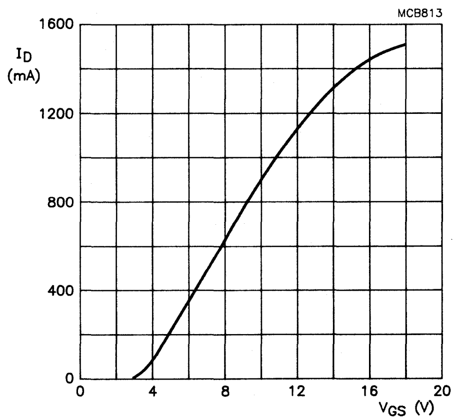
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 3 mA; V_{GS} = 0	40	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 12.5 V	–	–	10	μA
I_{GSS}	gate-source leakage current	±V_{GS} = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 3 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 0.3 A; V_{DS} = 10 V	80	135	–	mS
$R_{DS(on)}$	drain-source on-state resistance	I_D = 0.3 A; V_{GS} = 15 V	–	3.5	4	Ω
I_{DSX}	on-state drain current	V_{GS} = 15 V; V_{DS} = 10 V	–	1.3	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	5.3	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	7.8	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	1.8	–	pF



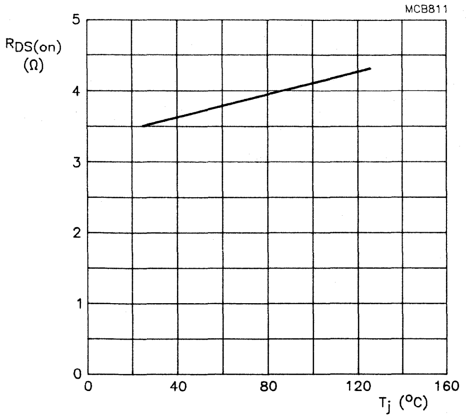
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



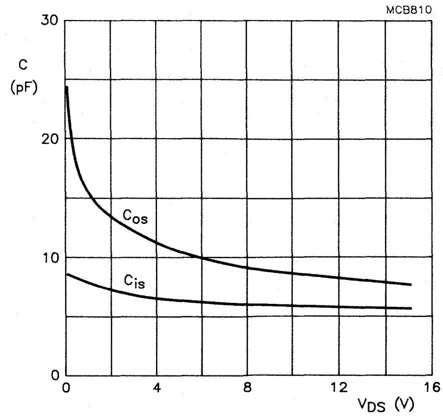
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values.



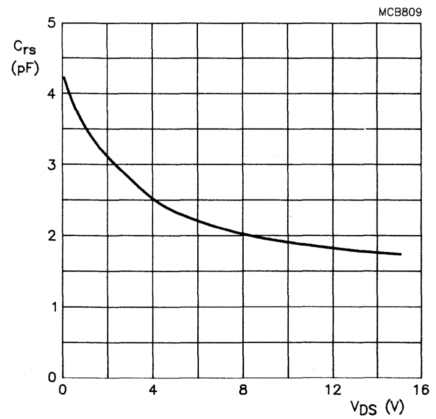
V_{GS} = 15 V; I_D = 0.3 A.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

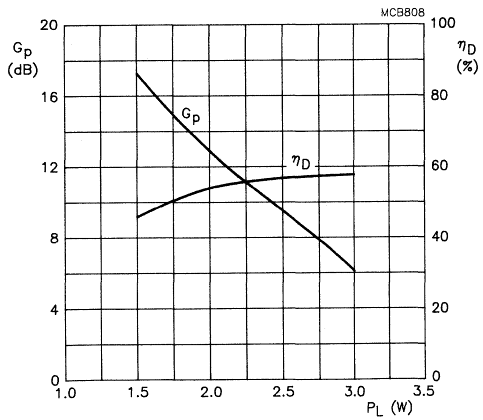
T_{mb} = 25 °C; R_{GS} = 237 Ω; unless otherwise specified.
RF performance in CW operation in a common source class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	12.5	20	2	> 10 typ. 13	> 50 typ. 55

Ruggedness in class-B operation

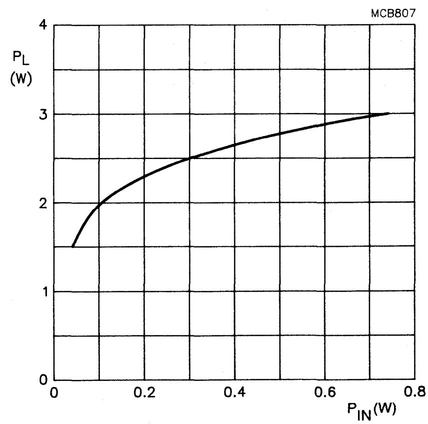
The BLF221 is capable of withstanding a load mismatch corresponding to VSWR = 50:1 through all phases under the following conditions:

V_{DS} = 15.5 V; f = 175 MHz at rated load power.



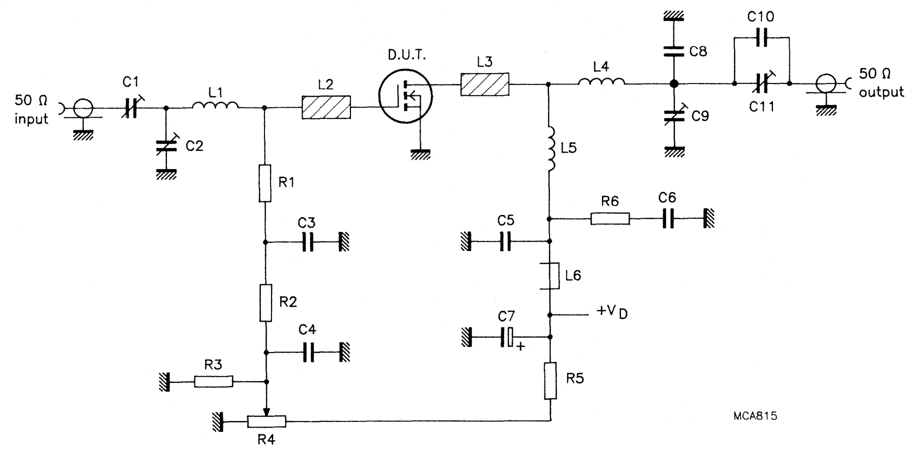
Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA; f = 175 MHz.

Fig.9 Power gain and efficiency as a functions of load power, typical values.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA; f = 175 MHz.

Fig.10 Load power as a function of input power, typical values.



f = 175 MHz.

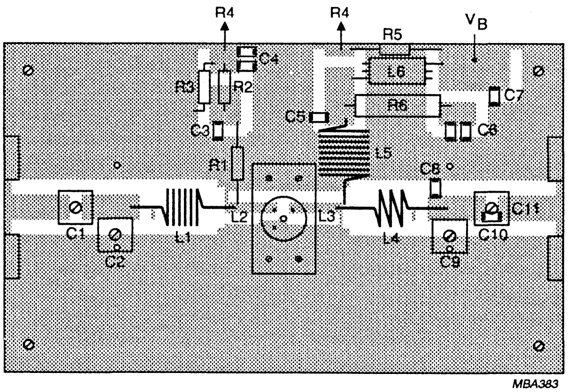
Fig.11 Test circuit for class-B operation.

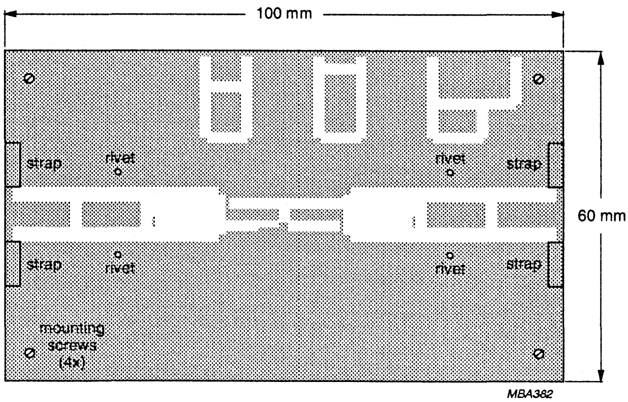
List of components (class-B test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C11	film dielectric trimmer	2 to 9 pF		2222 809 09005
C2, C9	film dielectric trimmer	2 to 9 pF		2222 809 09002
C3, C5	multilayer ceramic chip capacitor (note 1)	1 nF, 500 V		
C4, C6	multilayer ceramic chip capacitor	2 x 100 nF in parallel, 50 V		2222 852 47104
C7	Sprague electrolytic tantalum capacitor	2.2 μF, 35 V		
C8	multilayer ceramic chip capacitor (note 1)	5.1 pF, 500 V		
C10	multilayer ceramic chip capacitor (note 1)	9.1 pF, 500 V		
L1	6 turns enamelled 0.8 mm copper wire	137 nH	length 5.1 mm int. dia. 4.5 mm leads 2 x 5 mm	
L2, L3	stripline (note 2)	81 Ω	8 mm x 2 mm	
L4	3 turns enamelled 1 mm copper wire	57 nH	length 5 mm int. dia. 6 mm leads 2 x 5 mm	
L5	9 turns enamelled 1 mm copper wire	355 nH	length 11 mm int. dia. 7 mm leads 2 x 5 mm	
L6	grade 3B Ferroxcube RF choke			4312 020 36642
R1	0.4 W metal film resistor	237 Ω		2322 151 72371
R2	0.4 W metal film resistor	1 kΩ		2322 151 71002
R3	0.4 W metal film resistor	1 MΩ		2322 151 71005
R4	10 turns cermet potentiometer	5 kΩ		
R5	0.4 W metal film resistor	7.5 kΩ		2322 151 77502
R6	1 W metal film resistor	10 Ω		2322 153 51009

Notes

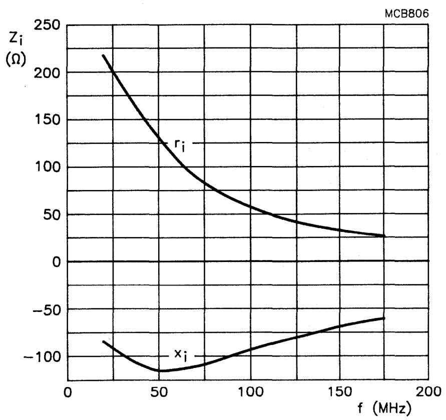
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric ($\varepsilon_r = 2.2$), thickness 1.6 mm.





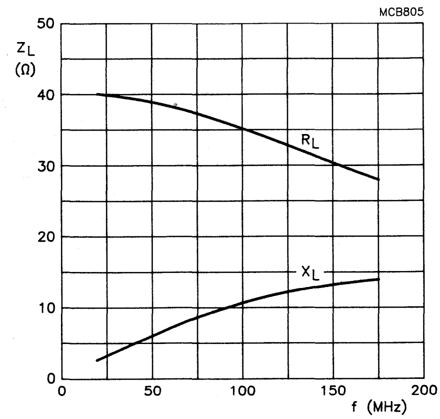
The circuit and components are situated on one side of the printed circuit board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets for a direct contact between upper and lower sheets. Heatsinking is achieved by pressing the transistor against a brass thermal conductor (10 x 20 x 1.5 mm), which is connected to the heatsink by four screws.

Fig.12 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA; R_{GS} = 237 Ω; P_L = 2 W.

Fig.13 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA; R_{GS} = 237 Ω; P_L = 2 W.

Fig.14 Load impedance as a function of frequency (series components), typical values.

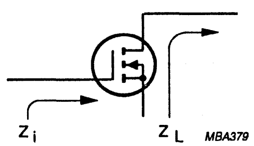
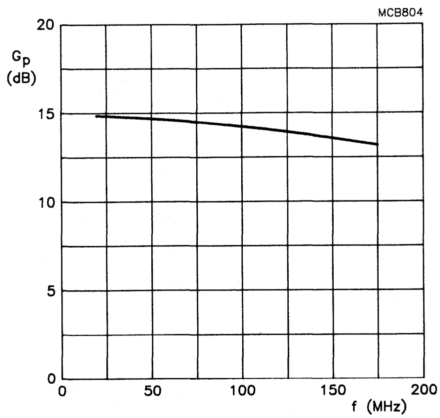


Fig.15 Definition of MOS impedance.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA; R_{GS} = 237 Ω; P_L = 2 W.

Fig.16 Power gain as a function of frequency, typical values.

FEATURES

- Easy power control
- Good thermal stability
- Withstands full load mismatch.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for communications transmitter applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead, SOT123 flange envelope, with a ceramic cap. All leads are isolated from the flange.

PINNING - SOT123

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

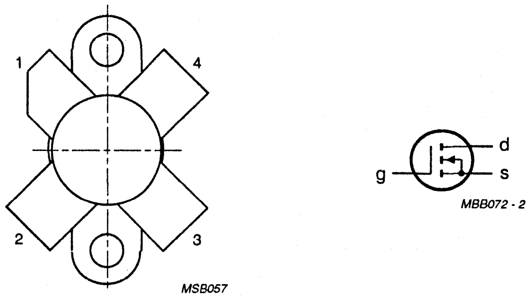


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	12.5	30	> 8.5	> 60

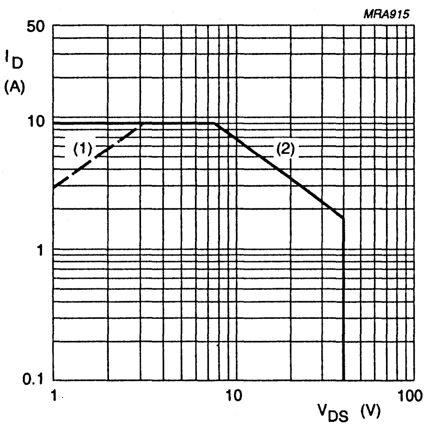
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	40	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	9	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	68	W
T_{stg}	storage temperature		−65	150	°C
T_j	junction temperature		–	200	°C

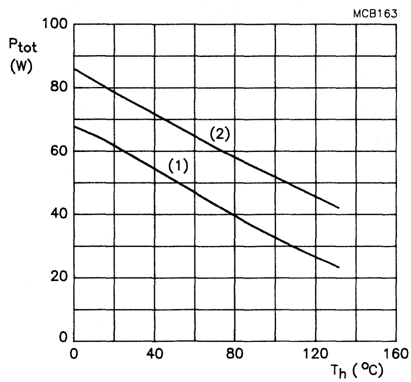
THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	2.6 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	0.3 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



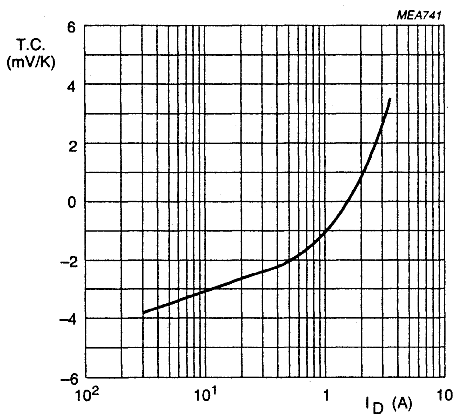
(1) Continuous operation.
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

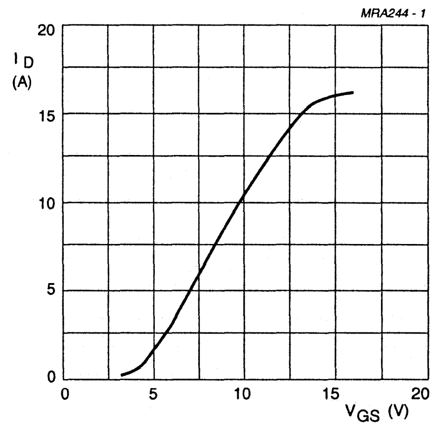
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 30 mA	40	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 12.5 V	–	–	1	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 30 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 3.5 A; V_{DS} = 10 V	1.5	2.2	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 3.5 A; V_{GS} = 15 V	–	0.25	0.35	Ω
I_{DSX}	on-state drain current	V_{GS} = 15 V; V_{DS} = 10 V	–	16	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	120	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	140	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	20	–	pF



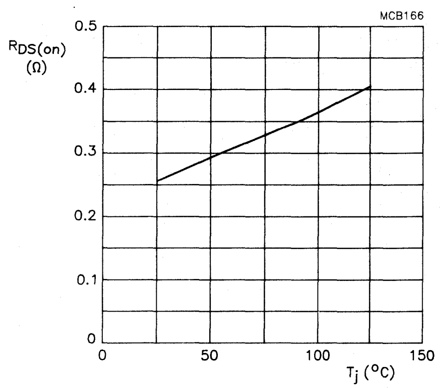
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



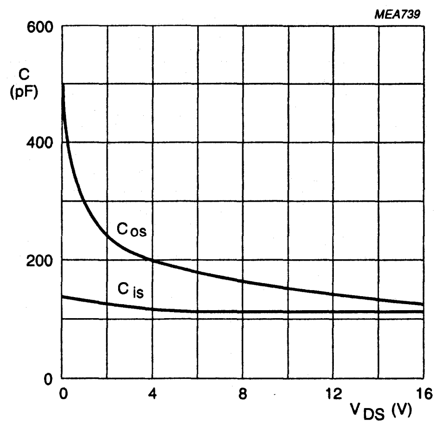
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values.



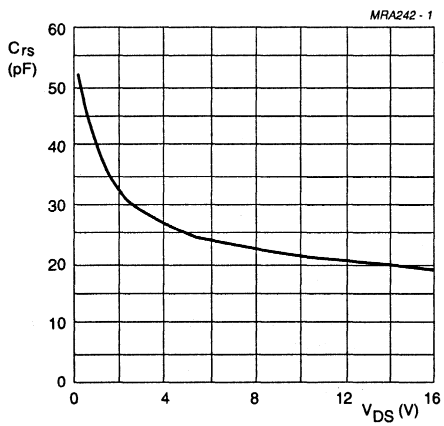
V_{GS} = 15 V; I_D = 3.5 A.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

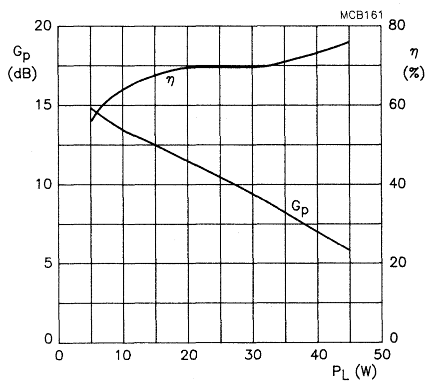
T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W; unless otherwise specified.
RF performance in CW operation in a common source class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_c (%)
CW, class-B	175	12.5	100	30	> 8.5 typ. 9.5	> 60 typ. 70

Ruggedness in class-B operation

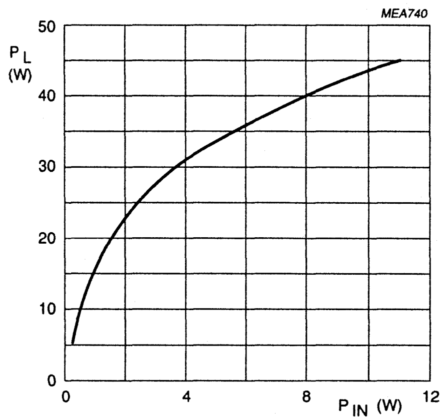
The BLF225 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 15.5 V; f = 175 MHz at rated load power.



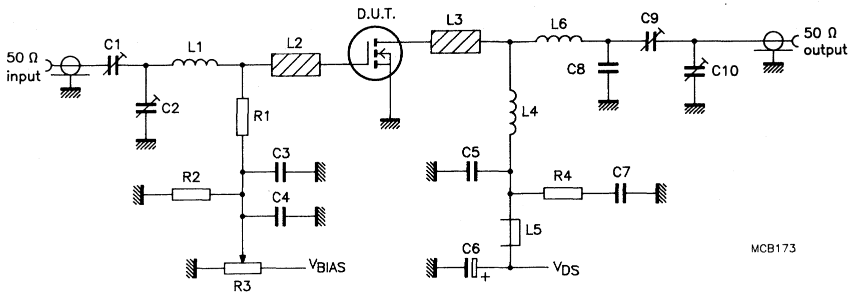
Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 100 mA; f = 175 MHz.

Fig.9 Power gain and efficiency as functions of load power, typical values.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 100 mA; f = 175 MHz.

Fig.10 Load power as a function of input power, typical values.



f = 175 MHz.

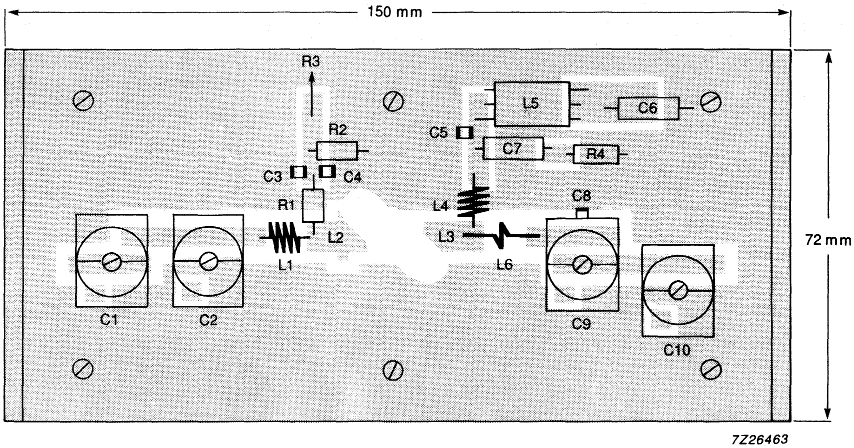
Fig.11 Test circuit for class-B operation.

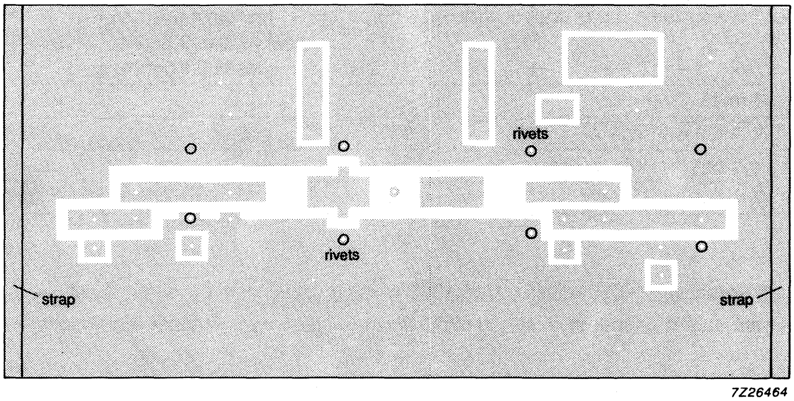
List of components (class-B test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	4 to 40 pF		2222 809 07008
C2, C10	film dielectric trimmer	5 to 60 pF		2222 809 07011
C3	multilayer ceramic chip capacitor (note 1)	100 pF, 500 V		
C4	ceramic chip capacitor	100 nF, 50 V		2222 852 47104
C5	multilayer ceramic chip capacitor (note 1)	680 pF, 500 V		
C6	electrolytic capacitor	10 µF, 63 V		2222 030 38109
C7	polyester capacitor	100 nF, 250 V		
C8	multilayer ceramic chip capacitor (note 1)	43 pF, 500 V		
C9	film dielectric trimmer	7 to 100 pF		2222 809 07015
L1	3 turns enamelled 0.5 mm copper wire	18 nH	length 3.3 mm int. dia. 2 mm leads 2 x 5 mm	
L2, L3	stripline (note 2)	31 Ω	12 x 6 mm	
L4	3 turns enamelled 1.5 mm copper wire	28 nH	length 8.2 mm int. dia. 4 mm leads 2 x 5 mm	
L5	grade 3B Ferroxcube RF choke			4312 020 36642
L6	1 turn enamelled 1.5 mm copper wire	36 nH	length 4 mm int. dia. 3.5 mm leads 2 x 5 mm	
R1	0.4 W metal film resistor	1 kΩ		2322 151 51002
R2	0.4 W metal film resistor	1 MΩ		2322 151 51005
R3	10 turns cermet potentiometer	5 kΩ		
R4	0.4 W metal film resistor	10 Ω		2322 151 51009

Notes

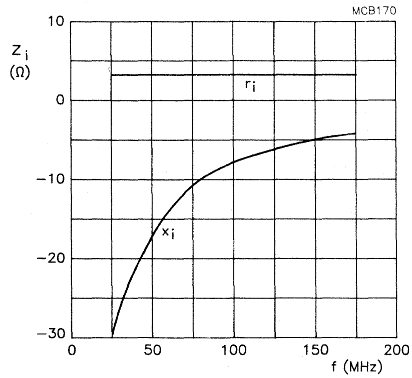
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric (ε_r = 4.5), thickness 1⁄16 inch.





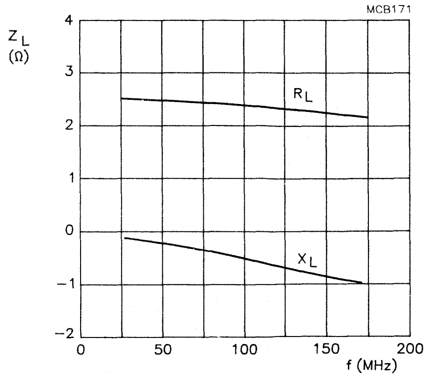
The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of copper straps and hollow rivets for a direct contact between upper and lower sheets.

Fig.12 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 100 mA; P_L = 30 W.

Fig.13 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 100 mA; P_L = 30 W.

Fig.14 Load impedance as a function of frequency (series components), typical values.

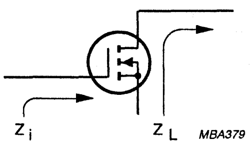
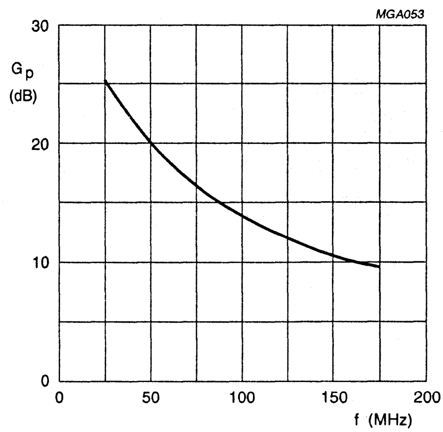


Fig.15 Definition of MOS impedance.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 100 mA; P_L = 30 W.

Fig.16 Power gain as a function of frequency, typical values.

HF/VHF power MOS transistor

BLF241

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Withstands full load mismatch
- Gold metallization ensures excellent reliability.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for professional transmitter applications in the HF/VHF frequency range.

The transistor is encapsulated in a 3-lead SOT5 (TO-39) metal envelope with the drain connected to the case.

PINNING - SOT5

PIN	DESCRIPTION
1	source
2	gate
3	drain

PIN CONFIGURATION

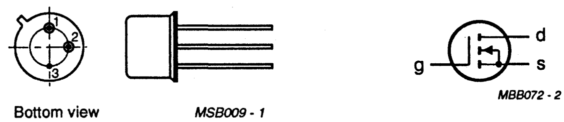


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)
CW, class-AB	175	12.5	100	2	> 10; typ. 12.5	< 50; typ. 55
CW, class-B	175	28	10	3	typ. 14	typ. 50

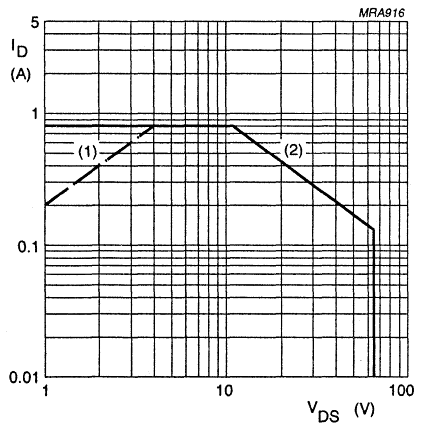
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	0.8	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	8.75	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

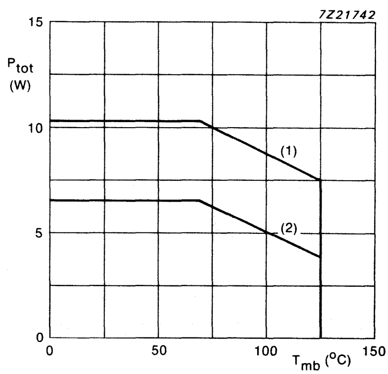
THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	20 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



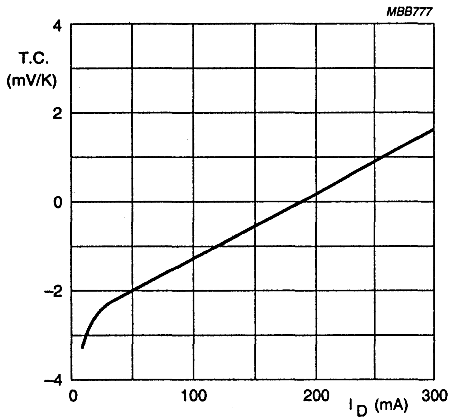
(1) Short-time operation during mismatch.
(2) Continuous operation.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

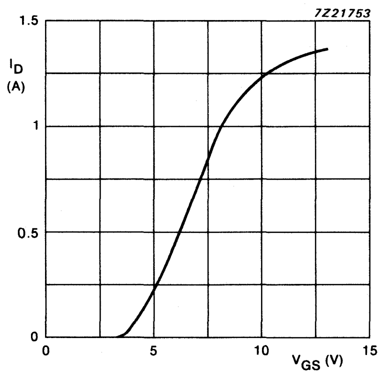
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 50 mA; V_{GS} = 0	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	10	μA
I_{GSS}	gate-source leakage current	±V_{GS} = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 3 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 0.3 A; V_{DS} = 10 V	0.16	0.24	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 0.3 A; V_{GS} = 10 V	–	3.3	5	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	1.2	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	16	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	13	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	2.4	–	pF



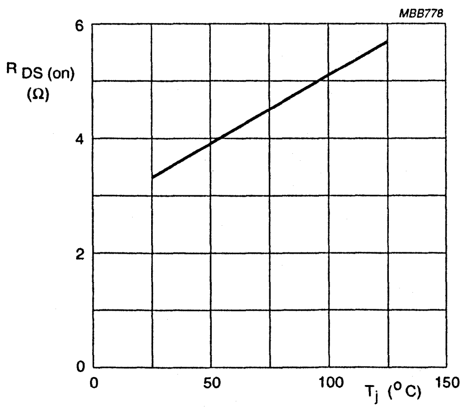
V_{DS} = 12.5 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



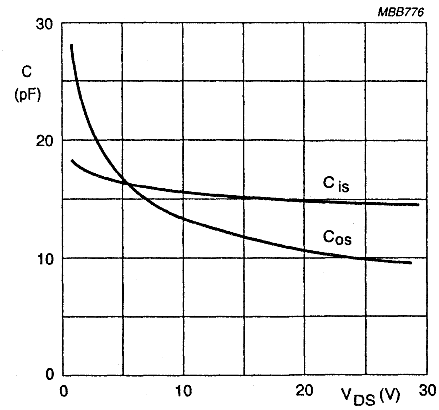
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values.



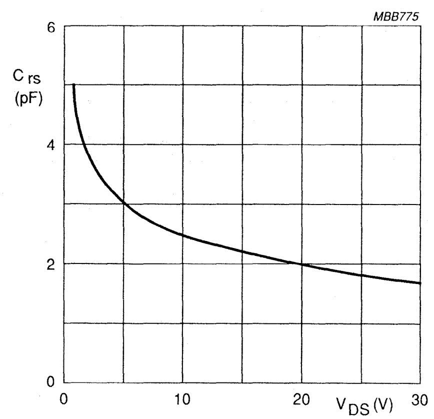
I_D = 0.3 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



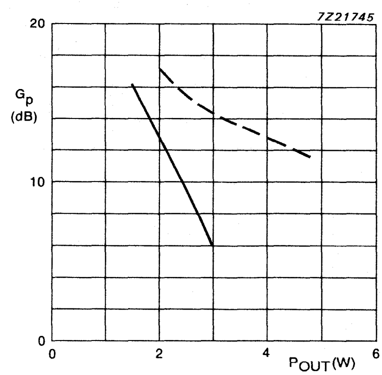
V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

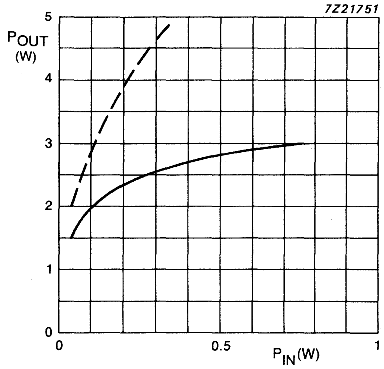
Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.



solid line: V_{DS} = 12.5 V.

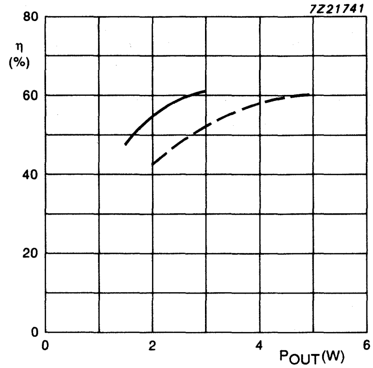
dotted line: V_{DS} = 28 V.

Fig.9 Power gain as a function of load power, typical values.



solid line: V_{DS} = 12.5 V.
dotted line: V_{DS} = 28 V.

Fig.10 Output power as a function of input power, typical values.



solid line: V_{DS} = 12.5 V; I_{DQ} = 100 mA; R_{GS} = 220 Ω.
dotted line: V_{DS} = 28 V; I_{DQ} = 10 mA; R_{GS} = 47 Ω.

Fig.11 Efficiency as a function of output power, typical values.

APPLICATION INFORMATION

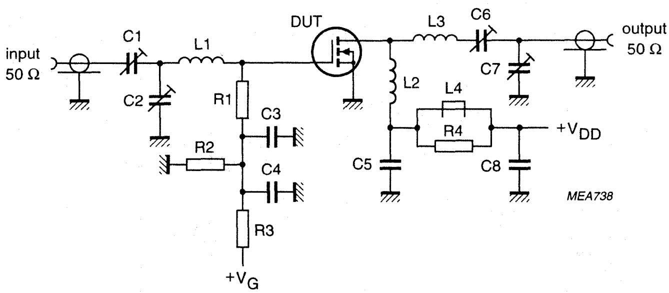
T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.2 K/W; unless otherwise specified.
RF performance in SSB operation in a common source circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	R_{GS} (Ω)
CW class-AB	175	12.5	100	2	> 10 typ. 12.5	< 50 typ. 55	220
CW class-B	175	28	10	3	typ. 14	typ. 50	47

Ruggedness in class-B operation

The BLF241 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 28 V; f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 8.8 K/W at rated output power.



f = 175 MHz.

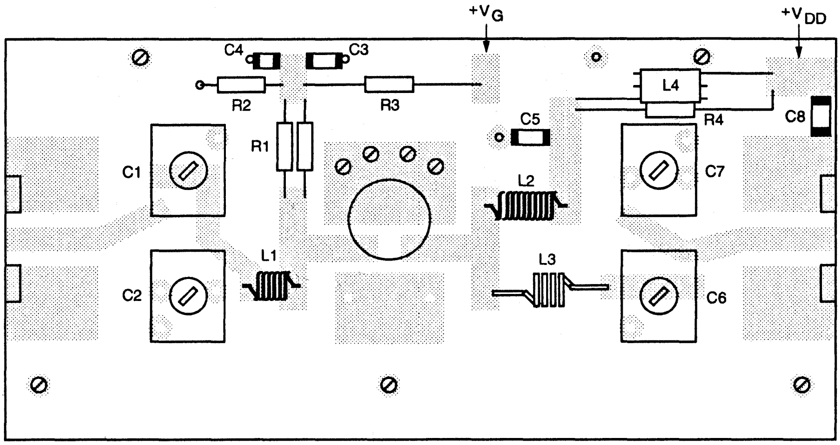
Fig.12 Test circuit.

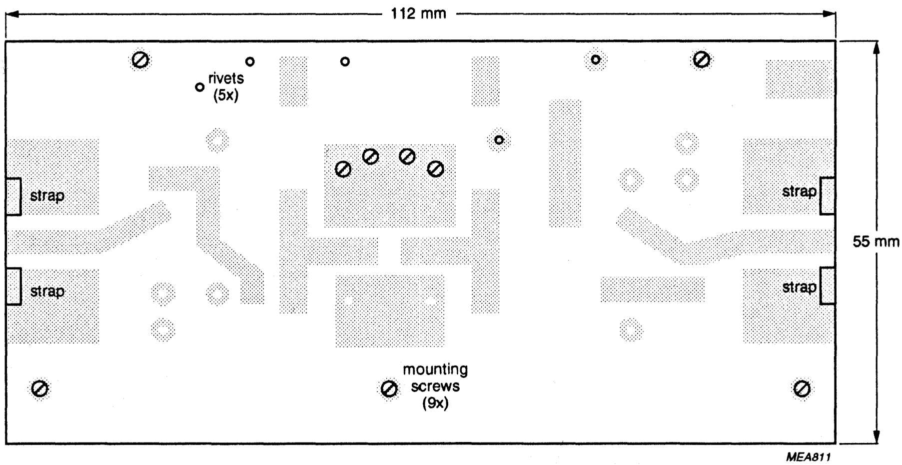
List of components

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C6	film dielectric trimmer	4 to 40 pF		2222 809 07008
C2, C7	film dielectric trimmer	2.5 to 20 pF		2222 809 07004
C3, C5	multilayer ceramic chip capacitor	1 nF		2222 581 13102
C4, C8	multilayer ceramic chip capacitor	100 nF		2222 852 47104
L1	6 turns enamelled 0.5 mm copper wire	64.7 nH	length 5.8 mm int. dia. 3 mm leads 2 x 5 mm	
L2	10 turns enamelled 0.5 mm copper wire	178 nH	length 7.4 mm int. dia. 3.5 mm leads 2 x 5 mm	
L3	4 turns enamelled 1 mm copper wire	56.9 nH	length 6.5 mm int. dia. 4.5 mm leads 2 x 5 mm	
L4	grade 3B Ferroxcube RF choke			4312 020 36640
R1	0.4 W metal film resistor	2 x 442 Ω in parallel		
R2	0.4 W metal film resistor	100 kΩ		
R3	0.4 W metal film resistor	1 kΩ		
R4	0.4 W metal film resistor	10 Ω		

Note

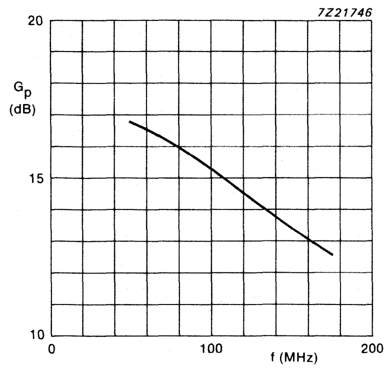
1. At V_{DS} = 28 V operation, L3 = 102.2 nH and R1 = 2 x 95.3 Ω in parallel.





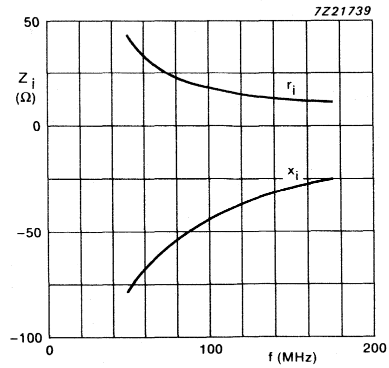
The other side of the board is fully metallized, to serve as a ground plane. Earth connections are made by means of copper foil straps and hollow rivets for a direct contact between upper and lower sheets. Heatsinking is achieved by pressing the transistor against an insulating thermal conductor (Al_2O_3-disc), which is attached to a track on the printed circuit board. This track is connected to the heatsink by means of four screws.

Fig.13 Component layout for 175 MHz test circuit.



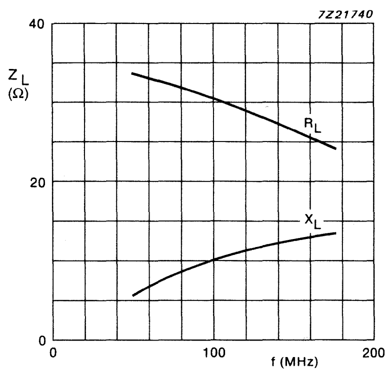
Class-AB operation; V_{DS} = 12.5 V; I_{DQ} = 100 mA; R_{GS} = 220 Ω.

Fig.14 Power gain as a function of frequency, typical values.



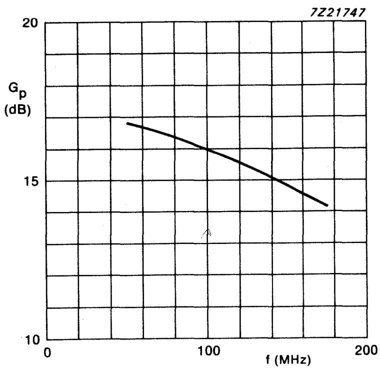
Class-AB operation; V_{DS} = 12.5 V; I_{DQ} = 100 mA; R_{GS} = 220 Ω.

Fig.15 Input impedance as a function of frequency (series components), typical values.



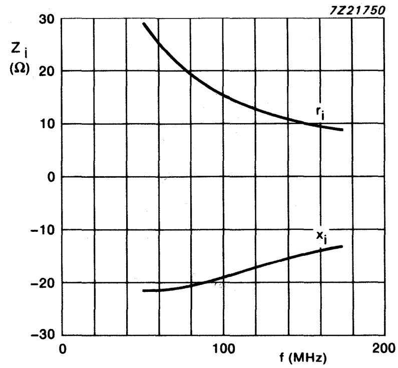
Class-AB operation; V_{DS} = 12.5 V; I_{DQ} = 100 mA; R_{GS} = 220 Ω.

Fig.16 Load impedance as a function of frequency (series components), typical values.



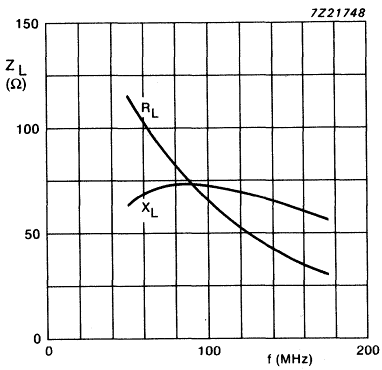
Class-B operation; V_{DS} = 28 V; I_{DQ} = 10 mA; R_{GS} = 47 Ω.

Fig.17 Power gain as a function of frequency, typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 10 mA; R_{GS} = 47 Ω.

Fig.18 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 10 mA; R_{GS} = 47 Ω.

Fig.19 Load impedance as a function of frequency (series components), typical values.

HF/VHF power MOS transistor — BLF242

FEATURES

- High power gain
- Low noise
- Easy power control
- Good thermal stability
- Withstands full load mismatch
- Gold metallization ensures excellent reliability.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for professional transmitter applications in the HF/VHF frequency range.

The transistor is encapsulated in a 4-lead, SOT123 flange envelope, with a ceramic cap. All leads are isolated from the flange.

PINNING - SOT123

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

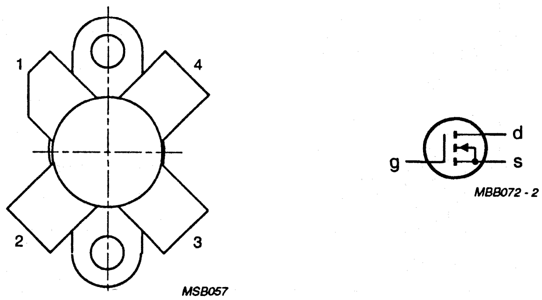


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	28	5	> 13 typ. 16	> 50 typ. 60

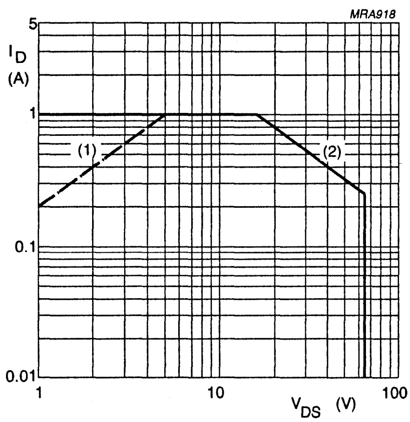
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	1	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	16	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

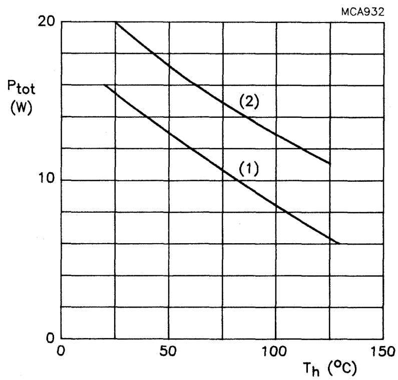
SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	T_{mb} = 25 °C; P_{tot} = 16 W	11 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	T_{mb} = 25 °C; P_{tot} = 16 W	0.3 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Continuous operation.

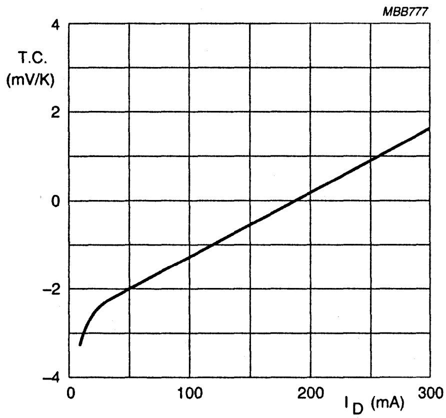
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

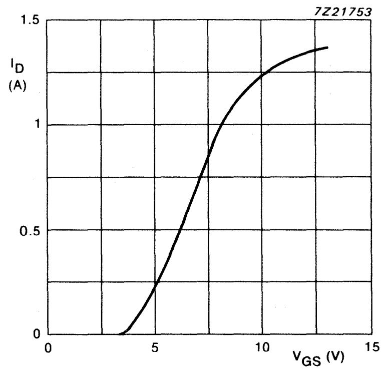
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 0.1 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	10	μA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 3 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 0.3 A; V_{DS} = 10 V	0.16	0.24	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 0.3 A; V_{GS} = 1 V	–	3.3	5	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	1.2	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	13	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	9.4	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	1.7	–	pF



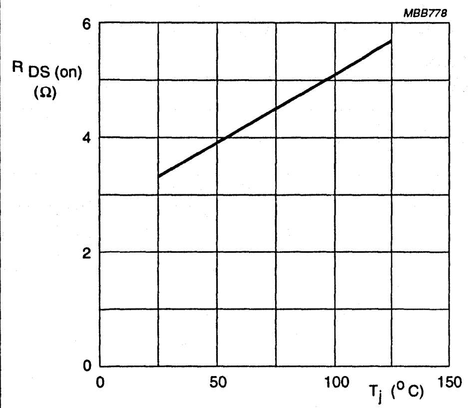
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



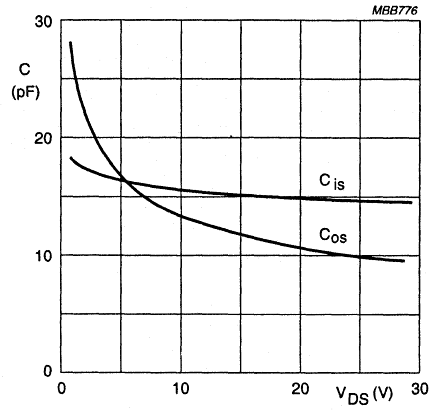
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values.



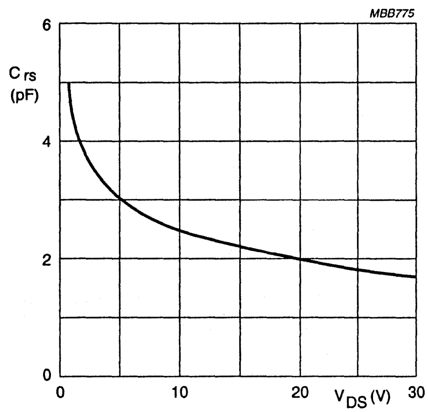
I_D = 0.3 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W; unless otherwise specified.
RF performance in CW operation in a common source class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	R_{GS} (Ω)
CW, class-B	175	28	10	5	> 13 typ. 16	> 50 typ. 60	47

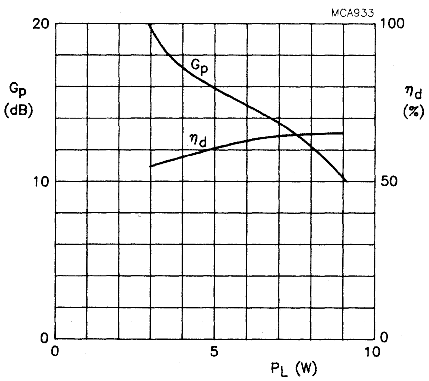
Ruggedness in class-B operation

The BLF242 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 28 V; f = 175 MHz at rated output power.

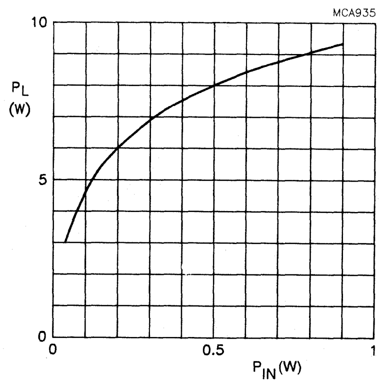
Noise figure (see Fig.11)

V_{DS} = 28 V; I_D = 0.2 A; f = 175 MHz; R_{GS} = 47 Ω; T_h = 25 °C. Input and output power matched for P_L = 5 W; F = typ. 5.5 dB.



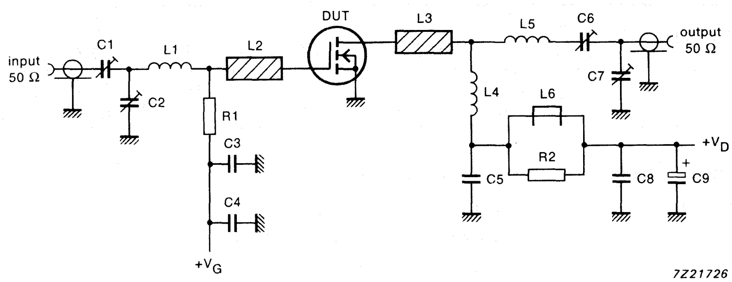
Class-B operation; V_{DS} = 28 V; I_{DQ} = 10 mA; R_{GS} = 47 Ω; f = 175 MHz.

Fig.9 Power gain and efficiency as functions of load power, typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 10 mA; R_{GS} = 47 Ω; f = 175 MHz.

Fig.10 Load power as a function of input power, typical values.



f = 175 MHz.

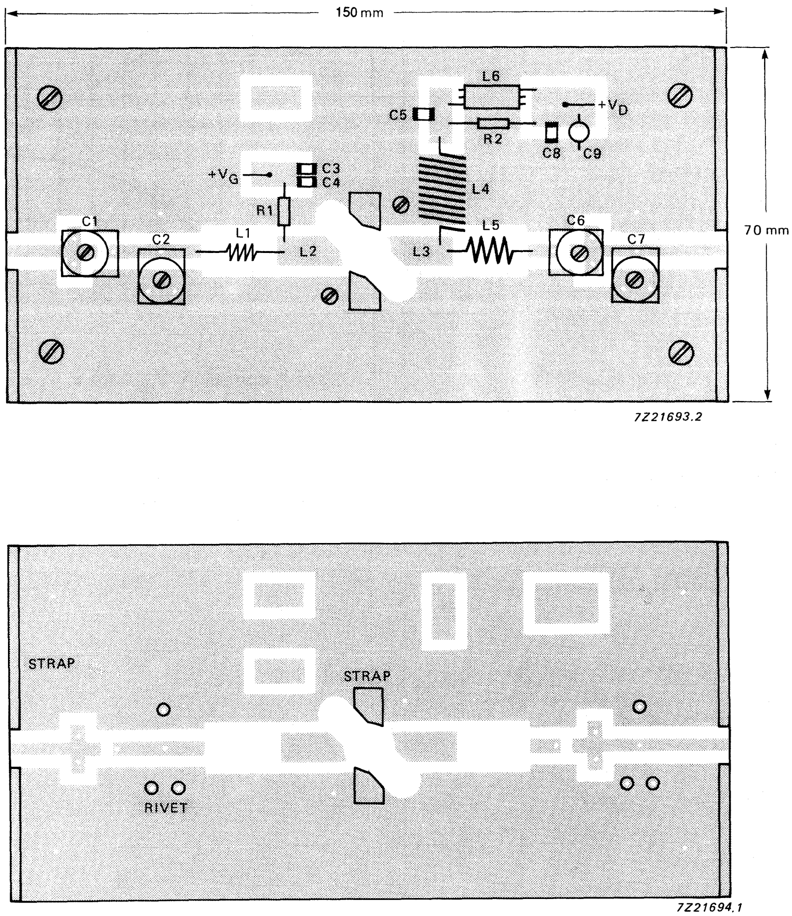
Fig.11 Test circuit for class-B operation.

List of components (class-B test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C7	film dielectric trimmer	4 to 40 pF		2222 809 08002
C3	multilayer ceramic chip capacitor (note 1)	100 pF		
C4, C8	ceramic chip capacitor	100 nF		2222 852 47104
C6	film dielectric trimmer	5 to 60 pF		2222 809 08003
C9	electrolytic capacitor	2.2 µF, 40 V		
L1	5 turns enamelled 0.7 mm copper wire	53 nH	length 5.4 mm int. dia. 3 mm leads 2 x 5 mm	
L2, L3	stripline (note 2)	30 Ω	10 x 6 mm	
L4	11 turns enamelled 1 mm copper wire	500 nH	length 15.5 mm int. dia. 8 mm leads 2 x 5 mm	
L5	5 turns enamelled 1 mm copper wire	79 nH	length 9.1 mm int. dia. 5 mm leads 2 x 5 mm	
L6	grade 3B Ferroxcube RF choke			4312 020 36640
R1	0.5 W metal film resistor	47 Ω		
R2	0.5 W metal film resistor	10 Ω		

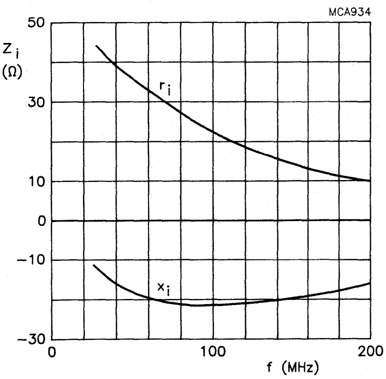
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric (ε_r = 4.5), thickness 1⁄16 inch.



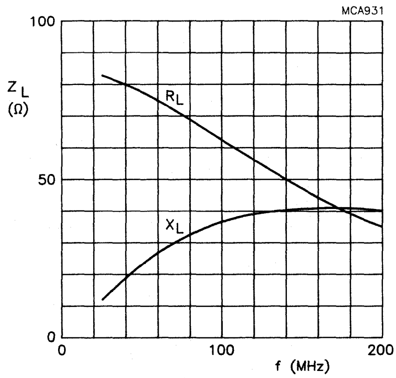
The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by fixing screws, copper straps and hollow rivets at the edges of the board and under the source.

Fig.12 Component layout for 175 MHz class-B test circuit.



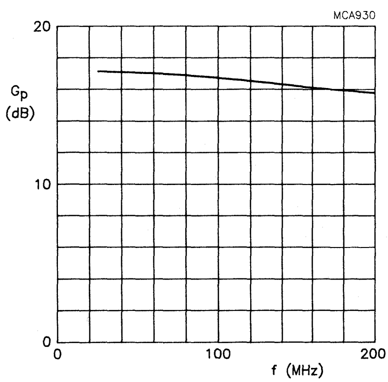
Class-B operation; V_{DS} = 28 V; P_L = 30 W;
R_{GS} = 47 Ω; T_h = 25 °C.

Fig.13 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; P_L = 30 W;
R_{GS} = 47 Ω; T_h = 25 °C.

Fig.14 Load impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; P_L = 30 W;
R_{GS} = 47 Ω; T_h = 25 °C.

Fig.15 Power gain as a function of frequency, typical values.

VHF power MOS transistor BLF244

FEATURES

- High power gain
- Low noise figure
- Easy power control
- Good thermal stability
- Withstands full load mismatch
- Gold metallization ensures excellent reliability.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for large signal amplifier applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead SOT123 flange envelope, with a ceramic cap. All leads are isolated from the flange.

Matched gate-source voltage (V_{GS}) groups are available on request.

PINNING - SOT123

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

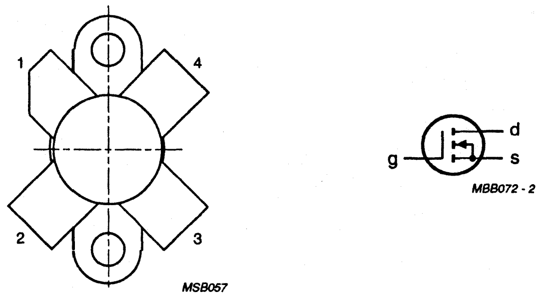


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	28	15	> 13	> 50

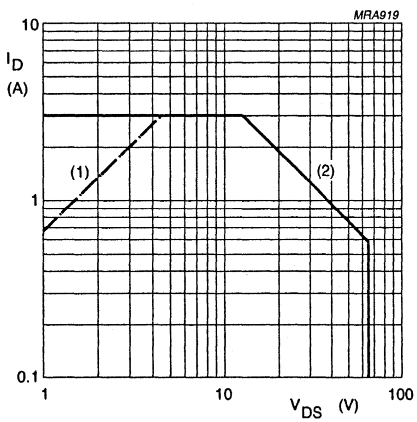
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	3	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	38	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

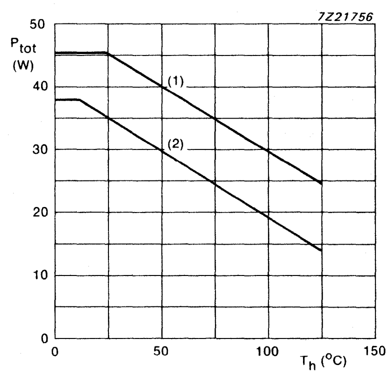
SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	T_{mb} = 25 °C; P_{tot} = 38 W	4.6 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	T_{mb} = 25 °C; P_{tot} = 38 W	0.3 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Short-time operation during mismatch.

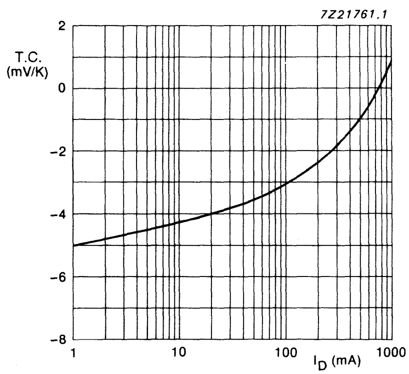
(2) Continuous operation.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

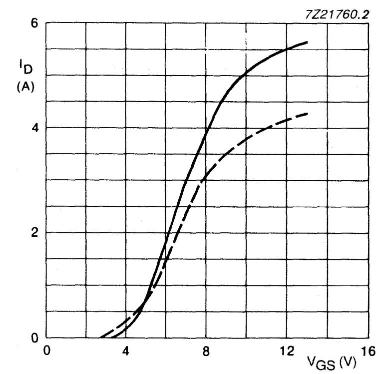
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 5 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	1	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 5 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched devices	I_D = 5 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 0.75 A; V_{DS} = 10 V	0.6	–	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 0.75 A; V_{GS} = 10 V	–	0.8	1.5	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	5	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	60	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	40	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	4.5	–	pF
F	noise figure (see Fig.13)	I_D = 0.5 A; V_{DS} = 28 V; R1 = 23 Ω; T_h = 25 °C; f = 175 MHz; $R_{th\ mb-h}$ = 0.3 K/W	–	4.3	–	dB



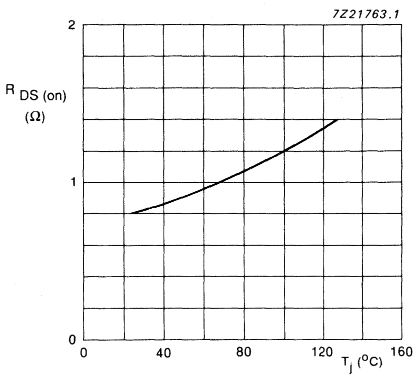
V_{DS} = 10 V; valid for T_j = 25 to 125 °C.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



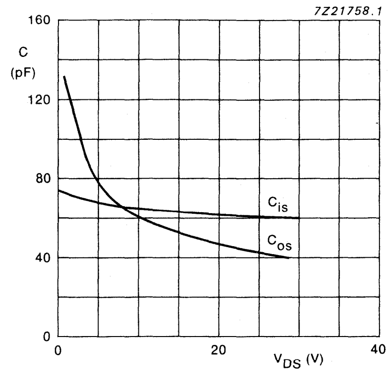
V_{DS} = 10 V.
solid line: T_j = 25 °C.
dotted line: T_j = 125 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values.



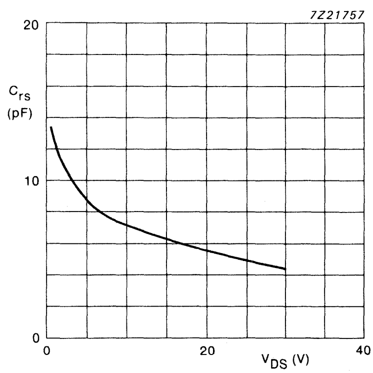
V_{GS} = 10 V; I_D = 0.75 A.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W; unless otherwise specified.
RF performance in CW operation in a common source class-B circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	Z_i (Ω) (note 1)	Z_L (Ω)	R1 (Ω)
CW, class-B	175	28	25	15	> 13 typ. 17	> 50 typ. 65	3.0 – j4.0	6.3 + j9.8	46.4//46.4
	175	12.5	25	6	typ. 15	typ. 60	3.0 – j4.0	4.5 + j3.3	100

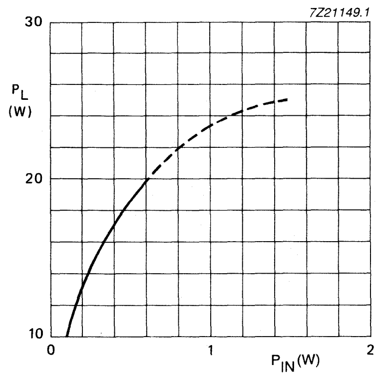
Note

1. R1 included.

Ruggedness in class-B operation

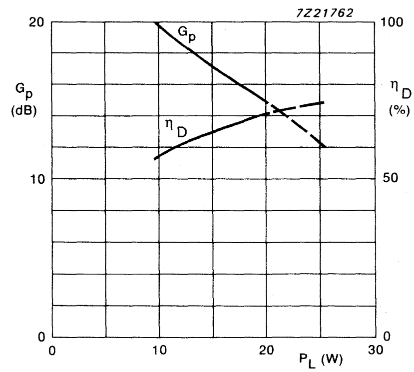
The BLF244 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W; at rated load power.



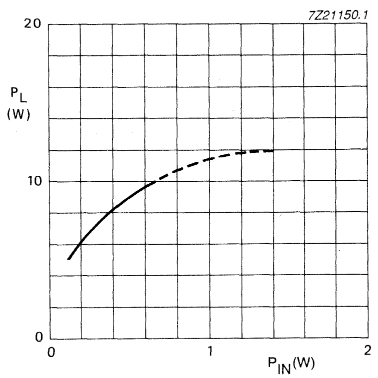
Class-B operation; V_{DS} = 28 V; I_{DQ} = 25 mA; f = 175 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W.

Fig.9 Load power as a function of input power, typical values.



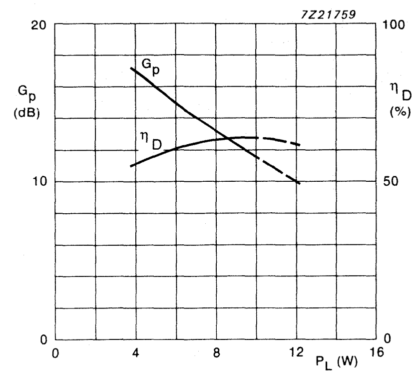
Class-B operation; V_{DS} = 28 V; I_{DQ} = 25 mA; f = 175 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W.

Fig.10 Power gain and efficiency as functions of load power, typical values.



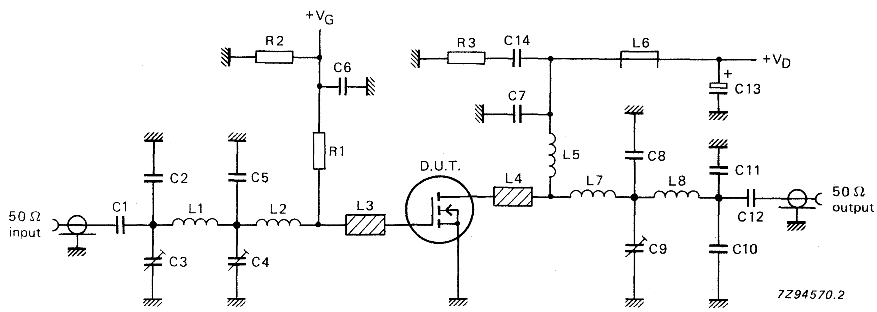
Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 25 mA;
f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.11 Load power as a function of input power, typical values.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 25 mA;
f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.12 Power gain and efficiency as functions of load power, typical values.



f = 175 MHz.

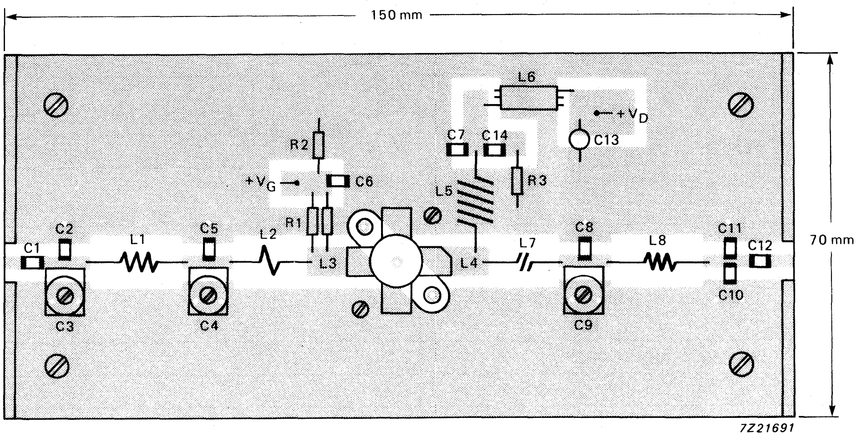
Fig.13 Test circuit for class-B operation.

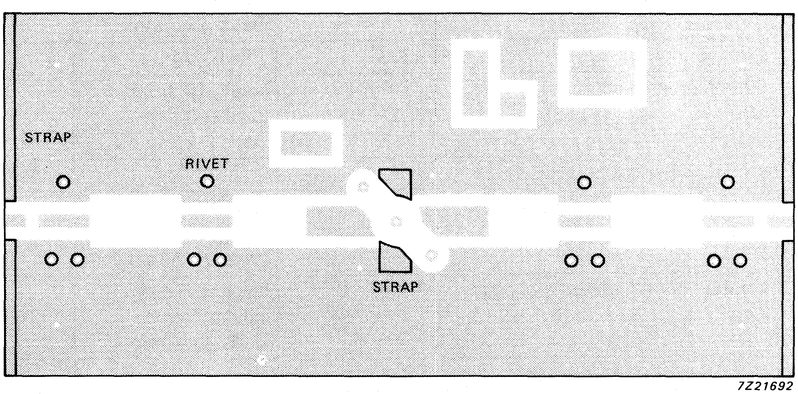
List of components (class-B test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C12	multilayer ceramic chip capacitor (note 1)	680 nF		
C2	multilayer ceramic chip capacitor (note 1)	20 pF		
C3, C4, C9	film dielectric trimmer	5 to 60 pF		2222 809 08003
C5	multilayer ceramic chip capacitor (note 1)	75 pF		
C6	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C7	multilayer ceramic chip capacitor (note 1)	100 pF		
C8	multilayer ceramic chip capacitor (note 1)	47 pF		
C10, C11	multilayer ceramic chip capacitor (note 1)	11 pF		
C13	solid tantalum capacitor	2.2 μF		
C14	multilayer ceramic chip capacitor	100 nF		2222 852 47104
L1	4 turns enamelled 1 mm copper wire	32 nH	length 6.3 mm int. dia. 3 mm leads 2 x 5 mm	
L2	1 turn enamelled 1 mm copper wire	12.2 nH	int. dia. 5.6 mm leads 2 x 5 mm	
L3, L4	stripline (note 2)	30 Ω	15 x 6 mm	
L5	6 turns enamelled 1 mm copper wire	119 nH	length 10.4 mm int. dia. 6 mm leads 2 x 5 mm	
L6	grade 3B Ferroxcube RF choke			4312 020 36640
L7	2 turns enamelled 1 mm copper wire	19 nH	length 2.4 mm int. dia. 3 mm leads 2 x 5 mm	
L8	4 turns enamelled 1 mm copper wire	28.5 nH	length 8.5 mm int. dia. 3 mm leads 2 x 5 mm	
R1	metal film resistor (note 3)			
R2	0.4 W metal film resistor	1 MΩ		
R3	0.4 W metal film resistor	10 Ω		

Notes

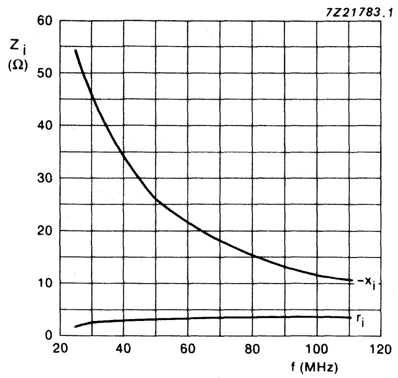
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric ($\varepsilon_r = 4.5$), thickness 1⁄16 inch.
3. Refer to Application Information for value.





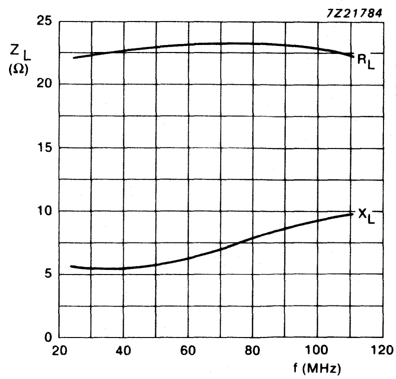
The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being unetched copper to serve as ground plane. Earth connections are made by fixing screws, copper straps and hollow rivets under the sources and around the edges to provide a direct contact between the copper on the component side and the ground plane.

Fig.14 Component layout for 175 MHz class-B test circuit.



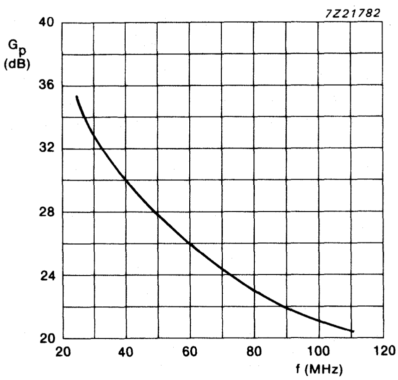
Class-B operation; V_{DS} = 28 V; I_{DQ} = 25 mA;
P_L = 15 W; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.15 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 25 mA;
P_L = 15 W; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.16 Load impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 25 mA;
P_L = 15 W; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.17 Power gain as a function of frequency, typical values.

VHF power MOS transistor — BLF245

FEATURES

- High power gain
- Low noise figure
- Easy power control
- Good thermal stability
- Withstands full load mismatch.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for large signal amplifier applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead SOT123 flange envelope, with a ceramic cap. All leads are isolated from the flange.

Matched gate-source voltage (V_{GS}) groups are available on request.

PINNING - SOT123

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

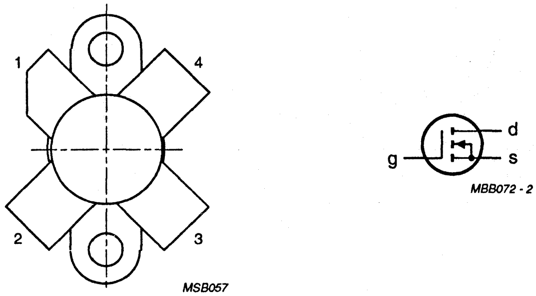


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	28	30	> 13	> 50

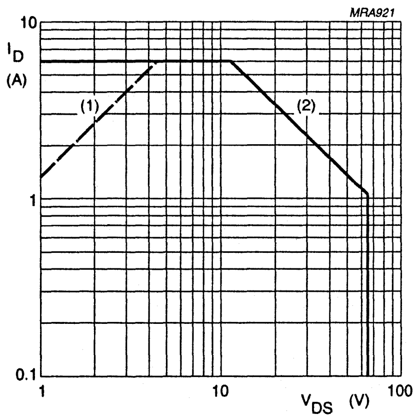
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage	$V_{GS} = 0$	–	65	V
$\pm V_{GS}$	gate-source voltage	$V_{DS} = 0$	–	20	V
I_D	DC drain current		–	6	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	68	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

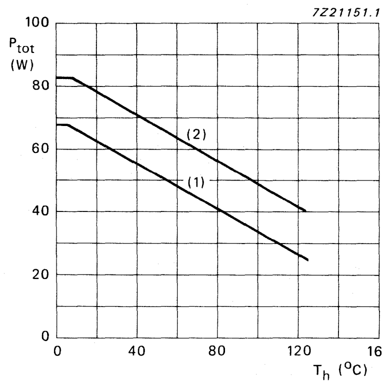
SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	T_{mb} = 25 °C; P_{tot} = 68 W	2.6 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	T_{mb} = 25 °C; P_{tot} = 68 W	0.3 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Continuous operation.

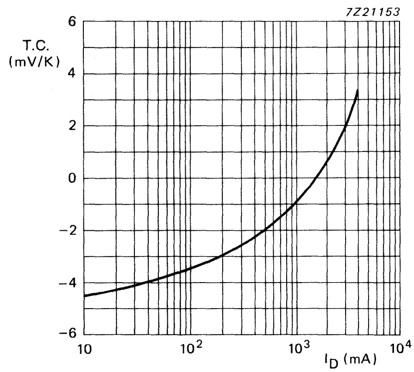
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

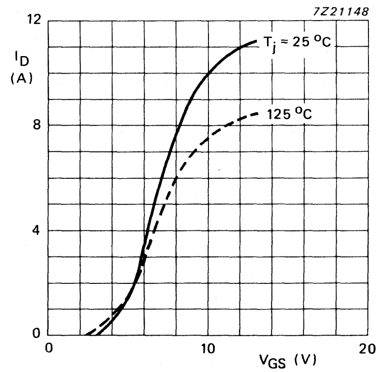
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 10 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	2	mA
I_{GSS}	gate-source leakage current	±V_{GS} = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 10 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched devices	I_D = 10 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 1.5 A; V_{DS} = 10 V	1.2	1.9	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 1.5 A; V_{GS} = 10 V	–	0.4	0.75	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	10	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	125	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	75	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	7	–	pF
F	noise figure (see Fig.14)	input and output power matched for: I_D = 1 A; V_{DS} = 28 V; P_L = 30 W; R1 = 1 kΩ; T_h = 25 °C; f = 175 MHz	–	2	–	dB



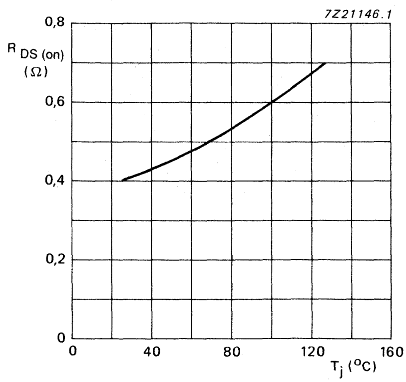
V_{DS} = 10 V; valid for T_j = 25 to 125 °C.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



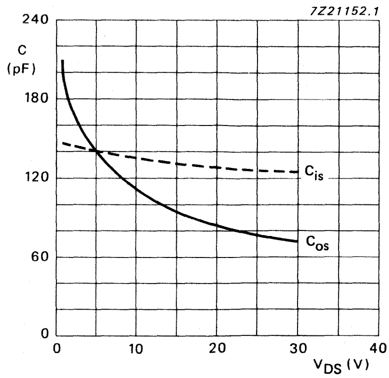
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values.



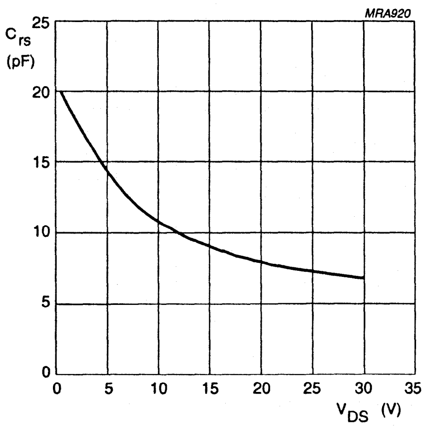
V_{GS} = 10 V; I_D = 1.5 A.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W; R1 = 1 kΩ.
RF performance in CW operation in a common source class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	Z_i (Ω) (note 1)	Z_L (Ω)
CW, class-B	175	28	50	30	> 13 typ. 15.5	< 50 typ. 67	2.0 – j2.7	3.9 + j4.4
	175	12.5	50	12	typ. 12	typ. 66	2.4 – j2.5	3.8 + j1.3

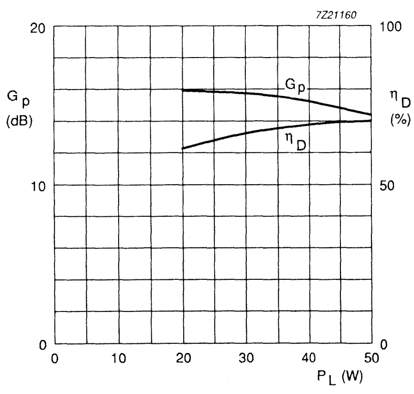
Note

1. R1 included.

Ruggedness in class-B operation

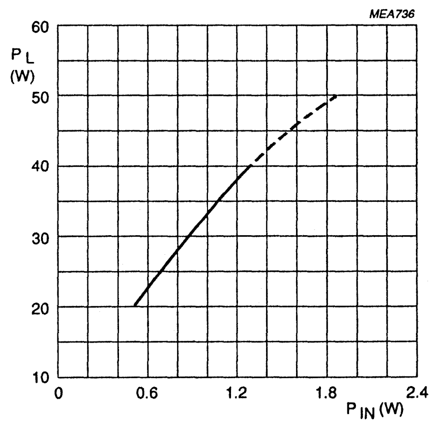
The BLF245 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W; at rated load power.



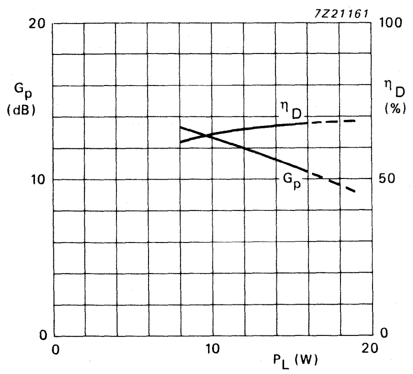
Class-B operation; V_{DS} = 28 V; I_{DQ} = 50 mA; f = 175 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W.

Fig.9 Power gain and efficiency as functions of load power, typical values.



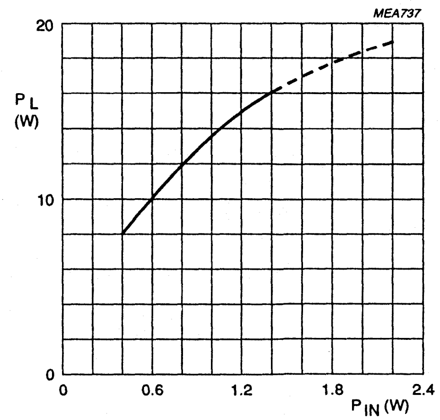
Class-B operation; V_{DS} = 28 V; I_{DQ} = 50 mA; f = 175 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W.

Fig.10 Load power as a function of input power, typical values.



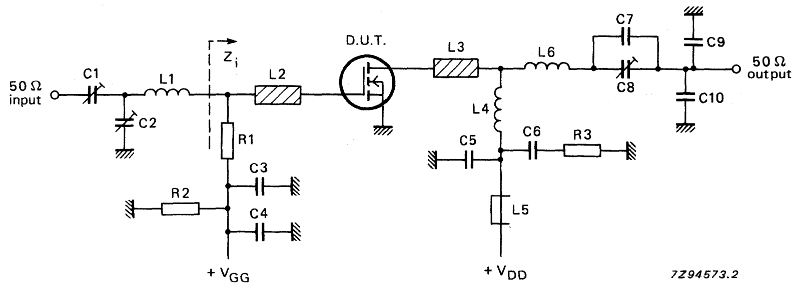
Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 50 mA; f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.11 Power gain and efficiency as functions of load power, typical values.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 50 mA; f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.12 Load power as a function of input power, typical values.



f = 175 MHz.

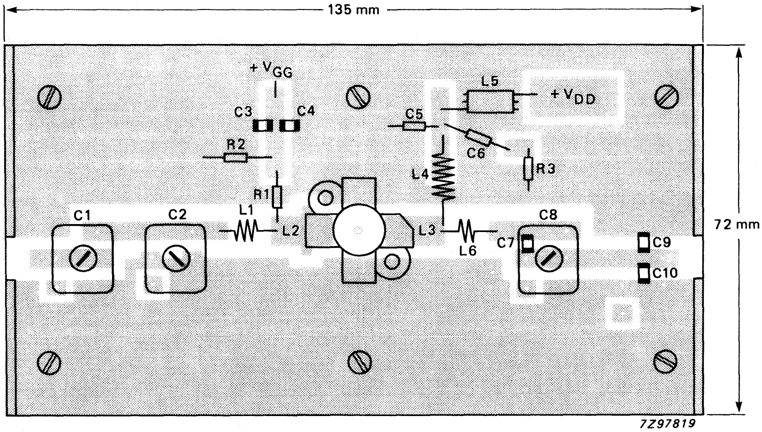
Fig.13 Test circuit for class-B operation.

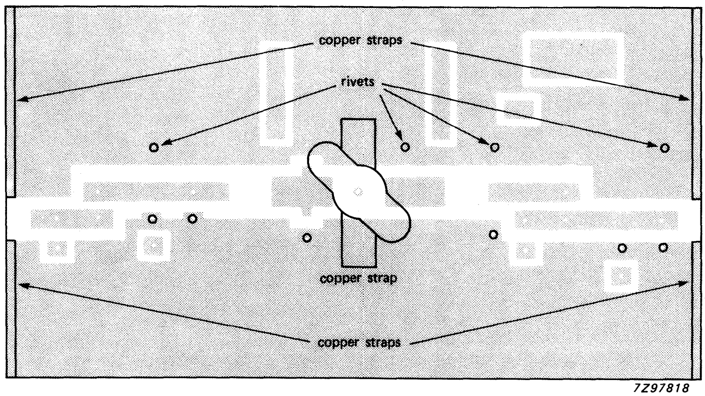
List of components (class-B test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	4 to 40 pF		2222 809 07008
C2, C8	film dielectric trimmer	5 to 60 pF		2222 809 07011
C3	multilayer ceramic chip capacitor	100 pF		2222 854 13101
C4, C6	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C5	ceramic capacitor	100 pF		2222 680 10101
C7	multilayer ceramic chip capacitor (note 1)	18 pF		
C9	multilayer ceramic chip capacitor (note 1)	27 pF		
C10	multilayer ceramic chip capacitor (note 1)	24 pF		
L1	3 turns enamelled 0.5 mm copper wire	13.5 nH	length 3.5 mm int. dia. 2 mm leads 2 x 2 mm	
L2, L3	stripline (note 2)	30 Ω	10 x 6 mm	
L4	6 turns enamelled 1.5 mm copper wire	98 nH	length 12.5 mm int. dia. 5 mm leads 2 x 2 mm	
L5	grade 3B Ferroxcube RF choke			4312 020 36640
L6	2 turns enamelled 1.5 mm copper wire	24.5 nH	length 4 mm int. dia. 5 mm leads 2 x 2 mm	
R1	metal film resistor	1 kΩ		
R2	metal film resistor	1 MΩ		
R3	metal film resistor	10 Ω		

Notes

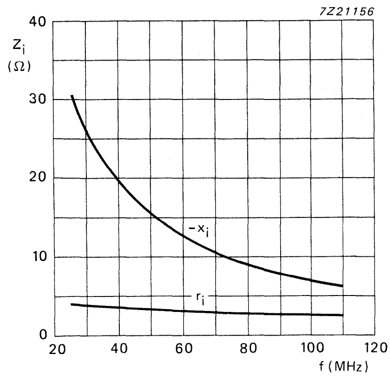
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are mounted on a double copper-clad PCB with epoxy fibre-glass dielectric (ε_r = 4.5), thickness 1⁄16 inch.





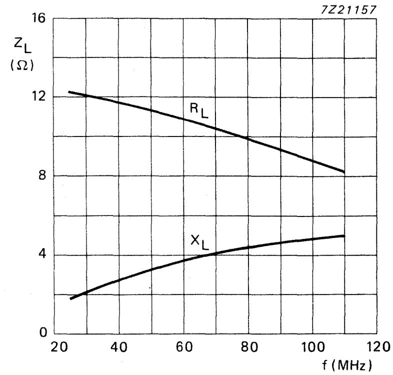
The circuit and components are situated on one side of the epoxy fibre-glass board; the other side is unetched copper and serves as an earth. Earth connections are made by means of fixing screws, hollow rivets and copper straps under the sources and around the edges, to provide a direct contact between the copper on the component side and the ground plane.

Fig.14 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 50 mA;
P_L = 30 W; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.15 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 50 mA;
P_L = 30 W; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.16 Load impedance as a function of frequency (series components), typical values.

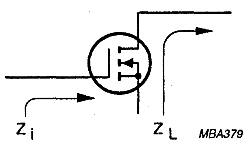
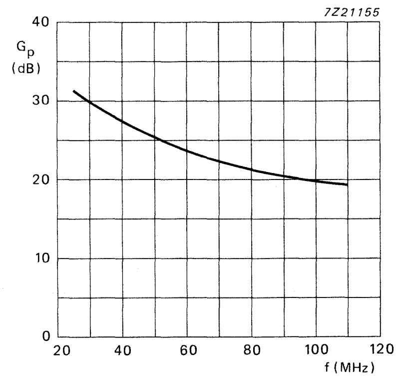


Fig.17 Definition of MOS impedance.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 50 mA;
P_L = 30 W; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.3 K/W.

Fig.18 Power gain as a function of frequency, typical values.

VHF push-pull power MOS transistor

BLF245B

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

Dual push-pull silicon N-channel enhancement mode vertical D-MOS transistor designed for large signal amplifier applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead, SOT279 balanced flange envelope, with a ceramic cap. The mounting flange provides the common source connection for the transistors.

PINNING - SOT279

PIN	DESCRIPTION
1	gate 1
2	drain 1
3	gate 2
4	drain 2
5	source

PIN CONFIGURATION

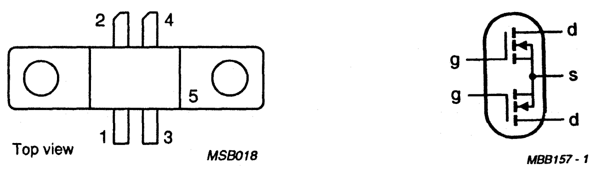


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a push-pull common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	28	30	> 14	> 55

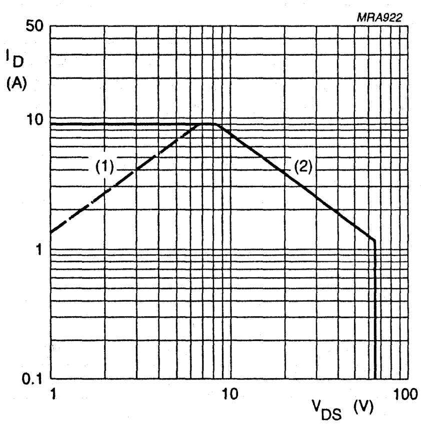
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).
Per transistor section unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	4.5	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C; total device; both sections equally loaded	–	75	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

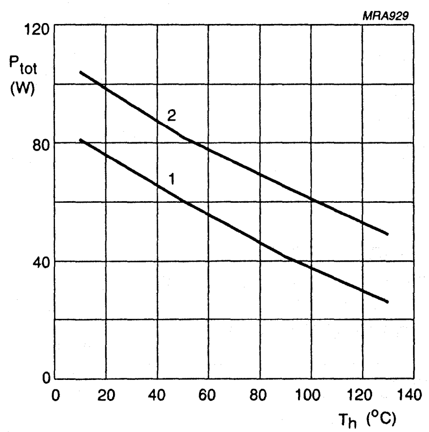
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded	2.3 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded	0.3 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.
Total device; both sections equally loaded.

Fig.2 DC SOAR.



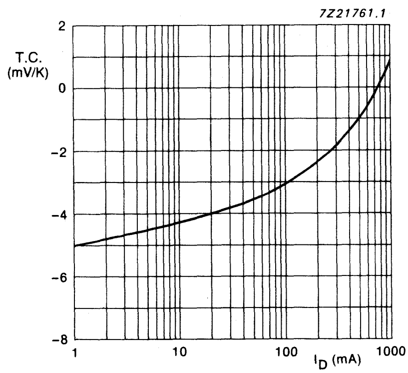
(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS (per section)

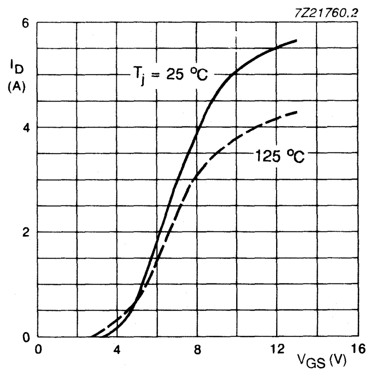
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 5 mA; V_{GS} = 0	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	1	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 5 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 0.75 A; V_{DS} = 10 V	600	850	–	mS
$R_{DS(on)}$	drain-source on-state resistance	I_D = 0.75 A; V_{GS} = 10 V	–	0.8	1.5	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	5	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	60	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	40	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	4.5	–	pF



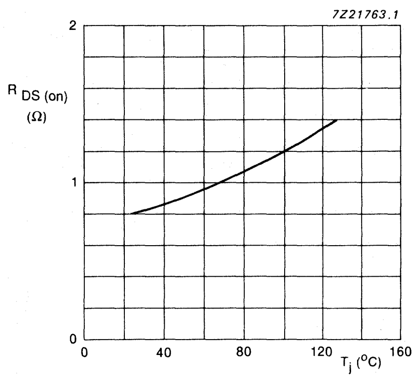
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values per section.



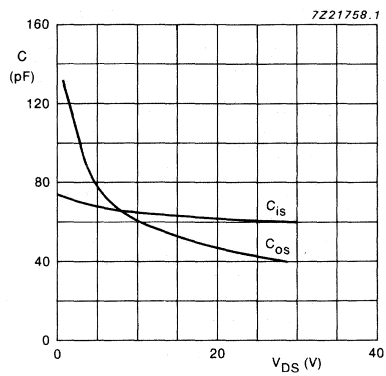
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values per section.



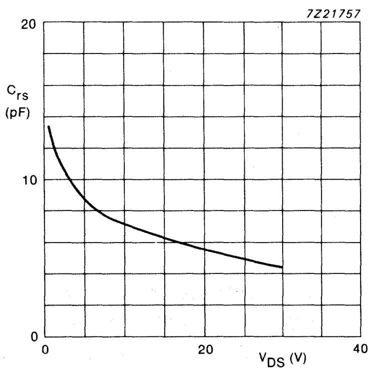
$I_D = 0.75$ A; $V_{GS} = 10$ V

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values per section.



$V_{GS} = 0$; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values per section.



$V_{GS} = 0$; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values per section.

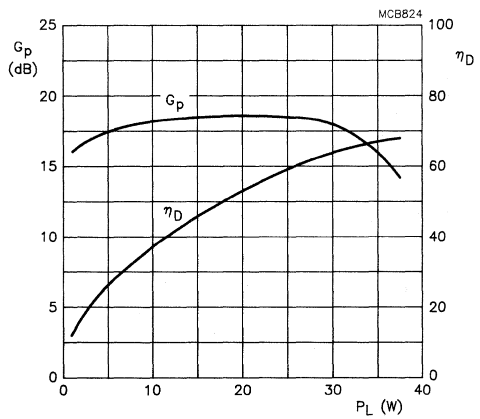
APPLICATION INFORMATION FOR CLASS-B OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.3 K/W; unless otherwise specified.
RF performance in a push-pull, common source, class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	28	2 x 25	30	> 14 typ. 18	> 55 typ. 65

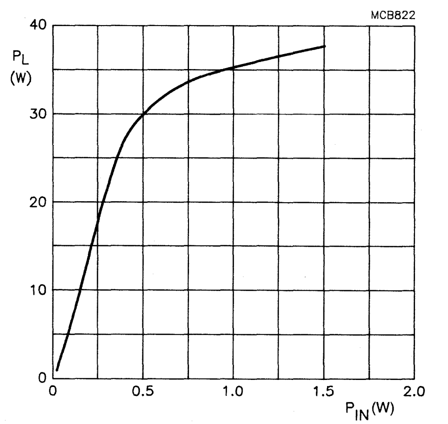
Ruggedness in class-B operation

The BLF245B is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases, under the following conditions:
V_{DS} = 28 V, f = 175 MHz at rated output power.



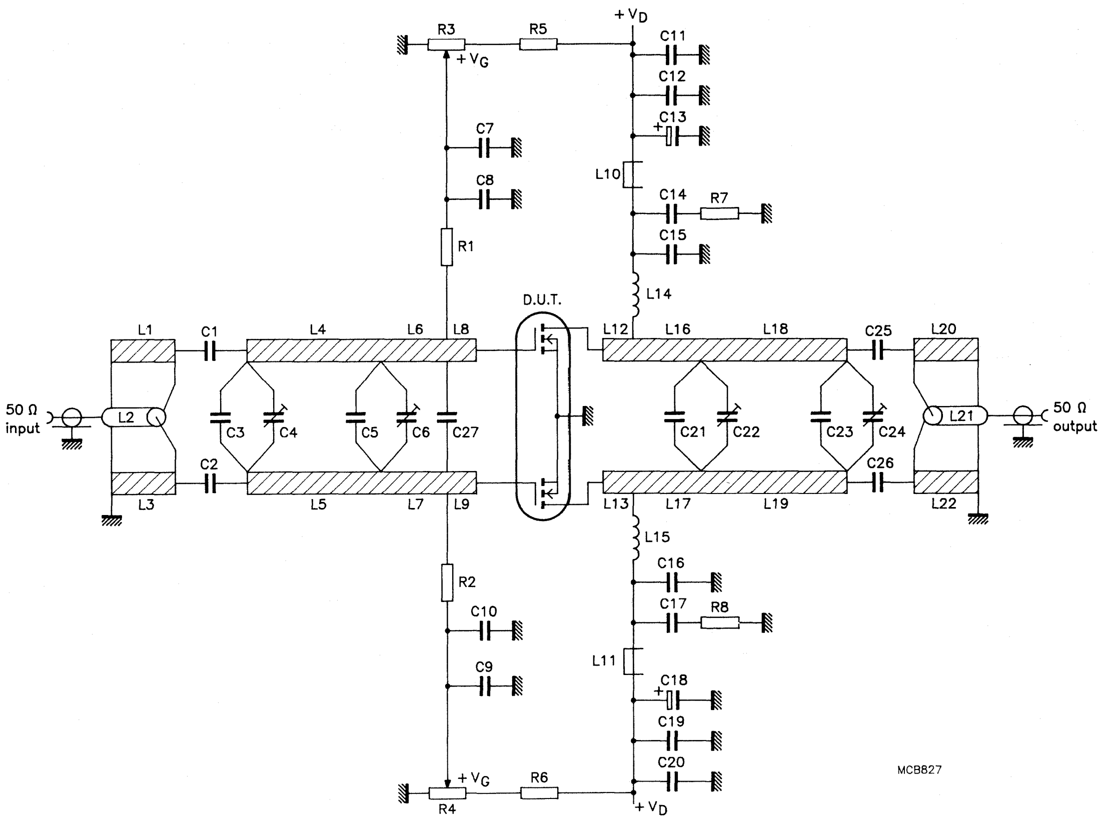
Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 25 mA; Z_L = 8.8 + j12.7 Ω; f = 175 MHz.

Fig.9 Power gain and efficiency as functions of output power, typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 25 mA; Z_L = 8.8 + j12.7 Ω; f = 175 MHz.

Fig.10 Load power as a function of input power, typical values.



f = 175 MHz.

Fig.11 Test circuit for class-B operation.

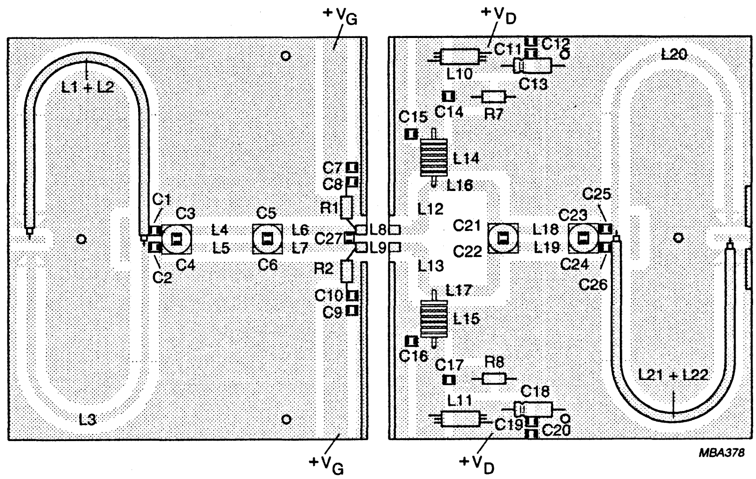
List of components (see test circuit)

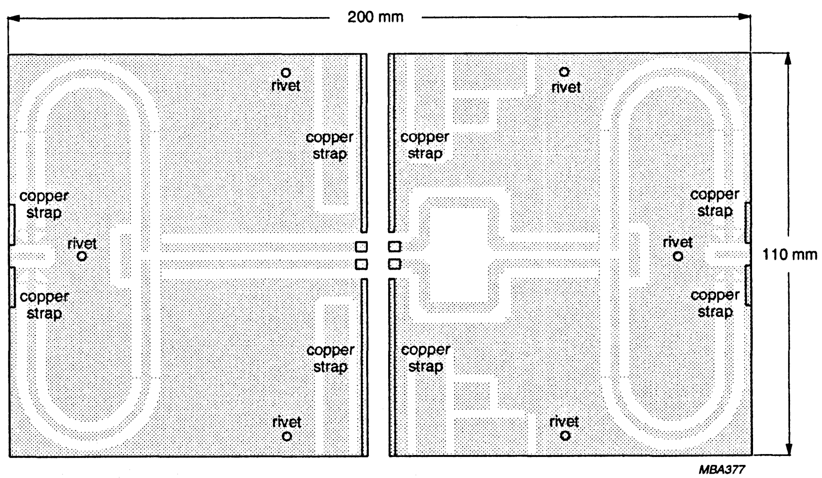
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor (note 1)	270 pF		
C3	multilayer ceramic chip capacitor (note 1)	24 pF		
C4	film dielectric trimmer	4 to 60 pF		2222 809 08002
C5, C25, C26	multilayer ceramic chip capacitor (note 1)	91 pF		
C6, C22, C24	film dielectric trimmer	5 to 60 pF		2222 809 08003

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C7, C9, C12, C14, C17, C19	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C8, C10	multilayer ceramic chip capacitor (note 1)	680 pF		
C11, C20	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C13, C18	electrolytic capacitor	10 µF, 63 V		
C15, C16	multilayer ceramic chip capacitor (note 1)	100 pF		
C21, C27	multilayer ceramic chip capacitor (note 1)	75 pF		
C23	multilayer ceramic chip capacitor (note 1)	36 pF		
L1, L3, L20, L22	stripline (note 2)	55 Ω	length 111 mm width 2.5 mm	
L2, L21	semi-rigid cable	50 Ω	length 111 mm ext. dia. 2.2 mm	
L4, L5	stripline (note 2)	49.5 Ω	length 28 mm width 3 mm	
L6, L7	stripline (note 2)	49.5 Ω	length 22.5 mm width 3 mm	
L8, L9	stripline (note 2)	49.5 Ω	length 4.5 mm width 3 mm	
L10, L11	grade 3B Ferroxcube RF choke			4312 020 36642
L12, L13	stripline (note 2)	49.5 Ω	length 21 mm width 3 mm	
L14, L15	4 turns enamelled 1 mm copper wire	70 nH	length 9 mm int. dia. 6 mm leads 2 x 5 mm	
L16, L17	stripline (note 2)	49.5 Ω	length 30 mm width 3 mm	
L18, L19	stripline (note 2)	49.5 Ω	length 26 mm width 3 mm	
R1, R2	0.4 W metal film resistor	10 Ω		
R3, R4	10 turns potentiometer	50 kΩ		
R5, R6	0.4 W metal film resistor	205 kΩ		
R7, R8	0.4 W metal film resistor	10 Ω		

Notes

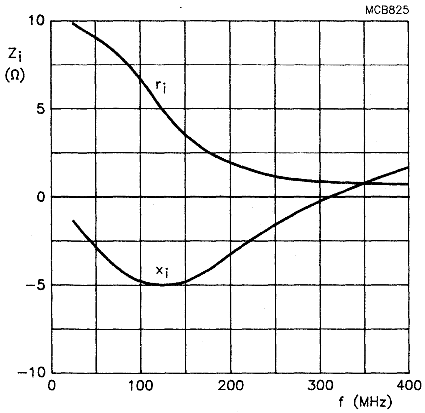
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with epoxy glass dielectric ($\varepsilon_r = 4.5$), thickness 1⁄16 inch. The other side of the board is fully metallized and used as a ground plane. The ground planes on each side of the board are connected together by means of copper straps and hollow rivets.





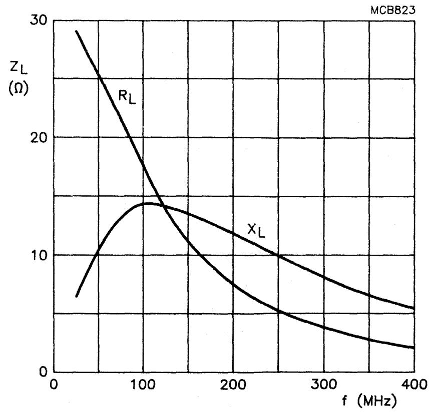
The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as a ground. Earth connections are made by means of copper straps and hollow rivets for a direct contact between the upper and lower sheets.

Fig.12 Component layout for 175 MHz test circuit.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 25 mA; R_{GS} = 10 Ω; P_L = 30 W (total device).

Fig.13 Input impedance as a function of frequency (series components), typical values per section.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 25 mA; R_{GS} = 10 Ω; P_L = 30 W (total device).

Fig.14 Load impedance as a function of frequency (series components), typical values per section.

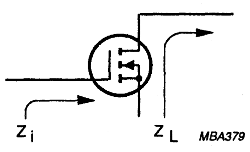
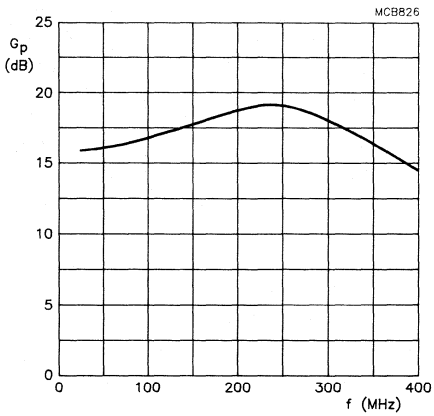


Fig.15 Definition of MOS impedance.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 25 mA; R_{GS} = 10 Ω; P_L = 30 W (total device).

Fig.16 Power gain as a function of frequency, typical values per section.

FEATURES

- High power gain
- Low noise figure
- Easy power control
- Good thermal stability
- Withstands full load mismatch.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for large signal amplifier applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead, SOT121 flange envelope, with a ceramic cap. All leads are isolated from the flange.

A marking code, showing gate-source voltage (V_{GS}) information is provided for matched pair applications. Refer to the 'General' section for further information.

PINNING - SOT121

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION

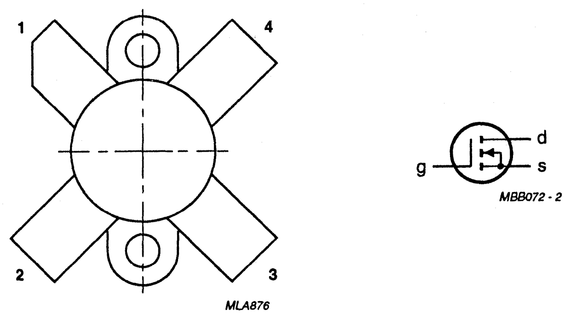


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	108	28	80	≥ 16	≥ 55

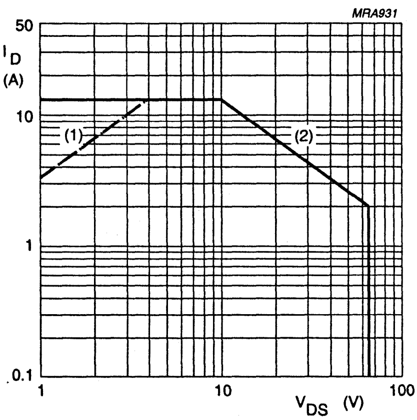
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	13	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	130	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

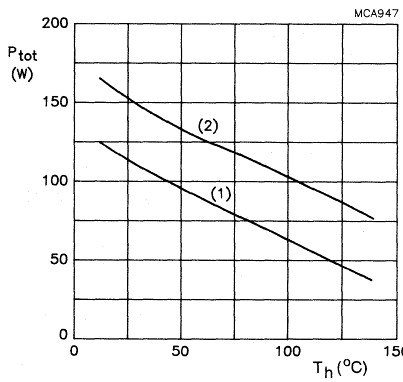
SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	1.35 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	0.2 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Continuous operation.

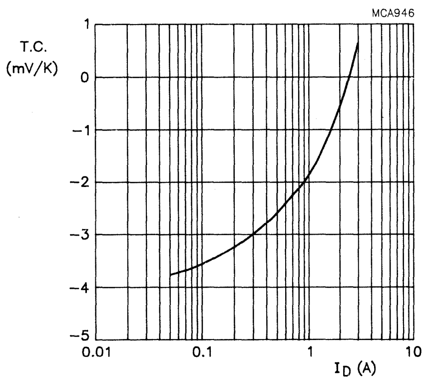
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

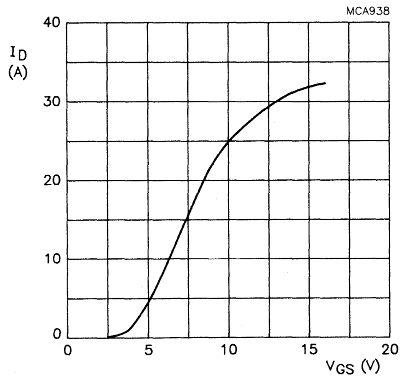
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 50 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	2.5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 50 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched pairs	I_D = 50 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 2.5 A or 5 A; V_{DS} = 10 V	3	4.2	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 5 A; V_{GS} = 10 V	–	0.2	0.3	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	22	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	225	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	180	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	25	–	pF



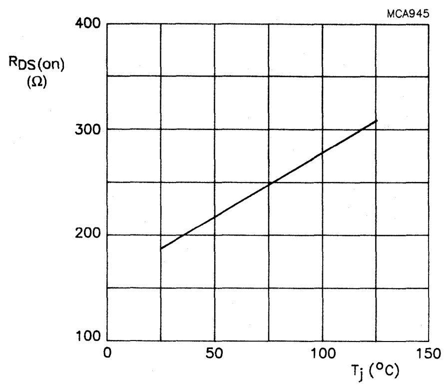
V_{DS} = 10 V; valid for T_h = 25 to 70 °C.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



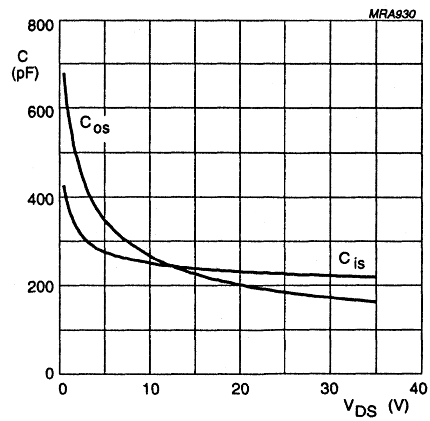
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values.



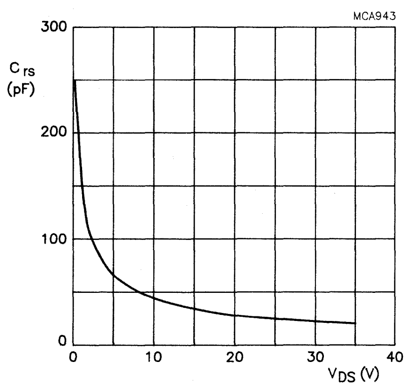
V_{GS} = 10 V; I_D = 5 A.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.2 K/W; R_{GS} = 12 Ω; unless otherwise specified.
RF performance in CW operation in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	108	28	0.1	80	> 16	> 55
CW, class-B	108	28	0.1	80	typ. 18	typ. 65
CW, class-C	108	28	0 (note 1)	80	typ. 15	typ. 72

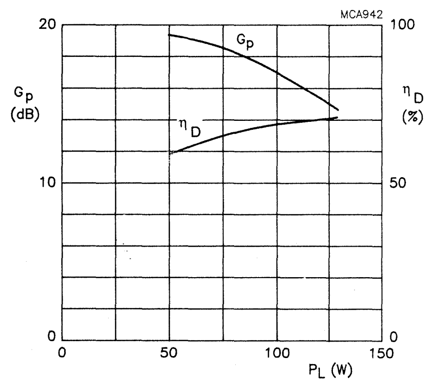
Note

1. V_{GS} = 0 (class-C).

Ruggedness in class-B operation

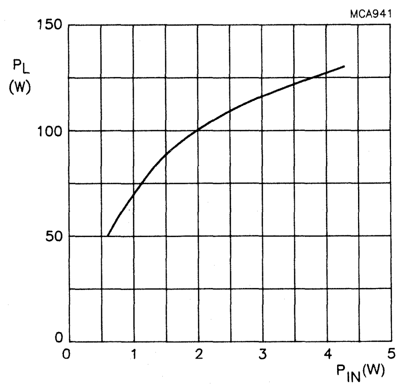
The BLF246 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 28 V; f = 108 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0.2 K/W; at rated output power.



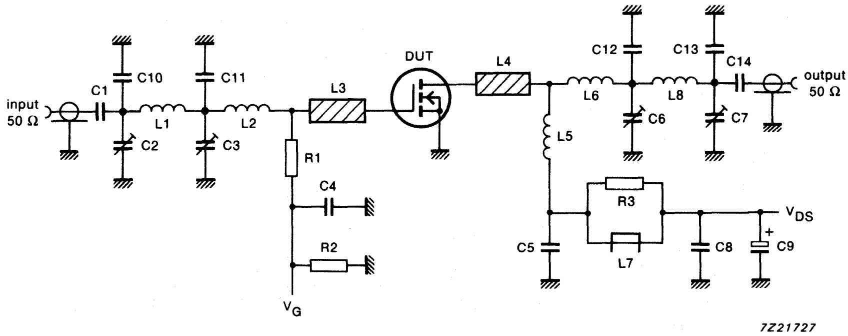
Class-B operation; V_{DS} = 28 V; I_{DQ} = 0.1 A; R_{GS} = 12 Ω; f = 108 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0.2 K/W.

Fig.9 Power gain and efficiency as functions of load power, typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 0.1 A; R_{GS} = 12 Ω; f = 108 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0.2 K/W.

Fig.10 Load power as a function of input power, typical values.



f = 108 MHz.

Fig.11 Test circuit for class-B operation.

Noise figure

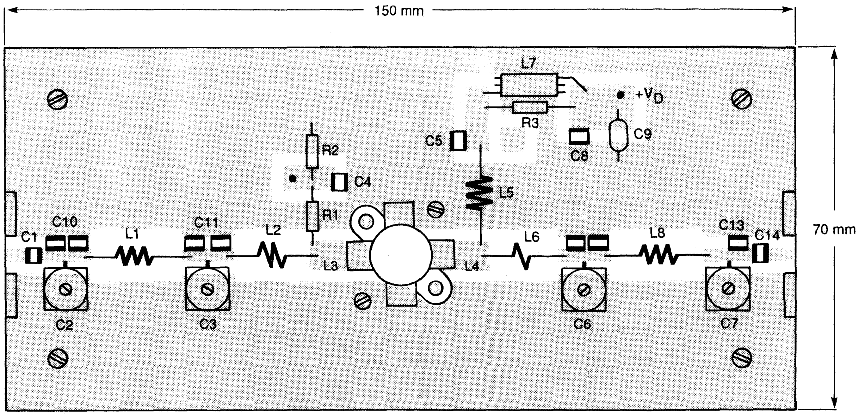
Measured with 80 W power-matched source and load in the test circuit (see Fig.11) with V_{DS} = 28 V; I_D = 2 A; f = 108 MHz; R_{GS} = 27 Ω; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.2 K/W; F = typ. 3 dB.

List of components (class-B test circuit)

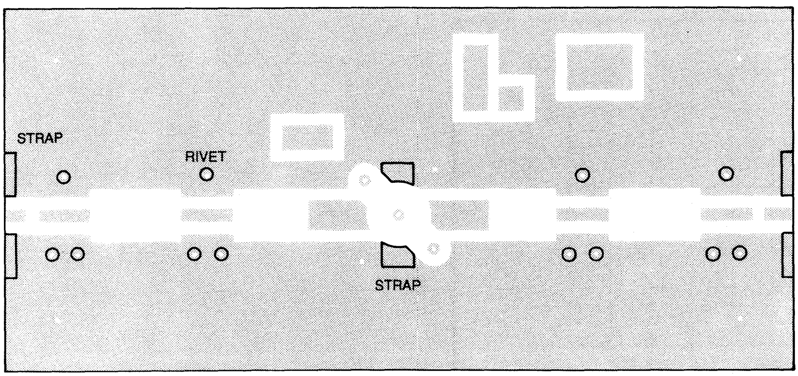
COMPONENT	DESCRIPTION	VALUE	DIMENSION	CATALOGUE NO.
C1, C4, C5, C8, C14	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C2, C3. C6. C7	film dielectric trimmer	5 to 60 pF		2222 809 08003
C9	electrolytic capacitor	2.2 μF, 63 V		2222 030 38228
C10	multilayer ceramic chip capacitor; note 1	68 pF + 39 pF in parallel		
C11	multilayer ceramic chip capacitor; note 1	69 pF + 100 pF in parallel		
C12	multilayer ceramic chip capacitor; note 1	2 × 100 pF in parallel		
C13	multilayer ceramic chip capacitor; note 1	62 pF		
L1	5 turns enamelled 0.6 mm copper wire	52 nH	length 6.5 mm int. dia. 3 mm leads 2 × 10 mm	
L2	2 turns enamelled 0.6 mm copper wire	19 nH	length 3.5 mm int. dia.3 mm leads 2 × 7.5 mm	
L3, L4	stripline; note 2	31 Ω	length 13 mm width 6 mm	
L5	3 turns enamelled 1.6 mm copper wire	36 nH	length 12 mm int. dia.6 mm leads 2 × 5 mm	
L6	hairpin of enamelled 1.6 mm copper wire	14 nH	length 20 mm	
L7	Ferroxcube grade 3B HF choke			4312 020 36640
L8	3 turns enamelled 1.6 mm copper wire	52 nH	length 8 mm int. dia.6 mm leads 2 × 9 mm	
R1	0.4 W metal film resistor	2 × 24 Ω in parallel		
R2	0.4 W metal film resistor	100 kΩ		
R3	0.4 W metal film resistor	10 Ω		

Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are mounted on a double copper-clad printed-circuit board with fibre-glass dielectric ($\varepsilon_r = 4.5$); thickness 1.6 mm.



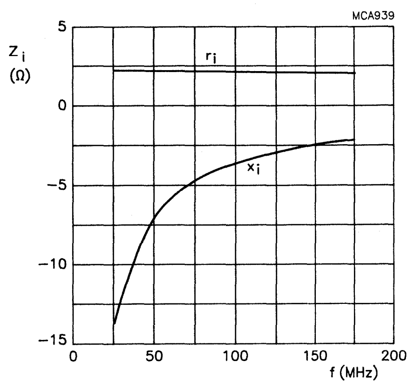
7Z26091



7Z26092

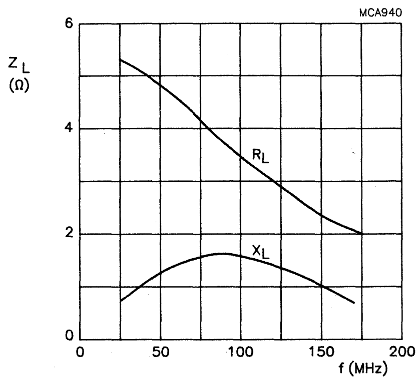
The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as a ground. Earth connections are made by means of hollow rivets, whilst under the source leads, copper straps are used for a direct contact between the upper and lower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

Fig.12 Component layout for 108 MHz class-B test circuit.



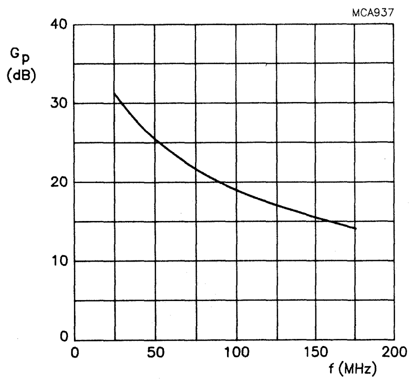
Class-B operation; V_{DS} = 28 V; I_{DQ} = 0.1 A;
R_{GS} = 12 Ω; P_L = 80 W; T_h = 25 °C;
$R_{th\ mb\text{-}h}$ = 0.2 K/W.

Fig.13 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 0.1 A;
R_{GS} = 12 Ω; P_L = 80 W; T_h = 25 °C;
$R_{th\ mb\text{-}h}$ = 0.2 K/W.

Fig.14 Load impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 0.1 A;
R_{GS} = 12 Ω; P_L = 80 W; T_h = 25 °C;
$R_{th\ mb\text{-}h}$ = 0.2 K/W.

Fig.15 Power gain as a function of frequency, typical values.

VHF push-pull power MOS transistor

BLF246B

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

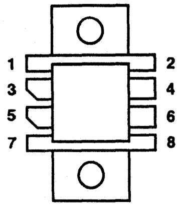
Silicon N-channel enhancement mode vertical D-MOS push-pull transistor designed for large signal applications in the VHF frequency range.

The transistor is encapsulated in a balanced 8 lead, SOT161 flange envelope, with a ceramic cap. All leads are isolated from the flange.

PINNING - SOT161

PIN	DESCRIPTION
1	source
2	source
3	drain 1
4	gate 1
5	drain 2
6	gate 2
7	source
8	source

PIN CONFIGURATION



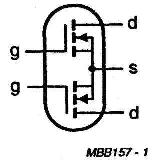


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a push-pull common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	28	60	> 14	> 55

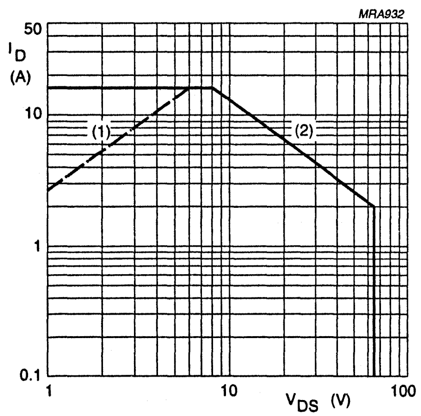
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).
Per transistor section unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	8	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C; total device; both sections equally loaded	–	130	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

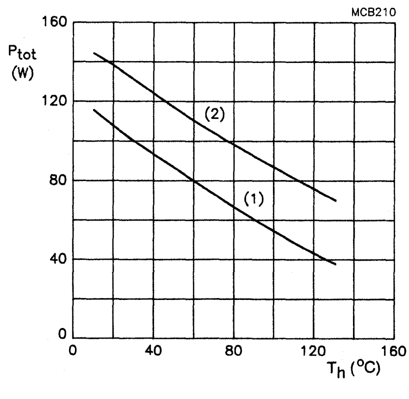
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded	1.35 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded	0.25 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.
Total device; both sections equally loaded.

Fig.2 DC SOAR.



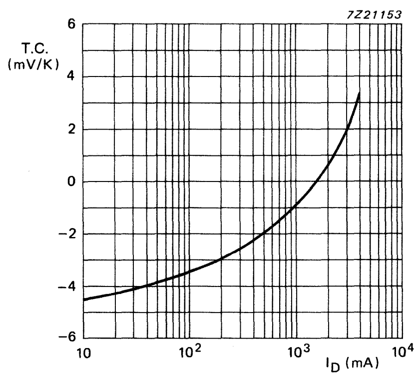
(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS (per section)

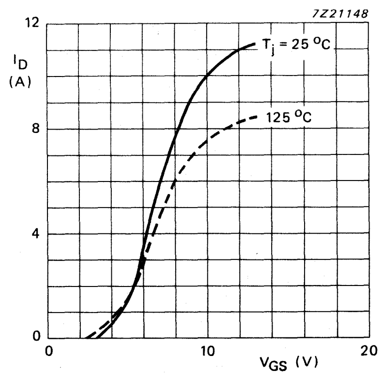
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 10 mA; V_{GS} = 0	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	2	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 10 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 1.5 A; V_{DS} = 10 V	1.2	1.8	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 1.5 A; V_{GS} = 10 V	–	0.4	0.75	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	10	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	125	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	75	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	11	–	pF



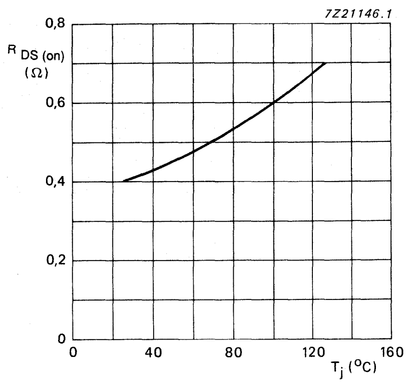
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values per section.



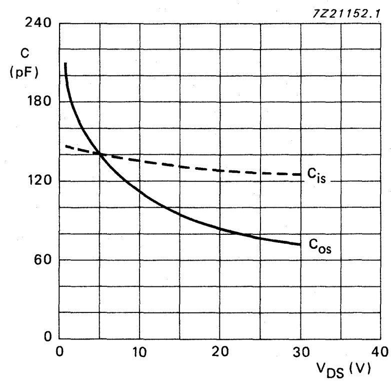
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values per section.



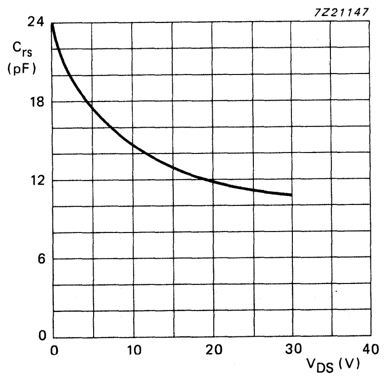
I_D = 1.5 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values per section.

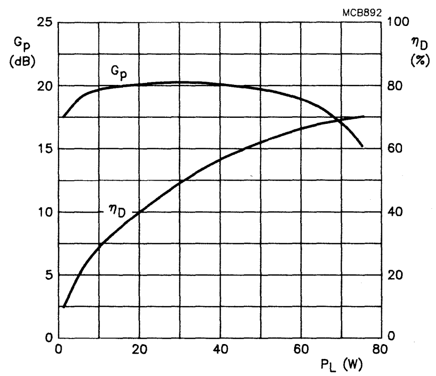
APPLICATION INFORMATION FOR CLASS-B OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.25 K/W; unless otherwise specified.
RF performance in a push-pull, common source, class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	28	2 x 50	60	> 14 typ. 19	> 55 typ. 65

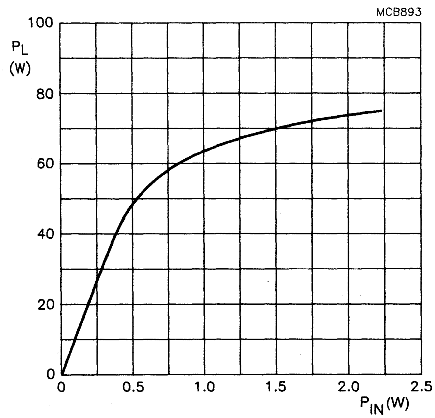
Ruggedness in class-B operation

The BLF246B is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases, under the following conditions:
V_{DS} = 28 V, f = 175 MHz at rated output power.



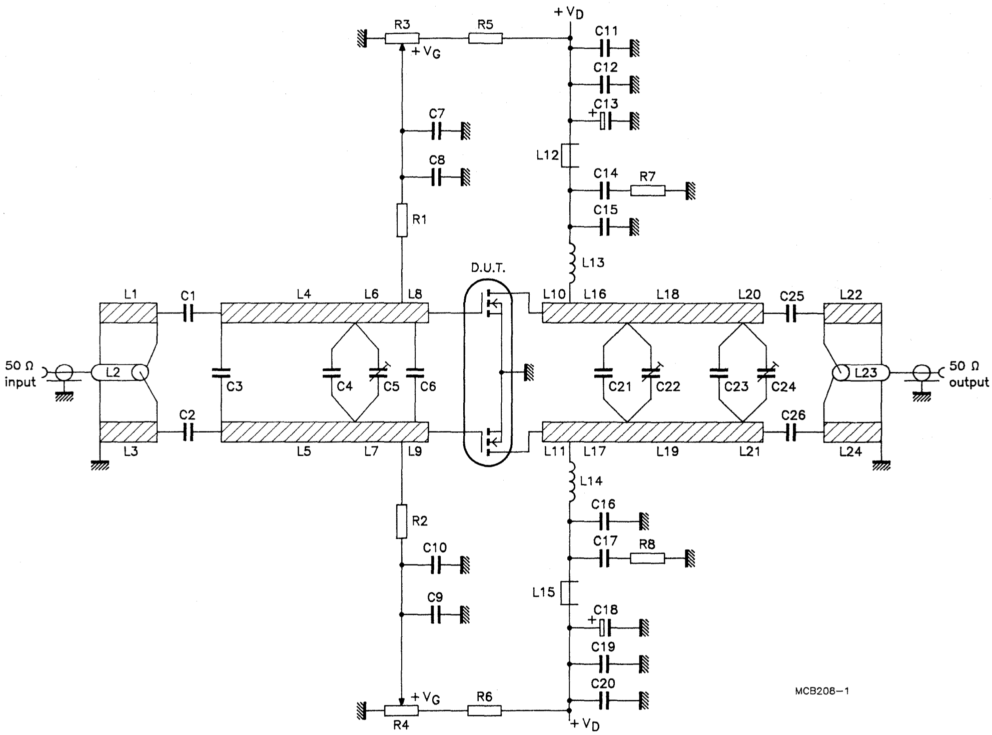
Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 50 mA; Z_L = 4.6 + j5 Ω; f = 175 MHz.

Fig.9 Power gain and efficiency as functions of output power, typical values.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 50 mA; Z_L = 4.6 + j5 Ω; f = 175 MHz.

Fig.10 Load power as a function of drive power, typical values.



f = 175 MHz.

Fig.11 Test circuit for class-B operation.

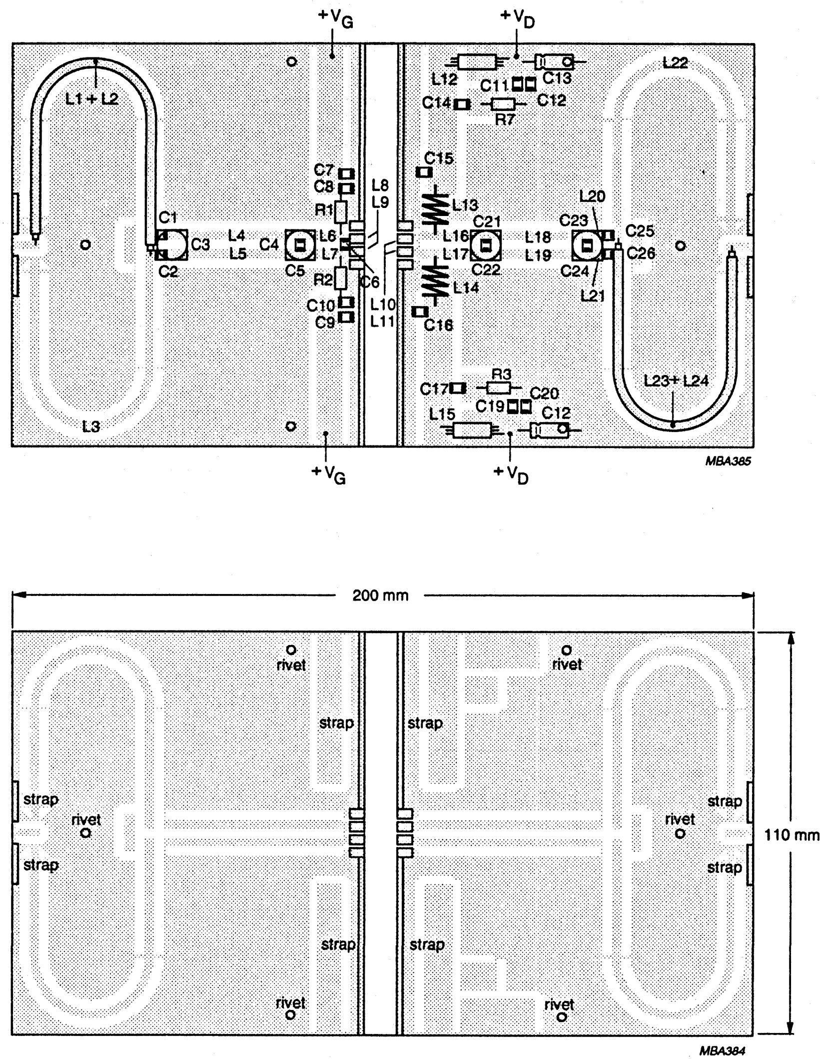
List of components (class-B test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C25, C26	multilayer ceramic chip capacitor (note 1)	91 pF		
C3	film dielectric trimmer	4 to 40 pF		2222 809 08002
C4	multilayer ceramic chip capacitor (note 1)	180 pF		
C5, C22, C24	film dielectric trimmer	5 to 60 pF		2222 809 08003
C6	multilayer ceramic chip capacitor (note 1)	100 pF		

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C7, C9, C12, C14, C17, C19	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C8, C10, C15, C16	multilayer ceramic chip capacitor (note 1)	680 pF		
C11, C20	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C13, C18	electrolytic capacitor	10 µF, 63 V		
C21	multilayer ceramic chip capacitor (note 1)	82 pF		
C23	multilayer ceramic chip capacitor (note 1)	33 pF		
L1, L3, L22, L24	stripline (note 2)	55 Ω	length 111 mm width 2.5 mm	
L2, L23	semi-rigid cable	50 Ω	length 111 mm ext. dia. 2.2 mm	
L4, L5	stripline (note 2)	50 Ω	length 6.5 mm width 2.8 mm	
L6, L7	stripline (note 2)	50 Ω	length 35 mm width 2.8 mm	
L8, L9	stripline (note 2)	50 Ω	length 5 mm width 2.8 mm	
L10, L11	stripline (note 2)	50 Ω	length 9 mm width 2.8 mm	
L12, L15	grade 3B Ferroxcube RF choke			4312 020 36642
L13, L14	4 turns enamelled 1 mm copper wire	50 nH	length 6.5 mm int. dia. 4 mm leads 2 x 5 mm	
L16, L17	stripline (note 2)	50 Ω	length 17 mm width 2.8 mm	
L18, L19	stripline (note 2)	50 Ω	length 26 mm width 2.8 mm	
L20, L21	stripline (note 2)	50 Ω	length 4 mm width 2.8 mm	
R1, R2, R7, R8	0.4 W metal film resistor	10 Ω		
R3, R4	10 turns potentiometer	50 kΩ		
R5, R6	0.4 W metal film resistor	205 kΩ		

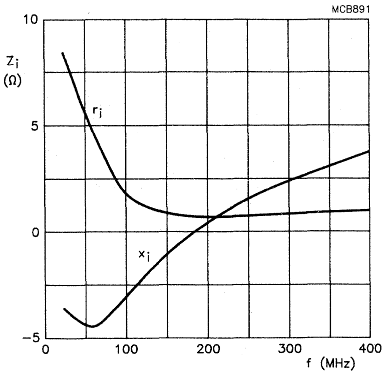
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with epoxy glass dielectric ($\varepsilon_r = 4.5$), thickness 1⁄16 inch. The other side of the board is fully metallized and used as a ground plane. The ground planes on each side of the board are connected together by means of copper straps and hollow rivets.



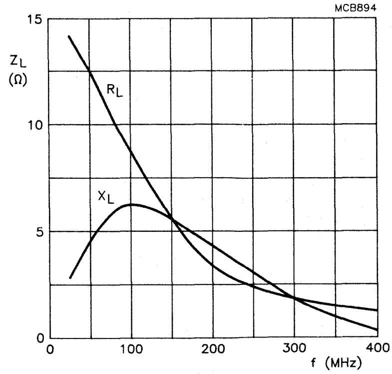
The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as a ground. Earth connections are made by means of copper straps and hollow rivets for a direct contact between the upper and lower sheets.

Fig.12 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 50 mA; R_{GS} = 10 Ω; P_L = 60 W (total device).

Fig.13 Input impedance as a function of frequency (series components), typical values per section.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 50 mA; R_{GS} = 10 Ω; P_L = 60 W (total device).

Fig.14 Load impedance as a function of frequency (series components), typical values per section.

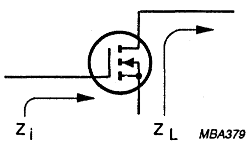
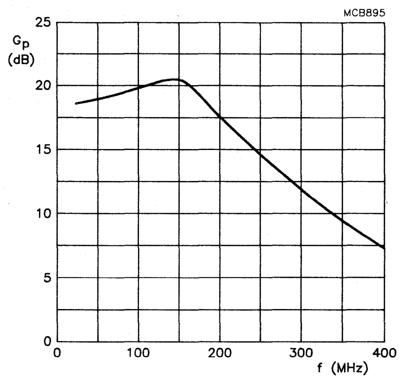


Fig.15 Definition of MOS impedance.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 50 mA; R_{GS} = 10 Ω; P_L = 60 W (total device).

Fig.16 Power gain as a function of frequency, typical values per section.

VHF push-pull power MOS transistor BLF247B

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Withstands full load mismatch.

APPLICATIONS

- Large signal applications in the VHF frequency range.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS push-pull transistor encapsulated in a 4-lead, SOT262A1 balanced flange type package with two ceramic caps. The mounting flange provides the common source connection for the transistor.

PINNING - SOT262A1

PIN	DESCRIPTION
1	drain 1
2	drain 2
3	gate 1
4	gate 2
5	source

PIN CONFIGURATION

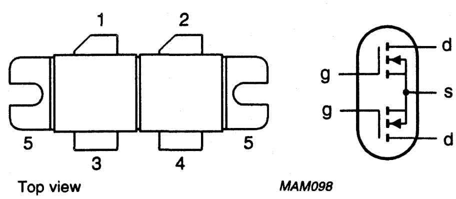


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in a antistatic package. The gate-source input must be protected against static charge during transport or handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	225	28	150	≥12	≥55

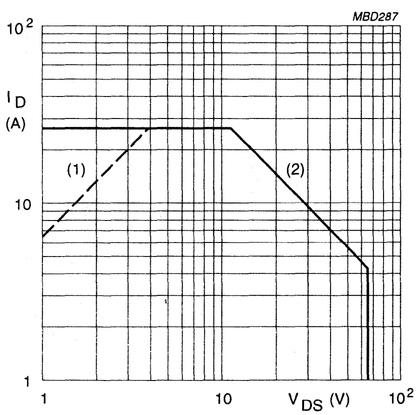
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Per transistor section					
V_{DS}	drain-source voltage (DC)		–	65	V
V_{GS}	gate-source voltage		–	±20	V
I_D	drain current (DC)		–	13	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C; total device; both sections equally loaded	–	280	W
T_{stg}	storage temperature		−65	+150	°C
T_j	operating junction temperature		–	+200	°C

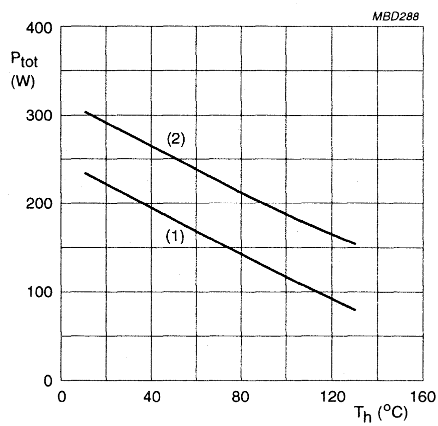
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded	0.63	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded	0.15	K/W



Total device; both sections equally loaded.
(1) Current in this area may be limited by R_{DSon}.
(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



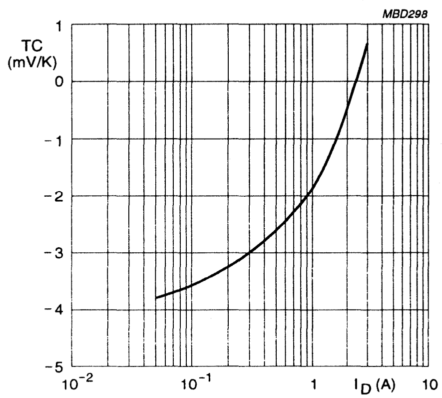
Total device; both sections equally loaded.
(1) Continuous operation.
(2) Short-time operation during mismatch.

Fig.3 Power derating curves.

CHARACTERISTICS

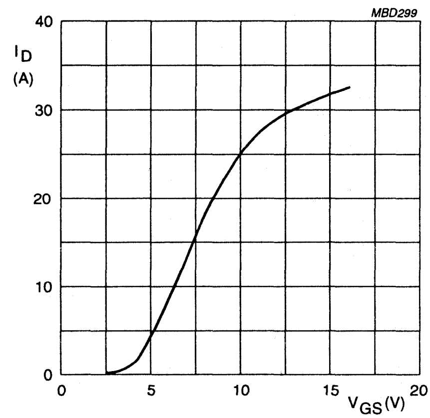
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Per transistor section						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 50 mA; V_{GS} = 0	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	2.5	mA
I_{GSS}	gate-source leakage current	V_{GS} = ±20 V; V_{DS} = 0	–	–	1	µA
V_{GSth}	gate-source threshold voltage	I_D = 50 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 5 A; V_{GS} = 10 V	3	4.2	–	S
R_{DSon}	drain-source on-state resistance	I_D = 5 A; V_{GS} = 10 V	–	0.2	0.3	Ω
I_{DSX}	drain cut-off current	V_{GS} = 10 V; V_{DS} = 10 V	–	22	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	225	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	180	–	pF
C_{rs}	reverse transfer capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	25	–	pF



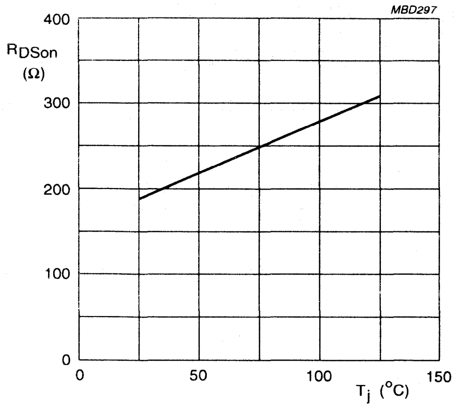
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values per section.



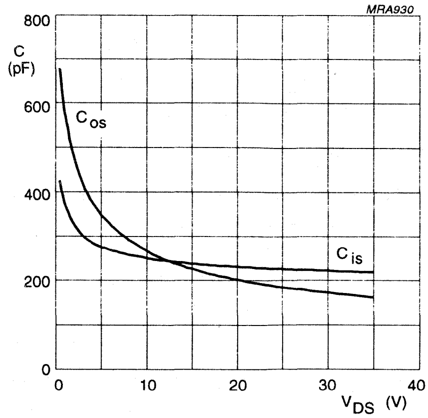
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values per section.



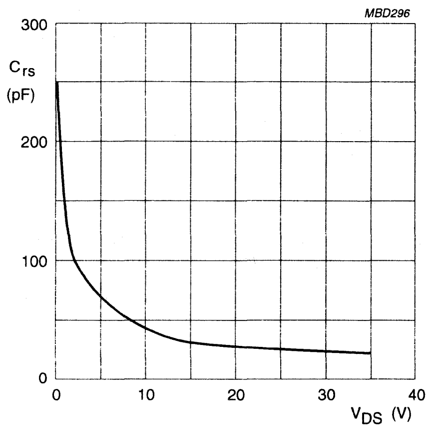
I_D = 5 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.8 Reverse transfer capacitance as a function of drain-source voltage, typical values per section.

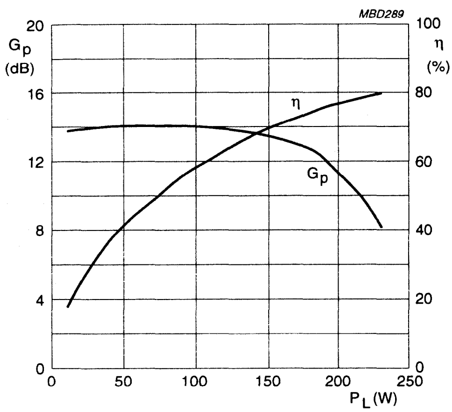
APPLICATION INFORMATION

RF performance in a push-pull, common source, class-B test circuit: T_h = 25 °C; $R_{th\ mb-h}$ = 0.15 K/W.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	225	28	2 × 100	150	≥12 typ. 13.5	≥55 typ. 70

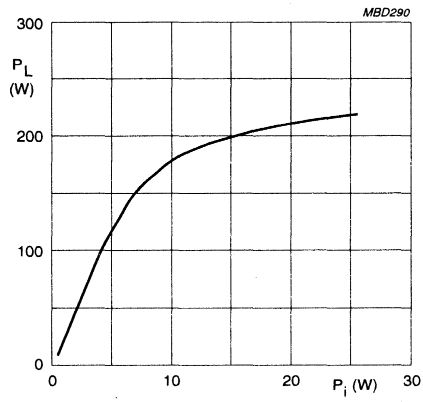
Ruggedness in class-B operation

The BLF247B is capable of withstanding a full load mismatch corresponding to VSWR = 50 through all phases under the following conditions: V_{DS} = 28 V; f = 175 MHz; T_h = 25 °C; P_L = 150 W; $R_{th\ mb-h}$ = 0.15 K/W.



Class-B operation.
V_{DS} = 28 V.
I_{DQ} = 2 × 100 mA.
Z_L = 1.3 + j0.6 Ω per section.
f = 225 MHz.

Fig.9 Power gain and efficiency as functions of load power; typical values.



Class-B operation.
V_{DS} = 28 V.
I_{DQ} = 2 × 100 mA.
Z_L = 1.3 + j0.6 Ω per section.
f = 225 MHz.

Fig.10 Load power as a function of input power; typical values.

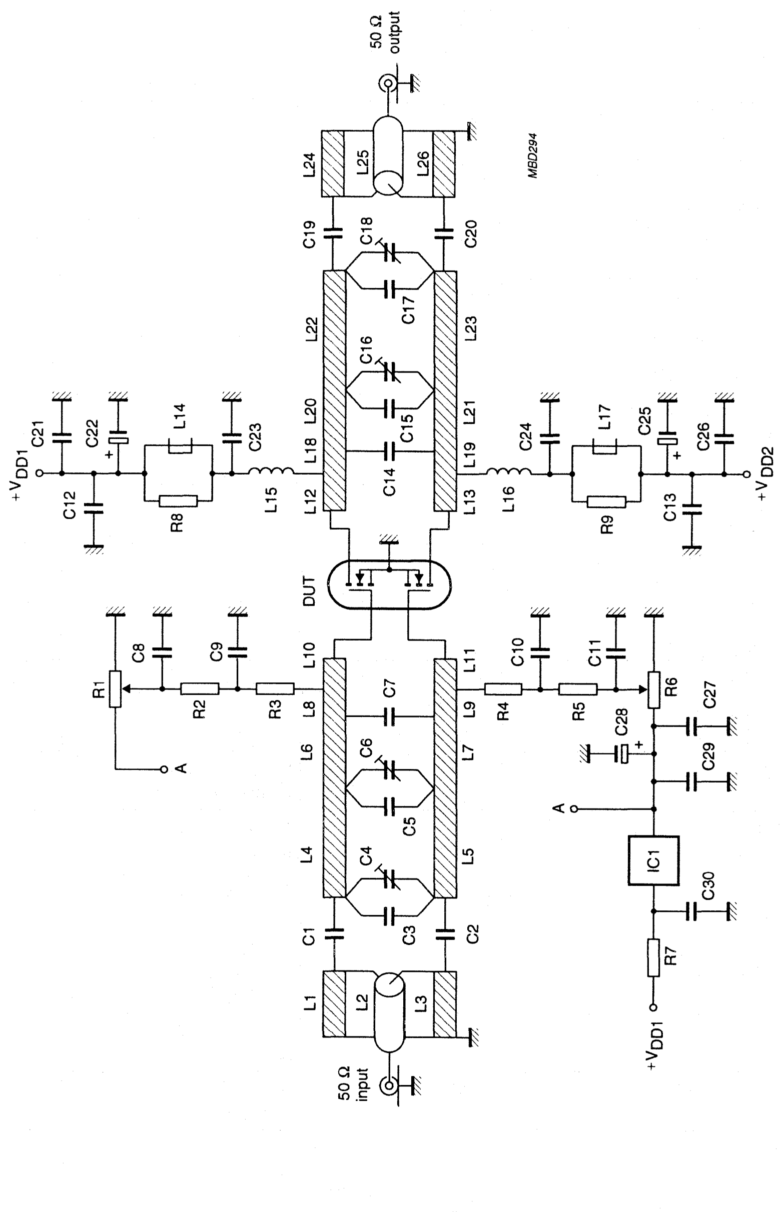


Fig.11 Test circuit for Class-B operation at 225 MHz.

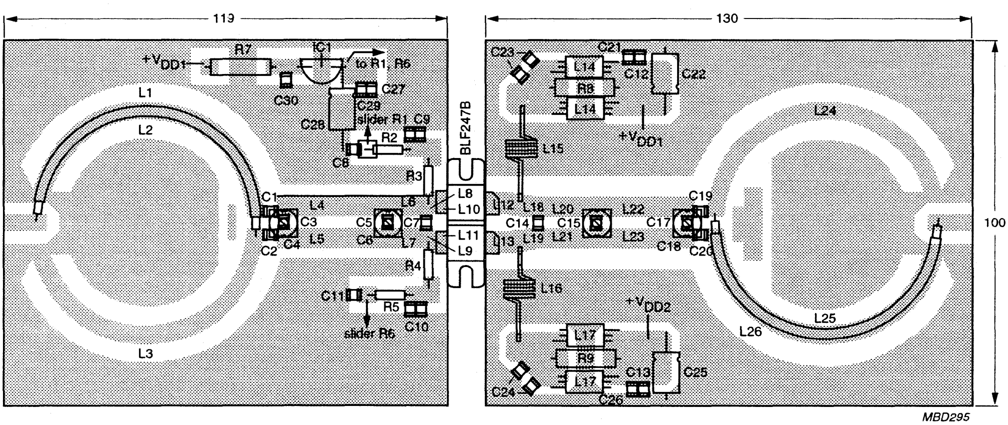
List of components (see Figs 11 and 12)

COMPONENT	DESCRIPTION	VALUE	DIMENSION	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor; note 1	200 pF		
C3	multilayer ceramic chip capacitor; note 1	27 pF		
C4, C6, C18	film dielectric trimmer	2 to 9 pF		2222 809 09005
C5	multilayer ceramic chip capacitor; note 1	39 pF		
C7	multilayer ceramic chip capacitor; note 1	91 pF		
C8, C11, C12, C13, C27	multilayer ceramic chip capacitor	100 nF; 50 V		2222 852 47104
C9, C10	multilayer ceramic chip capacitor; note 1	2 × 1 nF in parallel		
C14	multilayer ceramic chip capacitor; note 1	2 × 36 pF in parallel		
C15	multilayer ceramic chip capacitor; note 1	18 pF		
C16	film dielectric trimmer	2 to 18 pF		2222 809 09006
C17	multilayer ceramic chip capacitor; note 1	6.8 pF		
C19, C20	multilayer ceramic chip capacitor; note 1	47 pF		
C21, C26, C29, C30	multilayer ceramic chip capacitor; note 1	1 nF		
C22, C25, C28	electrolytic capacitor	10 μF; 63 V		2222 030 38109
C23, C24	multilayer ceramic chip capacitor; note 1	2 × 470 nF in parallel		
L1, L3, L24, L26	stripline; note 2	50 Ω	length 80 mm width 4.8 mm	
L2, L25	semi-rigid cable; note 3	50 Ω	ext. conductor: length 80 mm diameter 3.6 mm	
L4, L5	stripline; note 2	43 Ω	length 30 mm width 6 mm	
L6, L7	stripline; note 2	43 Ω	length 10 mm width 6 mm	
L8, L9	stripline; note 2	43 Ω	length 2 mm width 6 mm	
L10, L11	stripline; note 2	43 Ω	length 4 mm width 6 mm	
L12, L13	stripline; note 2	43 Ω	length 10 mm width 6 mm	
L14, L17	Ferroxcube grade 3B wideband HF choke	2 in parallel		4312 02036642

COMPONENT	DESCRIPTION	VALUE	DIMENSION	CATALOGUE NO.
L15, L16	3 turns enamelled 1.6 mm copper wire	50 nH	length 7.8 mm internal diameter 6 mm leads 2 × 10 mm	
L18, L19	stripline; note 2	43 Ω	length 6 mm width 6 mm	
L20, L21	stripline; note 2	43 Ω	length 15 mm width 6 mm	
L22, L23	stripline; note 2	43 Ω	length 26.5 mm width 6 mm	
R1, R6	10 turns potentiometer	50 kΩ		
R2, R3, R4, R5	metal film resistor	1 kΩ; 0.4 W		
R7	metal film resistor	5.11 kΩ; 1 W		
R8, R9	metal film resistor	10 Ω; 1 W		
IC1	voltage regulator			78L05

Notes

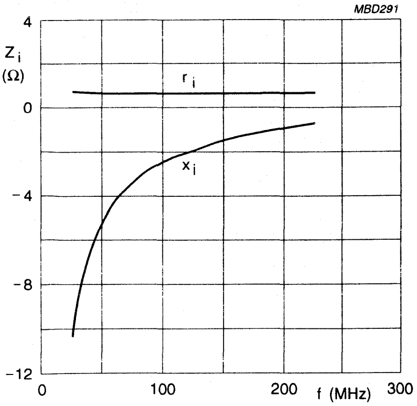
1. American Technical Ceramics type 100B or capacitor of same quality.
2. The striplines are on a double copper-clad printed-circuit board with glass microfibre PTFE dielectric (ε_r = 2.2); thickness $^1/_{16}$ inch; thickness of the copper sheet 2 × 35 μm.
3. Semi-rigid cables L2 and L25 are soldered onto striplines L1 and L26.



Dimensions in mm.

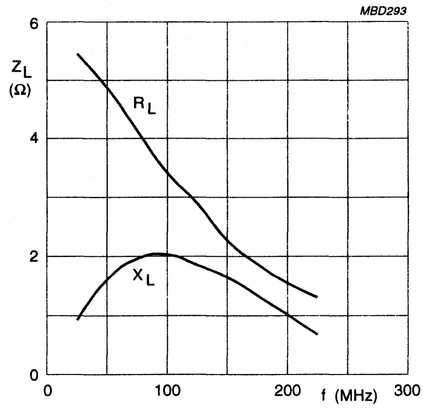
The circuit and components are situated on one side of the printed-circuit board, the other side being fully metallized to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets for a direct contact between upper and lower sheets.

Fig.12 Component layout for 225 MHz class-B test circuit.



V_{DS} = 28 V.
I_{DQ} = 2 × 100 mA.
T_h = 25 °C.
P_L = 150 W (total device).

Fig.13 Input impedance as a function of frequency (series components), typical values per section.



V_{DS} = 28 V.
I_{DQ} = 2 × 100 mA.
T_h = 25 °C.
P_L = 150 W (total device).

Fig.14 Load impedance as a function of frequency (series components), typical values per section.

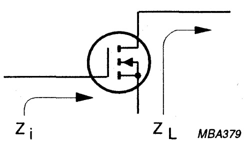
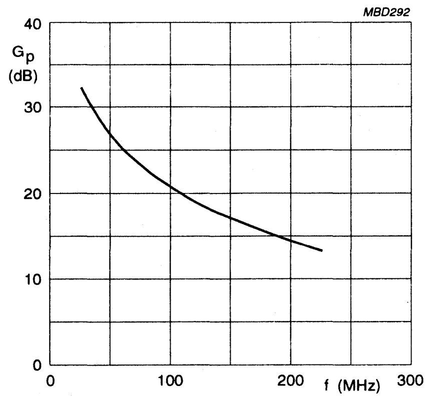


Fig.15 Definition of MOS impedances.



V_{DS} = 28 V.
I_{DQ} = 2 × 100 mA.
T_h = 25 °C.
P_L = 150 W (total device).

Fig.16 Power gain as a function of frequency, typical values per section.

VHF push-pull power MOS transistor

BLF248

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

Dual push-pull silicon N-channel enhancement mode vertical D-MOS transistor, designed for large signal amplifier applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead SOT262 A1 balanced flange envelope, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

PINNING - SOT262 A1

PIN	DESCRIPTION
1	drain 1
2	drain 2
3	gate 1
4	gate 2
5	source

PIN CONFIGURATION

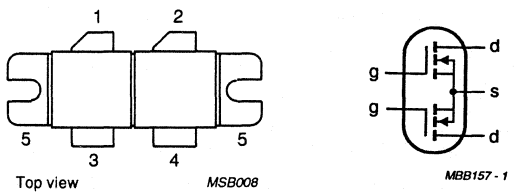


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a push-pull common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
class-AB	225	28	300	> 10	> 55
	175	28	300	typ. 13	typ. 67

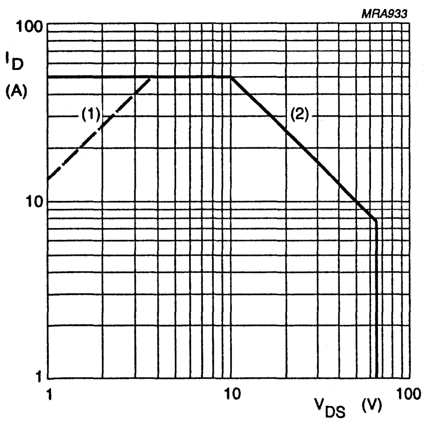
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).
Per transistor section unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	25	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C total device; both sections equally loaded	–	500	W
T_{stg}	storage temperature		−65	150	°C

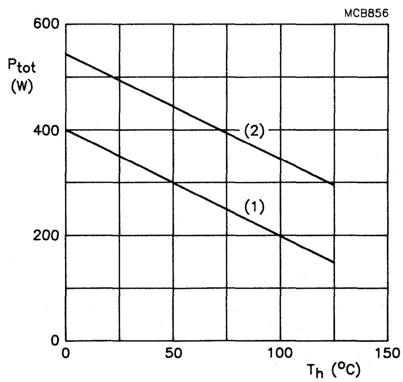
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded.	0.35 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded.	0.15 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.
Total device; both sections equally loaded.

Fig.2 DC SOAR.



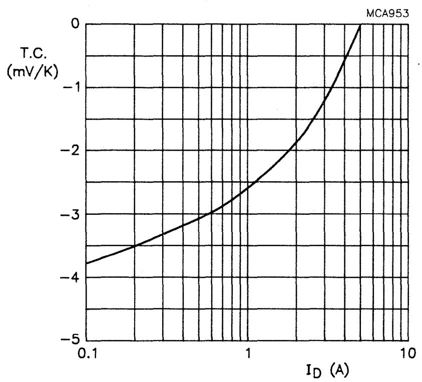
(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS (per section)

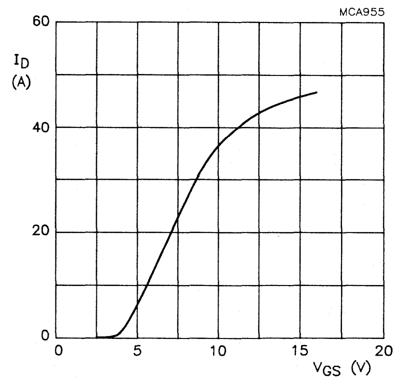
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 100 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 100 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of both transistor sections	I_D = 100 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 8 A; V_{DS} = 10 V	5	7.5	–	S
g_{fs1}/g_{fs2}	forward transconductance ratio of both transistor sections	I_D = 8 A; V_{DS} = 10 V	0.9	–	1.1	
$R_{DS(on)}$	drain-source on-state resistance	I_D = 8 A; V_{GS} = 10 V	–	0.1	0.15	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	37	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	500	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	360	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	46	–	pF



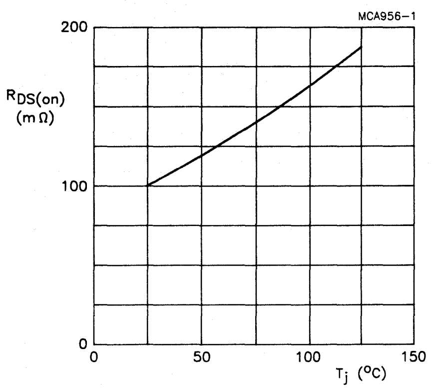
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values per section.



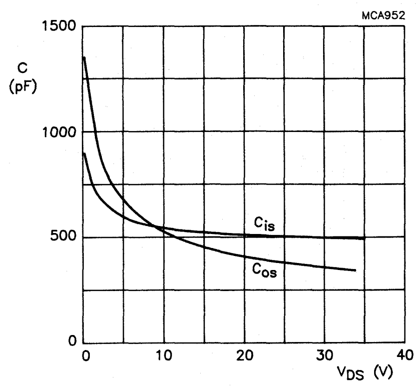
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values per section.



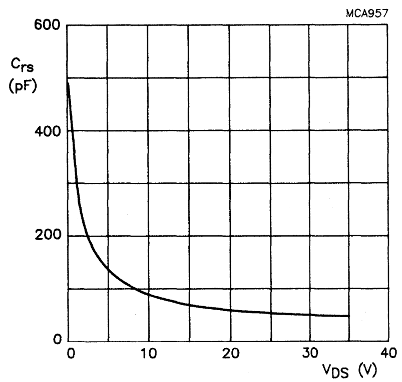
I_D = 8 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values per section.

APPLICATION INFORMATION FOR CLASS-AB OPERATION

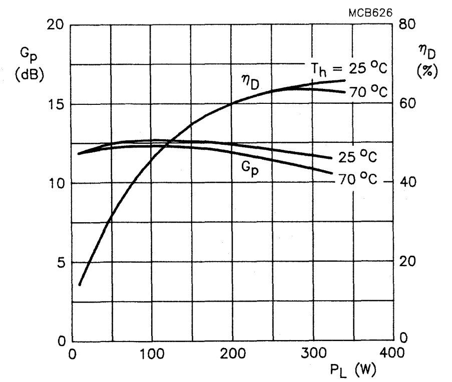
T_h = 25 °C; $R_{th\ mb-h}$ = 0.15 K/W, unless otherwise specified.
RF performance in a linear amplifier in a common source class-AB circuit.
R_{GS} = 536 Ω per section; optimum load impedance per section = 0.79 - j0.11 Ω.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
class-AB	225	28	300	> 10 typ. 11.5	> 55 typ. 65
	175	28	300	typ. 13	typ. 67

Ruggedness in class-AB operation

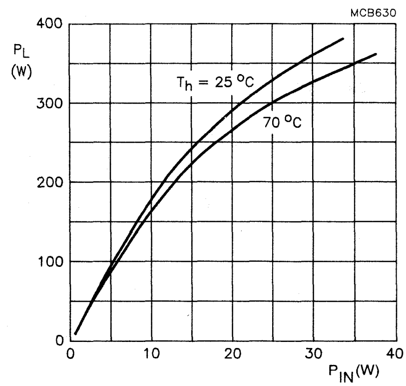
The BLF248 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 28 V; f = 225 MHz at rated output power.



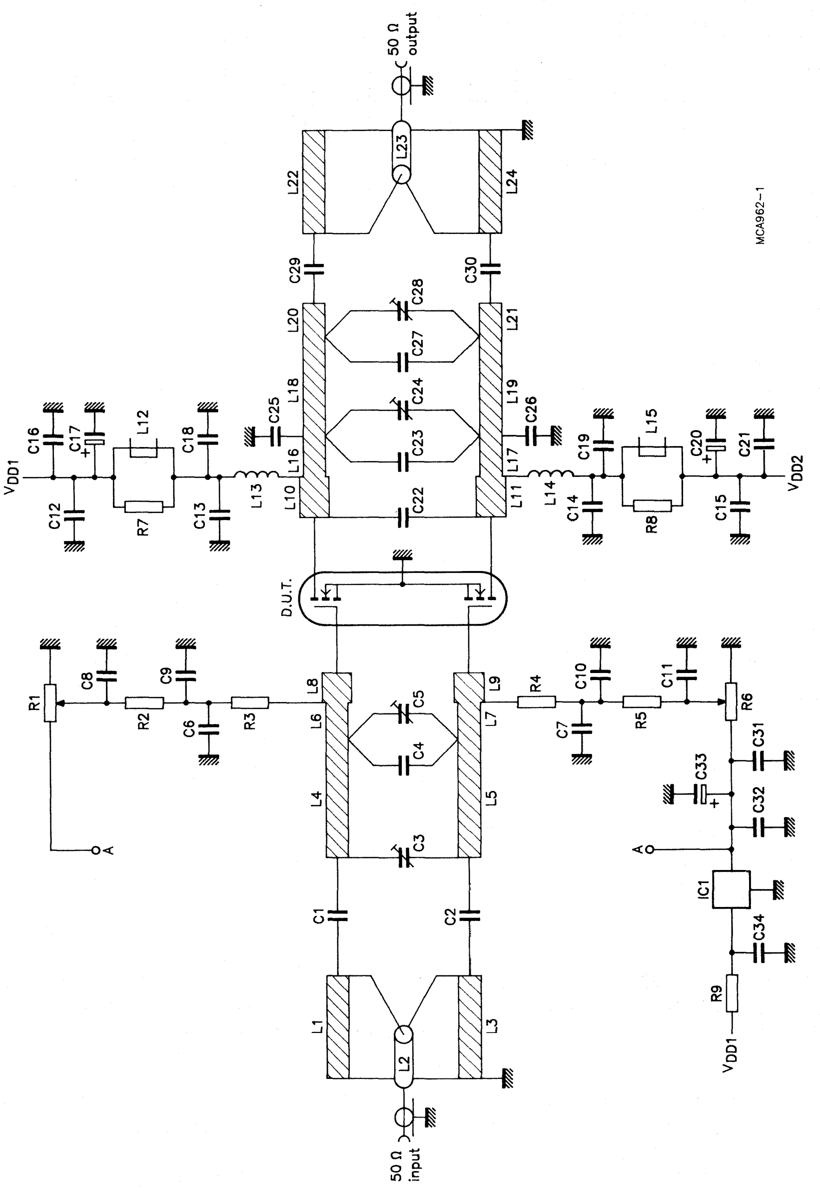
Class-AB operation; V_{DS} = 28 V; I_{DQ} = 2 x 250 mA; R_{GS} = 536 Ω (per section); Z_L = 0.79 + j0.11 Ω (per section); f = 225 MHz.

Fig.9 Power gain and efficiency as functions of load power, typical values.



Class-AB operation; V_{DS} = 28 V; I_{DQ} = 2 x 250 mA; R_{GS} = 536 Ω (per section); Z_L = 0.79 + j0.11 Ω (per section); f = 225 MHz.

Fig.10 Load power as a function of input power, typical values.



f = 225 MHz.

Fig.11 Test circuit for class-AB operation.

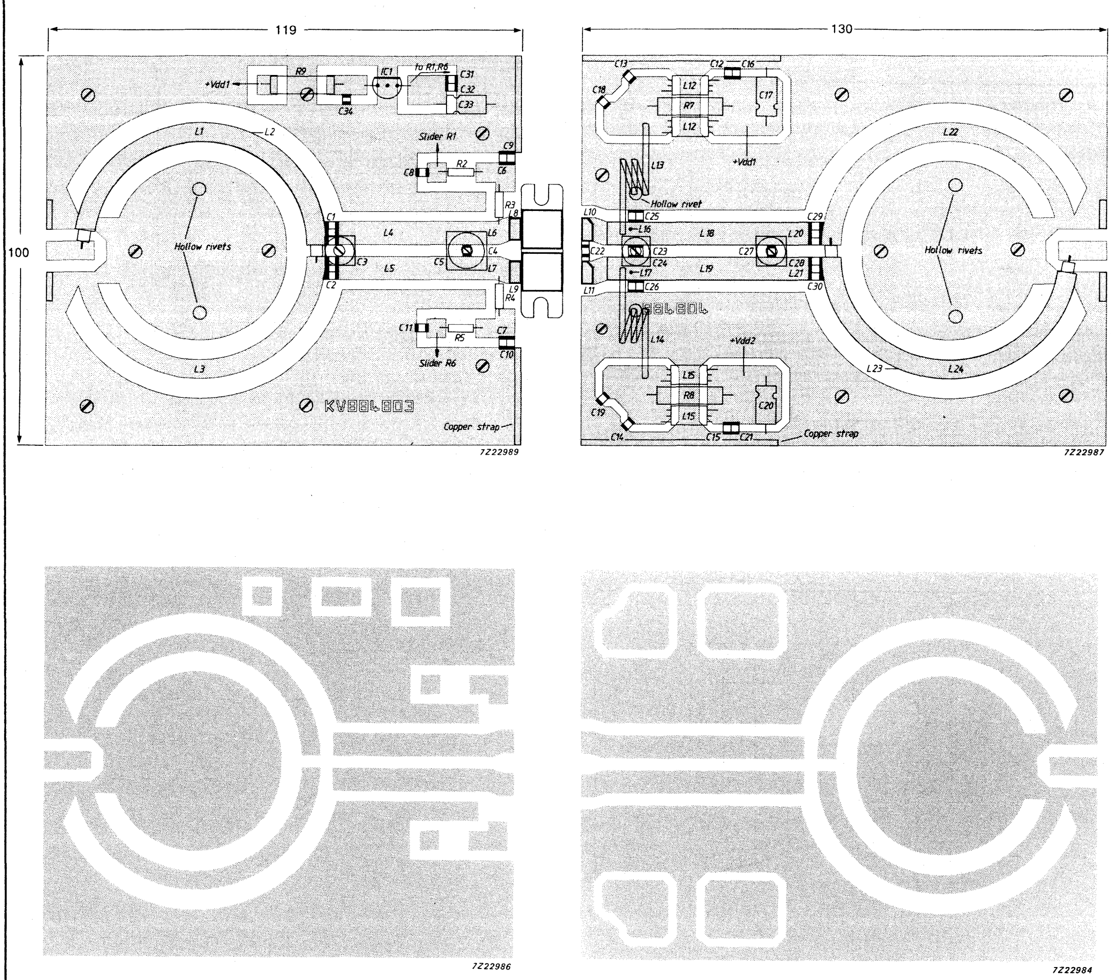
List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor (note 1)	2 x 56 pF + 18 pF in parallel, 500 V		
C3	film dielectric trimmer	2 to 9 pF		2222 809 09005
C4	multilayer ceramic chip capacitor (note 1)	47 pF, 500 V		
C5	film dielectric trimmer	5 to 60 pF		2222 809 08003
C6, C7, C9, C10, C12, C15, C31, C34	multilayer ceramic chip capacitor (note 1)	1 nF, 500 V		
C8, C11, C16, C21, C32	multilayer ceramic chip capacitor	100 nF, 50 V		2222 852 47104
C13, C14, C18, C19	multilayer ceramic chip capacitor (note 1)	510 pF, 500 V		
C17, C20, C33	electrolytic capacitor	10 µF, 63 V		
C22	multilayer ceramic chip capacitor (note 1)	82 pF, 500 V		
C23	multilayer ceramic chip capacitor (note 1)	10 pF + 30 pF in parallel, 500 V		
C24, C28	film dielectric trimmer	2 to 18 pF		2222 809 09006
C25, C26	multilayer ceramic chip capacitor (note 1)	39 pF + 47 pF in parallel, 500 V		
C27	multilayer ceramic chip capacitor (note 1)	18 pF, 500 V		
C29, C30	multilayer ceramic chip capacitor (note 1)	3 x 100 pF in parallel, 500 V		
L1, L3, L22, L24	stripline (note 2)	50 Ω	4.8 x 80 mm	
L2, L23	semi-rigid cable (note 3)	50 Ω	ext. dia. 3.6 mm ext. conductor length 80 mm	
L4, L5	stripline (note 2)	43 Ω	6 x 32.5 mm	
L6, L7, L10, L11	stripline (note 2)	43 Ω	6 x 10.5 mm	
L8, L9	stripline (note 2)	43 Ω	6 x 3 mm	
L12, L15	grade 3B Ferroxcube wide-band HF choke	2 in parallel		4312 020 36642
L13, L14	2 turns enamelled 1.6 mm copper wire	25 nH	int. dia. 5 mm leads 2 x 7 mm space 2.5 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L16, L17	stripline (notes 2 and 4)	43 Ω	6 x 3 mm	
L18, L19	stripline (notes 2 and 4)	43 Ω	6 x 35 mm	
L20, L21	stripline (notes 2 and 4)	43 Ω	6 x 9 mm	
R1, R6	10 turns potentiometer	50 kΩ		
R2, R5	0.4 W metal film resistor	1 kΩ		
R3, R4	0.4 W metal film resistor	536 Ω		
R7, R8	1 W metal film resistor	10 Ω ±5%		
R9	1 W metal film resistor	3.16 kΩ		
IC1	78L05 voltage regulator			

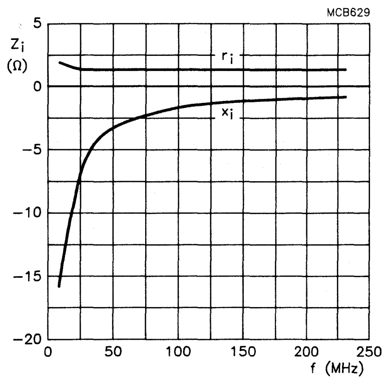
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. L1, L3 - L11, L16 - L22 and L24 are micro-striplines on a double copper-clad printed circuit board, with glass microfibre PTFE dielectric ($\varepsilon_r = 2.2$), thickness 1⁄16 inch, thickness of copper sheet 2 x 35 μm.
3. L2 and L23 are soldered on striplines L1 and L24 respectively.
4. A copper strap, thickness 0.8 mm, is soldered on striplines L16 - L21.



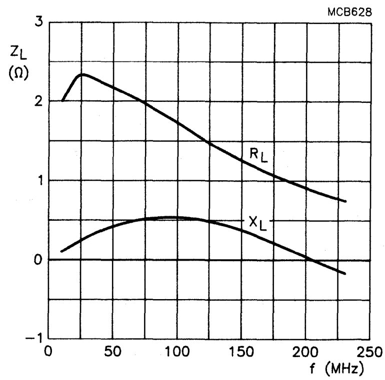
The circuit and components are situated on one side of the printed circuit board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets.

Fig.12 Component layout for 225 MHz class-AB test circuit.



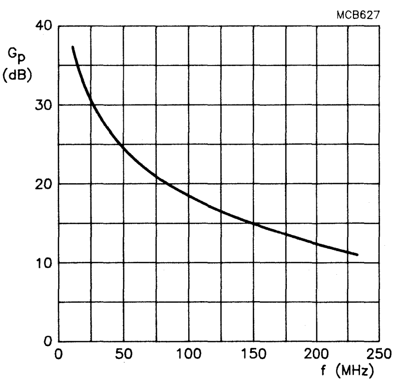
Class-AB operation; V_{DS} = 28 V; I_D = 2 x 250 mA; R_{GS} = 536 Ω (per section); P_L = 300 W (total device); T_h = 25 °C.

Fig.13 Input impedance as a function of frequency (series components), typical values per section.



Class-AB operation; V_{DS} = 28 V; I_D = 2 x 250 mA; R_{GS} = 536 Ω (per section); P_L = 300 W (total device); T_h = 25 °C.

Fig.14 Load impedance as a function of frequency (series components), typical values per section.



Class-AB operation; V_{DS} = 28 V; I_D = 2 x 250 mA; R_{GS} = 536 Ω (per section); P_L = 300 W (total device); T_h = 25 °C.

Fig.15 Power gain as a function of frequency, typical values per section.

VHF power MOS transistor BLF276

FEATURES

- High power gain
- Easy power control
- Good thermal stability

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for large signal amplifier applications in the VHF frequency range. The transistor delivers an output power of 100 W in class-B operation at a supply voltage of 50 V.

The transistor is encapsulated in a 6-lead, SOT119 pill-package envelope, with a ceramic cap.

PINNING - SOT119D3

PIN	DESCRIPTION
1	source
2	source
3	gate
4	drain
5	source
6	source

PIN CONFIGURATION

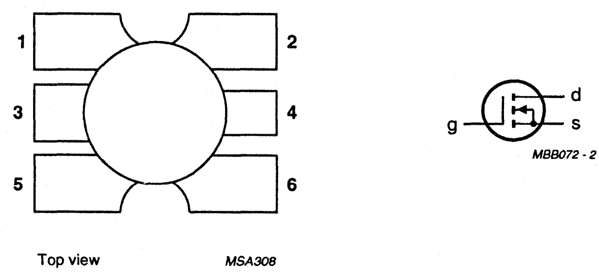


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	225	50	100	≥ 13	≥ 50
	108	50	100	≥ 18	≥ 60

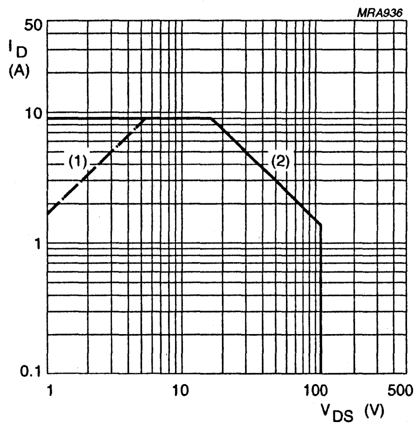
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	110	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	9	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	150	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

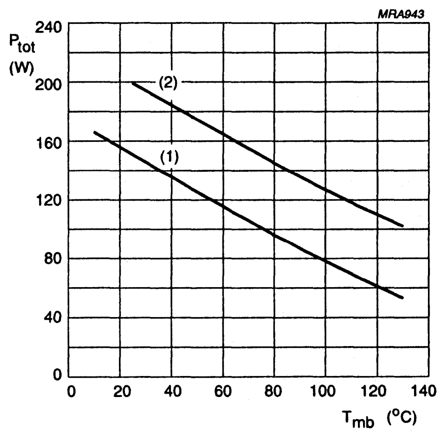
SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	P_{tot} = 150 W; T_{mb} = 25 °C	max. 1.17 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Continuous operation.

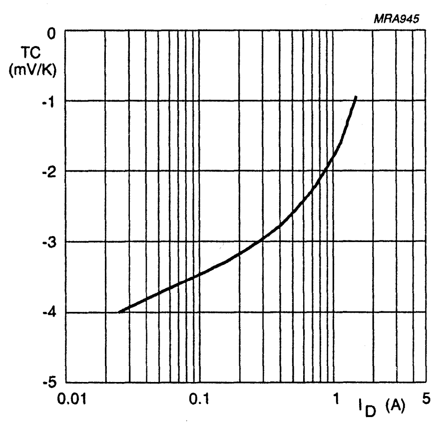
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

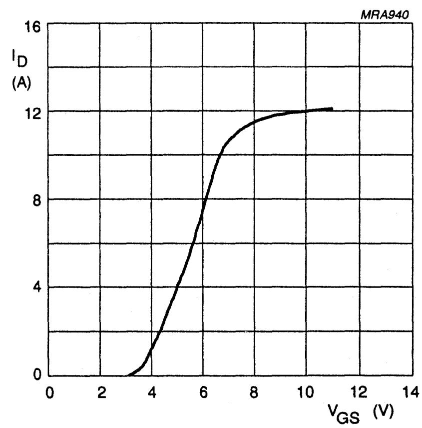
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 30 mA	110	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 50 V	–	–	1	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 50 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 3 A; V_{DS} = 10 V	2.7	–	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 3 A; V_{GS} = 10 V	–	0.4	0.6	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	8	12	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	240	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	95	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	7	–	pF



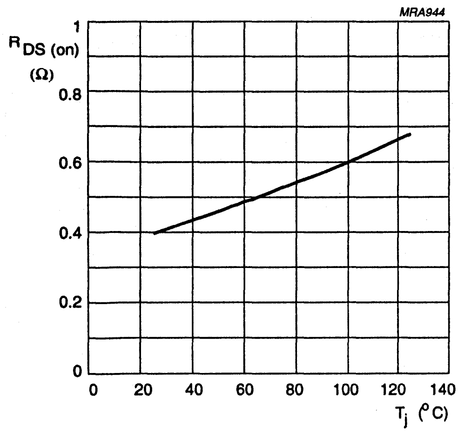
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



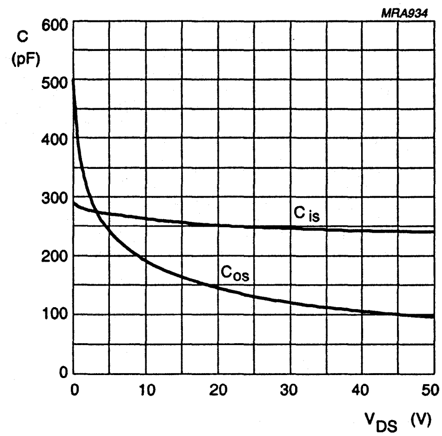
V_{DS} = 10 V.

Fig.5 Drain current as a function of gate-source voltage, typical values.



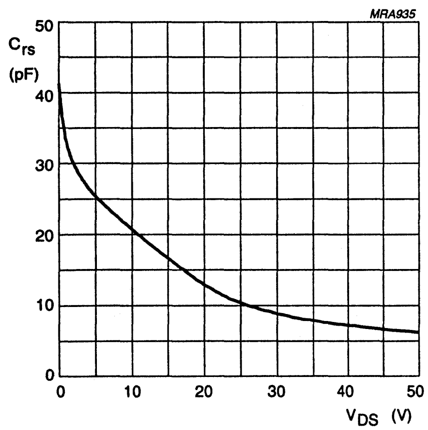
I_D = 3 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

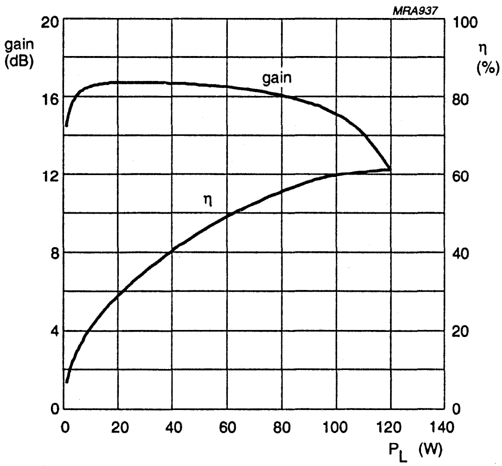
T_{mb} = 25 °C unless otherwise specified.
RF performance in CW operation in a common source class-B circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	225	50	50	100	≥ 13 typ. 15	≥ 50 typ. 57
	108	50	50	100	≥ 18 typ. 22	≥ 60 typ. 75

Ruggedness in class-B operation

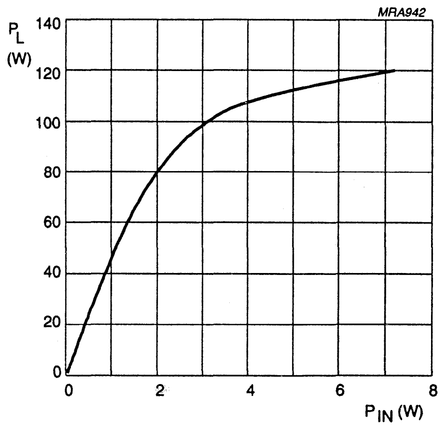
The BLF276 is capable of withstanding a load mismatch corresponding to VSWR = 8 through all phases under the following conditions:

V_{DS} = 50 V; f = 225 MHz;
T_{mb} = 25 °C at rated load power.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 50 mA;
f = 225 MHz.

Fig.9 Power gain and efficiency as functions of load power, typical values.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 50 mA;
f = 225 MHz.

Fig.10 Load power as a function of input power, typical values.

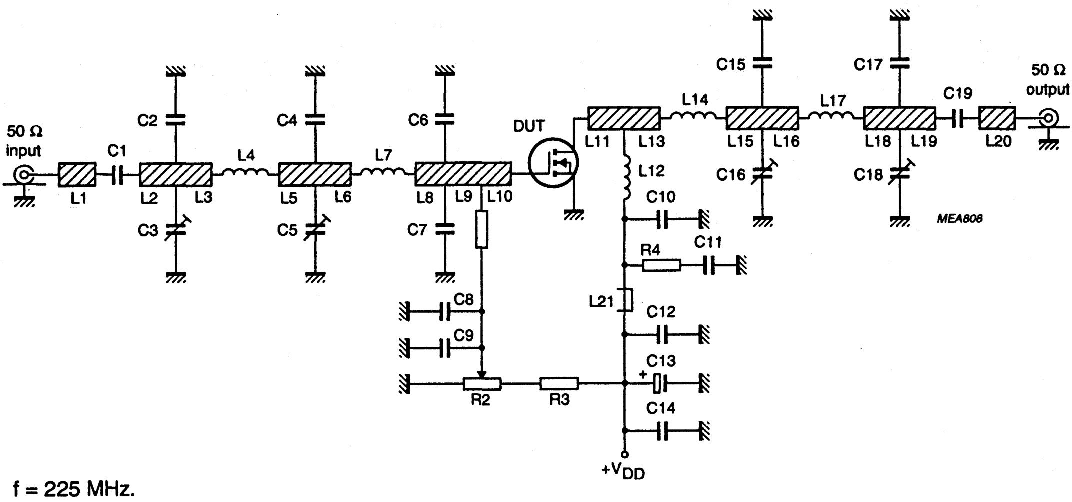


Fig.11 Test circuit for class-B operation.

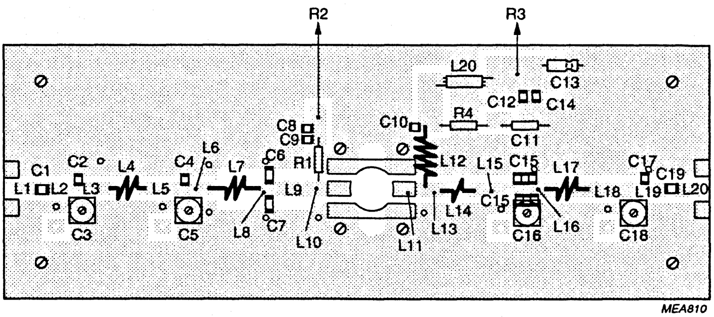
List of components (class-B test circuit)

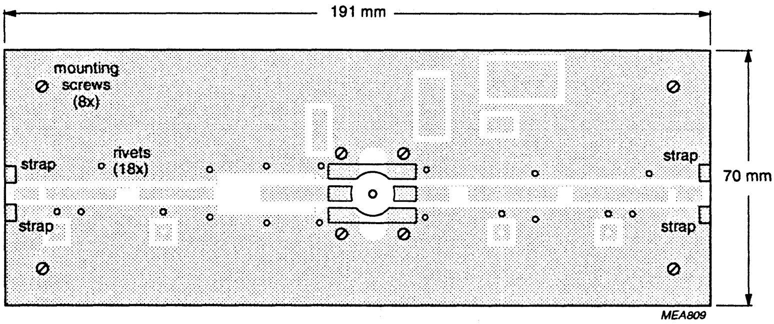
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C9, C19	multilayer ceramic chip capacitor (note 1)	680 pF, 500 V		
C2	multilayer ceramic chip capacitor (note 1)	15 pF, 500 V		
C3, C5, C16, C18	film dielectric trimmer	4 to 40 pF		2222 809 08002
C4	multilayer ceramic chip capacitor (note 1)	13 pF, 500 V		
C6, C7	multilayer ceramic chip capacitor (note 1)	62 pF, 500 V		
C8, C14	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C10	multilayer ceramic chip capacitor (note 1)	100 pF, 500 V		
C11	foil capacitor	100 nF, 100 V		2222 368 21204
C12	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C13	electrolytic capacitor	10 µF, 63 V		2222 030 38109
C15	multilayer ceramic chip capacitor (note 2)	2 x 33 pF in parallel, 500 V		
C17	multilayer ceramic chip capacitor (note 1)	18 pF, 500 V		
L1	stripline (note 3)	49 Ω	length 8 mm width 4 mm	
L2	stripline (note 3)	49 Ω	length 12 mm width 4 mm	
L3	stripline (note 3)	49 Ω	length 7.5 mm width 4 mm	
L4	2 turns enamelled 1.5 mm copper wire	18 nH	length 4.2 mm int. dia. 4 mm leads 2 x 1 mm	
L5	stripline (note 3)	49 Ω	length 15.5 mm width 4 mm	
L6	stripline (note 3)	49 Ω	length 5 mm width 4 mm	
L7	2 turns enamelled 1.5 mm copper wire	16 nH	length 3.3 mm int. dia. 3 mm leads 2 x 4 mm	
L8	stripline (note 3)	31 Ω	length 6 mm width 6 mm	
L9	stripline (note 3)	31 Ω	length 9.5 mm width 6 mm	
L10, L11	stripline (note 3)	31 Ω	length 10 mm width 6 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L12	3 turns enamelled 1.5 mm copper wire	50 nH	length 4.8 mm int. dia. 5 mm leads 2 x 4 mm	
L13	stripline (note 3)	31 Ω	length 5 mm width 6 mm	
L14	1 turn enamelled 1.5 mm copper wire		int. dia. 2.8 mm leads 2 x 1 mm	
L15	stripline (note 3)	36 Ω	length 16.5 mm width 5 mm	
L16	stripline (note 3)	36 Ω	length 8 mm width 5 mm	
L17	2 turns enamelled 1.5 mm copper wire	17 nH	length 4.7 mm int. dia. 4 mm leads 2 x 2 mm	
L18	stripline (note 3)	36 Ω	length 17.5 mm width 5 mm	
L19, L20	stripline (note 3)	36 Ω	length 8.5 mm width 5 mm	
L21	grade 3B Ferroxcube wide-band RF choke			4312 020 36642
R1	1 W metal film resistor	9.09 Ω		2222 153 59098
R2	10 turns potentiometer	50 kΩ		
R3	0.4 W metal film resistor	400 kΩ		2322 151 74024
R4	0.4 W metal film resistor	10 Ω		2322 151 11009

Notes

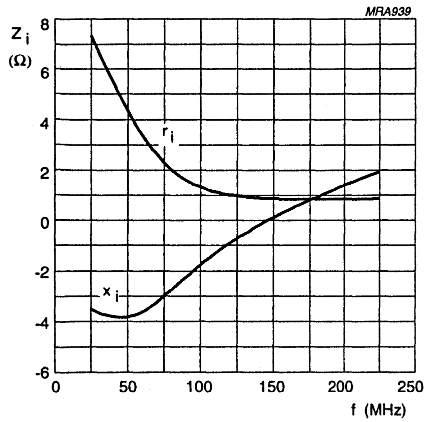
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. American Technical Ceramics (ATC) capacitor, type 175B or other capacitor of the same quality.
3. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass PTFE dielectric (ε_r = 4.5); thickness 1⁄16 inch.





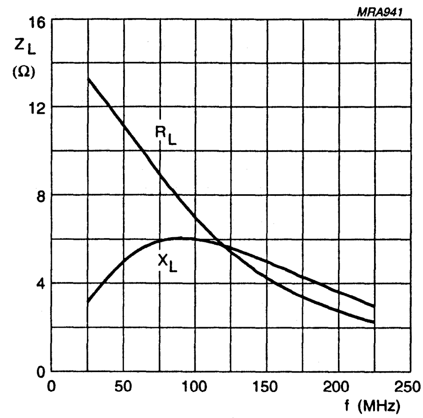
The circuit and components are situated on one side of the printed circuit board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets between upper and lower sheets.

Fig.12 Component layout for 225 MHz class-B test circuit.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 50 mA;
R_{GS} = 9.1 Ω; P_L = 100 W.

Fig.13 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 50 mA;
R_{GS} = 9.1 Ω; P_L = 100 W.

Fig.14 Load impedance as a function of frequency (series components), typical values.

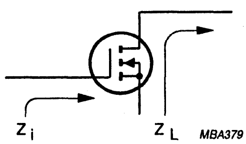
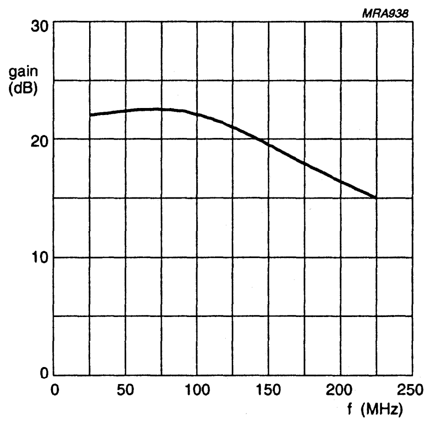


Fig.15 Definition of MOS impedance.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 50 mA;
R_{GS} = 9.1 Ω; P_L = 100 W.

Fig.16 Power gain as a function of frequency, typical values.

VHF power MOS transistor — BLF277

FEATURES

- High power gain
- Easy power control
- Gold metallization ensures excellent reliability
- Good thermal stability
- Withstands full load mismatch.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for large signal amplifier applications in the VHF frequency range.

The transistor is encapsulated in a 6-lead, SOT119 flange envelope, with a ceramic cap. All leads are isolated from the flange.

A marking code, showing gate-source voltage (V_{GS}) information is provided for matched pair applications. Refer to the 'General' section for further information.

PINNING - SOT119

PIN	DESCRIPTION
1	source
2	source
3	gate
4	drain
5	source
6	source

PIN CONFIGURATION

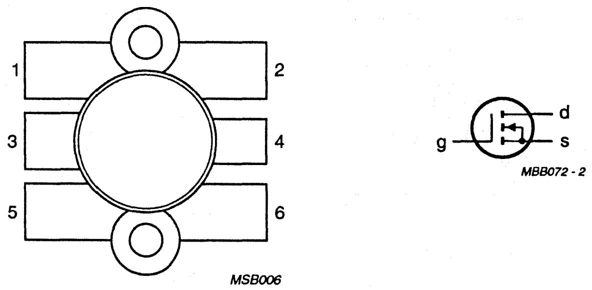


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	50	150	> 14	> 50

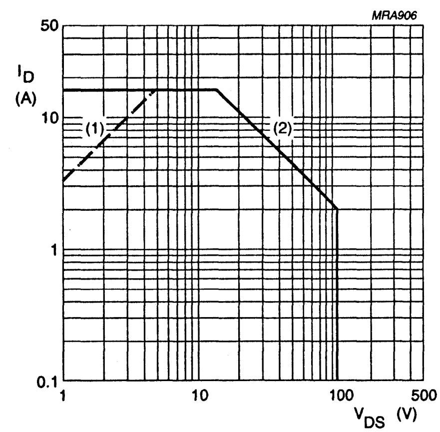
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	110	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	16	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	220	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

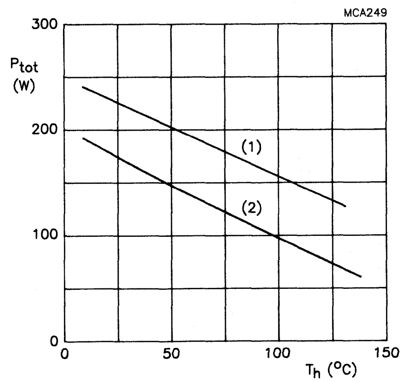
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	T_{mb} = 25 °C; P_{tot} = 220 W	0.8 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	T_{mb} = 25 °C; P_{tot} = 220 W	0.2 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



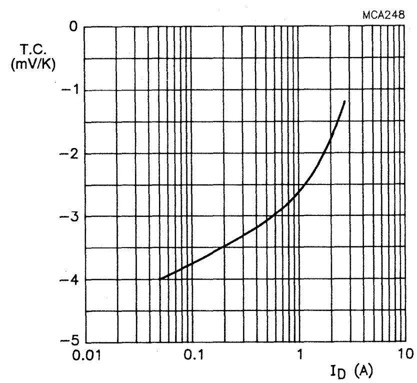
(1) Continuous operation.
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

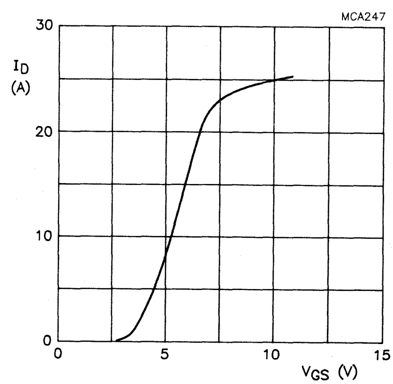
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 50 mA	110	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 50 V	–	–	2.5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 50 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched pairs	I_D = 50 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 5 A; V_{DS} = 10 V	4.5	6.2	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 5 A; V_{GS} = 10 V	–	0.2	0.3	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	25	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	480	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	190	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	14	–	pF



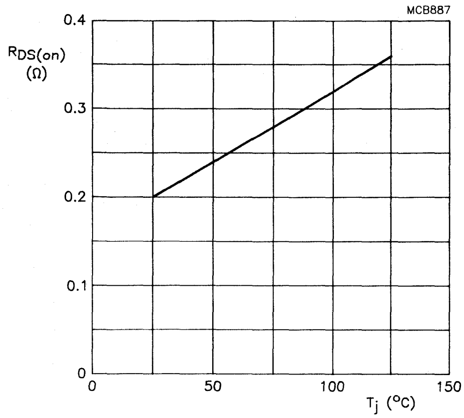
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



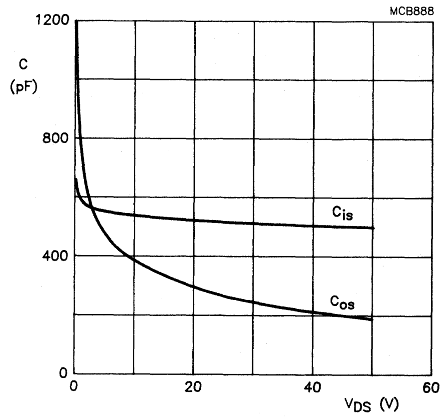
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values.



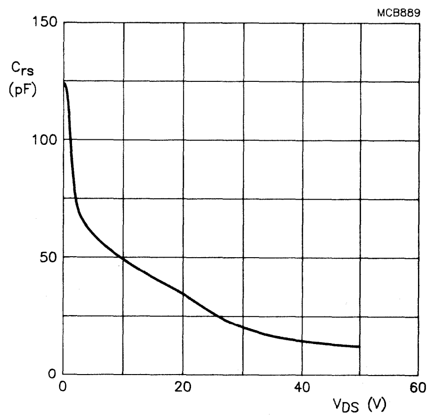
I_D = 5 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

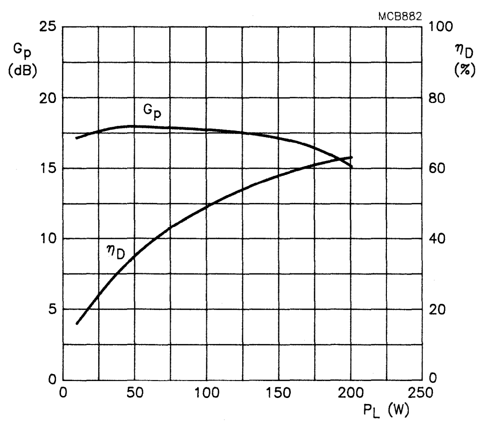
T_h = 25 °C; $R_{th\ mb-h}$ = 0.2 K/W; R_{GS} = 16 Ω; unless otherwise specified.
RF performance in CW operation in a common source class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	175	50	0.1	150	> 14 typ. 17	> 50 typ. 58

Ruggedness in class-B operation

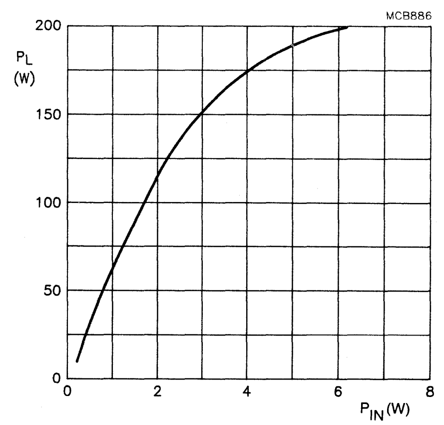
The BLF277 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 50 V; f = 175 MHz at rated load power.



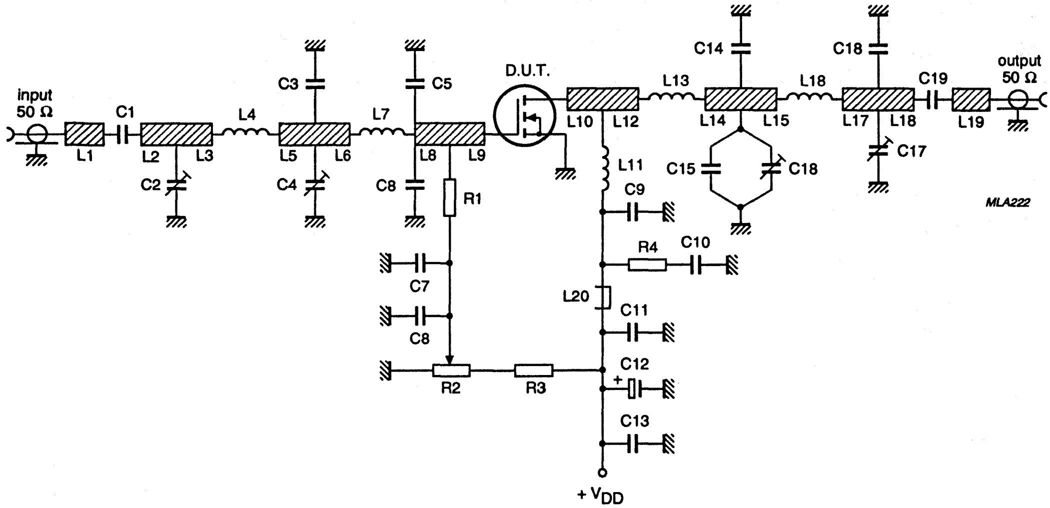
Class-B operation; V_{DS} = 50 V; I_{DQ} = 0.1 A;
Z_L = 1.4 + j1.6 Ω; f = 175 MHz.

Fig.9 Power gain and efficiency as functions of load power, typical values.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 0.1 A;
Z_L = 1.4 + j1.6 Ω; f = 175 MHz.

Fig.10 Load power as a function of input power, typical values.



f = 175 MHz.

Fig.11 Test circuit for class-B operation.

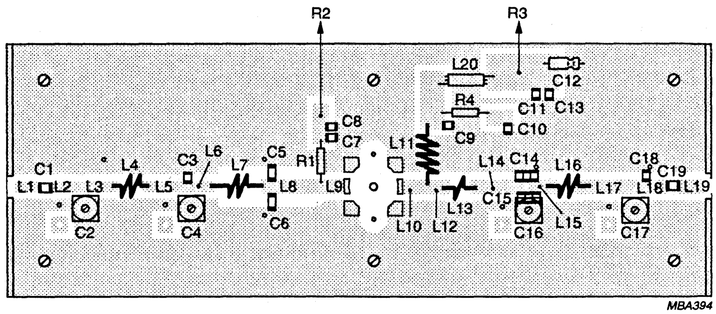
List of components (class-B test circuit)

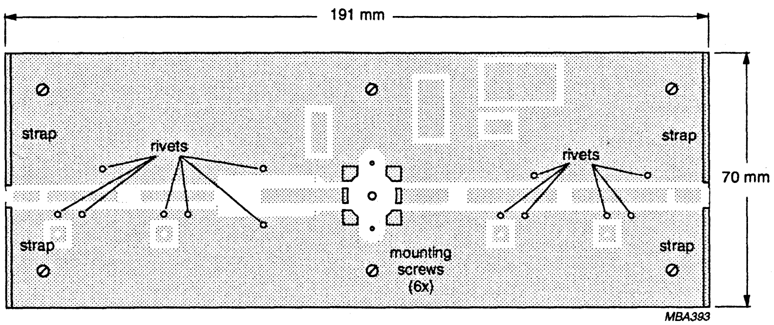
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C8, C19	multilayer ceramic chip capacitor (note 1)	680 pF		
C2, C4, C17	film dielectric trimmer	5 to 60 pF		2222 809 08003
C3	multilayer ceramic chip capacitor (note 1)	33 pF		
C5, C6, C9	multilayer ceramic chip capacitor (note 1)	100 pF		
C7, C10, C13	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C11	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C12	electrolytic capacitor	10 μF, 63 V		
C14, C15	multilayer ceramic chip capacitor (note 2)	3 x 22 pF in parallel		
C16	film dielectric trimmer	4 to 40 pF		2222 809 08002
C18	multilayer ceramic chip capacitor (note 1)	18 pF		
L1	stripline (note 3)	49 Ω	length 8 mm width 4 mm	
L2	stripline (note 3)	49 Ω	length 12 mm width 4 mm	
L3	stripline (note 3)	49 Ω	length 7.5 mm width 4 mm	
L4	2 turns enamelled 1.5 mm copper wire	25 nH	length 3.7 mm int. dia. 5 mm leads 2 x 1 mm	
L5	stripline (note 3)	49 Ω	length 15.5 mm width 4 mm	
L6	stripline (note 3)	49 Ω	length 5 mm width 4 mm	
L7	2 turns enamelled 1.5 mm copper wire	25 nH	length 4.2 mm int. dia. 5 mm leads 2 x 4 mm	
L8	stripline (note 3)	31 Ω	length 18 mm width 6 mm	
L9	stripline (note 3)	31 Ω	length 6 mm width 6 mm	
L10, L12	stripline (note 3)	31 Ω	length 7 mm width 6 mm	
L11	3 turns enamelled 1.5 mm copper wire	40 nH	length 6.8 mm int. dia. 5 mm leads 2 x 3 mm	
L13	1 turn enamelled 1.5 mm copper wire	3 nH	int. dia. 2.8 mm leads 2 x 1 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L14	stripline (note 3)	36 Ω	length 15.5 mm width 5 mm	
L15	stripline (note 3)	36 Ω	length 8 mm width 5 mm	
L16	2 turns enamelled 2.5 mm copper wire	28 nH	length 5.5 mm int. dia. 5 mm leads 2 x 3 mm	
L17	stripline (note 3)	36 Ω	length 12 mm width 5 mm	
L18, L19	stripline (note 3)	36 Ω	length 8.5 mm width 5 mm	
L20	grade 3B Ferroxcube RF choke			4312 020 36642
R1	0.4 W metal film resistor	16 Ω		
R2	10 turn potentiometer	50 kΩ		
R3	0.4 W metal film resistor	400 kΩ		
R4	0.4 W metal film resistor	100 Ω		

Notes

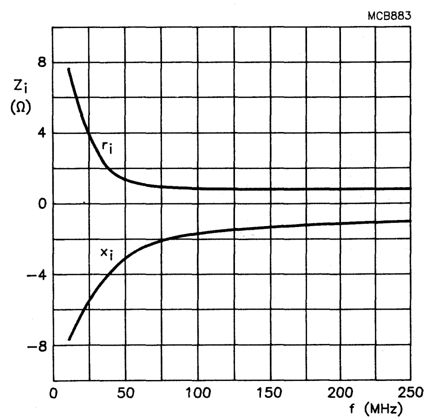
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. American Technical Ceramics (ATC) capacitor, type 175B or other capacitor of the same quality.
3. The striplines are mounted double copper-clad printed circuit board, with epoxy glass dielectric ($\varepsilon_r = 4.5$); thickness 1.6 mm.





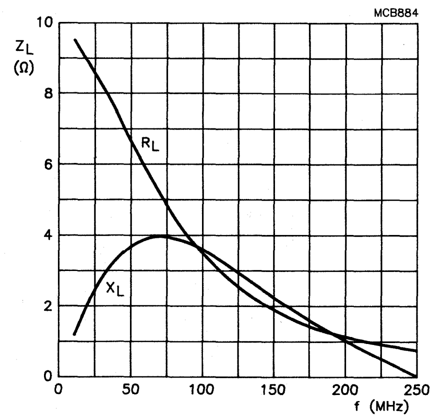
The circuit and components are situated on one side of the printed circuit board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets.

Fig.12 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 0.1 A; R_{GS} = 16 Ω; P_L = 150 W.

Fig.13 Input impedance as a function of frequency (series components), typical values.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 0.1 A; R_{GS} = 16 Ω; P_L = 150 W.

Fig.14 Load impedance as a function of frequency (series components), typical values.

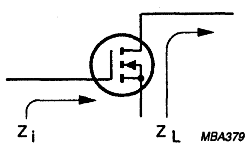
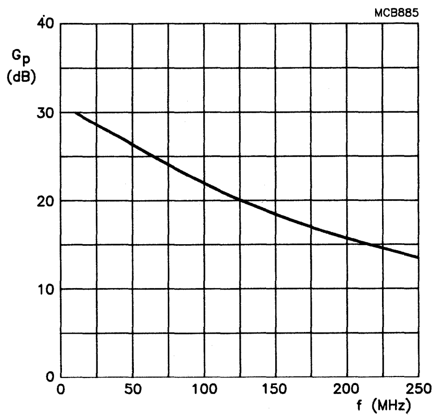


Fig.15 Definition of MOS impedance.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 0.1 A; R_{GS} = 16 Ω; P_L = 150 W.

Fig.16 Power gain as a function of frequency, typical values.

VHF push-pull power MOS transistor

BLF278

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

Dual push-pull silicon N-channel enhancement mode vertical D-MOS transistor, designed for broadcast transmitter applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead SOT262 balanced flange envelope, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

PINNING - SOT262A1

PIN	DESCRIPTION
1	drain 1
2	drain 2
3	gate 1
4	gate 2
5	source

PIN CONFIGURATION

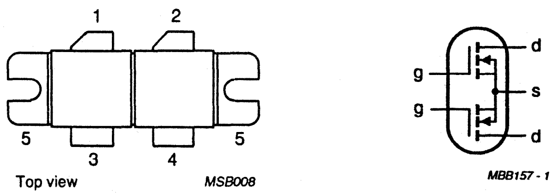


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a push-pull common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	108	50	300	> 20	> 60
CW, class-C	108	50	300	typ. 18	typ. 80
CW, class-AB	225	50	250	> 14 typ. 16	> 50 typ. 55

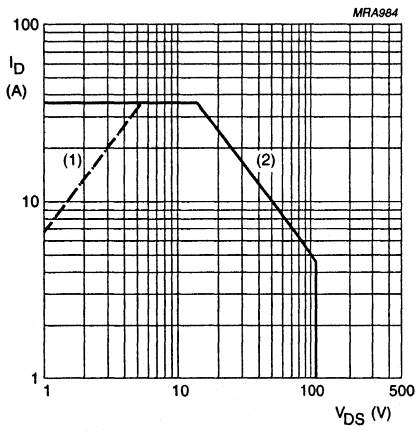
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).
Per transistor section unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	110	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	18	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C total device; both sections equally loaded	–	500	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

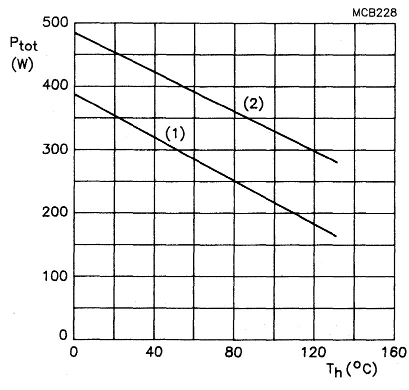
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded.	max. 0.35 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded.	max. 0.15 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.
Total device; both sections equally loaded.

Fig.2 DC SOAR.



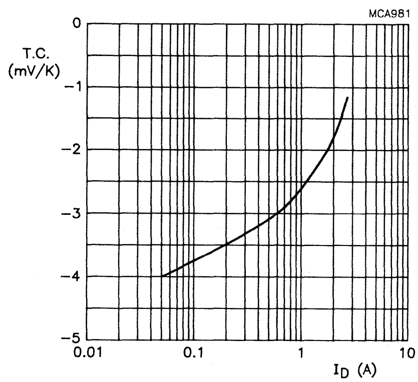
(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS (per section)

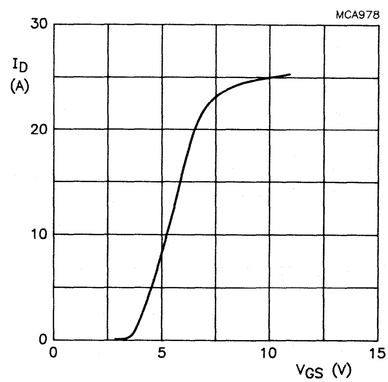
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 50 mA	110	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 50 V	–	–	2.5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 50 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of both sections	I_D = 50 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 5 A; V_{DS} = 10 V	4.5	6.2	–	S
g_{fs1}/g_{fs2}	forward transconductance ratio of both sections	I_D = 5 A; V_{DS} = 10 V	0.9	–	1.1	
$R_{DS(on)}$	drain-source on-state resistance	I_D = 5 A; V_{GS} = 10 V	–	0.2	0.3	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	25	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	480	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	190	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	14	–	pF
C_{d-f}	drain-flange capacitance		–	5.4	–	pF



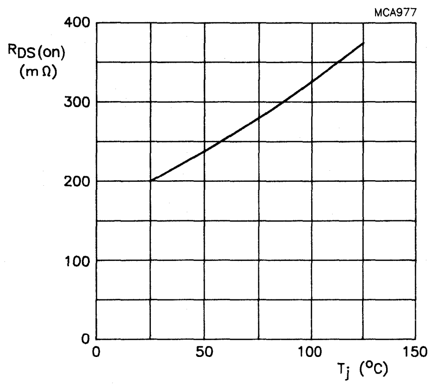
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values per section.



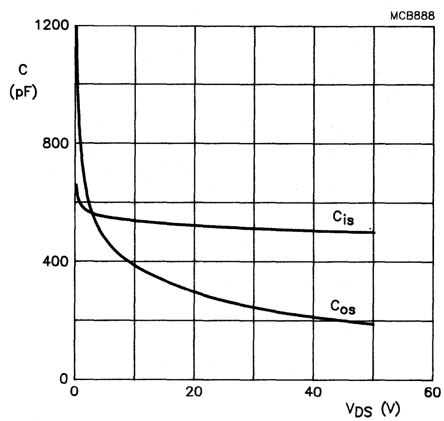
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values per section.



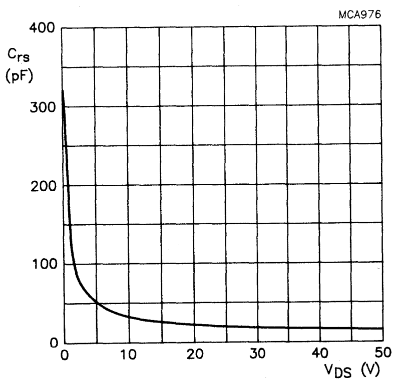
I_D = 5 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values per section.

APPLICATION INFORMATION FOR CLASS-B OPERATION

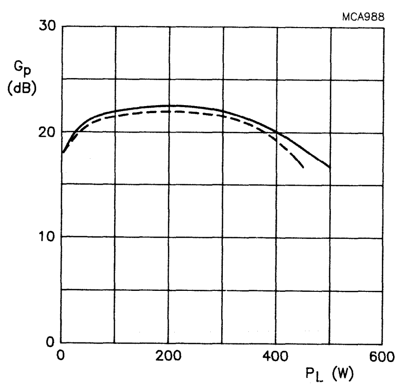
T_h = 25 °C; $R_{th\ mb-h}$ = 0.15 K/W, unless otherwise specified.
RF performance in CW operation in a common source class-B circuit.
R_{GS} = 4 Ω per section; optimum load impedance per section = 3.2 + j4.3 Ω (V_{DS} = 50 V).

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	108	50	2 x 0.1	300	> 20 typ. 22	> 60 typ. 70
CW, class-C	108	50	V_{GS} = 0	300	typ. 18	typ. 80

Ruggedness in class-B operation

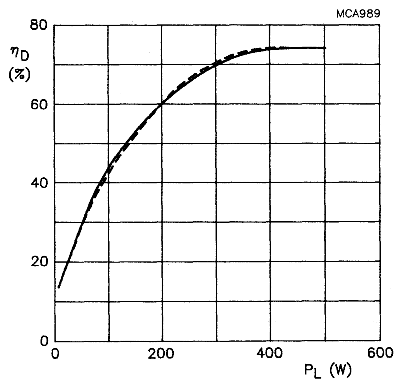
The BLF278 is capable of withstanding a load mismatch corresponding to VSWR = 7 through all phases under the following conditions:

V_{DS} = 50 V; f = 108 MHz at rated load power.



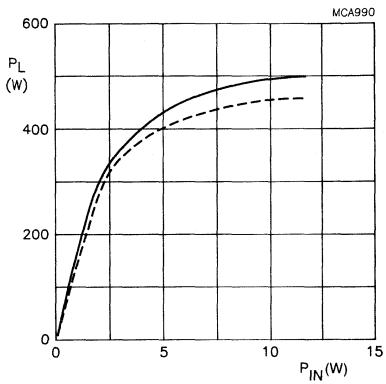
Class-B operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.1 A;
Z_L = 3.2 + j4.3 Ω (per section);
R_{GS} = 4 Ω (per section); f = 108 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.9 Power gain as a function of load power, typical values.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.1 A;
Z_L = 3.2 + j4.3 Ω (per section);
R_{GS} = 4 Ω (per section); f = 108 MHz.
solid line: T_h = 25 °C.
dotted line: T_h = 70 °C.

Fig.10 Efficiency as a function of load power, typical values.

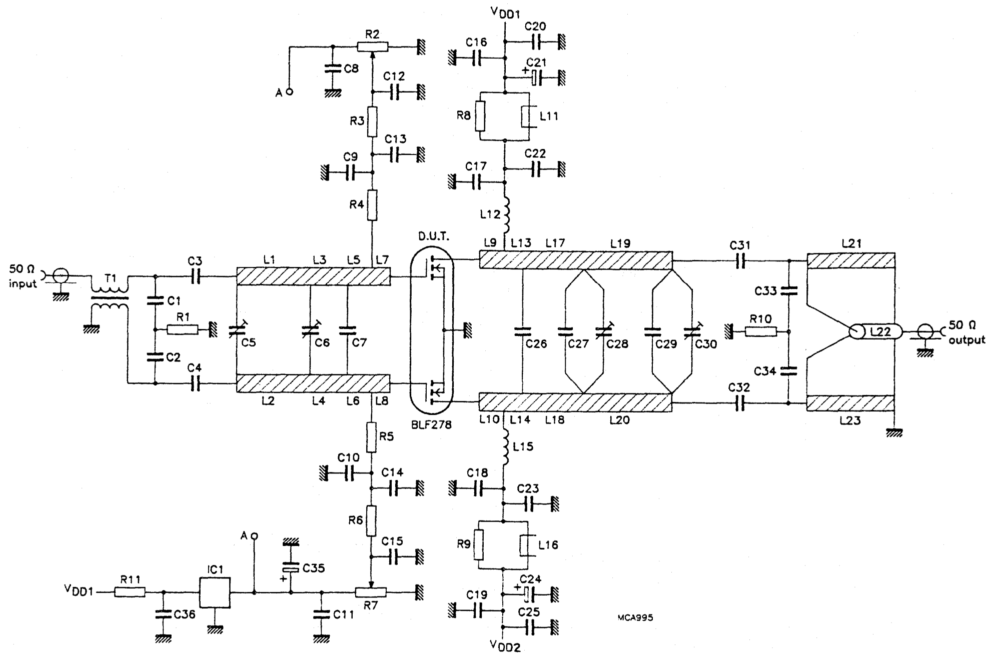


Class-B operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.1 A; Z_L = 3.2 + j4.3 Ω (per section); R_{GS} = 4 Ω (per section); f = 108 MHz.

solid line: T_h = 25 °C.

dotted line: T_h = 70 °C.

Fig.11 Load power as a function of input power, typical values.



f = 108 MHz.

Fig.12 Test circuit for class-B operation.

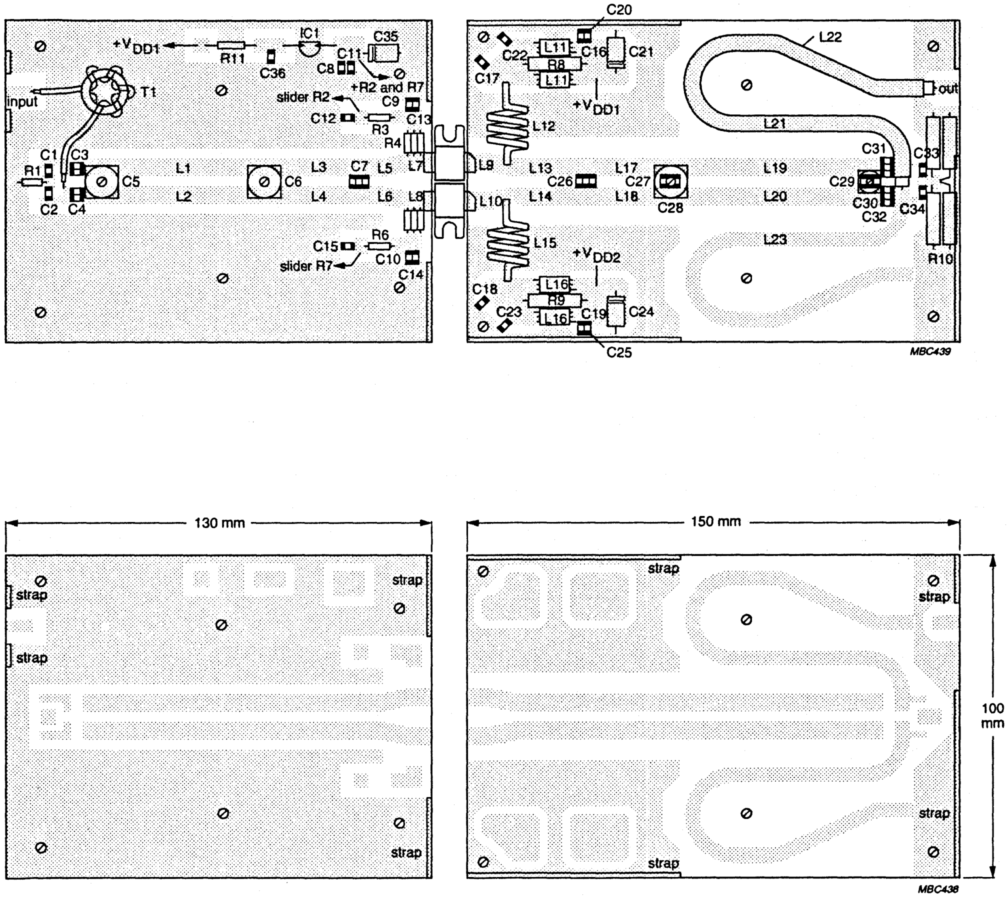
List of components (class-B test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C33, C34	multilayer ceramic chip capacitor (note 1)	22 pF, 500 V		
C3, C4	multilayer ceramic chip capacitor (note 1)	100 pF + 68 pF in parallel, 500 V		
C5, C6, C28	film dielectric trimmer	5 to 60 pF		2222 809 08003
C7	multilayer ceramic chip capacitor (note 1)	2 x 100 pF + 1 x 120 pF in parallel, 500 V		
C8, C11, C12, C15, C16, C19, C36	multilayer ceramic chip capacitor	100 nF, 500 V		2222 852 47104
C9, C10, C13, C14, C20, C25	multilayer ceramic chip capacitor (note 1)	1 nF, 500 V		
C17, C18, C22, C23	multilayer ceramic chip capacitor (note 1)	470 pF, 500 V		
C21, C24, C35	electrolytic capacitor	10 µF, 63 V		
C26	multilayer ceramic chip capacitor (note 1)	2 x 15 pF + 1 x 18 pF in parallel, 500 V		
C27	multilayer ceramic chip capacitor (note 1)	3 x 15 pF in parallel, 500 V		
C29	multilayer ceramic chip capacitor (note 1)	2 x 18 pF + 1 x 15 pF in parallel, 500 V		
C30	film dielectric trimmer	2 to 18 pF		2222 809 09006
C31, C32	multilayer ceramic chip capacitor (note 1)	3 x 43 pF in parallel, 500 V		
L1, L2	stripline (note 2)	43 Ω	length 57.5 mm width 6 mm	
L3, L4	stripline (note 2)	43 Ω	length 29.5 mm width 6 mm	
L5, L6	stripline (note 2)	43 Ω	length 14 mm width 6 mm	
L7, L8	stripline (note 2)	43 Ω	length 6 mm width 6 mm	
L9, L10	stripline (note 2)	43 Ω	length 17.5 mm width 6 mm	
L11, L16	2 x grade 3B Ferroxcube wideband HF chokes in parallel			4312 020 36642
L12, L15	4 turns enamelled 2 mm copper wire	85 nH	length 13.5 mm int. dia. 10 mm leads 2 x 7 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSION	CATALOGUE NO.
L13, L14	stripline (note 2)	43 Ω	length 19.5 mm width 6 mm	
L17, L18	stripline (note 2)	43 Ω	length 24.5 mm width 6 mm	
L19, L20	stripline (note 2)	43 Ω	length 66 mm width 6 mm	
L21, L23	stripline (note 2)	50 Ω	length 160 mm width 4.8 mm	
L22	semi-rigid cable (note 3)	50 Ω	ext. dia. 3.6 mm outer conductor length 160 mm	
R1	0.4 W metal film resistor	10 Ω		
R2, R7	10 turn potentiometer	50 kΩ		
R3, R6	0.4 W metal film resistor	3 × 12.1 Ω in parallel		
R4, R5	0.4 W metal film resistor	10 Ω; 1 W		
R8, R9	1 W metal film resistor	10 Ω ±5%		
R10	1 W metal film resistor	4 × 10 Ω in parallel		
R11	1 W metal film resistor	5.11 kΩ		
IC1	voltage regulator 78L05			
T1	1:1 Balun; 7 turns type 4C6 50 Ω coaxial cable wound around toroid		14 × 9 × 5 mm	4322 020 90770

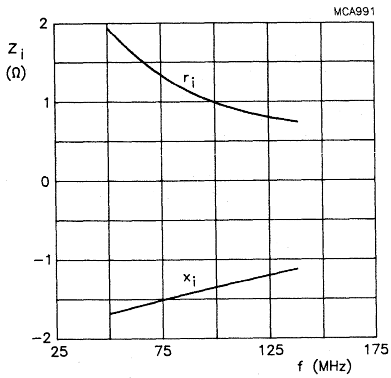
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. L1 - L10, L13, L14, L17 - L21 and L23 are striplines on a double copper-clad printed-circuit board, with glass microfibre PTFE dielectric ($\varepsilon_r = 2.2$); thickness $^1\!/_{16}$ inch; thickness of the copper sheet 2 × 35 μm.
3. L22 is soldered on to stripline L21.



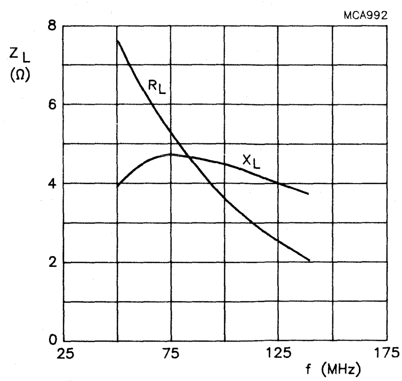
The circuit and components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as an earth. Earth connections are made by means of copper straps for a direct contact between upper and lower sheets.

Fig.13 Component layout for 108 MHz class-B test circuit.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.1 A; R_{GS} = 4 Ω (per section); P_L = 300 W.

Fig.14 Input impedance as a function of frequency (series components), typical values per section.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.1 A; R_{GS} = 4 Ω (per section); P_L = 300 W.

Fig.15 Load impedance as a function of frequency (series components), typical values per section.

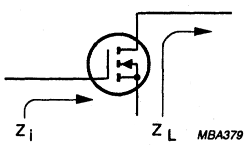
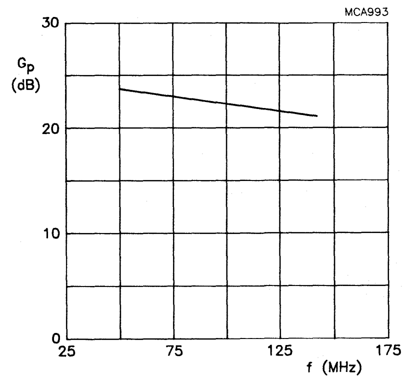


Fig.16 Definition of MOS impedance.



Class-B operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.1 A; R_{GS} = 4 Ω (per section); P_L = 300 W.

Fig.17 Power gain as a function of frequency, typical values per section.

APPLICATION INFORMATION FOR CLASS-AB OPERATION

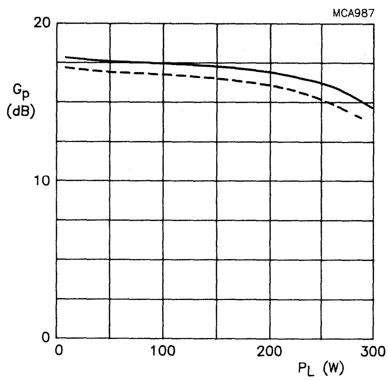
T_h = 25 °C; $R_{th\ mb-h}$ = 0.15 K/W, unless otherwise specified.
RF performance in CW operation in a common source class-AB circuit.
R_{GS} = 2.8 Ω per section; optimum load impedance per section = 0.74 + j2 Ω (V_{DS} = 50 V).

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	η_D (%)
CW, class-AB	225	50	2 x 0.5	250	> 14 typ. 16	> 50 typ. 55

Ruggedness in class-AB operation

The BLF278 is capable of withstanding a load mismatch corresponding to VSWR = 7 through all phases under the following conditions:

V_{DS} = 50 V; f = 225 MHz at rated output power.

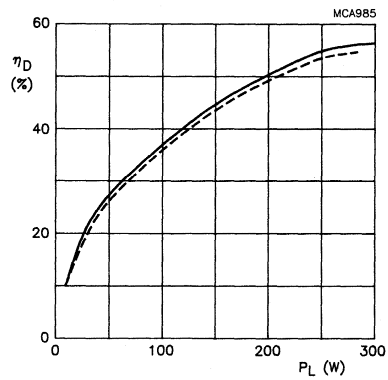


Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; Z_L = 0.74 + j2 Ω (per section); R_{GS} = 2.8 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C.

dotted line: T_h = 70 °C.

Fig.18 Power gain as a function of load power, typical values.

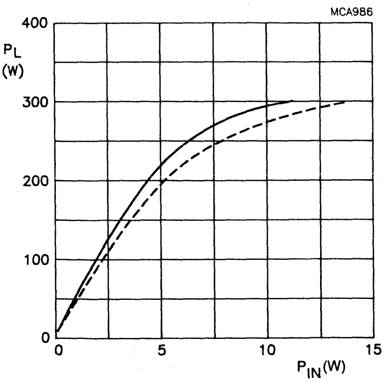


Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; Z_L = 0.74 + j2 Ω (per section); R_{GS} = 2.8 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C.

dotted line: T_h = 70 °C.

Fig.19 Efficiency as a function of load power, typical values.

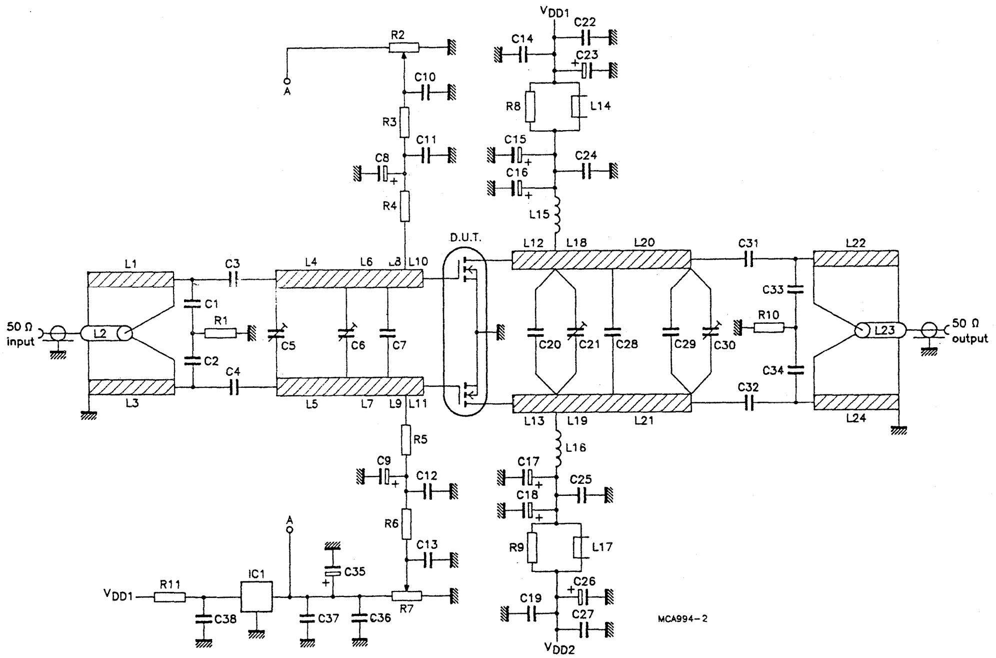


Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; Z_L = 0.74 + j2 Ω (per section); R_{GS} = 2.8 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C.

dotted line: T_h = 70 °C.

Fig.20 Load power as a function of input power, typical values.



f = 225 MHz.

Fig.21 Test circuit for class-AB operation.

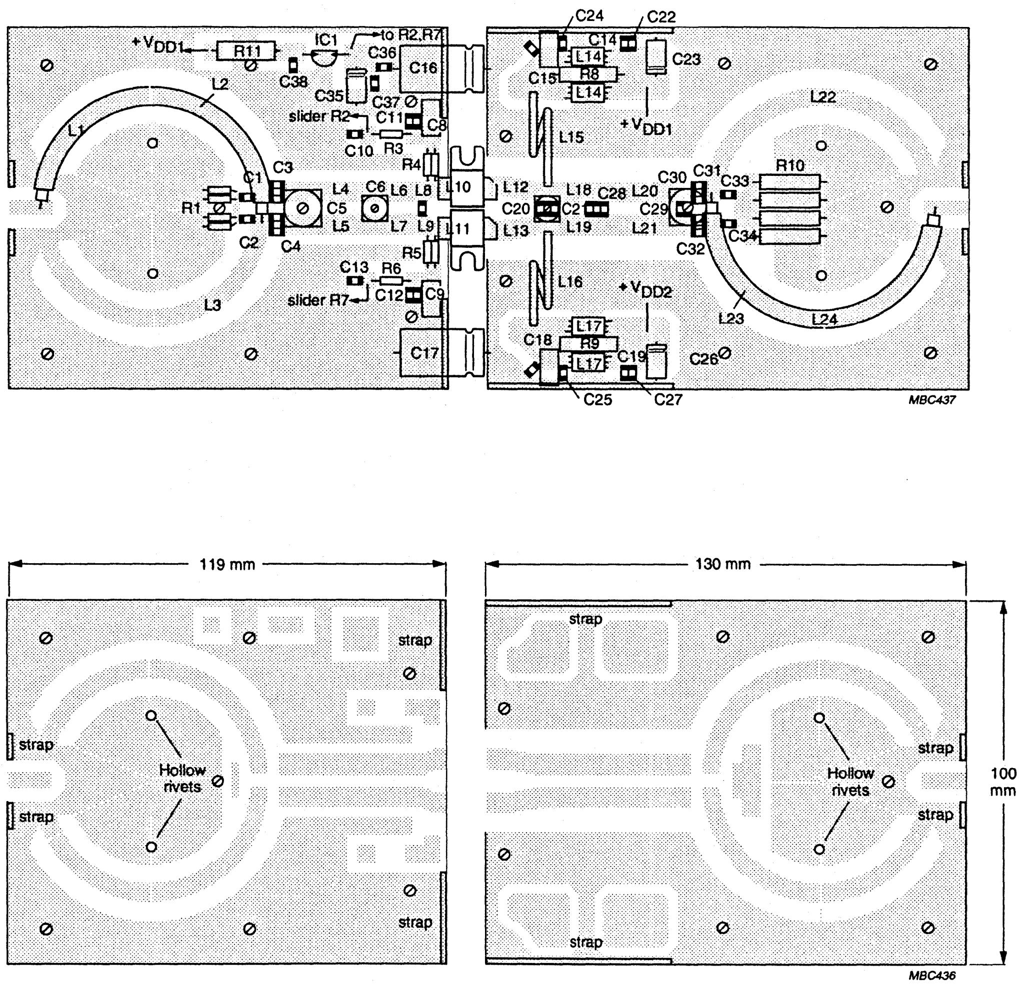
List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor (note 1)	27 pF, 500 V		
C3, C4, C31, C32	multilayer ceramic chip capacitor (note 1)	3 x 18 pF in parallel, 500 V		
C5	film dielectric trimmer	4 to 40 pF		2222 809 08002
C6, C30	film dielectric trimmer	2 to 18 pF		2222 809 09006
C7	multilayer ceramic chip capacitor (note 1)	100 pF, 500 V		
C8, C9, C15, C18	MKT film capacitor	1 μF, 63 V		2222 371 11105
C10, C13, C14, C19, C36	multilayer ceramic chip capacitor	100 nF, 50 V		2222 852 47104
C11, C12	multilayer ceramic chip capacitor (note 1)	2 x 1 nF in parallel, 500 V		
C16, C17	electrolytic capacitor	220 μF, 63 V		
C20	multilayer ceramic chip capacitor (note 1)	3 x 33 pF in parallel, 500 V		
C21	film dielectric trimmer	2 to 9 pF		2222 809 09005
C22, C27, C37, C38	multilayer ceramic chip capacitor (note 1)	1 nF, 500 V		
C23, C26, C35	electrolytic capacitor	10 μF, 63 V		
C24, C25	multilayer ceramic chip capacitor (note 1)	2 x 470 pF in parallel, 500 V		
C28	multilayer ceramic chip capacitor (note 1)	2 x 10 pF + 1 x 18 pF in parallel, 500 V		
C29	multilayer ceramic chip capacitor (note 1)	2 x 5.6 pF in parallel, 500 V		
C33, C34	multilayer ceramic chip capacitor (note 1)	5.6 pF, 500 V		
L1, L3, L22, L24	stripline (note 2)	50 Ω	length 80 mm width 4.8 mm	
L2, L23	semi-rigid cable (note 3)	50 Ω	ext. dia. 3.6 mm outer conductor length 80 mm	
L4, L5	stripline (note 2)	43 Ω	length 24 mm width 6 mm	
L6, L7	stripline (note 2)	43 Ω	length 14.5 mm width 6 mm	
L8, L9	stripline (note 2)	43 Ω	length 4.4 mm width 6 mm	
L10, L11	stripline (note 2)	43 Ω	length 3.2 mm width 6 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L12, L13	stripline (note 2)	43 Ω	length 15 mm width 6 mm	
L14, L17	2 x grade 3B Ferroxcube wideband HF chokes in parallel			4312 020 36642
L15, L16	1¾ turns enamelled 2 mm copper wire	40 nH	int. dia. 10 mm leads 2 x 7 mm space 1 mm	
L18, L19	stripline (note 2)	43 Ω	length 13 mm width 6 mm	
L20, L21	stripline (note 2)	43 Ω	length 29.5 mm width 6 mm	
R1	0.4 W metal film resistor	10 Ω		
R2, R7	10 turns potentiometer	50 kΩ		
R3, R6	0.4 W metal film resistor	1 kΩ		
R4, R5	0.4 W metal film resistor	2 x 5.62 Ω in parallel		
R8, R9	1 W metal film resistor	10 Ω ±5%		
R10	1 W metal film resistor	4 x 42.2 Ω in parallel		
R11	1 W metal film resistor	5.11 kΩ		
IC1	voltage regulator 78L05			

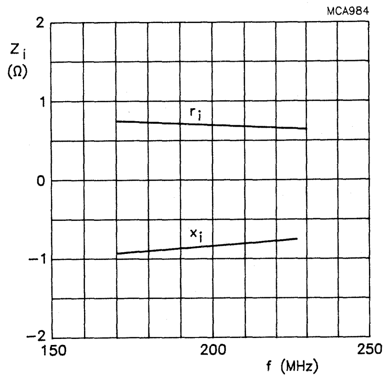
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. L1, L3 - L13, L18 - L22 and L24 are microstriplines on a double copper-clad printed circuit board, with glass microfibre reinforced PTFE dielectric ($\varepsilon_r = 2.2$), thickness 1⁄16 inch; thickness of copper sheet 2 x 35 μm.
3. L2 and L23 are soldered on to striplines L1 and L24 respectively.



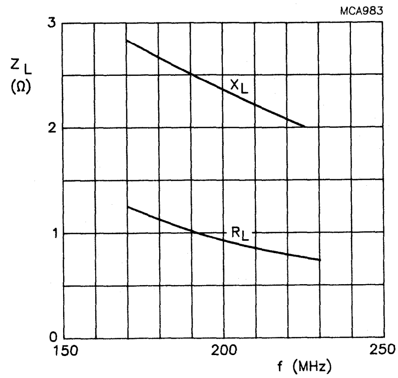
The circuit and components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as an earth. Earth connections are made by means of copper straps and hollow rivets for a direct contact between upper and lower sheets.

Fig.22 Component layout for 225 MHz class-AB test circuit.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; R_{GS} = 2.8 Ω (per section); P_L = 250 W.

Fig.23 Input impedance as a function of frequency (series components), typical values per section.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; R_{GS} = 2.8 Ω (per section); P_L = 250 W.

Fig.24 Load impedance as a function of frequency (series components), typical values per section.

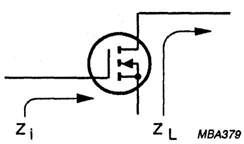
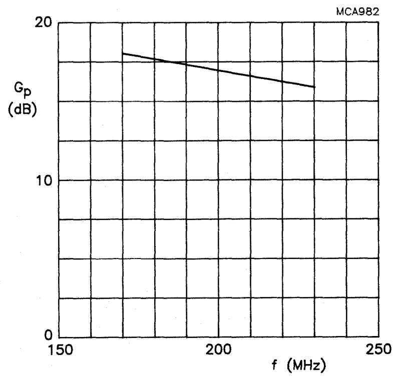


Fig.25 Definition of MOS impedance.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; R_{GS} = 2.8 Ω (per section); P_L = 250 W.

Fig.26 Power gain as a function of frequency, typical values per section.

VHF power MOS transistor BLF346

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for linear amplifier applications in Television transmitters and transposers.

The transistor is encapsulated in a 6-lead, SOT119 flange envelope, with a ceramic cap. All leads are isolated from the flange.

A marking code, showing gate-source voltage (V_{GS}) information is provided for matched pair applications. Refer to the 'General' section for further information.

PINNING - SOT119

PIN	DESCRIPTION
1	source
2	source
3	gate
4	drain
5	source
6	source

PIN CONFIGURATION

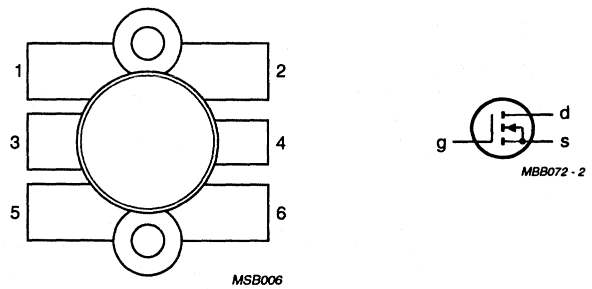


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance in a linear amplifier.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_D (A)	T_h (°C)	P_L (W)	G_p (dB)	d_{im} (dB) (note 1)
class-A	224.25	28	3	70	> 25	> 14	−52
				25	typ. 30	typ. 16.5	−52

Note

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

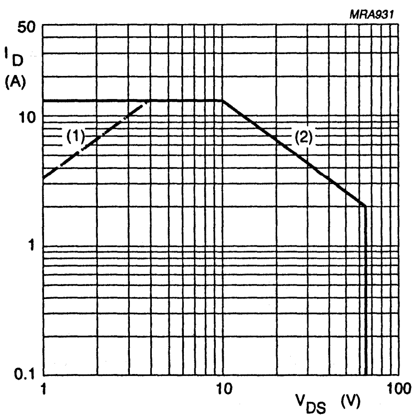
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DSS}	drain-source voltage		–	65	V
$\pm V_{GSS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	13	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	130	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

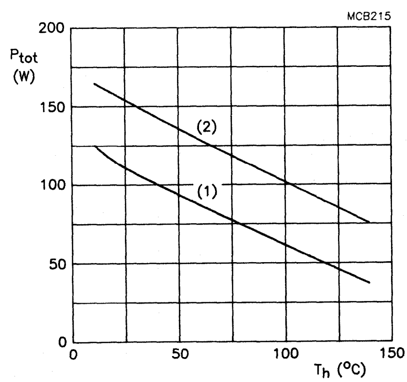
SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	T_{mb} = 25 °C; P_{tot} = 130 W	1.35 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	T_{mb} = 25 °C; P_{tot} = 130 W	0.2 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.

(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Continuous operation.

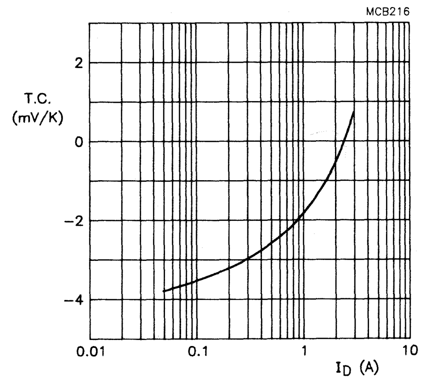
(2) Short-time operation during mismatch.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS

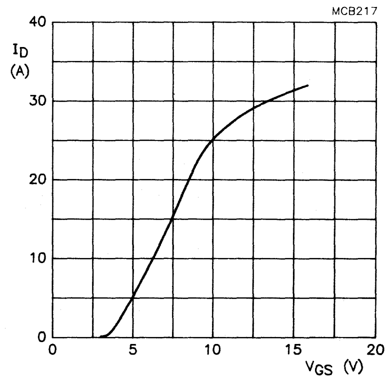
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 50 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	2.5	mA
I_{GSS}	gate-source leakage current	±V_{GS} = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 50 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of matched pairs	I_D = 50 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 5 A; V_{DS} = 10 V	3	4.2	–	S
$R_{DS(on)}$	drain-source on-state resistance	I_D = 5 A; V_{GS} = 10 V	–	0.2	0.3	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	22	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	225	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	180	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	25	–	pF



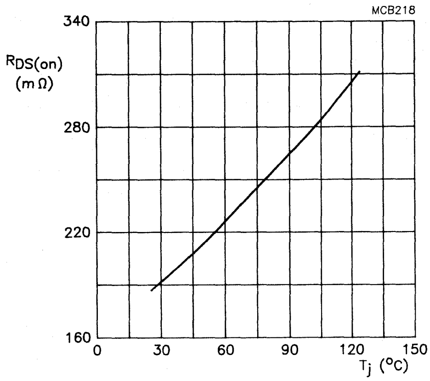
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



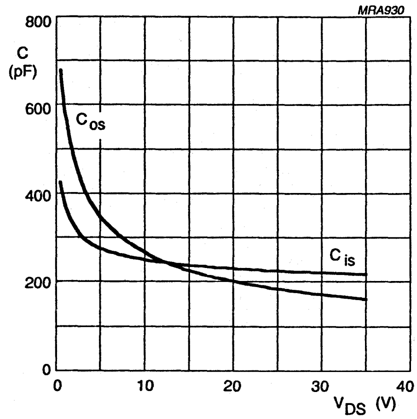
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values.



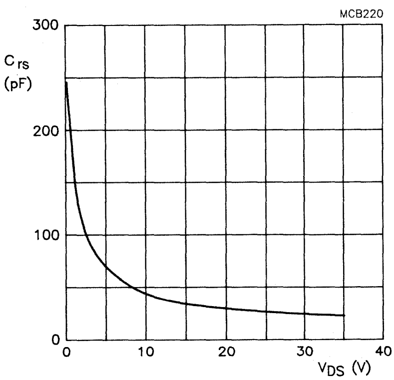
I_D = 5 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-A OPERATION

T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.2 K/W; Z_L = 1.1 + j0.2 Ω unless otherwise specified.
RF performance in a linear amplifier (common source class-A circuit).

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_D (A)	T_h (°C)	$P_{o\ sync}$ (W)	G_p (dB)	d_{im} (dB) (note 1)
class-A	224.25	28	3	70	> 25	> 14	−52
	224.25	28	3	25	typ. 30	typ. 16.5	−52
	224.25	28	3	70	typ. 20	typ. 14.5	−55
	224.25	28	3	25	typ. 22	typ. 15	−55

Note

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

Ruggedness in class-A operation

The BLF346 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 28 V; f = 225 MHz at rated output power.

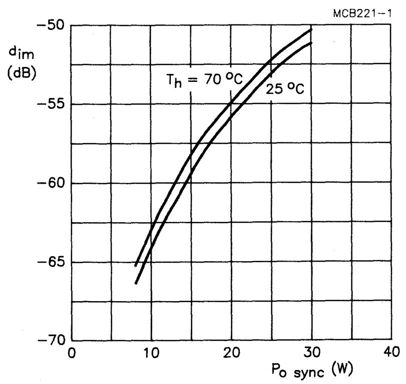
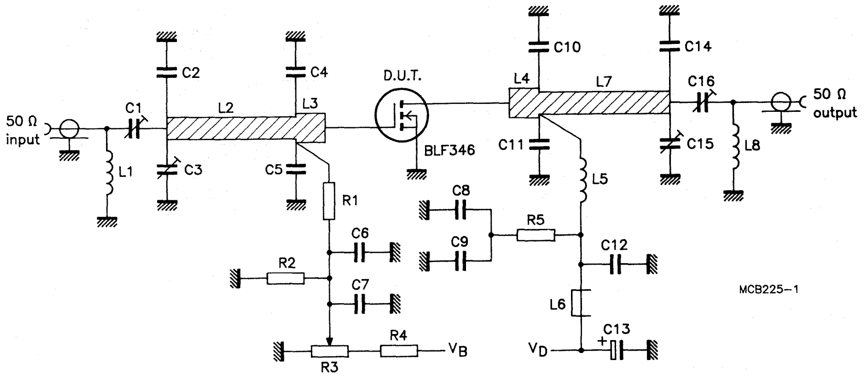


Fig.9 Intermodulation distortion as a function of peak synchronized output power.



f = 225 MHz.

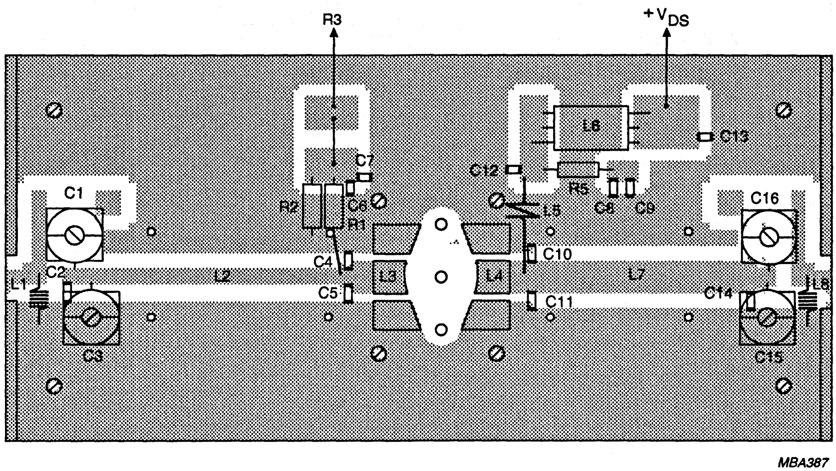
Fig.10 Test circuit for class-A operation.

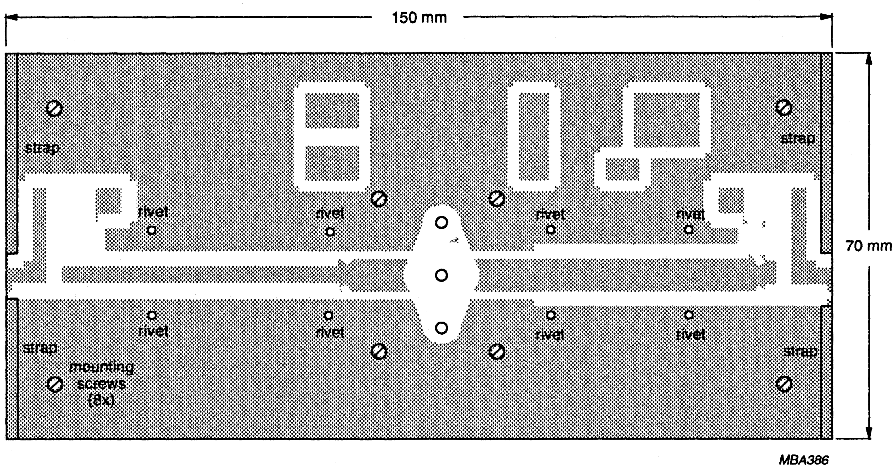
List of components (class-A test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	2 to 18 pF		2222 809 09003
C2	multilayer ceramic chip capacitor (note 1)	10 pF, 500 V		
C3, C15, C16	film dielectric trimmer	4 to 40 pF		2222 809 08002
C4, C5	multilayer ceramic chip capacitor (note 1)	56 pF, 500 V		
C6, C12	multilayer ceramic chip capacitor (note 1)	680 pF, 500 V		
C7, C8, C9	multilayer ceramic chip capacitor	100 nF, 50 V		2222 852 47104
C10, C11	multilayer ceramic chip capacitor (note 1)	43 pF, 500 V		
C13	electrolytic capacitor	10 μF, 63 V		2222 030 38109
C14	multilayer ceramic chip capacitor (note 1)	27 pF, 500 V		
L1	4 turns enamelled 0.7 mm copper wire	42.4 nH	length 4 mm int. dia. 3 mm leads 2 x 5 mm	
L2	stripline (note 2)	50 Ω	length 49 mm width 2.8 mm	
L3, L4	stripline (note 2)	31 Ω	length 11.5 mm width 6 mm	
L5	2 turns enamelled 1.5 mm copper wire	18.7 nH	length 8 mm int. dia. 4 mm leads 2 x 5 mm	
L6	grade 3B Ferroxcube RF choke			4312 020 36642
L7	stripline (note 2)	31 Ω	length 40 mm width 6 mm	
L8	3 turns enamelled 1.5 mm copper wire	28.8 nH	length 8 mm int. dia. 4 mm leads 2 x 5 mm	
R1	0.4 W metal film resistor	1 kΩ		2322 151 71002
R2	0.4 W metal film resistor	100 kΩ		2322 151 71004
R3	10 turns cermet potentiometer	100 Ω		
R4	0.4 W metal film resistor	316 kΩ		2322 153 53161
R5	0.4 W metal film resistor	10 Ω		2322 153 51009

Notes

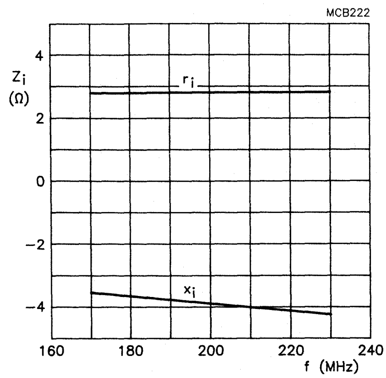
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board with epoxy fibre-glass dielectric ($\varepsilon_r = 4.5$), thickness $1/16$ inch.





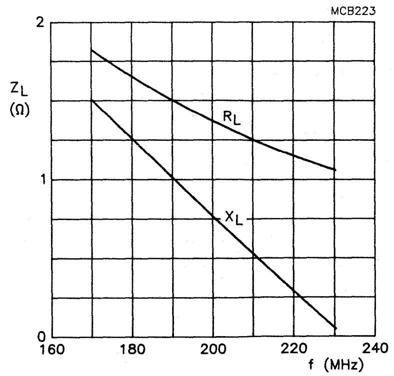
The circuit and components are situated on one side of the printed circuit board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets.

Fig.11 Component layout for 225 MHz class-A test circuit.



Class-A operation; V_{DS} = 28 V; I_D = 3 A; P_L = 30 W; T_h = 70 °C.

Fig.12 Input impedance as a function of frequency (series components), typical values.



Class-A operation; V_{DS} = 28 V; I_D = 3 A; P_L = 30 W; T_h = 70 °C.

Fig.13 Load impedance as a function of frequency (series components), typical values.

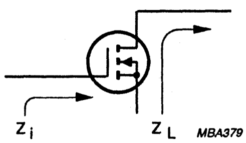
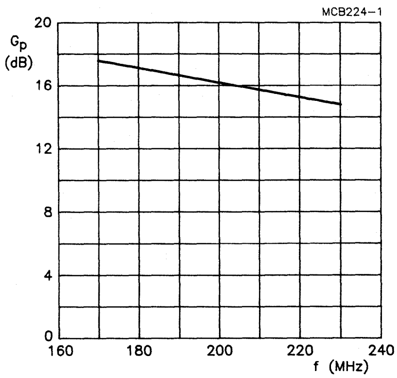


Fig.14 Definition of MOS impedance.



Class-A operation; V_{DS} = 28 V; I_D = 3 A; P_L = 30 W; T_h = 70 °C.

Fig.15 Power gain as a function of frequency, typical values.

VHF linear push-pull power MOS transistor

BLF348

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

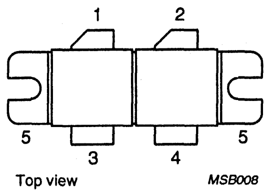
Dual push-pull silicon N-channel enhancement mode vertical D-MOS transistor, designed for broadcast transmitter applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead, SOT262 A1 balanced flange envelope, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

PINNING - SOT262A1

PIN	DESCRIPTION
1	drain 1
2	drain 2
3	gate 1
4	gate 2
5	source

PIN CONFIGURATION



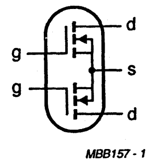


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance in a push-pull common source test circuit.

MODE OF OPERATION	f_{vision} (MHz)	V_{DS} (V)	I_D (A)	T_h (°C)	d_{im} (dB) (note 1)	$P_{o\ sync}$ (W)	G_p (dB)
class-A	224.25	28	2 x 4.6	70	−52	> 67	> 11
	224.25	28	2 x 4.6	25	−52	typ. 75	typ. 13

Note

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

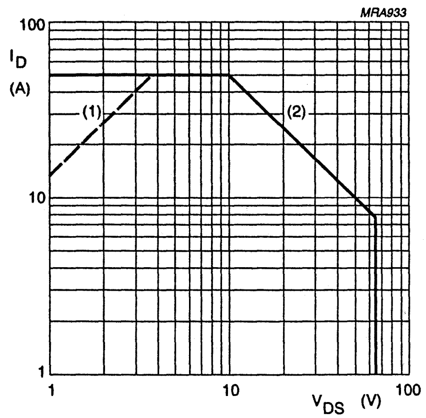
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).
Per transistor section unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DSS}	drain-source voltage		–	65	V
$\pm V_{GSS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	25	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C; total device; both sections equally loaded	–	500	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

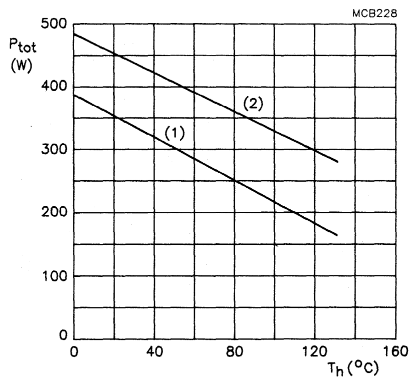
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded	0.35 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded	0.15 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.
Total device; both sections equally loaded.

Fig.2 DC SOAR.



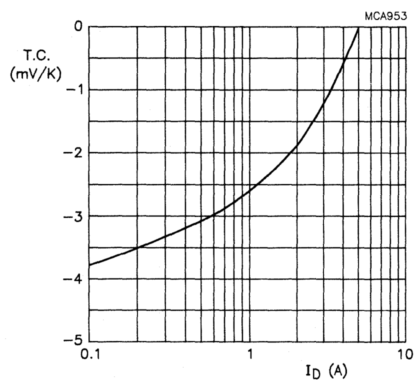
(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS (per section)

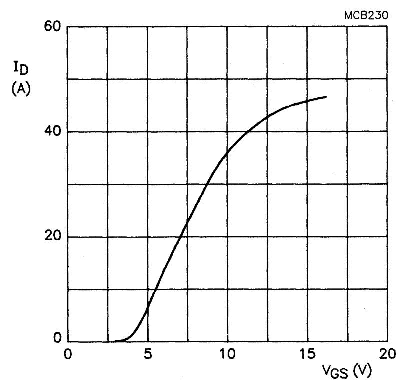
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 0.1 A	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 0.1 A; V_{DS} = 10 V	2	–	4.5	V
$\Delta V_{GS(th)}$	gate-source voltage difference of both transistor sections	I_D = 0.1 A; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 8 A; V_{DS} = 10 V	5	7.5	–	S
g_{fs1}/g_{fs2}	forward transconductance ratio of both transistor sections	I_D = 8 A; V_{DS} = 10 V	0.9	–	1.1	
$R_{DS(on)}$	drain-source on-state resistance	I_D = 8 A; V_{GS} = 10 V	–	0.1	0.15	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	37	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	495	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	340	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	40	–	pF



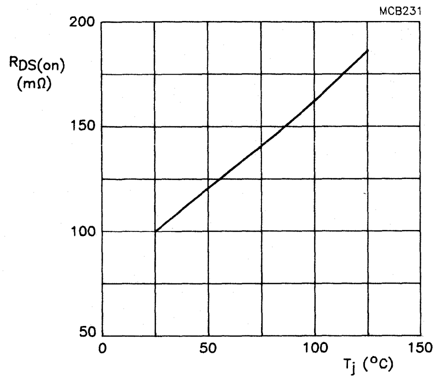
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values per section.



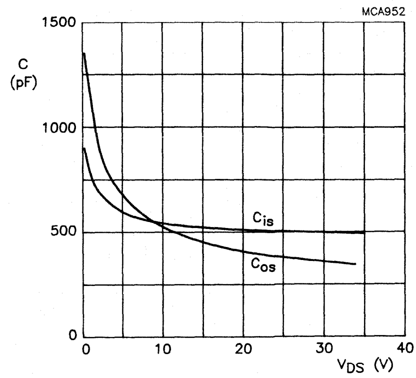
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values per section.



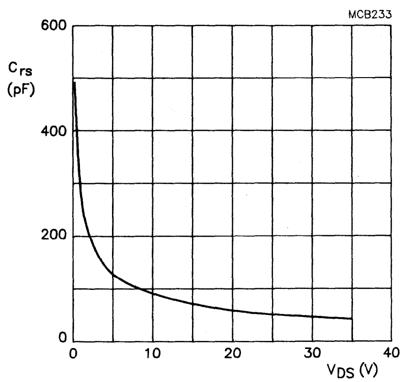
I_D = 8 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values per section.

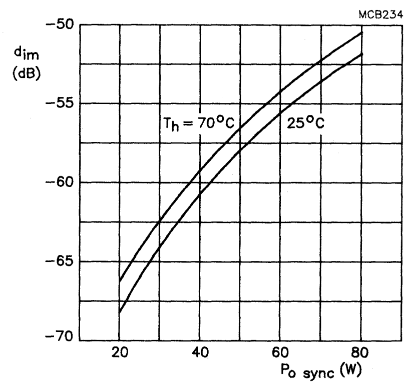


Fig.9 Intermodulation distortion as a function of peak synchronized output power.

APPLICATION INFORMATION FOR CLASS-A OPERATION

T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0.15 K/W unless otherwise specified.
RF performance in a linear amplifier (common source circuit class-A circuit).
R_{GS} = 82 Ω per section; optimum load impedance per section = 0.14 + j0.14 Ω.

MODE OF OPERATION	f_{vision} (MHz)	V_{DS} (V)	I_D (A)	T_h (°C)	d_{im} (dB) (note 1)	$P_{o\ sync}$ (W)	G_p (dB)
class-A	224.25	28	2 x 4.6	70	−52	> 67 typ. 70	> 11 typ. 12.5
	224.25	28	2 x 4.6	25	−52	typ. 75	typ. 13
	224.25	28	2 x 4.6	70	−55	> 54 typ. 57	> 11 typ.12.5
	224.25	28	2 x 4.6	25	−55	typ. 62	typ. 13

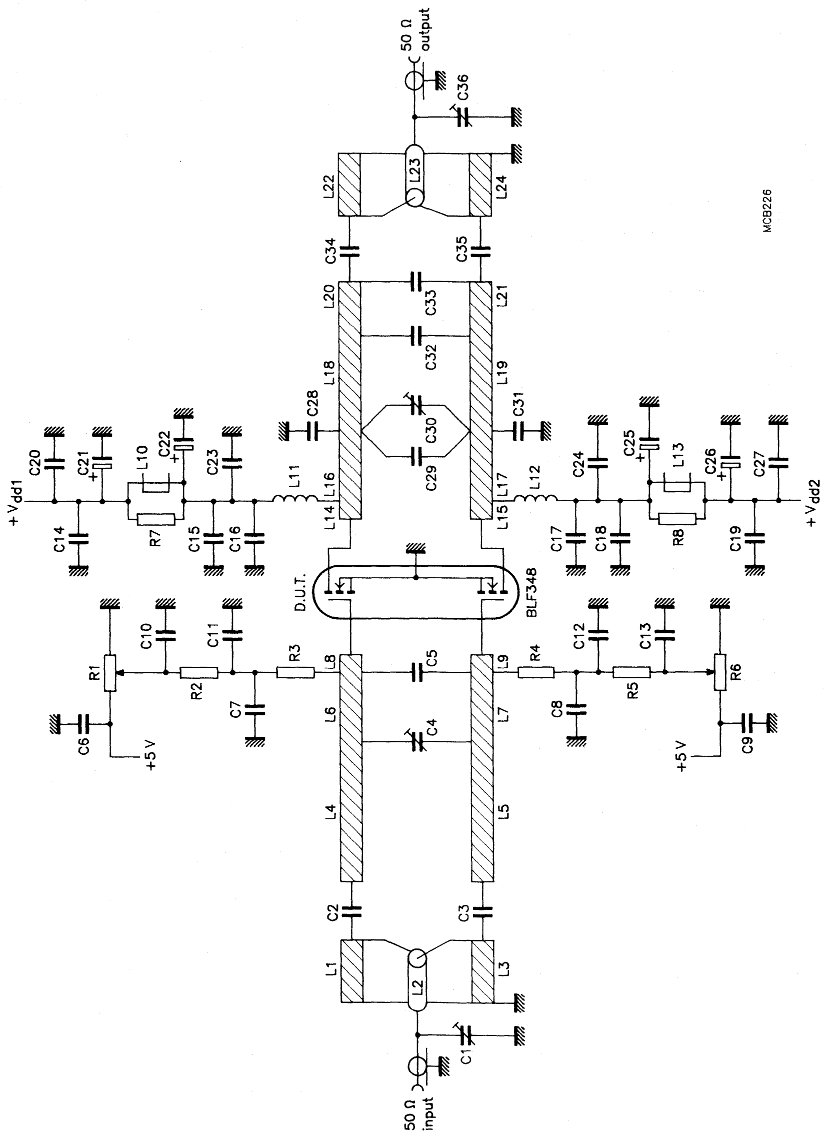
Note

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

Ruggedness in class-A operation

The BLF348 is capable of withstanding a load mismatch corresponding to VSWR = 20 through all phases under the following conditions:

V_{DS} = 28 V; f = 224.25 MHz at rated output power.



f = 225 MHz.

Fig.10 Test circuit for class-A operation.

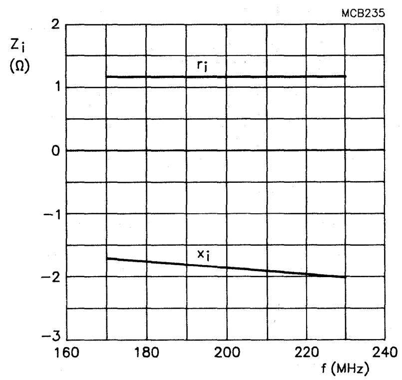
List of components (class-A test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	2 to 9 pF		2222 809 09006
C2, C3	multilayer ceramic chip capacitor (note 1)	2 x 10 pF in parallel + 22 pF		
C4, C30	film dielectric trimmer	5 to 60 pF		2222 809 08003
C5	multilayer ceramic chip capacitor (note 1)	82 pF, 500 V		
C6, C9, C10, C13, C14, C19	multilayer ceramic chip capacitor	100 nF, 50 V		2222 852 47104
C11, C12, C20, C27	multilayer ceramic chip capacitor (note 1)	1 nF, 500 V		
C7, C8, C16, C17	MKT film capacitor	1 µF		2222 371 11105
C21, C26	electrolytic capacitor	10 µF, 63 V		
C22, C25	electrolytic capacitor	220 µF, 63 V		
C15, C18, C23, C24	multilayer ceramic chip capacitor (note 1)	510 pF, 500 V		
C28, C31	multilayer ceramic chip capacitor (note 1)	2 x 8.2 pF in parallel, 500 V		
C29	multilayer ceramic chip capacitor (note 1)	3 x 39 pF in parallel, 500 V		
C32	multilayer ceramic chip capacitor (note 1)	33 pF, 500 V		
C33	multilayer ceramic chip capacitor (note 1)	18 pF, 500 V		
C34, C35	multilayer ceramic chip capacitor (note 1)	10 pF + 18 pF + 62 pF (3 in parallel), 500 V		
C36	film dielectric trimmer	2 to 18 pF		2222 809 09003
L1, L3, L22, L24	stripline (note 2)	50 Ω	4.8 x 80 mm	
L2, L23	semi-rigid cable (note 3)	50 Ω	ext. conductor length 80 mm ext. dia 3.6 mm	
L4, L5	stripline (note 2)	43 Ω	6 x 32 mm	
L6, L7	stripline (note 2)	43 Ω	6 x 7 mm	
L8, L9	stripline (note 2)	43 Ω	6 x 7 mm	
L10, L13	grade 3B Ferroxcube wideband HF choke	2 in parallel		4312 020 36642
L11, L12	¾ turn enamelled 2 mm copper wire	40 nH	space 1 mm int. dia. 10 mm leads 2 x 7 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L14, L15	stripline (notes 2 and 4)	43 Ω	6 x 6 mm	
L16, L17	stripline (notes 2 and 4)	43 Ω	6 x 9.5 mm	
L18, L19	stripline (notes 2 and 4)	43 Ω	6 x 27.5 mm	
L20, L21	stripline (notes 2 and 4)	43 Ω	6 x 13 mm	
R1, R6	10 turns Bourns potentiometer	50 kΩ		
R2, R5	0.4 W metal film resistor	1 kΩ		
R3, R4	0.4 W metal film resistor	82 Ω		
R7, R8	1 W, ±5% metal film resistor	10 Ω		

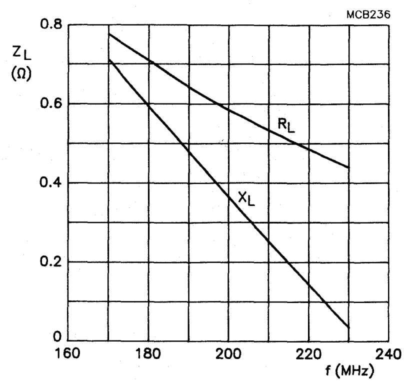
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines L1, L3 - L9, L14 - L22 and L24 are on a double copper-clad printed circuit board with glass microfibre PTFE dielectric (ε_r = 2.2); thickness 1⁄16 inch; thickness of copper sheet 2 x 35 μm.
3. Semi-rigid cables L2 and L23 are soldered on to striplines L1 and L24.
4. A copper strap, thickness 0.8 mm, is soldered on to striplines L14 - L21.



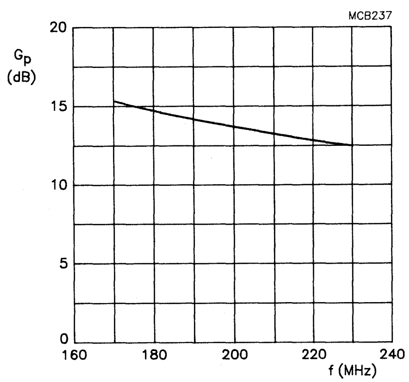
Class-A operation; V_{DS} = 28 V; I_{DQ} = 2 x 4.6 A; R_{GS} = 82 Ω (per section); T_h = 70 °C.

Fig.11 Input impedance as a function of frequency (series components), typical values.



Class-A operation; V_{DS} = 28 V; I_{DQ} = 2 x 4.6 A; R_{GS} = 82 Ω (per section); T_h = 70 °C.

Fig.12 Load impedance as a function of frequency (series components), typical values.



Class-A operation; V_{DS} = 28 V; I_{DQ} = 2 x 4.6 A; R_{GS} = 82 Ω (per section); T_h = 70 °C.

Fig.13 Power gain as a function of frequency, typical values.

VHF push-pull power MOS transistor

BLF368

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

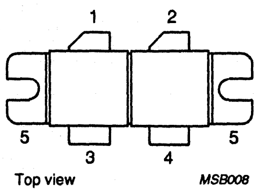
Dual push-pull silicon N-channel enhancement mode vertical D-MOS transistor, designed for broadcast transmitter applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead SOT262 A1 balanced flange envelope, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

PINNING - SOT262 A1

PIN	DESCRIPTION
1	drain 1
2	drain 2
3	gate 1
4	gate 2
5	source

PIN CONFIGURATION



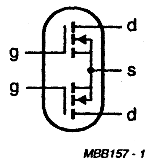


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a push-pull common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	ΔG_p (dB) (note 1)	η_D (%)
CW, class-AB	225	32	300	> 12 typ. 13.5	> 1 typ. 0.4	> 55 typ. 62

Note

1. Assuming a 3rd order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% synchronized input/25% synchronized output compression in television service (negative modulation, CCIR system).

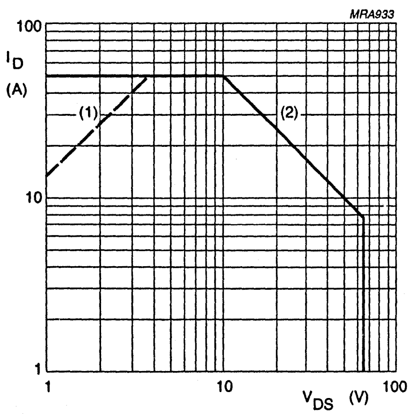
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).
Per transistor section unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DSS}	drain-source voltage		–	65	V
$\pm V_{GSS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	25	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C total device; both sections equally loaded	–	500	W
T_{stg}	storage temperature		−65	150	°C
T_j	junction temperature		–	200	°C

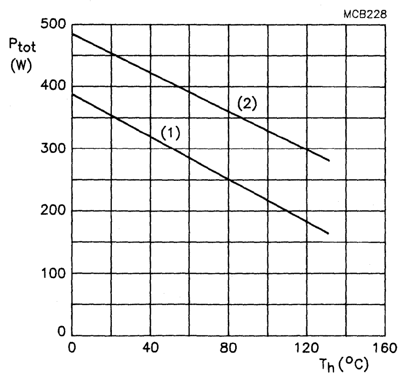
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded	0.35 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded	0.15 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.
Total device; both sections equally loaded.

Fig.2 DC SOAR.



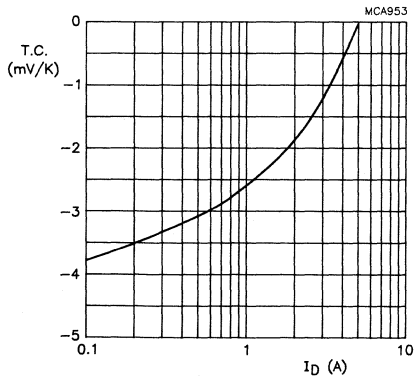
(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS (per section)

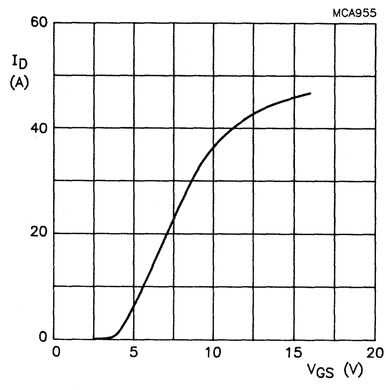
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 100 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 32 V	–	–	5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 100 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of both transistor sections	I_D = 100 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 8 A; V_{DS} = 10 V	5	7.5	–	S
g_{fs1}/g_{fs2}	forward transconductance ratio of both transistor sections	I_D = 8 A; V_{DS} = 10 V	0.9	–	1.1	
$R_{DS(on)}$	drain-source on-state resistance	I_D = 8 A; V_{GS} = 10 V	–	0.1	0.15	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	37	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 32 V; f = 1 MHz	–	495	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} =32 V; f = 1 MHz	–	340	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 32 V; f = 1 MHz	–	40	–	pF
$C_{d\text{-}f}$	drain-flange capacitance		–	5.4	–	pF



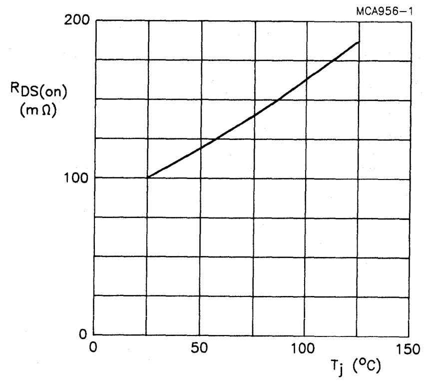
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values per section.



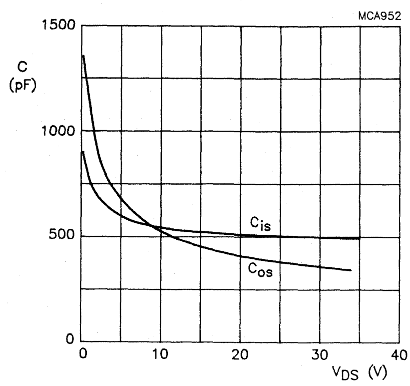
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values per section.



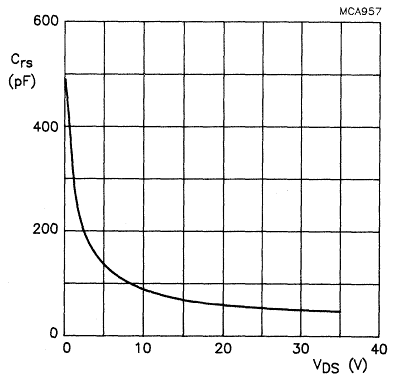
V_{GS} = 10 V; I_D = 8 A.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values per section.

APPLICATION INFORMATION FOR CLASS-AB OPERATION

T_h = 25 °C; $R_{th\ mb-h}$ = 0.15 K/W unless otherwise specified.
RF performance in CW operation in a common source class-AB circuit.
R_{GS} = 536 Ω per section; optimum load impedance per section = 1.34 + j0.34 Ω (V_{DS} = 32 V).

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	ΔG_p (dB) (note 1)	η_D (%)
CW, class-AB	225	32	2 x 250	300	> 12 typ. 13.5	> 1 typ. 0.4	> 55 typ. 62
	225	28	2 x 250	300	typ. 13	typ. 0.7	typ. 68
	225	35	2 x 250	300	typ. 14	typ. 0.2	typ. 60
	175	28	2 x 250	300	typ. 15	typ. 0.5	typ. 70

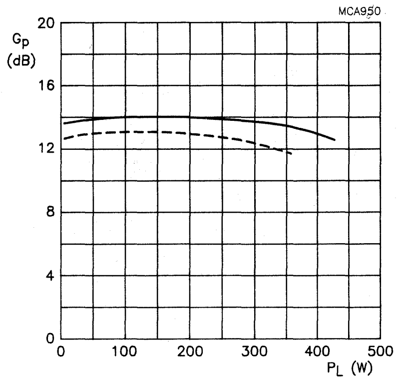
Note

1. Assuming a 3rd order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% synchronized input/25% synchronized output compression in television service (negative modulation, CCIR system).

Ruggedness in class-AB operation

The BLF368 is capable of withstanding a load mismatch corresponding to VSWR = 10 through all phases under the following conditions:

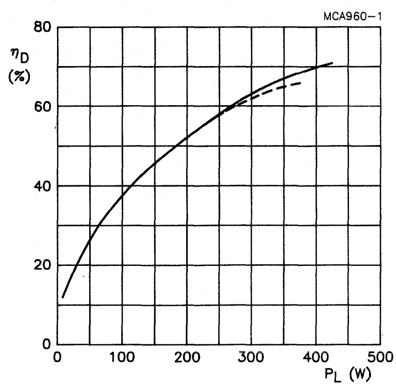
V_{DS} = 32 V; f = 225 MHz at rated output power.



Class-AB operation; V_{DS} = 32 V; I_{DQ} = 2 x 250 mA; Z_L = 1.34 + j0.34 Ω (per section); R_{GS} = 536 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C. dotted line: T_h = 70 °C.

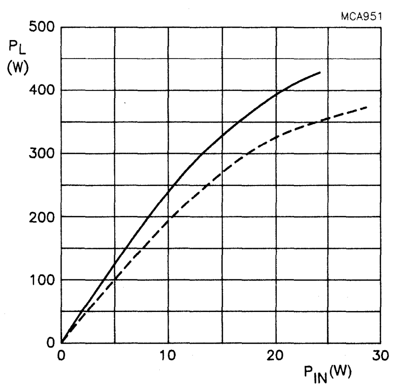
Fig.9 Power gain as a function of load power, typical values per section.



Class-AB operation; V_{DS} = 32 V; I_{DQ} = 2 x 250 mA; Z_L = 1.34 + j0.34 Ω (per section); R_{GS} = 536 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C. dotted line: T_h = 70 °C.

Fig.10 Efficiency as a function of load power, typical values per section.



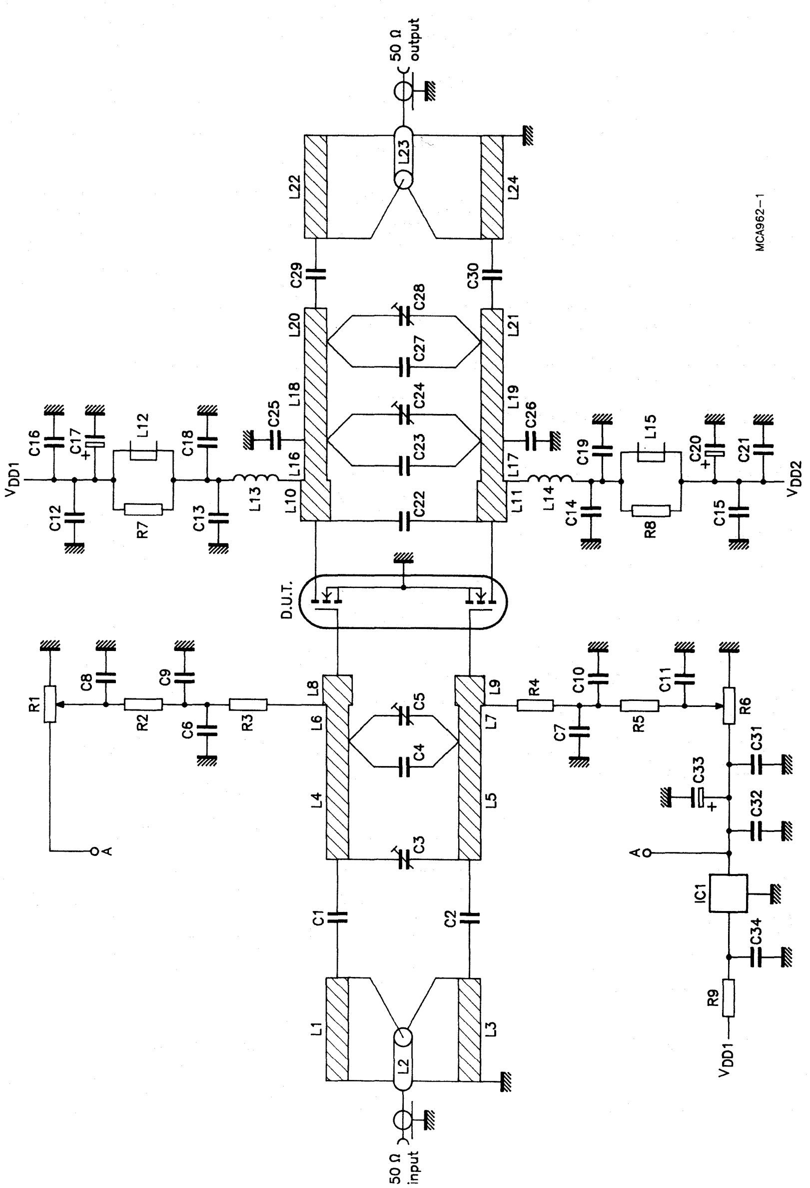
Class-AB operation; V_{DS} = 32 V; I_{DQ} = 2 x 250 mA; Z_L = 1.34 + j0.34 Ω (per section); R_{GS} = 536 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C. dotted line: T_h = 70 °C.

Fig.11 Load power as a function of input power, typical values per section.

VHF push-pull power MOS transistor

BLF368



f = 225 MHz.

Fig.12 Test circuit for class-AB operation.

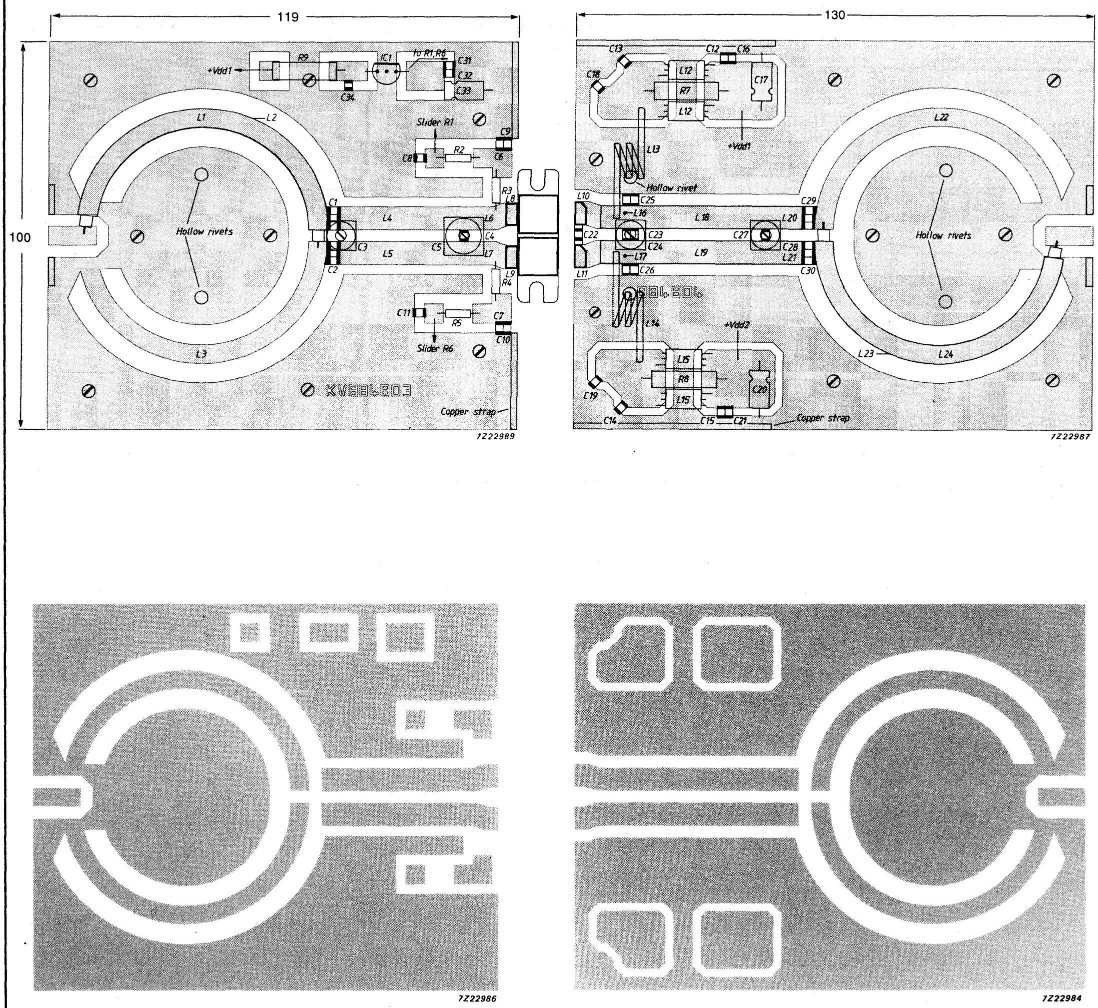
List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor (note 1)	2 x 56 pF in parallel + 18 pF, 500 V		
C3	film dielectric trimmer	2 to 9 pF		2222 809 09005
C4	multilayer ceramic chip capacitor (note 1)	47 pF, 500 V		
C5	film dielectric trimmer	5 to 60 pF		2222 809 08003
C6, C7, C9, C10, C12, C15, C31, C34	multilayer ceramic chip capacitor (note 1)	1 nF, 500 V		2222 852 47104
C8, C11, C16, C21, C32	multilayer ceramic chip capacitor (note 1)	100 nF, 50 V		
C17, C20, C33	electrolytic capacitor	10 μF, 63 V		
C22	multilayer ceramic chip capacitor (note 1)	82 pF, 500 V		
C23	multilayer ceramic chip capacitor (note 1)	10 pF + 30 pF in parallel, 500 V		
C24, C28	film dielectric trimmer	2 to 18 pF		2222 809 09006
C25, C26	multilayer ceramic chip capacitor (note 1)	39 pF + 47 pF in parallel, 500 V		
C27	multilayer ceramic chip capacitor (note 1)	18 pF, 500 V		
C29, C30	multilayer ceramic chip capacitor (note 1)	3 x 100 pF in parallel, 500 V		
L1, L3, L22, L24	stripline (note 2)	50 Ω	4.8 x 80 mm	
L2, L23	semi-rigid cable (note 3)	50 Ω	ext. conductor length 80 mm ext. dia 3.6 mm	
L4, L5	stripline (note 2)	43 Ω	6 x 32.5 mm	
L6, L7	stripline (note 2)	43 Ω	6 x 10.5 mm	
L8, L9	stripline (note 2)	43 Ω	6 x 3 mm	
L10, L11	stripline (note 2)	43 Ω	6 x 10.5 mm	
L12, L15	grade 3B Ferroxcube wideband HF choke	2 in parallel		4312 020 36642
L13, L14	2 turns enamelled 1.6 mm copper wire	25 nH	space 2.5 mm int. dia. 5 mm leads 2 x 7 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L16, L17	stripline (notes 2 and 4)	43 Ω	6 x 3 mm	
L18, L19	stripline (notes 2 and 4)	43 Ω	6 x 35 mm	
L20, L21	stripline (notes 2 and 4)	43 Ω	6 x 9 mm	
R1, R6	10 turns potentiometer	50 kΩ		
R2, R5	0.4 W metal film resistor	1 kΩ		
R3, R4	0.4 W metal film resistor	536 Ω		
R7, R8	1 W, ±5% metal film resistor	10 Ω		
R9	1 W metal film resistor	3.16 kΩ		
IC1	voltage regulator 78L05			

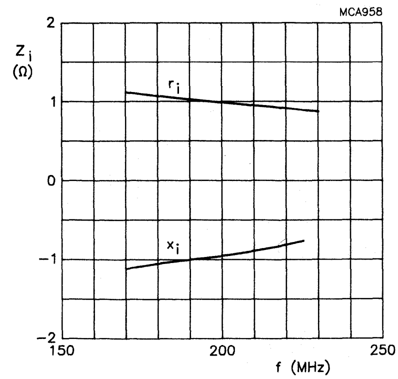
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines L1, L3 - L11, L16 - L22 and L24 are on a double copper-clad printed circuit board with glass microfibre PTFE dielectric (ε_r = 2.2); thickness 1⁄16 inch; thickness of copper sheet 2 x 35 µm.
3. Semi-rigid cables L2 and L23 are soldered on to striplines L1 and L24.
4. A copper strap, thickness 0.8 mm, is soldered on to striplines L16 - L21.



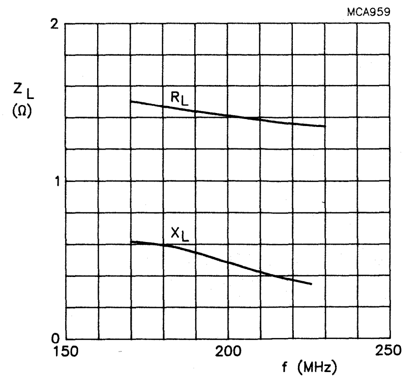
The circuit and components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets for a direct contact between upper and lower sheets.

Fig.13 Component layout for 225 MHz class-AB test circuit.



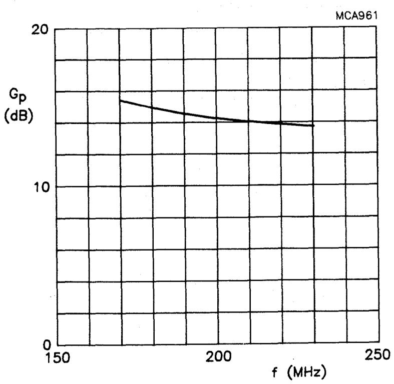
Class-AB operation; V_{DS} = 32 V; I_{DQ} = 2 x 250 mA; R_{GS} = 536 Ω (per section); P_L = 300 W

Fig.14 Input impedance as a function of frequency (series components), typical values per section.



Class-AB operation; V_{DS} = 32 V; I_{DQ} = 2 x 250 mA; R_{GS} = 536 Ω (per section); P_L = 300 W

Fig.15 Load impedance as a function of frequency (series components), typical values per section.



Class-AB operation; V_{DS} = 32 V; I_{DQ} = 2 x 250 mA; R_{GS} = 536 Ω (per section); P_L = 300 W

Fig.16 Power gain as a function of frequency, typical values per section.

VHF push-pull power MOS transistor

BLF378

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

Dual push-pull silicon N-channel enhancement mode vertical D-MOS transistor, designed for broadcast transmitter applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead SOT262A1 balanced flange envelope, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

PINNING – SOT262 A1

PIN	DESCRIPTION
1	drain 1
2	drain 2
3	gate 1
4	gate 2
5	source

PIN CONFIGURATION

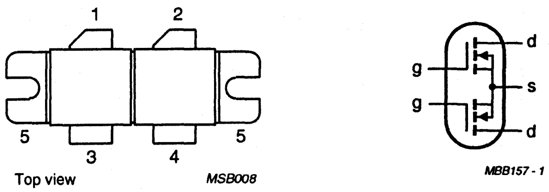


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a push-pull common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	ΔG_p (dB) (note 1)	η_D (%)
CW, class-AB	225	50	250	> 14 typ. 16	< 1 typ. 0.6	> 50 typ. 55

Note

1. Assuming a 3rd order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% synchronized input/25% synchronized output compression in television service (negative modulation, CCIR system).

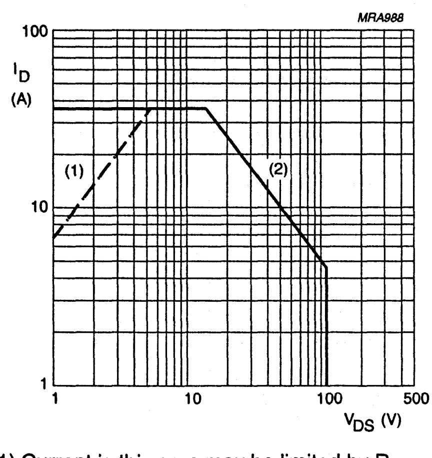
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).
Per transistor section unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DSS}	drain-source voltage		–	110	V
$\pm V_{GSS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	18	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C total device; both sections equally loaded	–	500	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

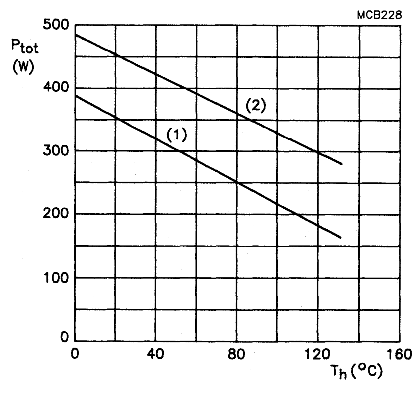
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded	0.35 K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded	0.15 K/W



(1) Current is this area may be limited by $R_{DS(on)}$.
(2) T_{mb} = 25 °C.
Total device; both sections equally loaded.

Fig.2 DC SOAR.



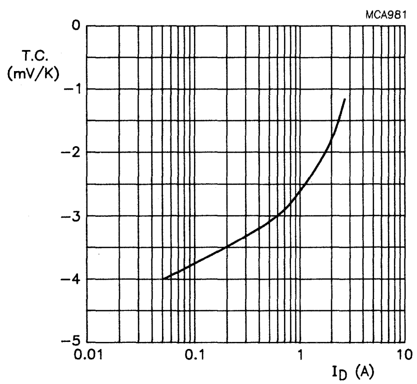
(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS (per section)

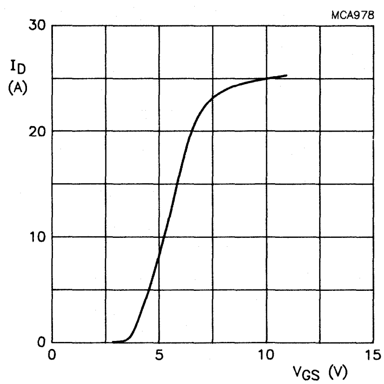
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 50 mA	110	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 50 V	–	–	2.5	mA
I_{GSS}	gate-source leakage current	$\pm V_{GS}$ = 20 V; V_{DS} = 0	–	–	1	μA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 50 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of both transistor sections	I_D = 50 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 5 A; V_{DS} = 10 V	4.5	6.2	–	S
g_{fs1}/g_{fs2}	forward transconductance ratio of both transistor sections	I_D = 5 A; V_{DS} = 10 V	0.9	–	1.1	
$R_{DS(on)}$	drain-source on-state resistance	I_D = 5 A; V_{GS} = 10 V	–	0.2	0.3	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	25	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	480	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} =50 V; f = 1 MHz	–	190	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 50 V; f = 1 MHz	–	14	–	pF
C_{d-f}	drain-flange capacitance		–	5.4	–	pF



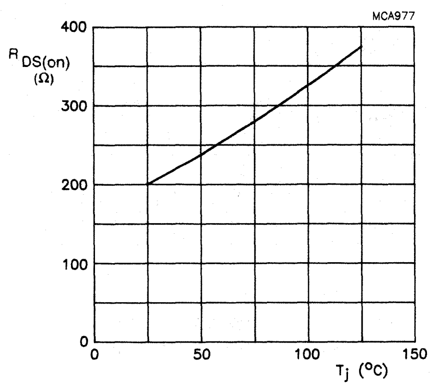
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values per section.



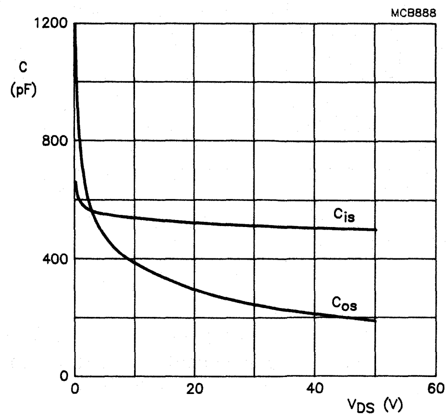
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage, typical values per section.



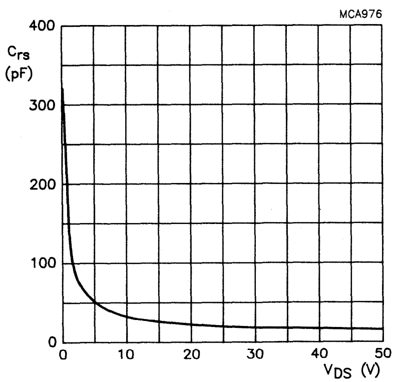
$I_D = 5$ A; $V_{GS} = 10$ V.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values per section.



$V_{GS} = 0$; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values per section.



$V_{GS} = 0$; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values per section.

APPLICATION INFORMATION FOR CLASS-AB OPERATION

T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.15 K/W unless otherwise specified.
RF performance in CW operation in a common source class-AB circuit.
R_{GS} = 2.8 Ω per section; optimum load impedance per section = 0.74 + j2 Ω (V_{DS} = 50 V).

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	ΔG_p (dB) (note 1)	η_D (%)
CW, class-AB	225	50	2 x 0.5	250	> 14 typ. 16	< 1 typ. 0.6	> 50 typ. 55
CW, class-AB	225	45	2 x 0.5	250	typ. 15	typ. 1	typ. 60

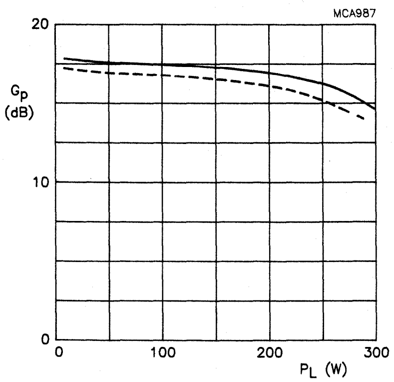
Note

1. Assuming a 3rd order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% synchronized input/25% synchronized output compression in television service (negative modulation, CCIR system).

Ruggedness in class-AB operation

The BLF378 is capable of withstanding a load mismatch corresponding to VSWR = 7 through all phases under the following conditions:

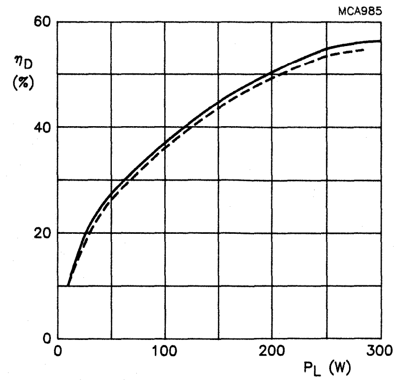
V_{DS} = 50 V; f = 225 MHz at rated output power.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; Z_L = 0.74 + j2 Ω (per section); R_{GS} = 2.8 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C. dotted line: T_h = 70 °C.

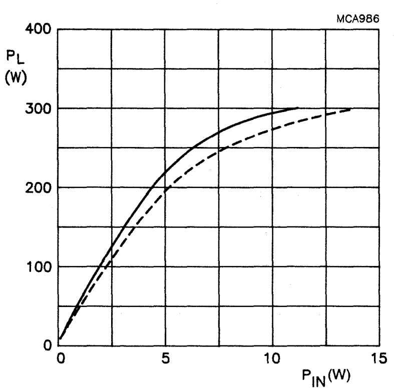
Fig.9 Power gain as a function of load power, typical values per section.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; Z_L = 0.74 + j2 Ω (per section); R_{GS} = 2.8 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C. dotted line: T_h = 70 °C.

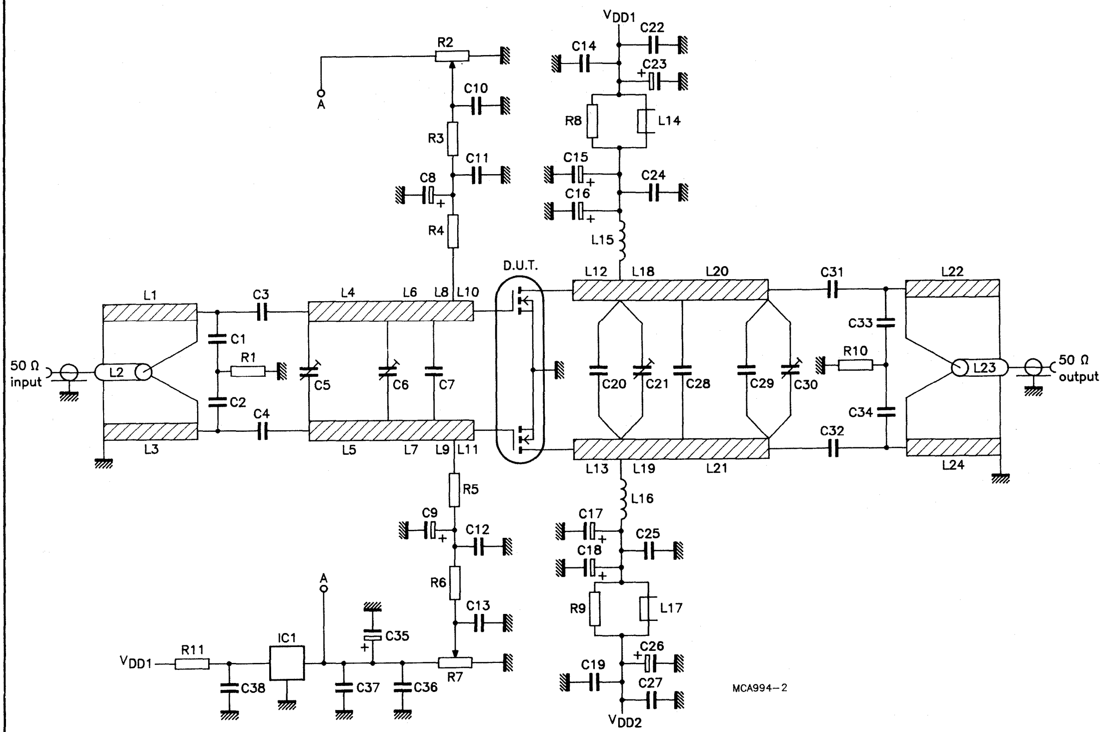
Fig.10 Efficiency as a function of load power, typical values per section.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; Z_L = 0.74 + j2 Ω (per section); R_{GS} = 2.8 Ω (per section); f = 225 MHz.

solid line: T_h = 25 °C. dotted line: T_h = 70 °C.

Fig.11 Load power as a function of input power, typical values per section.



f = 225 MHz.

Fig.12 Test circuit for class-AB operation.

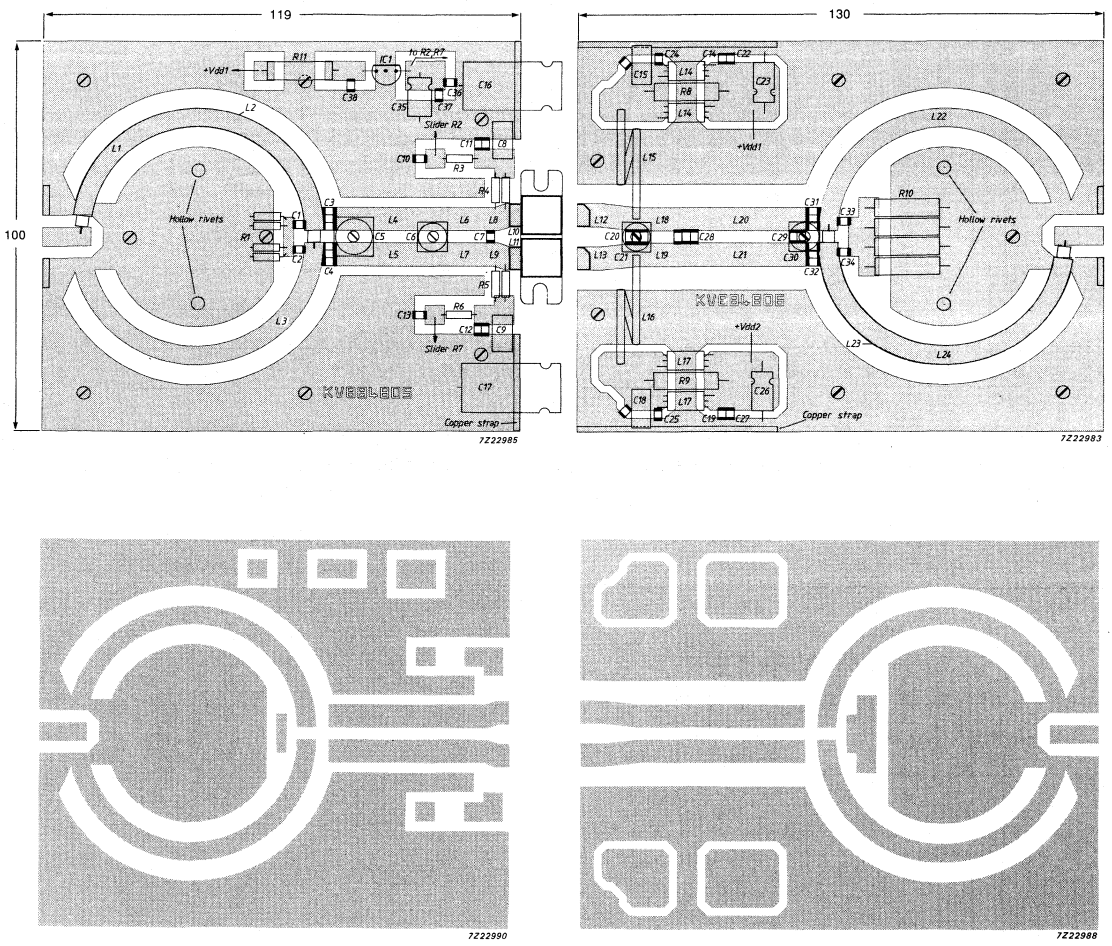
List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor (note 1)	27 pF, 500 V		
C3, C4, C31, C32	multilayer ceramic chip capacitor (note 1)	3 x 18 pF in parallel, 500 V		
C5	film dielectric trimmer	4 to 40 pF		2222 809 08002
C6, C30	film dielectric trimmer	2 to 18 pF		2222 809 09006
C7	multilayer ceramic chip capacitor (note 1)	100 pF, 500 V		
C8, C9, C15, C18	MKT film capacitor	1 μF, 63 V		2222 371 11105
C10, C13, C14, C19, C36	multilayer ceramic chip capacitor	100 nF, 50 V		2222 852 47104
C11, C12	multilayer ceramic chip capacitor (note 1)	2 x 1 nF in parallel, 500 V		
C16, C17	electrolytic capacitor	220 μF, 63 V		
C20	multilayer ceramic chip capacitor (note 1)	3 x 33 pF in parallel, 500 V		
C21	film dielectric trimmer	2 to 9 pF		2222 809 09005
C22, C27, C37, C38	multilayer ceramic chip capacitor (note 1)	1 nF, 500 V		
C23, C26, C35	electrolytic capacitor	10 μF, 63 V		
C24, C25	multilayer ceramic chip capacitor (note 1)	2 x 470 pF in parallel, 500 V		
C28	multilayer ceramic chip capacitor (note 1)	2 x 10 pF in parallel + 18 pF, 500 V		
C29	multilayer ceramic chip capacitor (note 1)	2 x 5.6 pF in parallel, 500 V		
C33, C34	multilayer ceramic chip capacitor (note 1)	5.6 pF, 500 V		
L1, L3, L22, L24	stripline (note 2)	50 Ω	4.8 x 80 mm	
L2, L23	semi-rigid cable (note 3)	50 Ω	ext. conductor length 80 mm ext. dia 3.6 mm	
L4, L5	stripline (note 2)	43 Ω	6 x 24 mm	
L6, L7	stripline (note 2)	43 Ω	6 x 14.5 mm	
L8, L9	stripline (note 2)	43 Ω	6 x 4.4 mm	
L10, L11	stripline (note 2)	43 Ω	6 x 3.2 mm	
L12, L13	stripline (note 2)	43 Ω	6 x 15 mm	
L14, L17	grade 3B Ferroxcube wideband HF choke	2 in parallel		4312 020 36642

COMPONENT	DESCRIPTION	VALUE	DIMENSION	CATALOGUE NO.
L15, L16	1¾ turns enamelled 2 mm copper wire	40 nH	space 1 mm int. dia. 10 mm leads 2 × 7 mm	
L18, L19	stripline (note 2)	43 Ω	6 × 13 mm	
L20, L21	stripline (note 2)	43 Ω	6 × 29.5 mm	
R1	0.4 W metal film resistor	10 Ω		
R2, R7	10 turn potentiometer	50 kΩ		
R3, R6	0.4 W metal film resistor	1 kΩ		
R4, R5	0.4 W metal film resistor	2 × 5.62 Ω in parallel		
R8, R9	1 W, ±5% metal film resistor	10 Ω		
R10	1 W metal film resistor	4 × 10 Ω in parallel		
R11	1 W metal film resistor	5.11 kΩ		
IC1	voltage regulator 78L05			

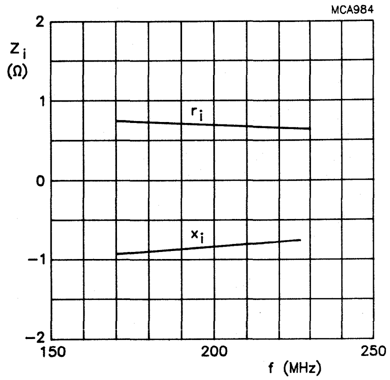
Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines L1, L3 - L13, L18 - L22 and L24 are on a double copper-clad printed-circuit board, with glass microfibre PTFE dielectric (ε_r = 2.2); thickness $^1/_{16}$ inch; thickness of the copper sheet 2 × 35 μm.
3. Semi-rigid cables L2 and L23 is soldered on to striplines L1 and L24.



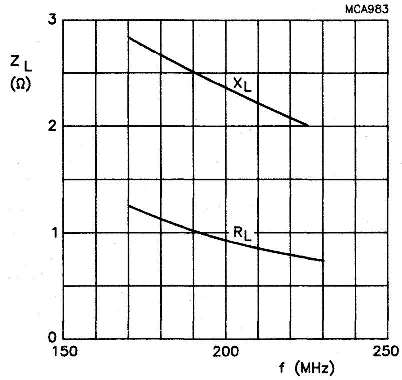
The circuit and components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets for a direct contact between upper and lower sheets.

Fig.13 Component layout for 225 MHz class-AB test circuit.



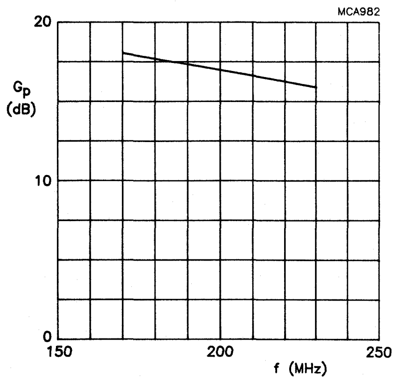
Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; R_{GS} = 2.8 Ω (per section); P_L = 250 W.

Fig.14 Input impedance as a function of frequency (series components), typical values per section.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; R_{GS} = 2.8 Ω (per section); P_L = 250 W.

Fig.15 Load impedance as a function of frequency (series components), typical values per section.



Class-AB operation; V_{DS} = 50 V; I_{DQ} = 2 x 0.5 A; R_{GS} = 2.8 Ω (per section); P_L = 250 W.

Fig.16 Power gain as a function of frequency, typical values per section.

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

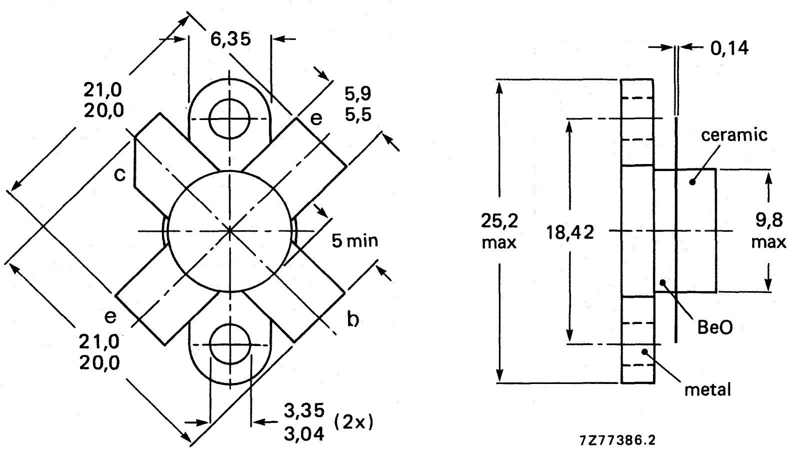
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

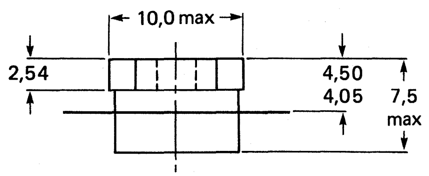
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**13,5**	**175**	**8**	**> 9,0**	**> 70**	**2,8 + j1,2**	**76 − j16**
c.w.	12,5	175	8	typ. 10,5	typ. 75	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





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

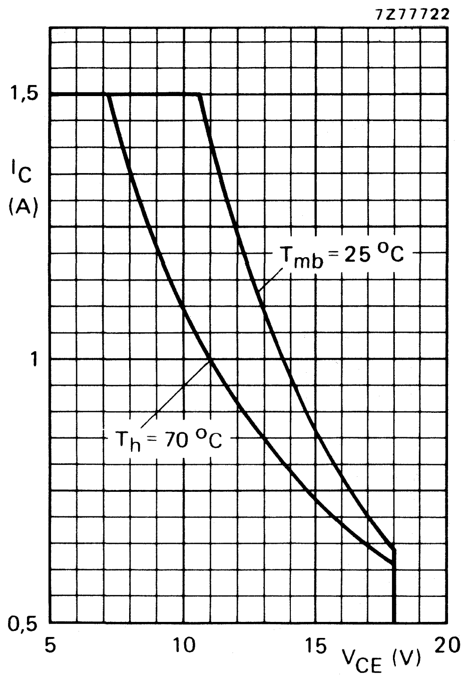


Fig. 2 D.C. SOAR.

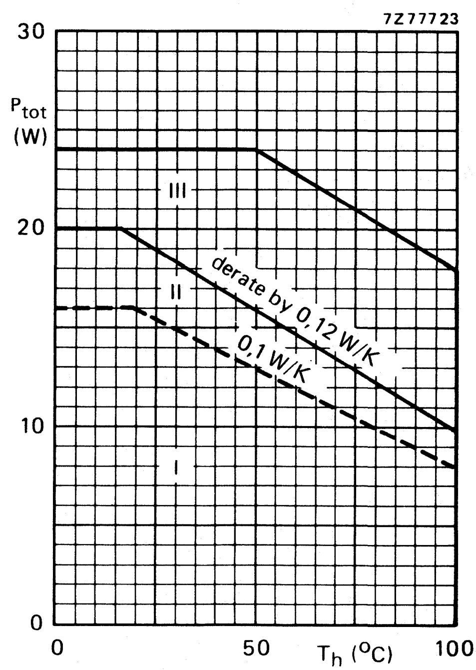


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 16,5 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

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

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	10,7	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	8,6	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 5$ mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	0,5	mJ
D.C. current gain * $I_C = 0,75$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40	
			10 to 100	
Collector-emitter saturation voltage * $I_C = 2$ A; $I_B = 0,4$ A	V_{CEsat}	typ.	0,85	V
Transition frequency at f = 100 MHz * $-I_E = 0,75$ A; $V_{CB} = 13,5$ V	f_T	typ.	950	MHz
$-I_E = 2$ A; $V_{CB} = 13,5$ V	f_T	typ.	850	MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c	typ.	16,5	pF
Feedback capacitance at f = 1 MHz $I_C = 100$ mA; $V_{CE} = 13,5$ V	C_{re}	typ.	12	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

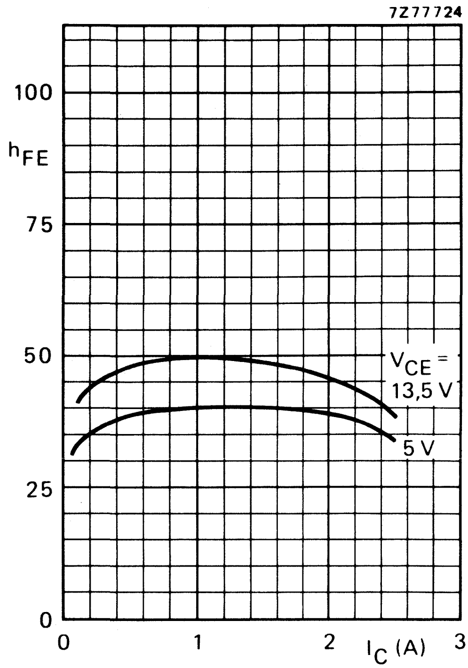


Fig. 4 Typical values; T_j = 25 °C.

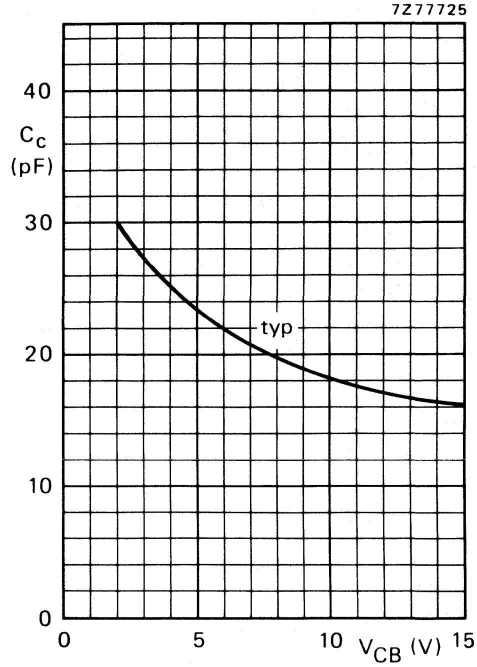


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

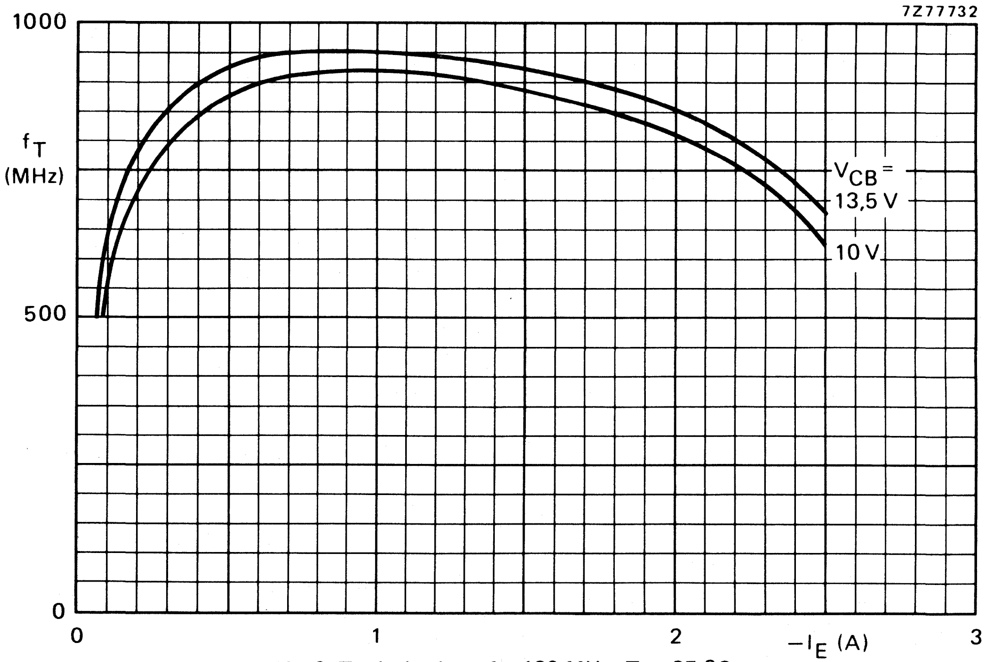


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	−	−

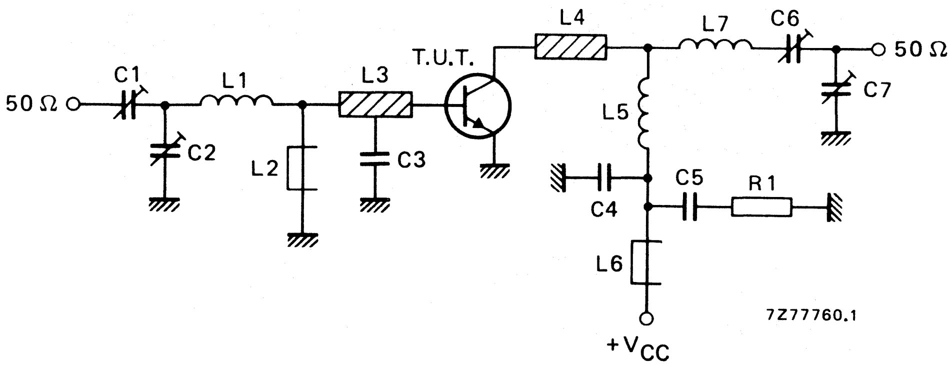


Fig. 7 Test circuit; c.w. class-B.

List of components:

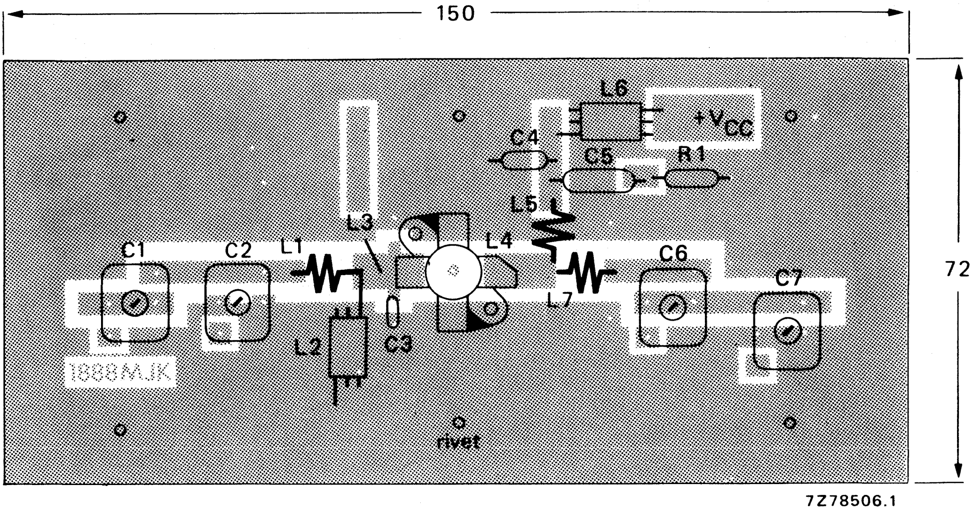
C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 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.



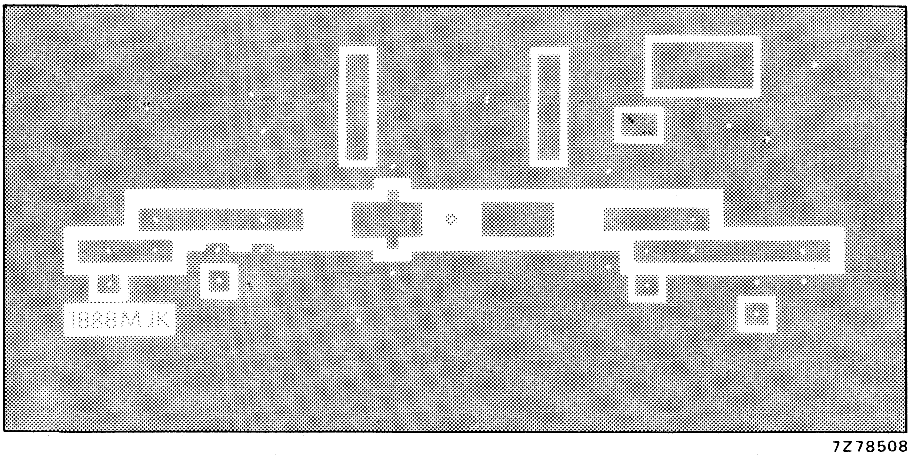


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

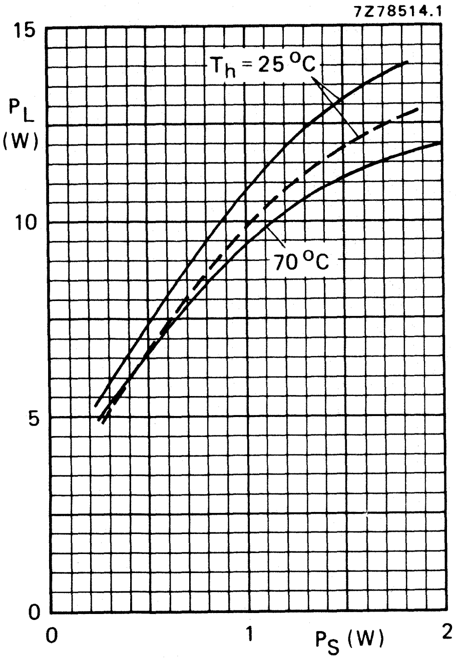


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; --- V_{CE} = 12,5 V.

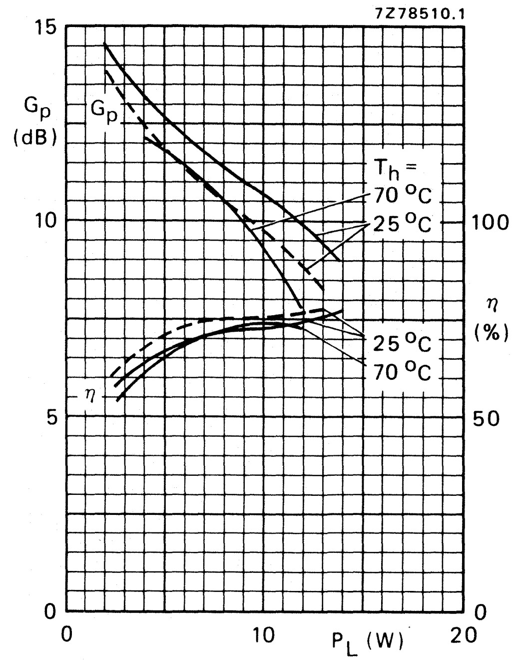


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; --- V_{CE} = 12,5 V.

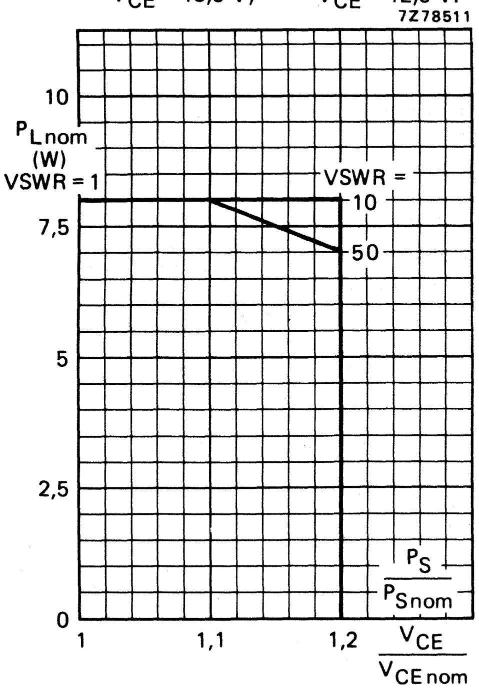


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb-h}$ = 0,3 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

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.

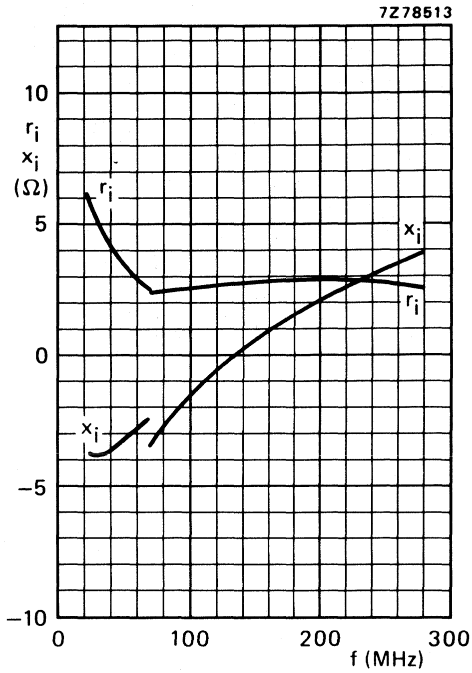


Fig. 12 Input impedance (series components).

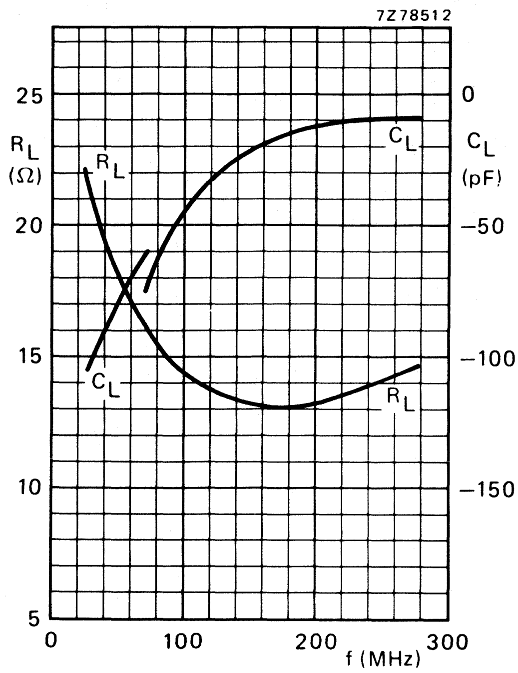


Fig. 13 Load impedance (parallel components).

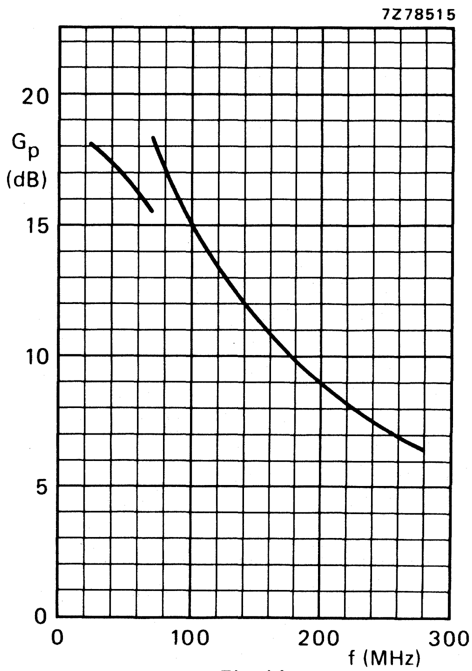


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 8 W;
T_h = 25 °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

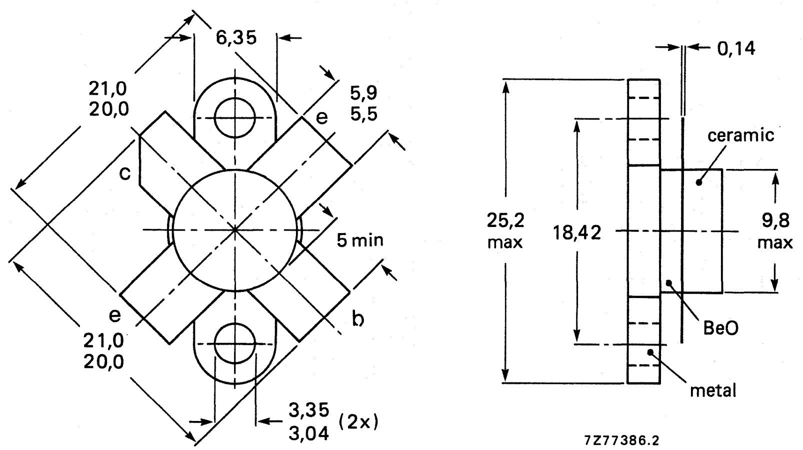
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

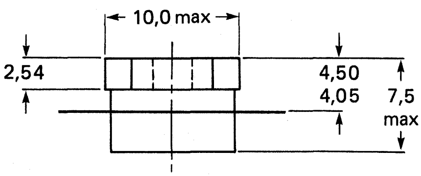
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**13,5**	**175**	**15**	**> 8,0**	**> 60**	**2,3 + j2,2**	**130 − j4,4**
c.w.	12,5	175	15	typ. 7,5	typ. 67	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





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

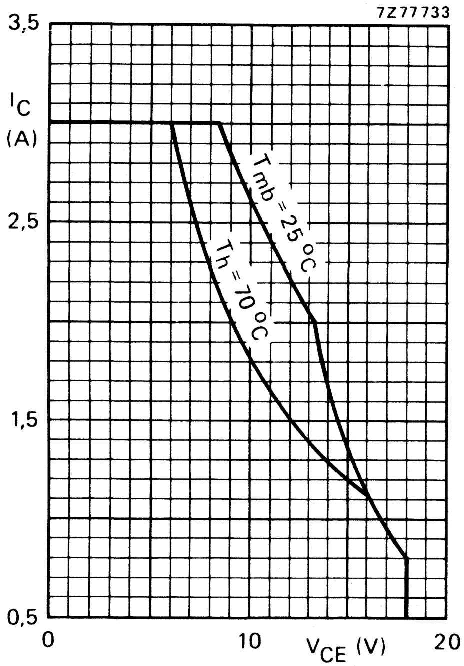


Fig. 2 D.C. SOAR.

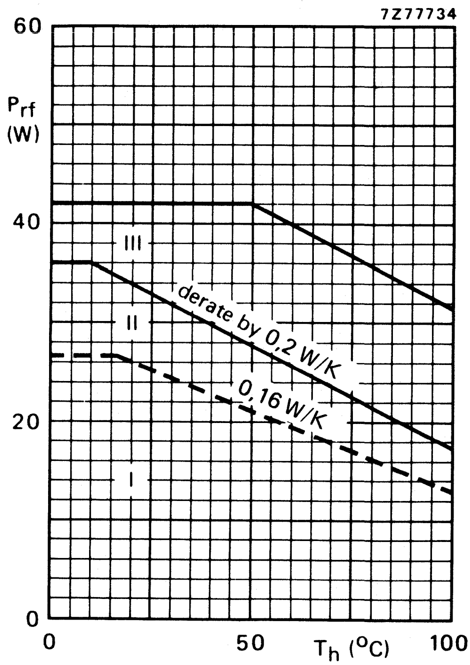


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 16,5 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

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

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

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage open collector; I_E = 4 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 18 V	I_{CES}	<	4	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	2,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	2,5	mJ
D.C. current gain * I_C = 1,5 A; V_{CE} = 5 V	h_{FE}	typ.	40	
			10 to 100	
Collector-emitter saturation voltage * I_C = 4,5 A; I_B = 0,9 A	V_{CEsat}	typ.	1,0	V
Transition frequency at f = 100 MHz * $-I_E$ = 1,5 A; V_{CB} = 13,5 V	f_T	typ.	850	MHz
$-I_E$ = 4,5 A; V_{CB} = 13,5 V	f_T	typ.	800	MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 13,5 V	C_c	typ.	32	pF
Feedback capacitance at f = 1 MHz I_C = 200 mA; V_{CE} = 13,5 V	C_{re}	typ.	23	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200$ µs; $\delta \leqslant 0{,}02$.

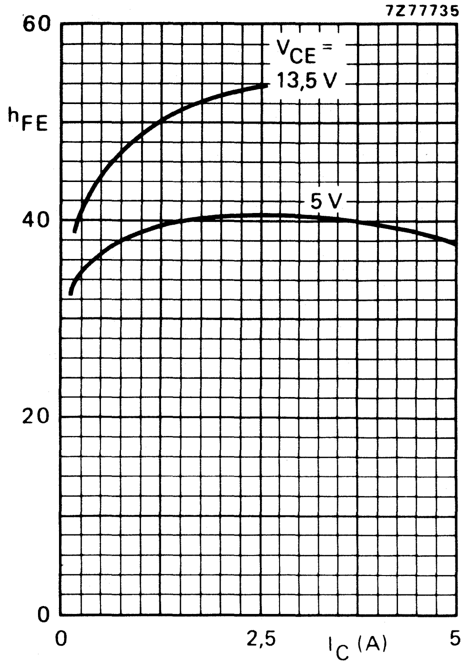


Fig. 4 Typical values; T_j = 25 °C.

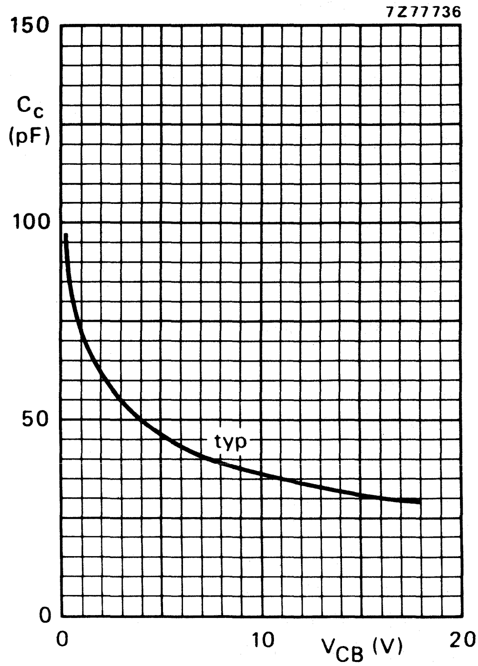


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

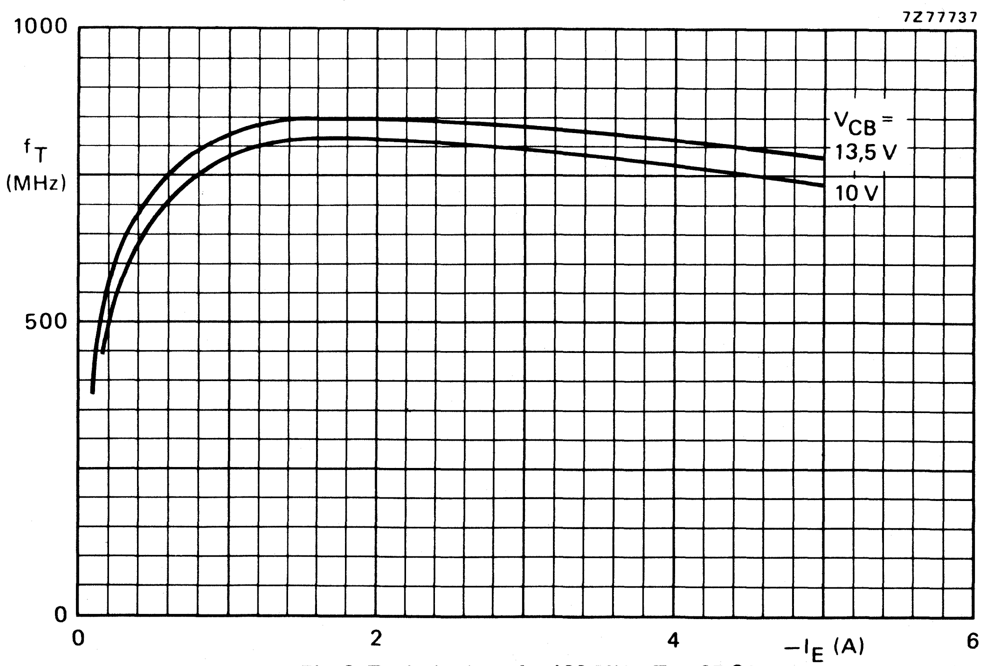


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C .

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	–	–

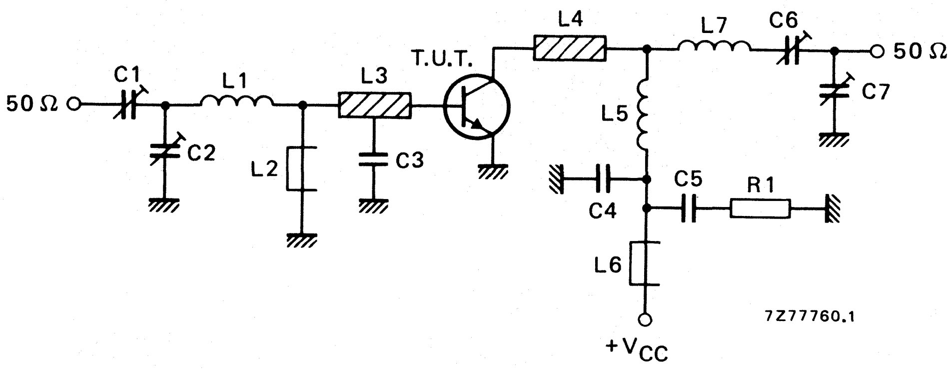


Fig. 7 Test circuit; c.w. class-B.

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.

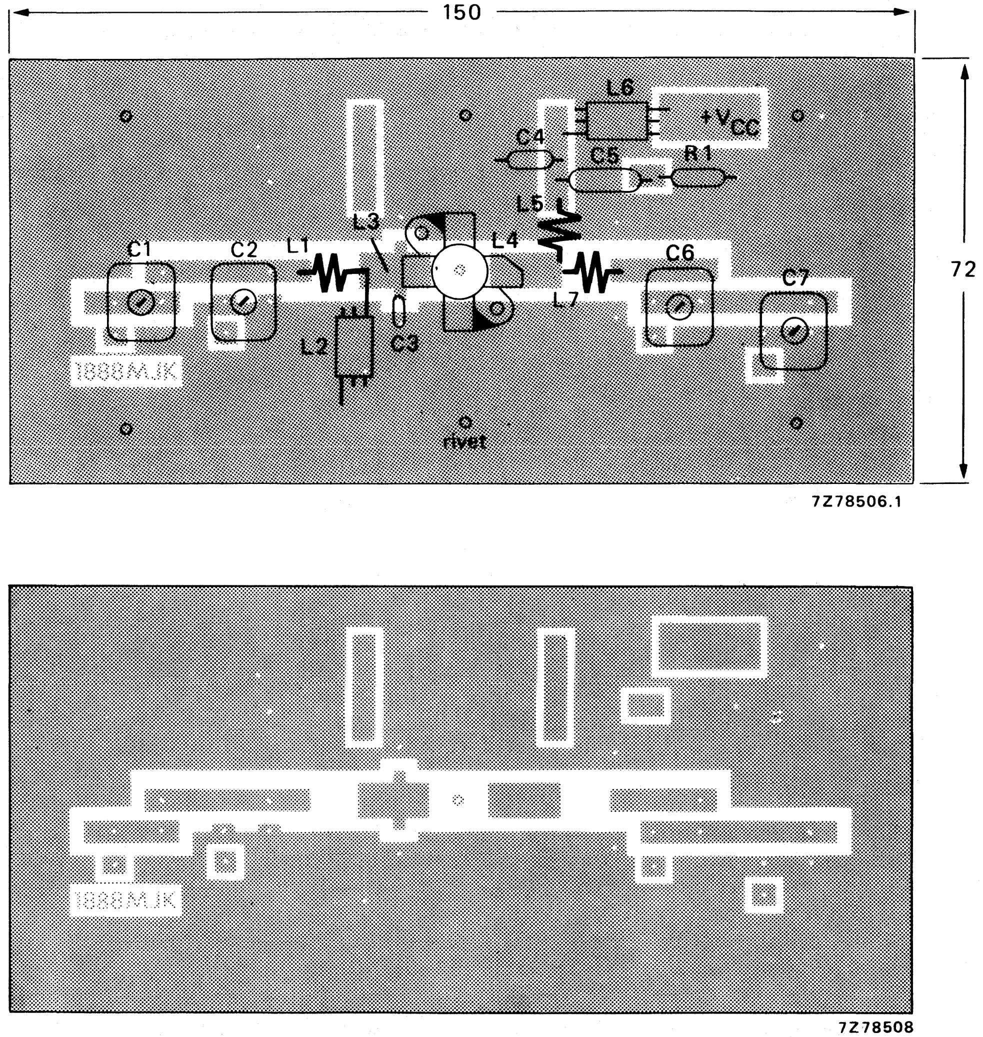


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

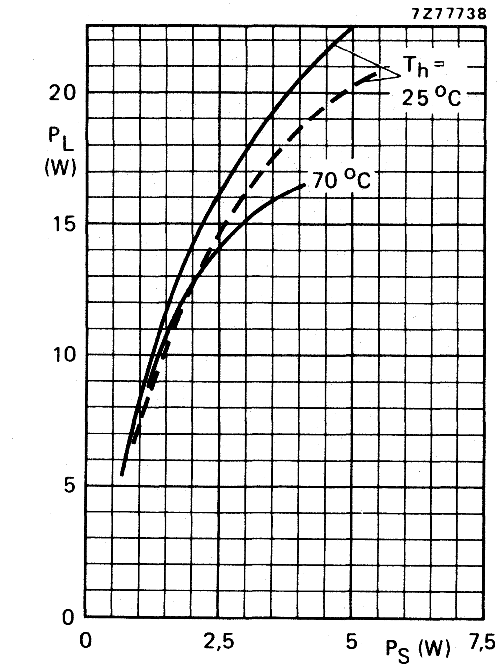


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

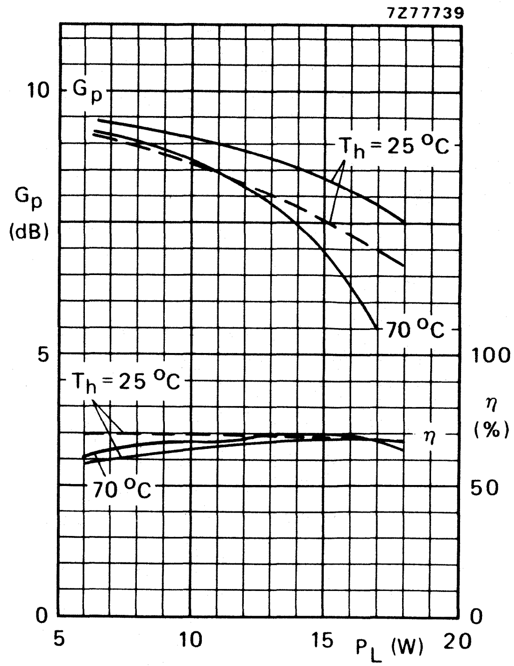


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

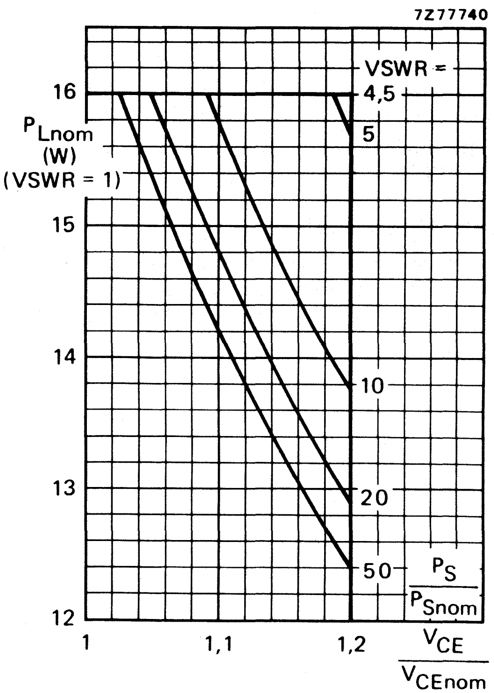


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,3 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

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.

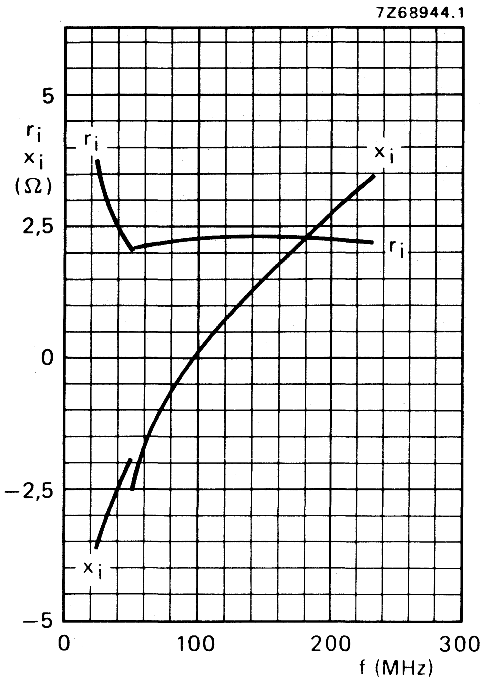


Fig. 12 Input impedance (series components).

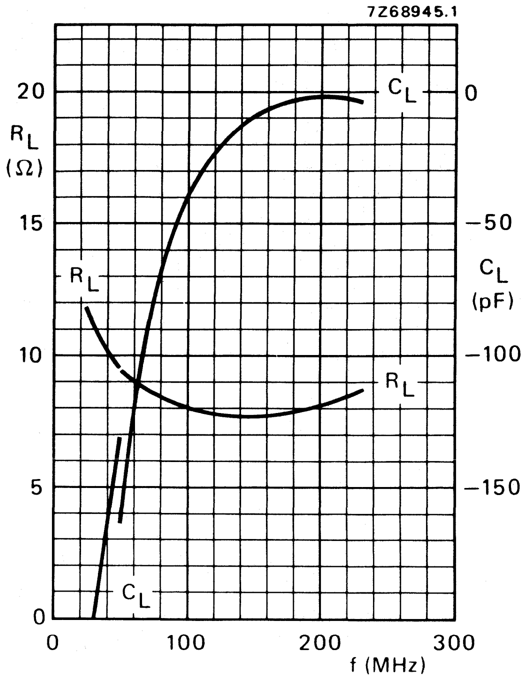


Fig. 13 Load impedance (parallel components).

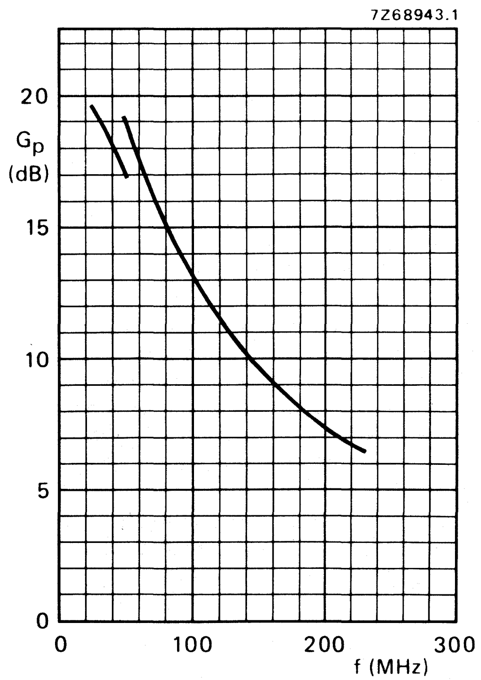


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values: V_{CE} = 13,5 V; P_L = 15 W; T_h = 25 °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.

VHF power transistor — BLV12

FEATURES

- Emitter-ballasting resistors for an optimum temperature profile
- Excellent reliability
- Withstands full load mismatch.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a 4-lead SOT123 flange envelope with a ceramic cap. It is designed for common emitter, class-B operation in mobile VHF transmitters with a supply voltage of 12.5 V. All leads are isolated from the mounting flange.

PINNING - SOT123

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. class-B	175	12.5	30	> 9	> 60

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

PIN CONFIGURATION

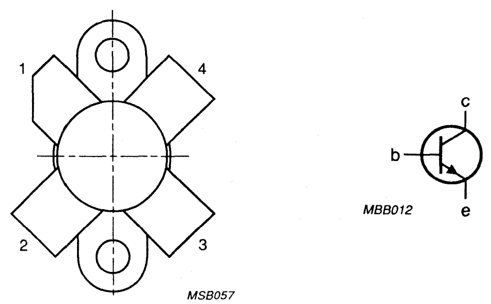
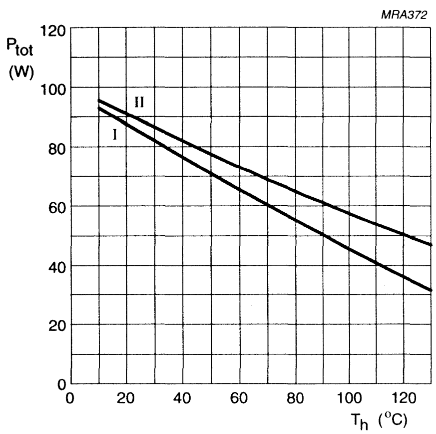


Fig.1 Simplified outline and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	36	V
V_{CEO}	collector-emitter voltage	open base	–	16	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C, $I_{C(AV)}$	collector current	DC or average value	–	6	A
I_{CM}	collector current	peak value f > 1 MHz	–	18	A
P_{tot}	total power dissipation	RF operation; f > 1 MHz; T_{mb} = 25 °C	–	100	W
T_{stg}	storage temperature range		−65	150	°C
T_j	junction operating temperature		–	200	°C



(I) Continuous DC operation.

(II) Short time operation during mismatch (f > 1 MHz).

Fig.2 Power/temperature derating curve.

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j\text{-}mb(RF)}$	from junction to mounting base	P_{tot} = 100 W; T_{mb} = 25 °C	1.75	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink		0.3	K/W

CHARACTERISTICS

T_j = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 10 mA	36	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 25 mA	16	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 2 mA	3	–	–	V
I_{CES}	collector-emitter leakage current	V_{BE} = 0; V_{CE} = 16 V	–	–	10	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 4 A	25	35	–	
f_T	transition frequency	V_{CE} = 12.5 V; I_E = 4 A; f = 500 MHz	–	1.6	–	GHz
C_c	collector capacitance	V_{CB} = 12.5 V; I_E = I_e = 0; f = 1 MHz	–	90	100	pF
C_{re}	feedback capacitance	V_{CE} = 12.5 V; I_C = 0; f = 1 MHz	–	60	70	pF
$C_{c\text{-}f}$	collector-flange capacitance	f = 1 MHz	–	2	–	pF

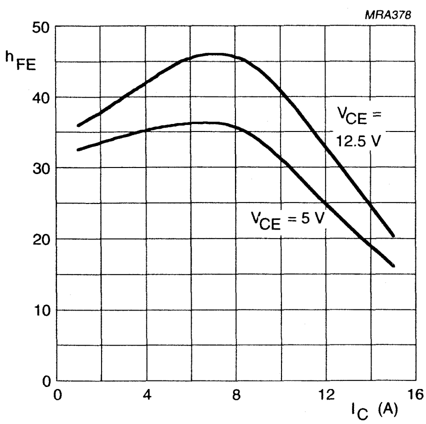
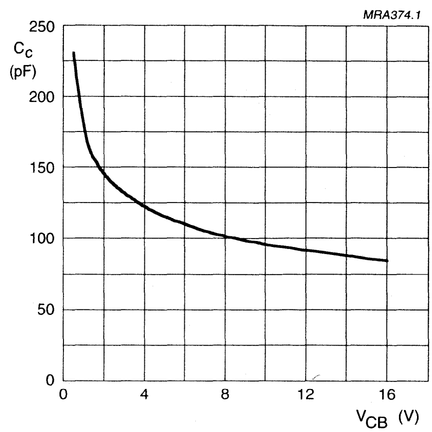
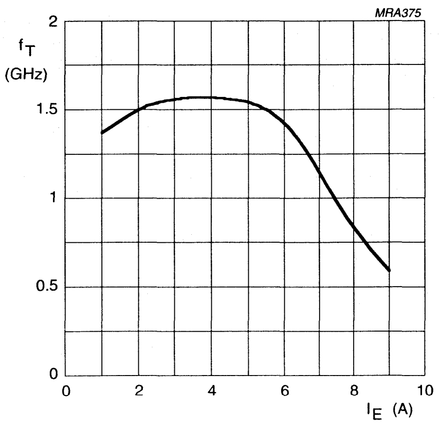


Fig.3 DC current gain as a function of collector current, typical values.



I_E = i_e = 0; f = 1 MHz.

Fig.4 Collector capacitance as a function of collector-base voltage, typical values.



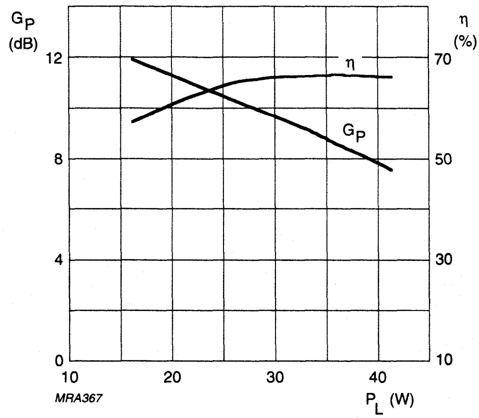
V_{CB} = 12.5 V.

Fig.5 Transition frequency as a function of emitter current, typical values.

APPLICATION INFORMATION

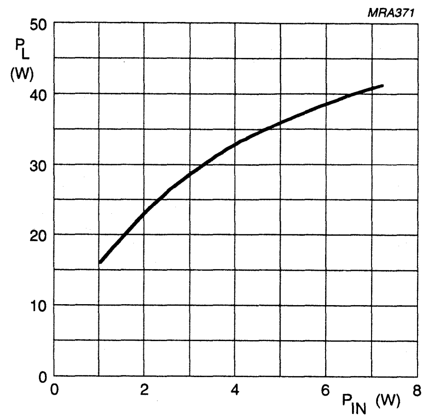
RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. class-B	175	12.5	30	> 9 typ. 9.8	> 60 typ. 66



Class-B operation; V_{CE} = 12.5 V; f = 175 MHz.

Fig.6 Gain and efficiency as functions of load power, typical values.



Class-B operation; V_{CE} = 12.5 V; f = 175 MHz.

Fig.7 Load power as a function of drive power, typical values.

Ruggedness in class-B operation

The BLV12 is capable of withstanding a full load mismatch corresponding to VSWR = 50:1 through all phases at rated output power, up to a supply voltage of 15.5 V, and f = 175 MHz.

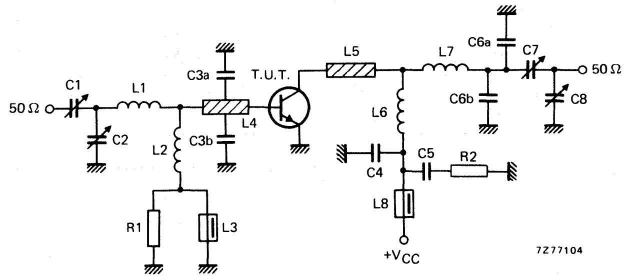


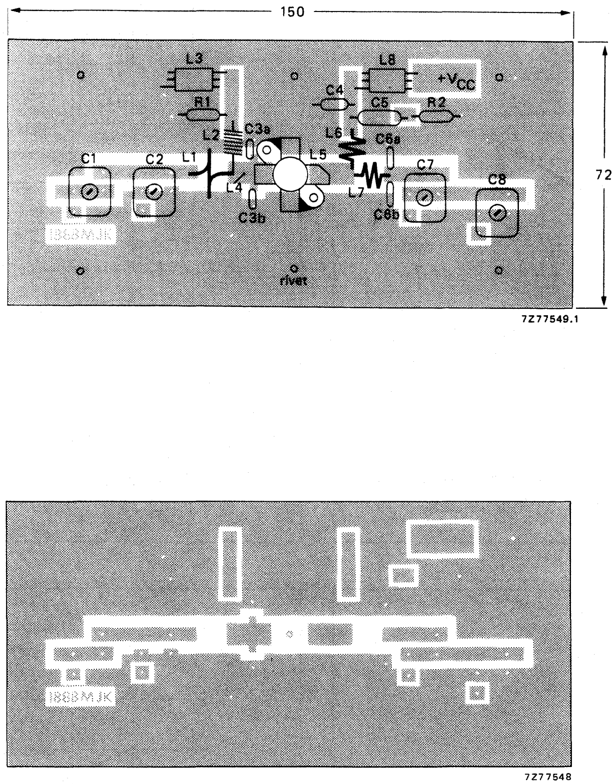
Fig.8 Class-B test circuit at f = 175 MHz.

List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	2.5 to 20 pF		2222 809 07004
C2, C8	film dielectric trimmer	4 to 40 pF		2222 809 07008
C3a, C3b	500 V ceramic capacitor	47 pF		
C4	500 V ceramic capacitor	120 pF		
C5	polyester capacitor	100 nF		
C6a, C6b	500 V ceramic capacitor	8.2 pF		
C7	film dielectric trimmer	5 to 60 pF		2222 809 07011
L1	1 turn enamelled 1.6 mm copper wire		int. dia. 9 mm; leads 2 x 5 mm	
L2	7 turns closely wound enamelled 0.5 mm copper wire	100 nH	int. dia. 3 mm; leads 2 x 5 mm	
L3, L8	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4, L5	stripline (note 1)		12 mm x 6 mm; note 2	
L6	2 turns enamelled 1.6 mm copper wire		int. dia. 5 mm; length 6 mm; leads 2 x 5 mm	
L7	2 turns enamelled 1.6 mm copper wire		int. dia. 4.5 mm; length 6 mm; leads 2 x 5 mm	
R1	0.25 W carbon resistor	10 Ω, 5%		
R2	0.25 W carbon resistor	4.7 Ω, 5%		

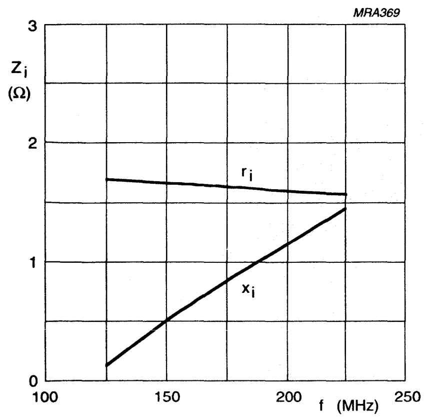
Notes

1. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric, thickness 1⁄16 inch.
2. Taps for capacitors C3a and C3b are situated 5 mm from the transistor.



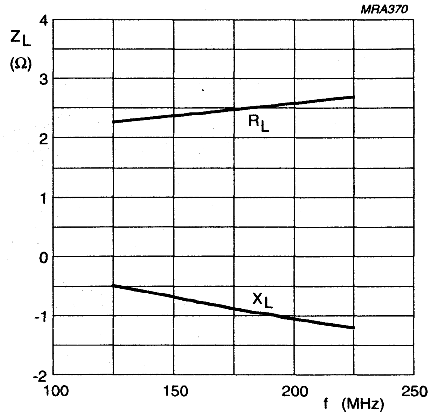
The circuit and components are situated on one side of an epoxy fibre-glass board; the other side is unetched and serves as a ground plane. Earth connections are made by means of hollow rivets and copper straps under the emitters, to provide a direct contact between the component side and the ground plane.

Fig.9 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.10 Input impedance (series components) as a function of frequency, typical values.



Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.11 Load impedance (series components) as a function of frequency, typical values.

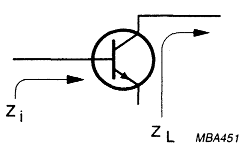
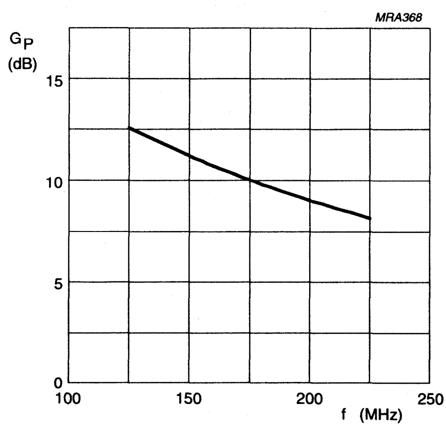


Fig.12 Definition of transistor impedance.



Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.13 Power gain as a function of frequency, typical values.

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

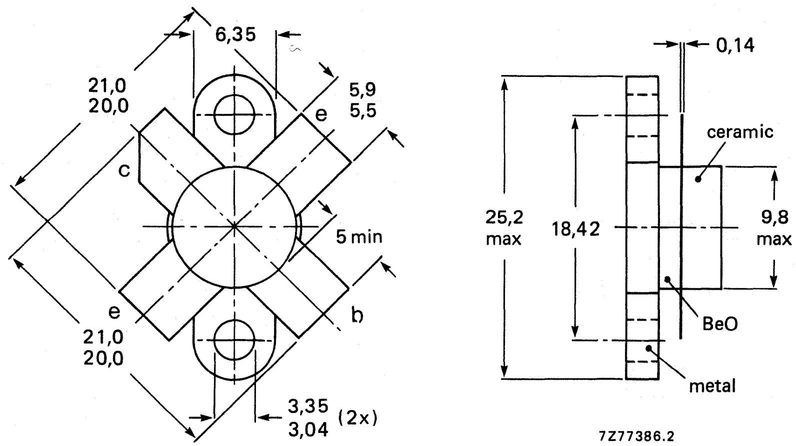
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

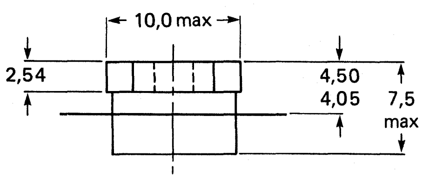
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	8	> 12	> 65	1,8 + j0,7	18 − j20

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





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

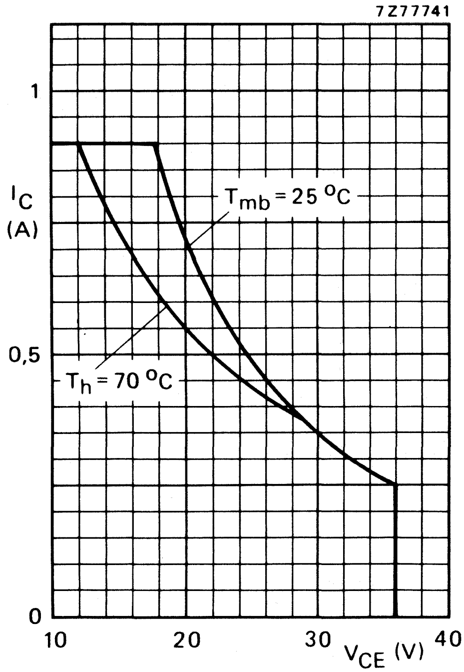


Fig. 2 D.C. SOAR.

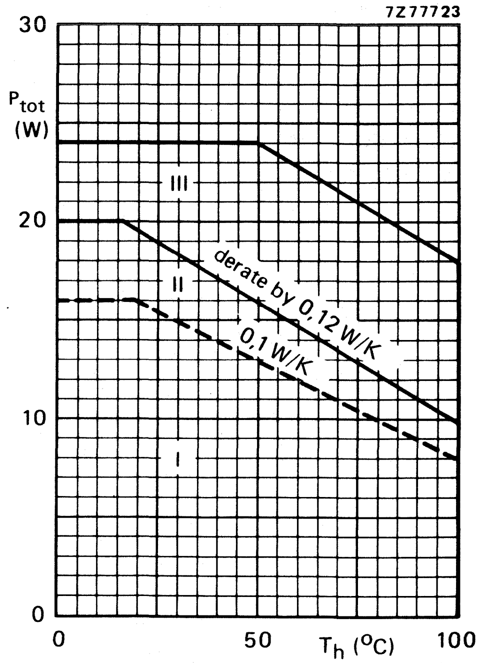


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

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

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	10,7	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	8,6	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 2 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	1	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	0,5	mJ
D.C. current gain * I_C = 0,4 A; V_{CE} = 5 V	h_{FE}	typ.	50 10 to 100	
Collector-emitter saturation voltage * I_C = 1,25 A; I_B = 0,25 A	V_{CEsat}	typ.	0,8	V
Transition frequency at f = 100 MHz * $-I_E$ = 0,4 A; V_{CB} = 28 V	f_T	typ.	600	MHz
$-I_E$ = 1,25 A; V_{CB} = 28 V	f_T	typ.	520	MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	10	pF
Feedback capacitance at f = 1 MHz I_C = 50 mA; V_{CE} = 28 V	C_{re}	typ.	7,1	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

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

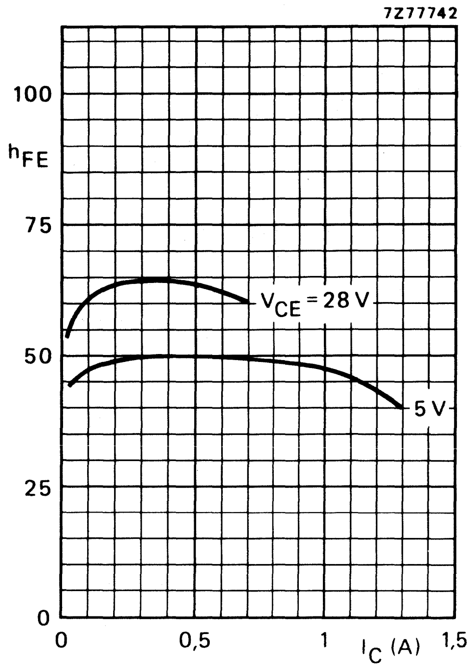


Fig. 4 Typical values; T_j = 25 °C.

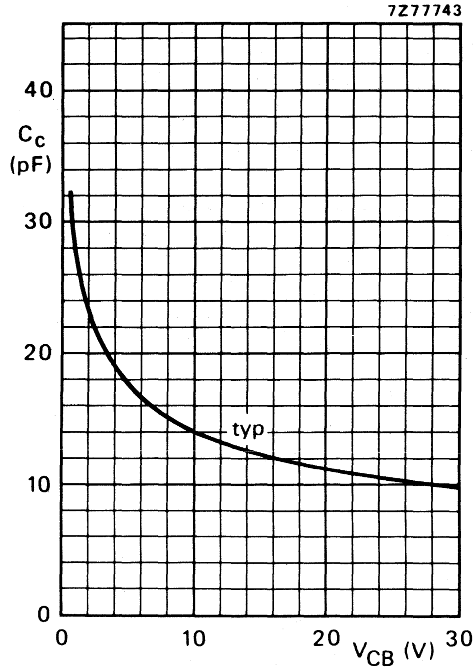


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

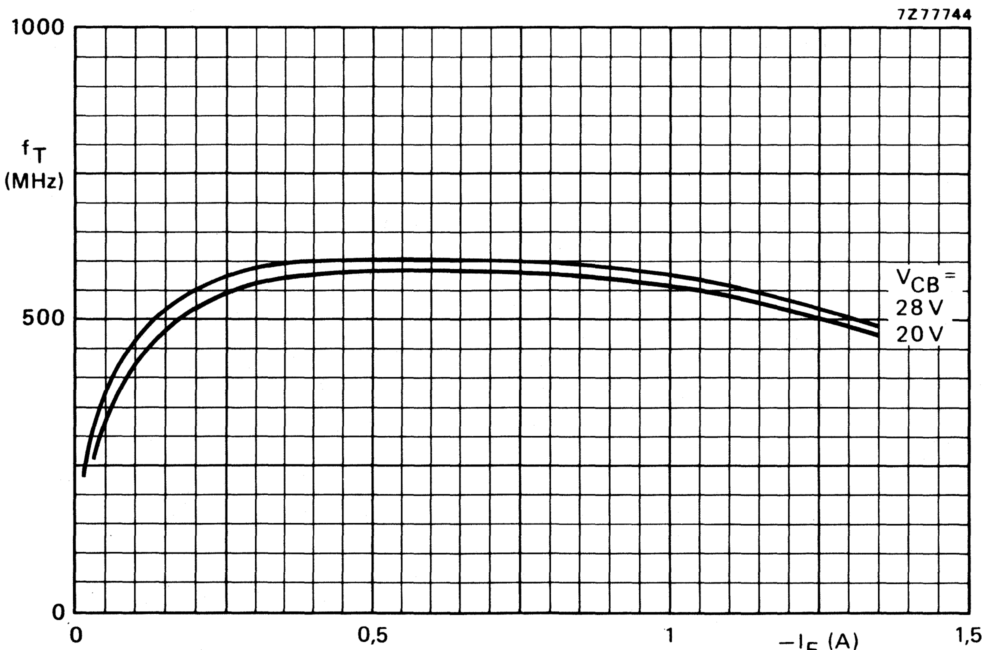


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	8	< 0,5	> 12	< 0,44	> 65	1,8 + j0,7	18 – j20

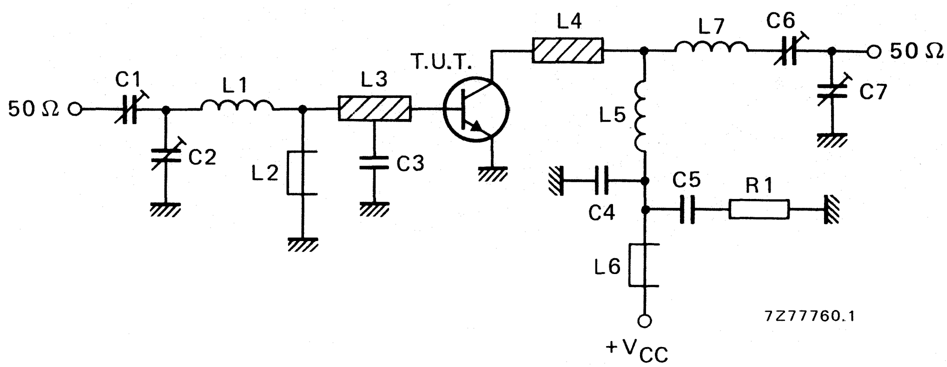


Fig. 7 Test circuit; c.w. class-B.

List of components:

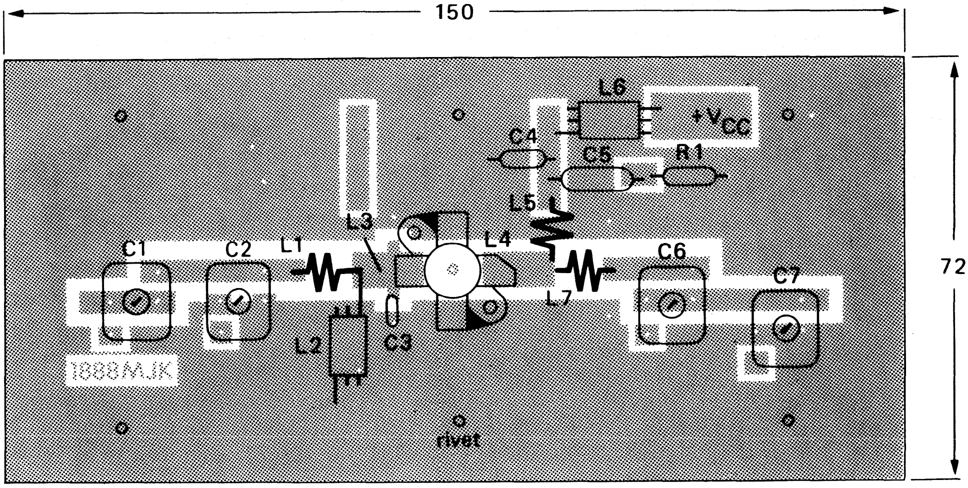
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3 = 27 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor

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.



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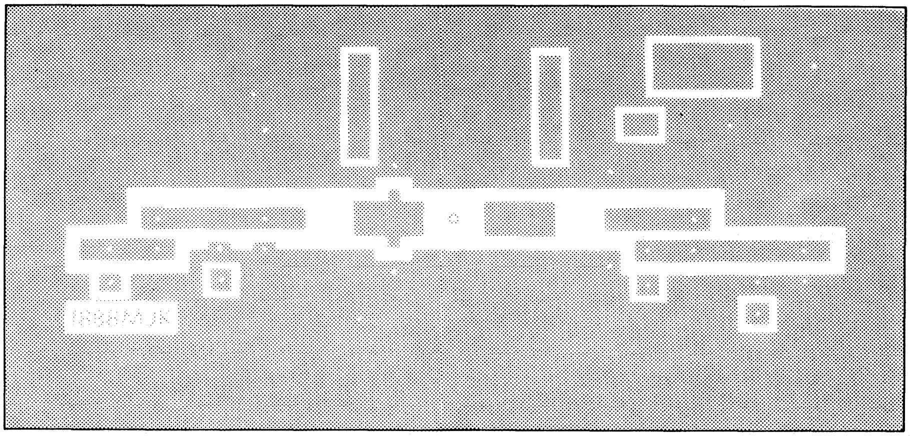

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Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

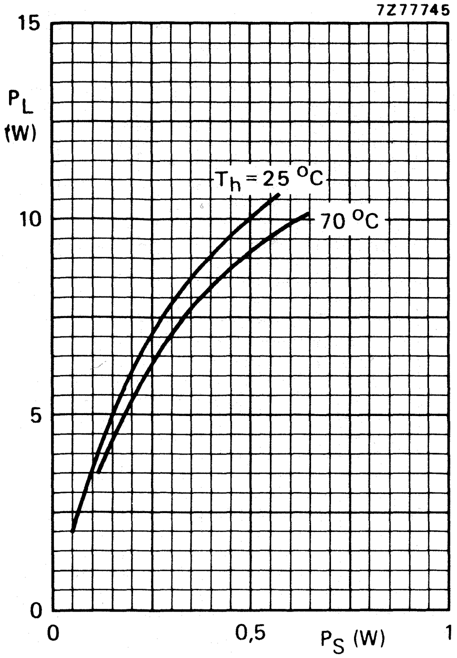


Fig. 9 Typical values; V_{CE} = 28 V; f = 175 MHz.

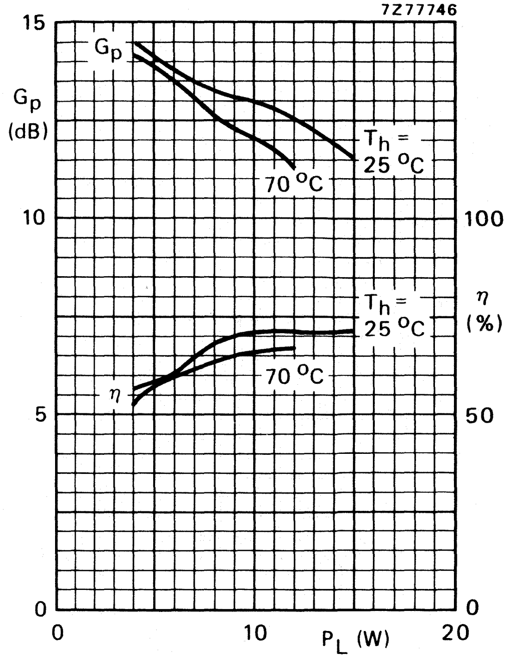


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

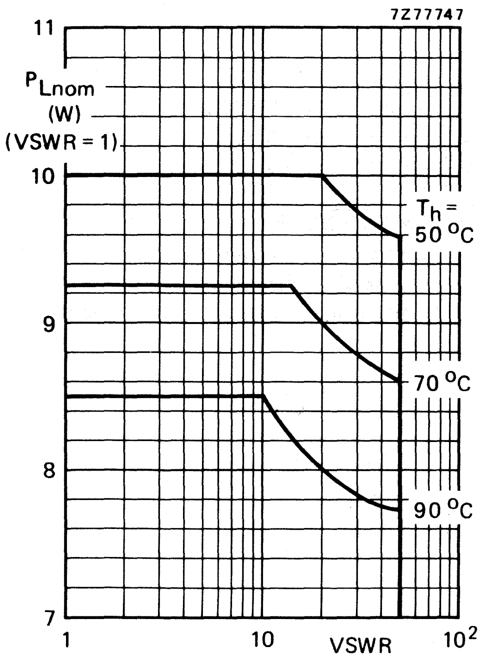


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,3 K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

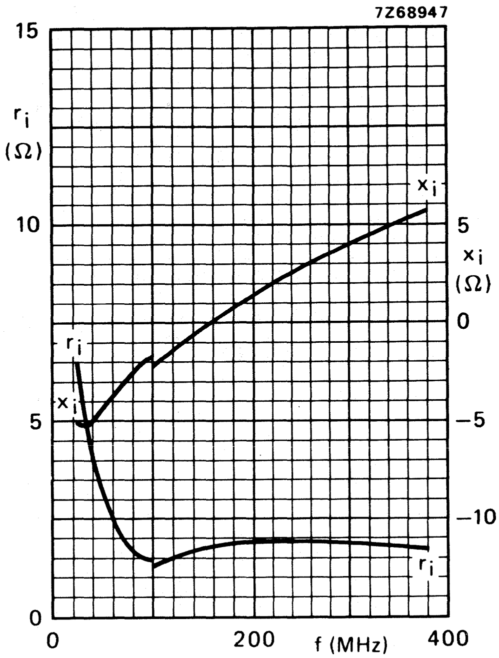


Fig. 12 Input impedance (series components).

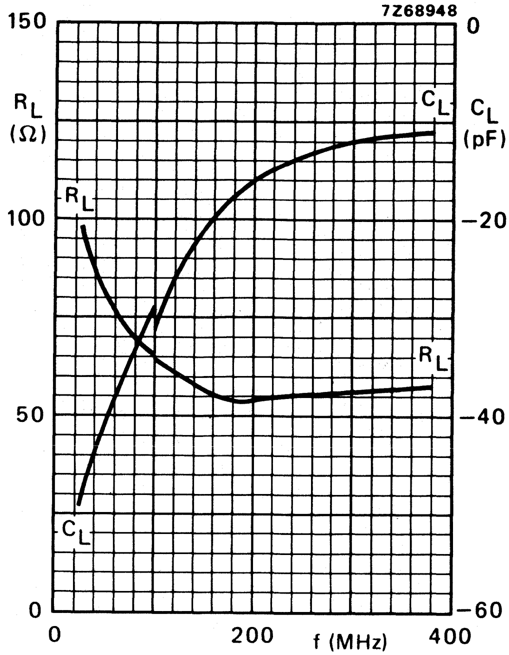


Fig. 13 Load impedance (parallel components).

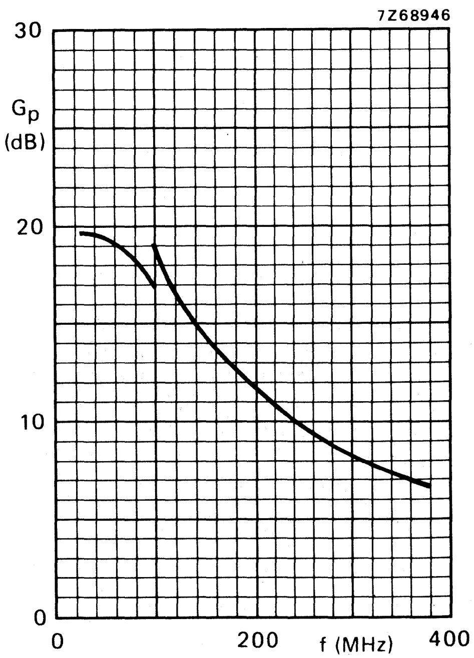


Fig. 14.

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 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

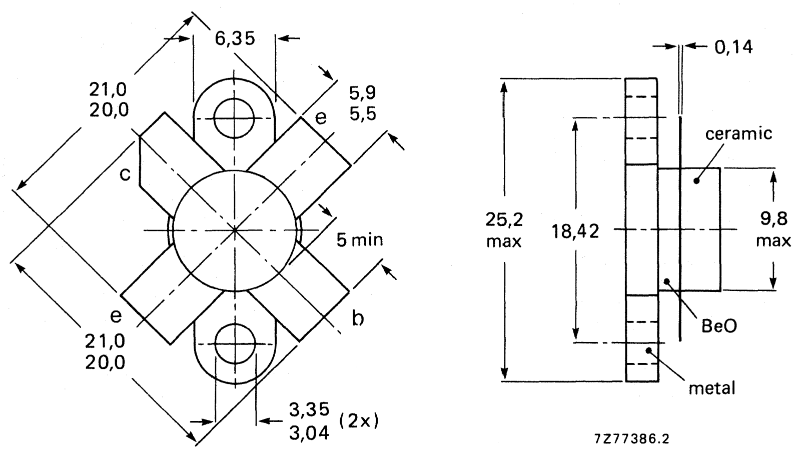
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

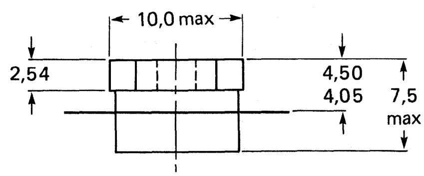
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	15	> 10	> 65	1,4 + j1,85	33 – j27,5

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





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

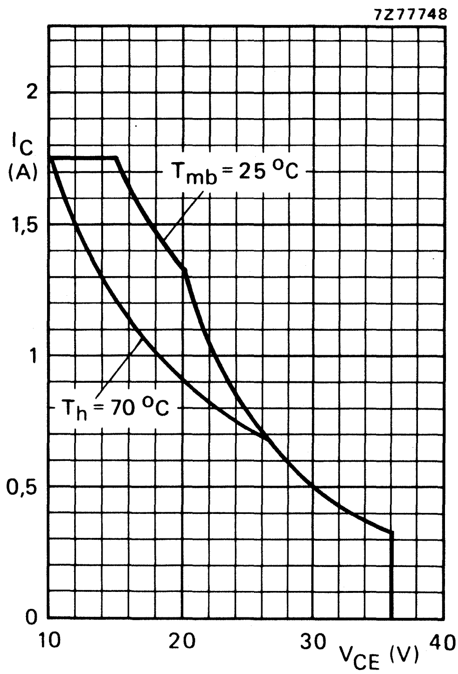


Fig. 2 D.C. SOAR.

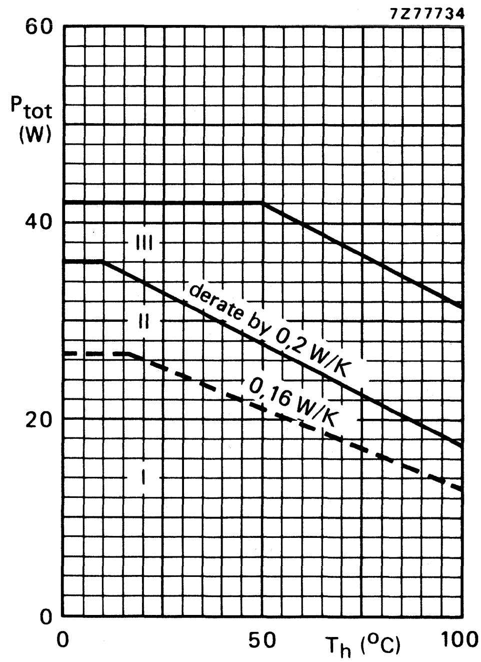


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

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

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

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 5$ mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage				
open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; $I_E = 2$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 36$ V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	2,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	2,5	mJ
D.C. current gain *				
$I_C = 0,7$ A; $V_{CE} = 5$ V	h_{FE}	typ.	50	
			10 to 100	
Collector-emitter saturation voltage *				
$I_C = 2$ A; $I_B = 0,4$ A	V_{CEsat}	typ.	0,65	V
Transition frequency at f = 100 MHz *				
$-I_E = 0,7$ A; $V_{CB} = 28$ V	f_T	typ.	650	MHz
$-I_E = 2$ A; $V_{CB} = 28$ V	f_T	typ.	625	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	18	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 28$ V	C_{re}	typ.	12,8	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

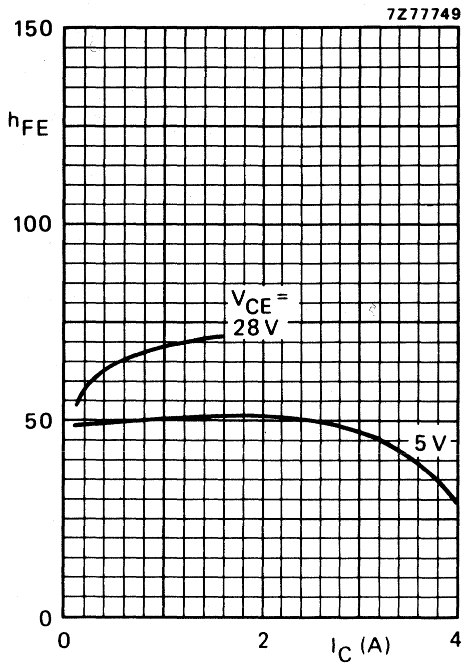


Fig. 4 Typical values; T_j = 25 °C.

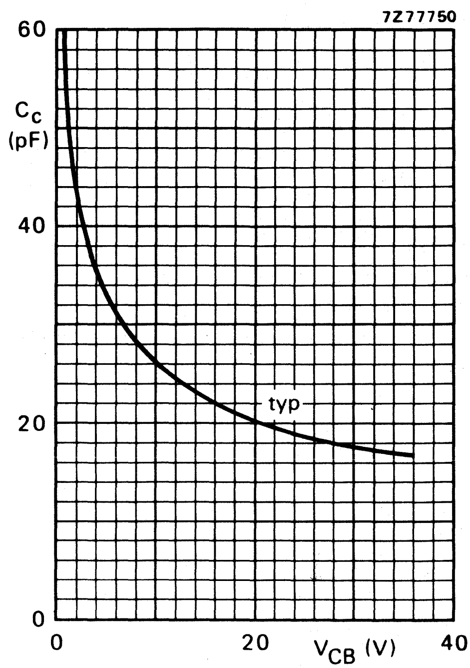


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

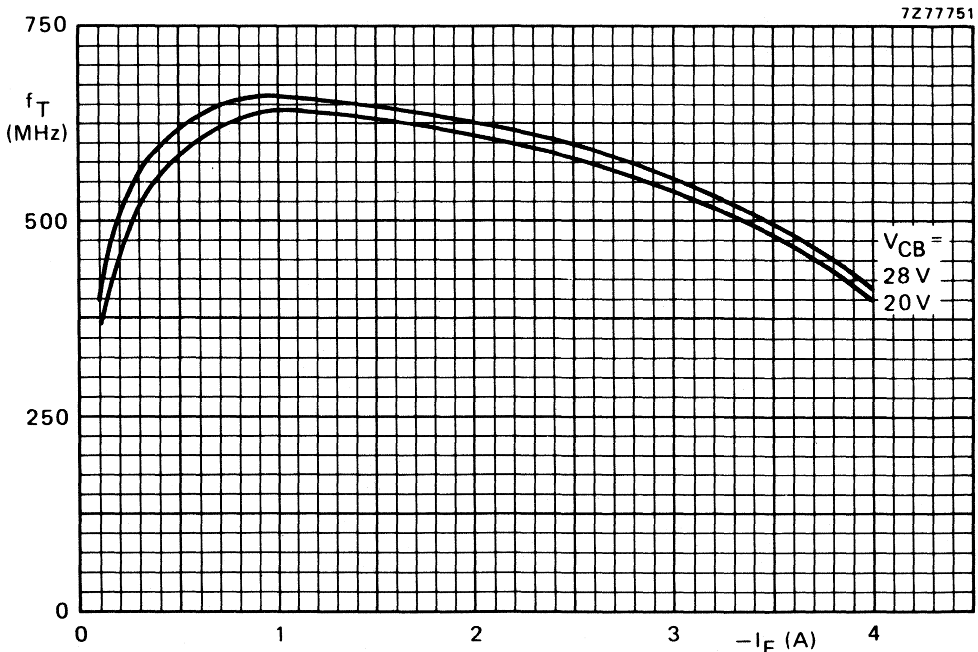


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	15	< 1,5	> 10	< 0,83	> 65	1,4 + j1,85	33 – j27,5

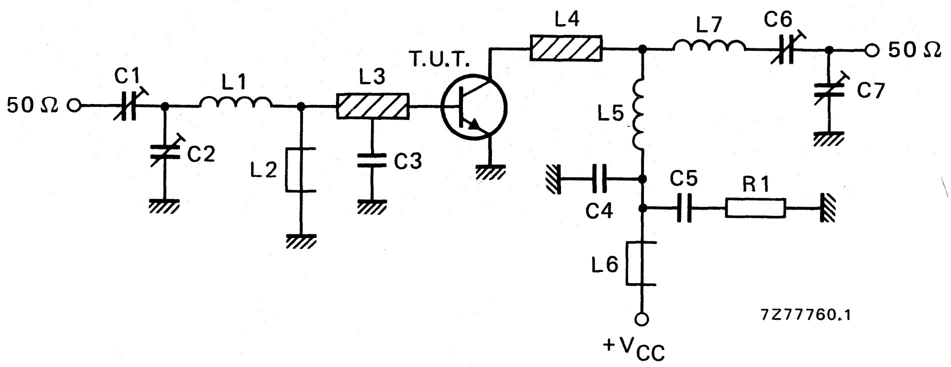


Fig. 7 Test circuit; c.w. class-B.

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.

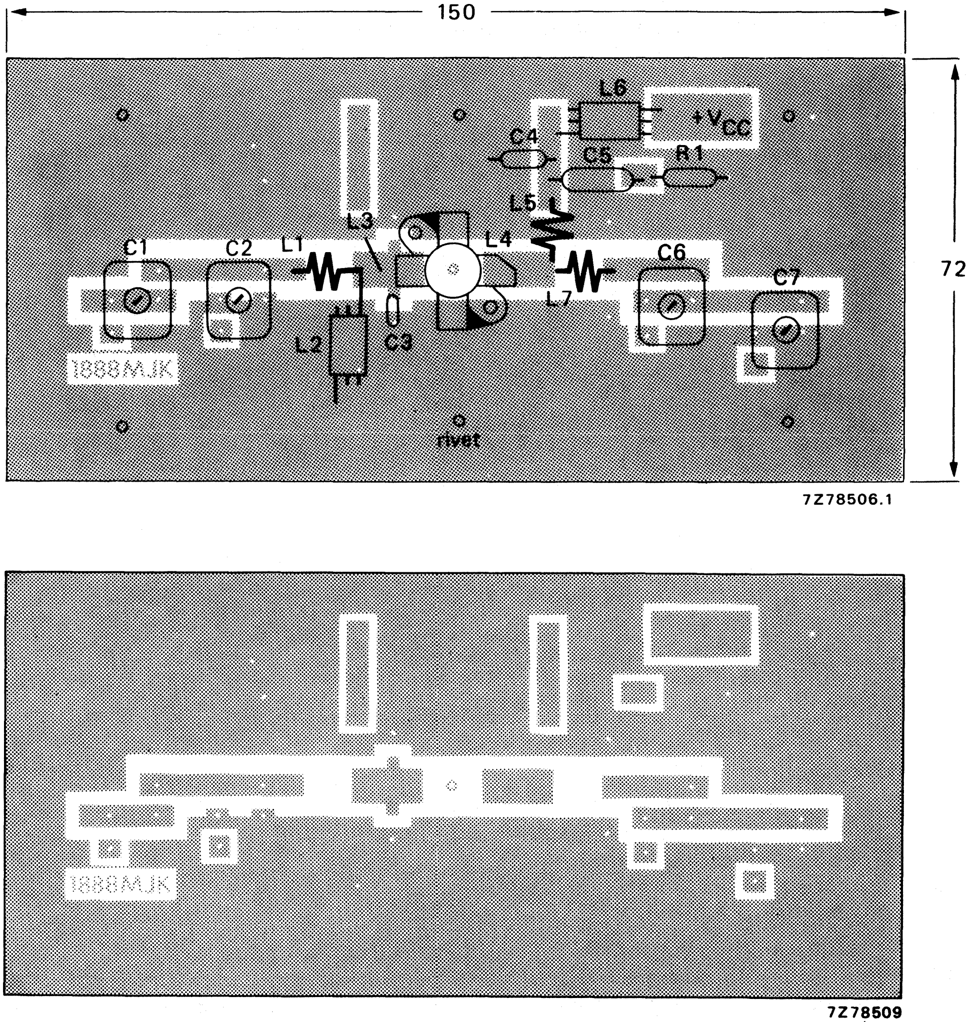


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

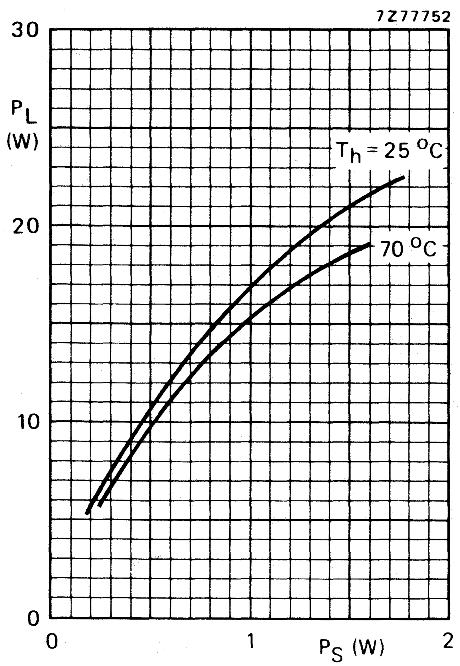


Fig. 9 Typical values; V_{CE} = 28 V; f = 175 MHz.

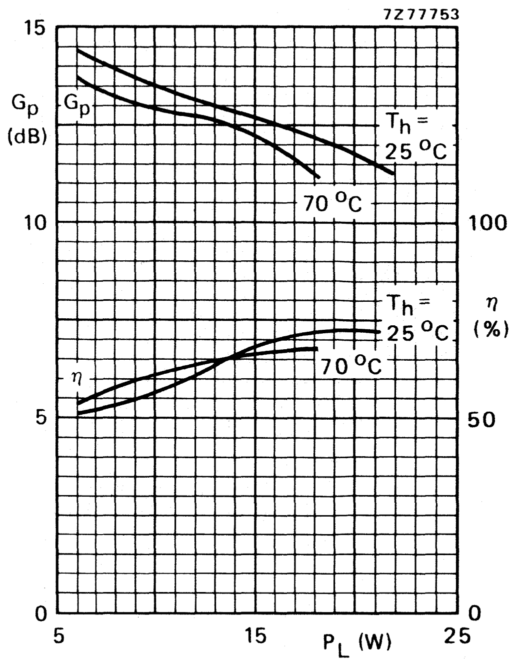


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

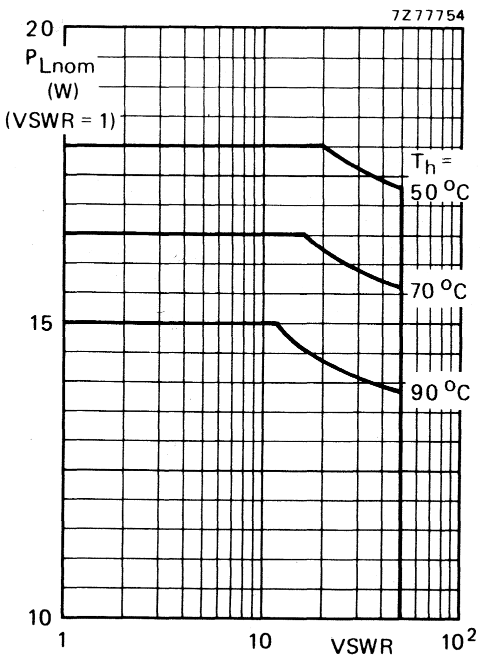


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,3 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

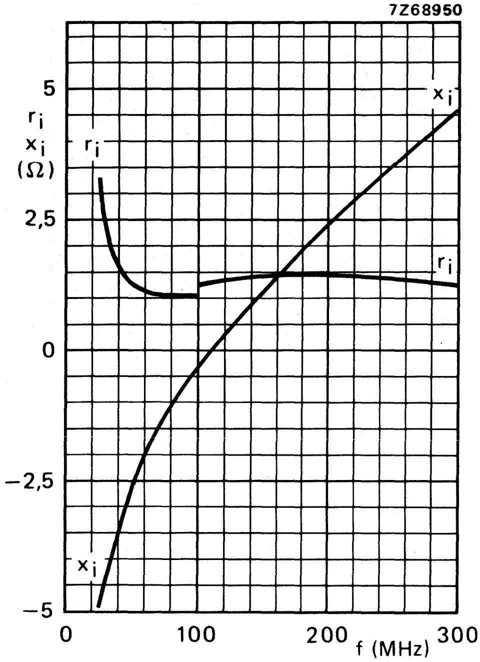


Fig. 12 Input impedance (series components).

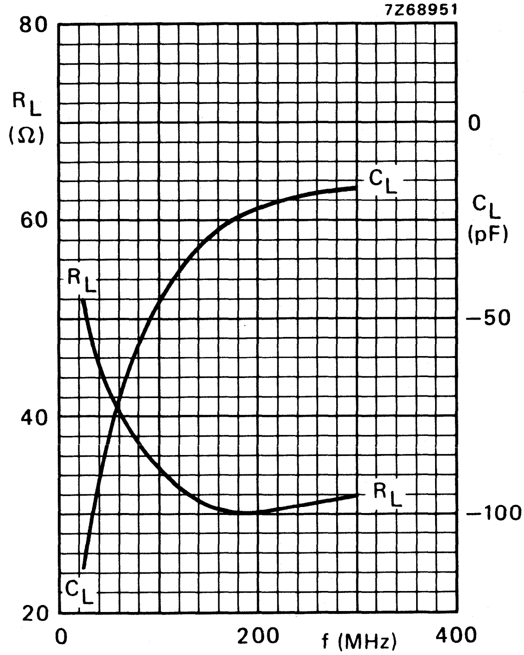


Fig. 13 Load impedance (parallel components).

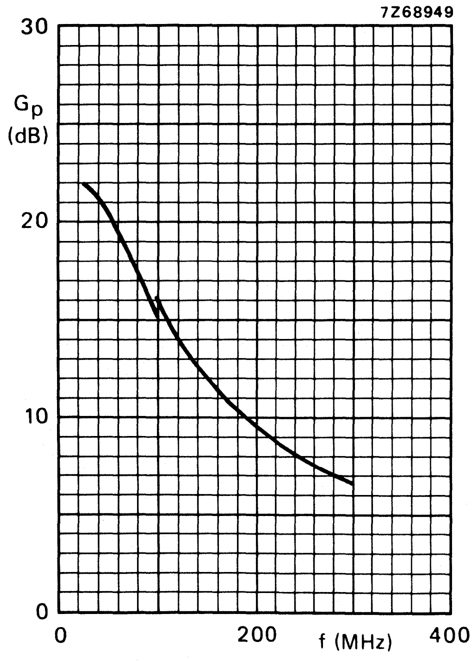


Fig. 14.

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 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 ½in 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 °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

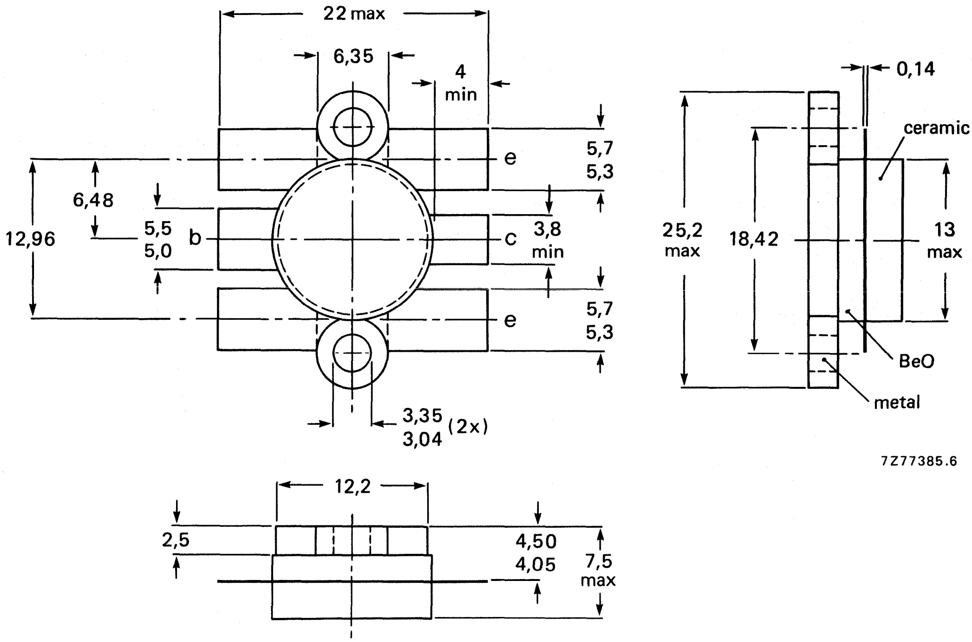
SOT-119 (see Fig. 1).

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

Dimensions in mm

Fig. 1 SOT-119.



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

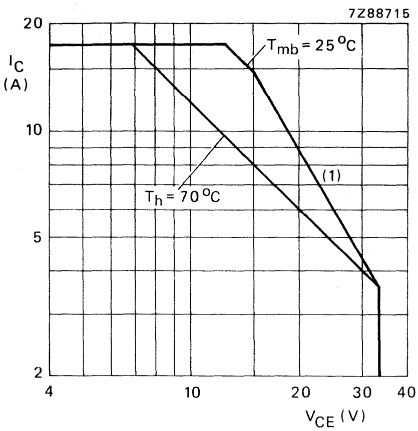
Recommended screw: cheese-head 4-40 UNC/2A

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.	65 V
open base	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.	17,5 A
(peak value); f > 1 MHz	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.

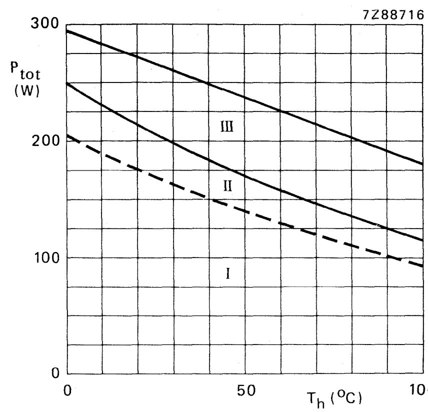


Fig. 3 Power derating curves vs. temperature.

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)	$R_{th\ j\text{-}mb(dc)}$	max	0,85 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	max	0,60 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max	0,2 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	65 V
open base; I_C = 200 mA	$V_{(BR)CEO}$	>	33 V
Emitter-base breakdown voltage			
open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 33 V	I_{CES}	<	25 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	20 mJ
R_{BE} = 10 Ω	E_{SBR}	>	20 mJ
D.C. current gain*			
I_C = 8,5 A; V_{CE} = 25 V	h_{FE}	typ.	50
			15 to 100
Collector-emitter saturation voltage*			
I_C = 20 A; I_B = 4,0 A	V_{CEsat}	typ.	1,6 V
Transition frequency at f = 100 MHz**			
$-I_E$ = 8,5 A; V_{CB} = 25 V	f_T	typ.	600 MHz
$-I_E$ = 20 A; V_{CB} = 25 V	f_T	typ.	600 MHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	275 pF
Feedback capacitance at f = 1 MHz			
I_C = 100 mA; V_{CE} = 25 V	C_{re}	typ.	155 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

* Measured under pulse conditions: $t_p \leq 300\ \mu s$; $\delta \leq 0,02$.
** Measured under pulse conditions: $t_p \leq 50\ \mu s$; $\delta \leq 0,01$.

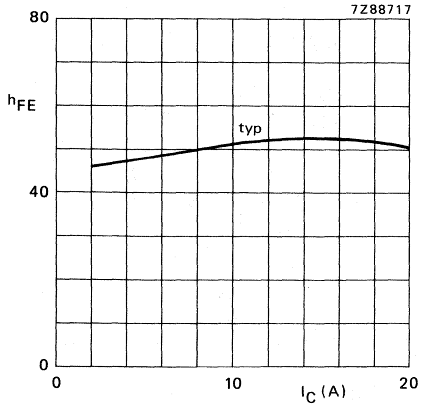


Fig. 4 V_{CE} = 25 V; T_j = 25 °C.

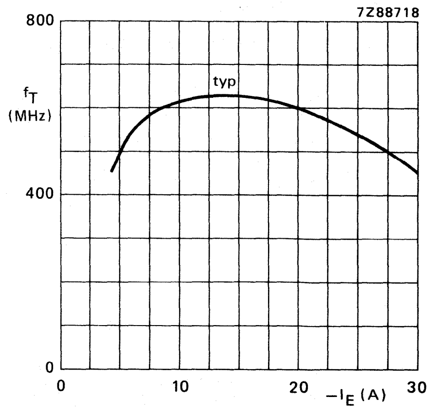


Fig. 5 V_{CB} = 25 V; f = 100 MHz; T_j = 25 °C.

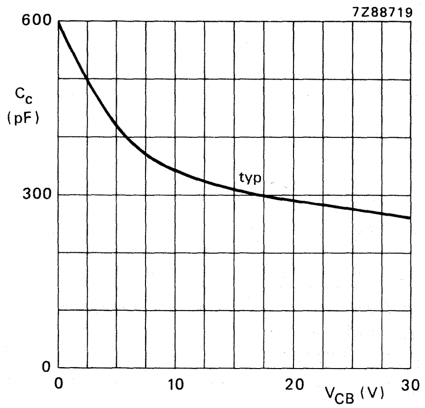


Fig. 6 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in narrow band c.w. operation (common-emitter class-B circuit) T_h = 25 °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

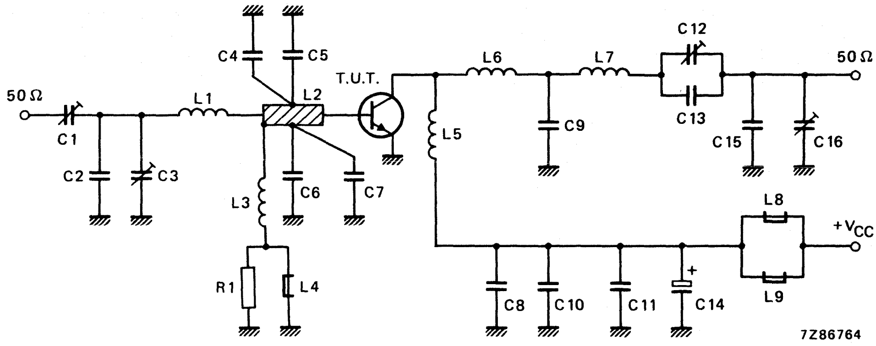


Fig. 7 Class-B test circuit at f = 108 MHz.

List of components

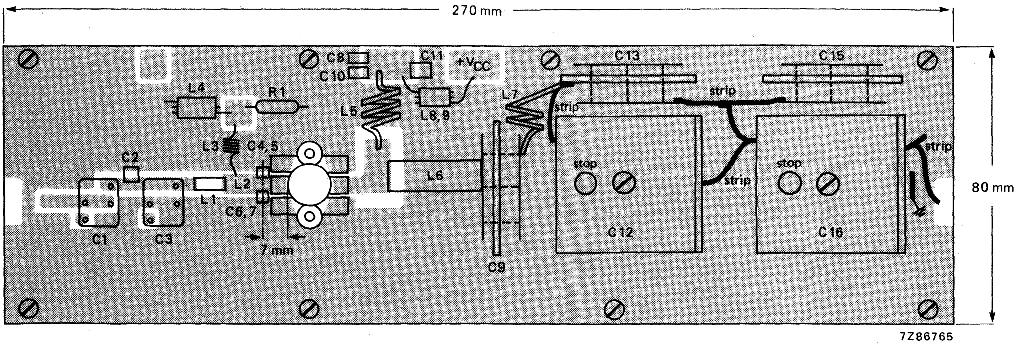
C1 = C3 = 7 to 100 pF film dielectric trimmer (cat. no. 2222 809 07015)
C2 = C4 = C5 = C6 = C7 = 100 pF (500 V) multilayer ceramic chip capacitor (ATC▲); except for C2 these capacitors are placed 7 mm from transistor edge
C8 = C10 = 470 pF multilayer ceramic chip capacitor (cat. no. 2222 856 13471)
C9 = 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.



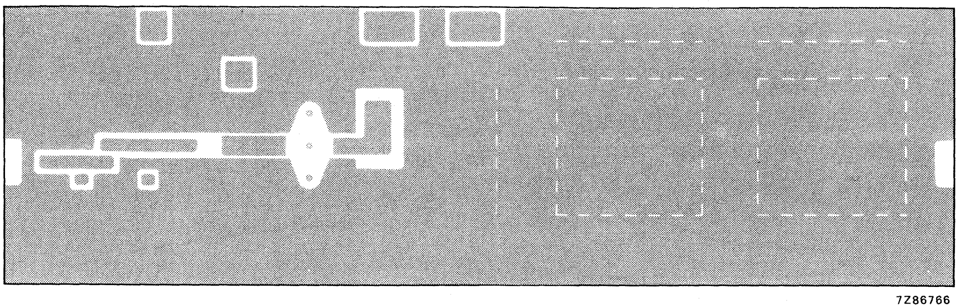


Fig. 8 Component layout and printed-circuit board for 108 MHz class-B test circuit. (Dimensions in mm.)

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.

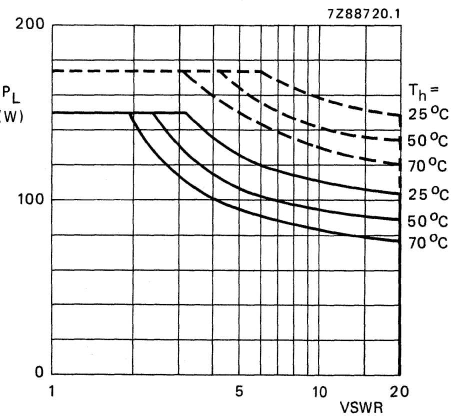


Fig. 9 R.F. SOAR. ——— f > 1 MHz (continuous);
– – – – short time operation during mismatch (f > 1 MHz).

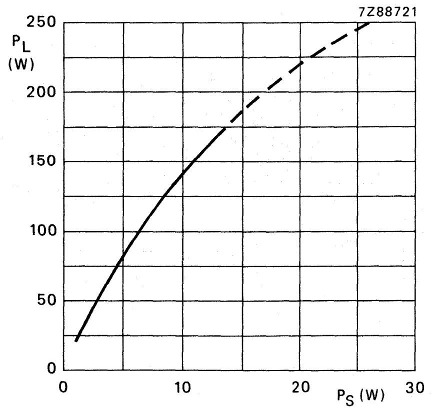


Fig. 10 Load power as a function of source power.

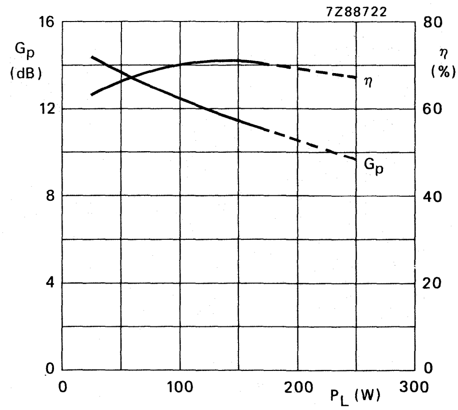


Fig. 11 Power gain and efficiency as a function of source power.

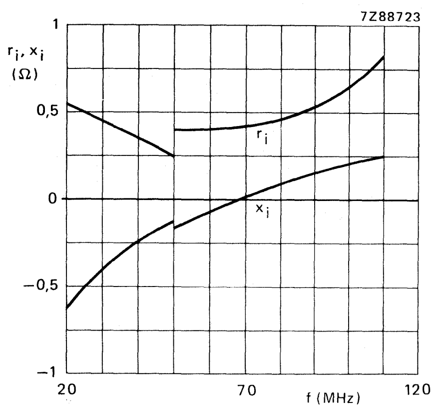


Fig. 12 Input impedance (series components).

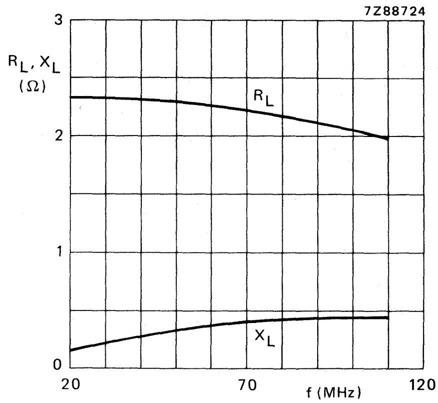


Fig. 13 Load impedance (series components).

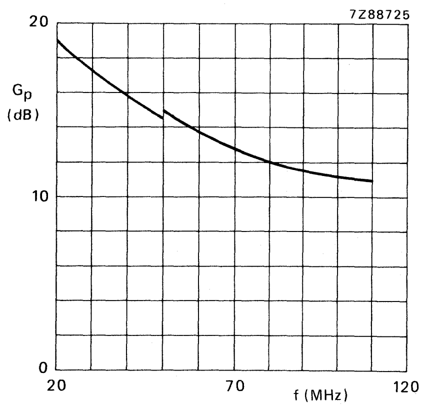


Fig. 14 Power gain as a function of frequency.

Conditions for Figs 10 and 11:

Test circuit tuned for each power level; typical values; V_{CE} = 28 V; f = 108 MHz; T_h = 25 °C; class-B operation.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 28 V; P_L = 175 W; T_h = 25 °C; class-B operation.

OPERATING NOTE for Figs 12, 13 and 14:

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.

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 ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

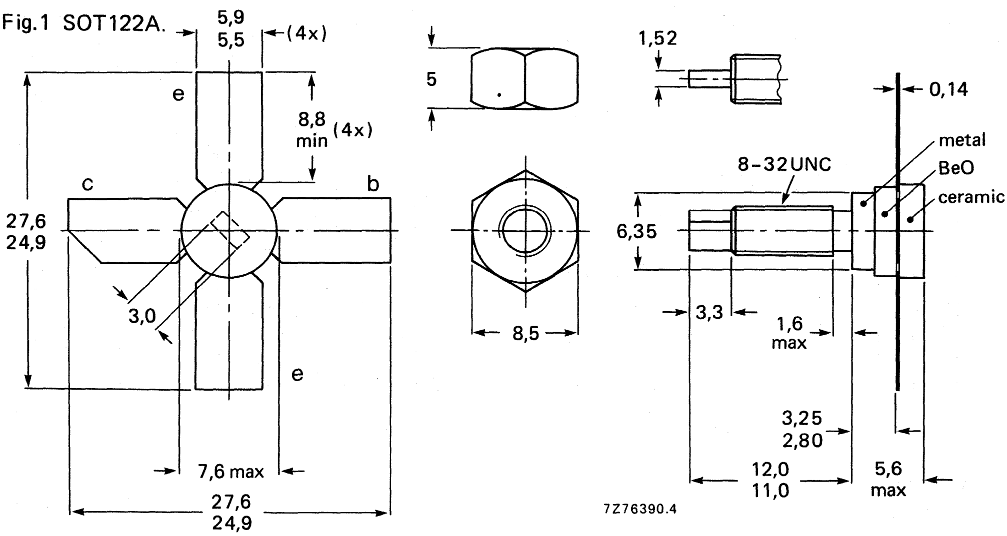
R.F. performance mode of operation	f_{vision} MHz	V_{CE} V	I_C A	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A; linear amplifier	224,25	25	0,46	70	−60	> 1,5	> 18
	224,25	25	0,46	25	−60	typ. 1,7	typ. 20

* 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 SOT122A.



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.

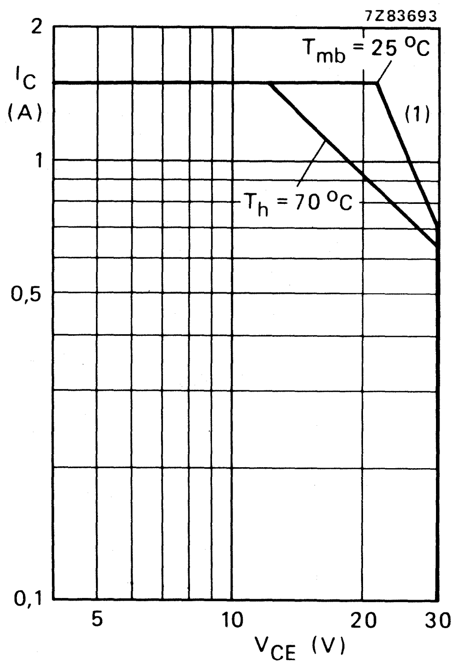
When locking is required an adhesive is preferred instead of a lock washer.

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 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.

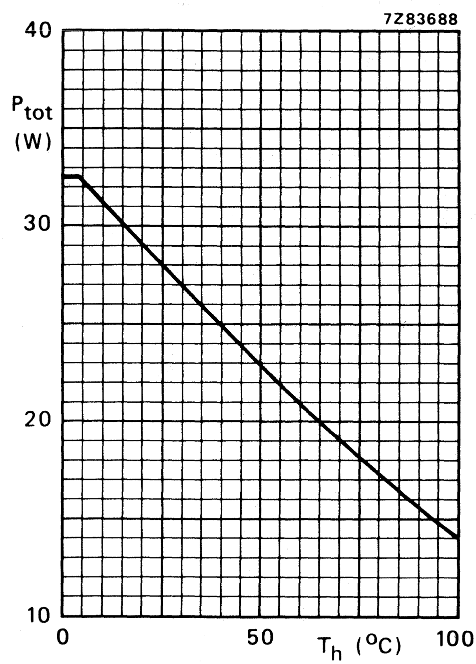


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 12 W; T_{mb} = 77 °C; i.e. T_h = 70 °C)	$R_{th\ j\text{-}mb}$	=	5,6 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

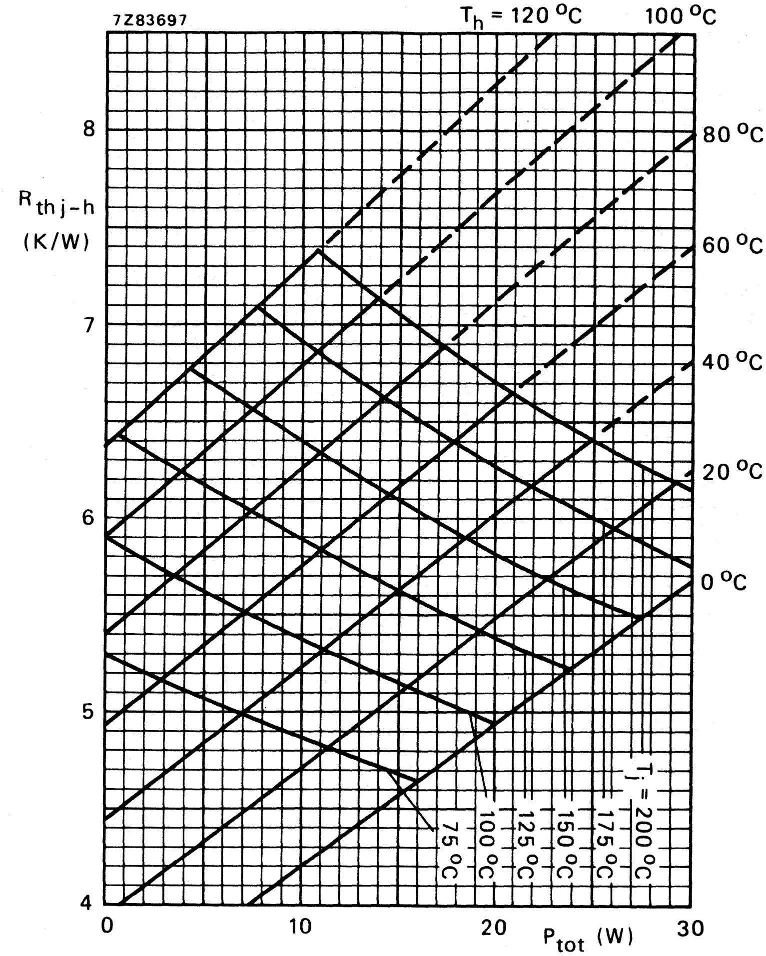


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,6 K/W).

Example

Nominal class-A operation; V_{CE} = 25 V; I_C = 0,46 A; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j\text{-}h}$	max.	6,13 K/W
	T_j	max.	140,5 °C
Typical device:	$R_{th\ j\text{-}h}$	typ.	5,45 K/W
	T_j	typ.	133 °C

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	60 V
open base; I_C = 50 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 4 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	4 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	2 mJ
R_{BE} = 10 Ω	E_{SBR}	>	2 mJ
D.C. current gain *			
I_C = 0,5 A; V_{CE} = 25 V	h_{FE}	typ.	65
			15 to 120
Collector-emitter saturation voltage *			
I_C = 1,0 A; I_B = 0,1 A	V_{CEsat}	typ.	0,8 V
Transition frequency at f = 500 MHz **			
$-I_E$ = 0,5 A; V_{CB} = 25 V	f_T	typ.	1,20 GHz
$-I_E$ = 1,0 A; V_{CB} = 25 V	f_T	typ.	1,15 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ.	18 pF
Feedback capacitance at f = 1 MHz			
I_C = 20 mA; V_{CE} = 25 V	C_{re}	typ.	9,2 pF
Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leq 300\ \mu s$; $\delta \leq 0{,}02$.
** Measured under pulse conditions: $t_p \leq 50\ \mu s$; $\delta \leq 0{,}01$.

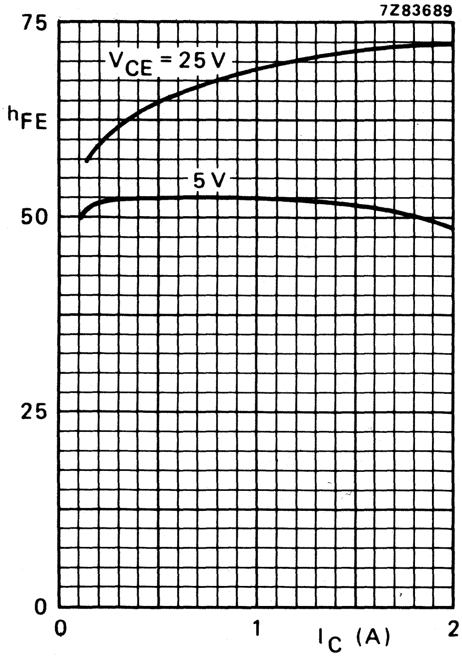


Fig. 5 Typical values; T_j = 25 °C.

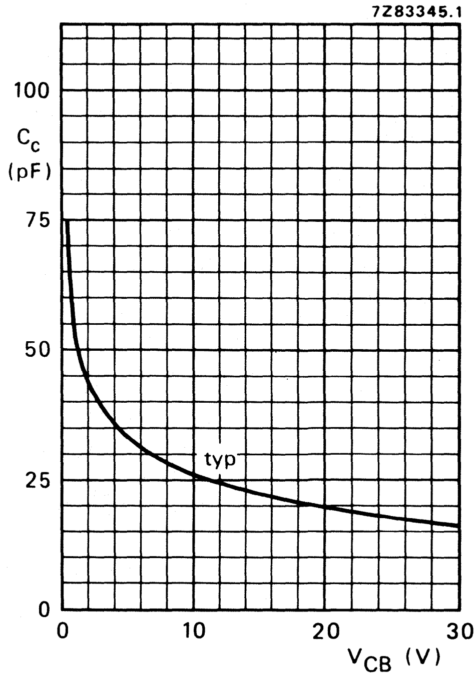


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

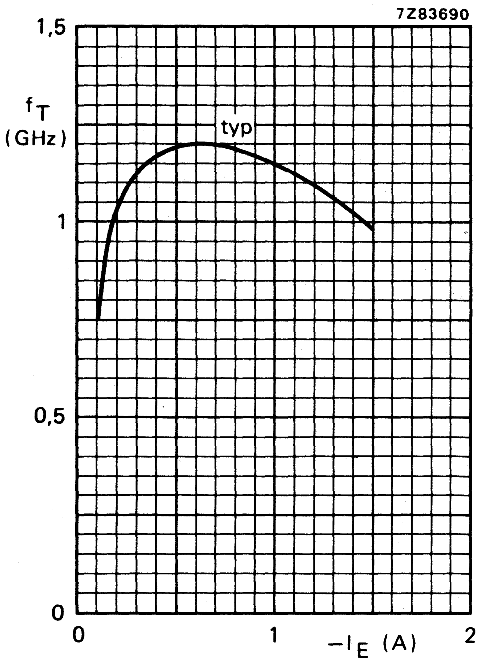


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

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 (°C)	d_{im} (dB) *	$P_{o\ sync}$ (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.

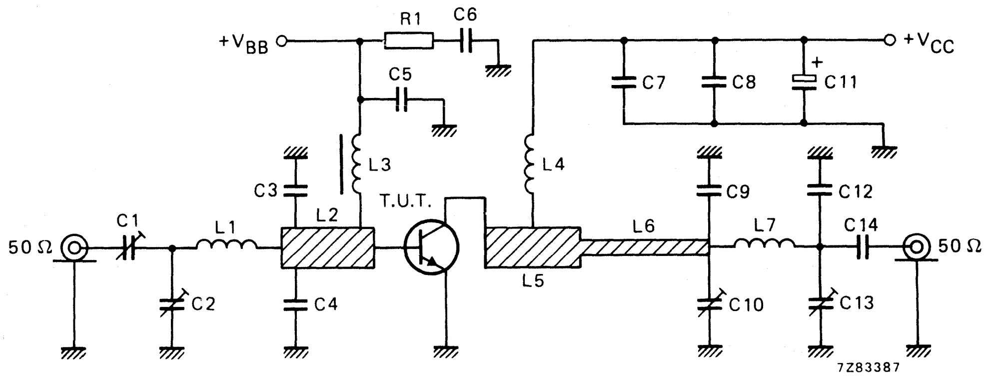


Fig. 8 Test circuit at f_{vision} = 224,25 MHz.

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 capacitor
C12 = 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 (ϵ_r ≈ 4,5); thickness 1/16".

R1 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

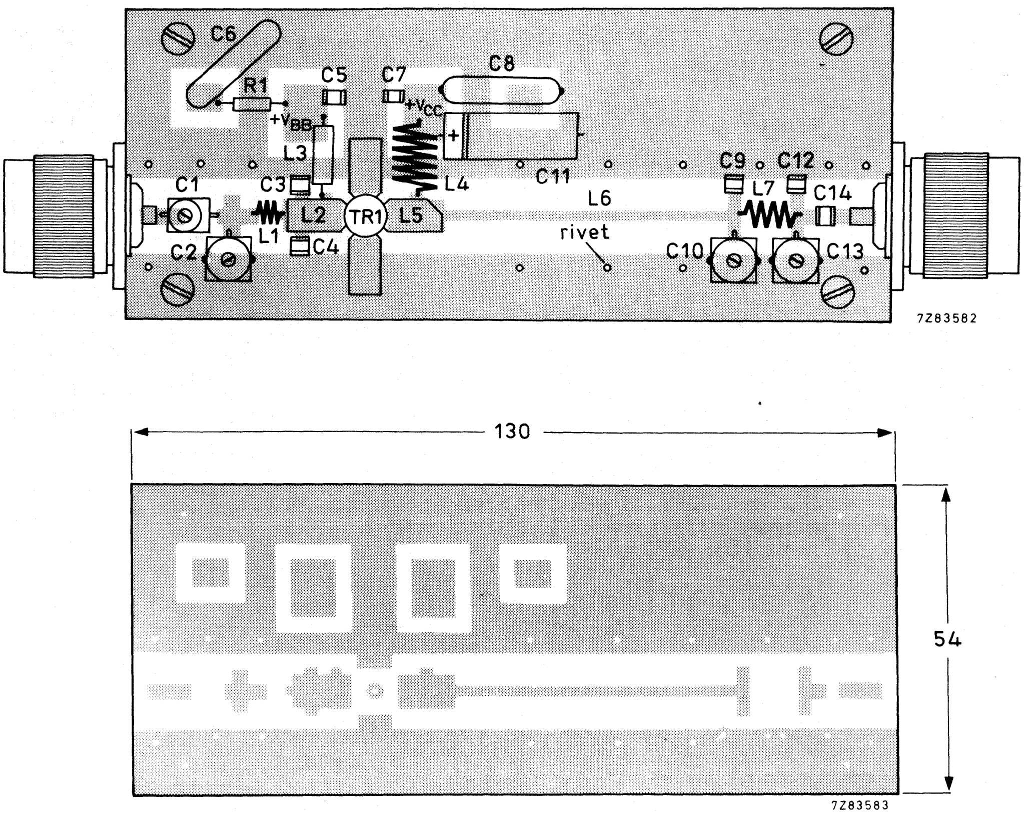


Fig. 9 Component layout and printed-circuit board for 224,25 MHz test circuit.

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.

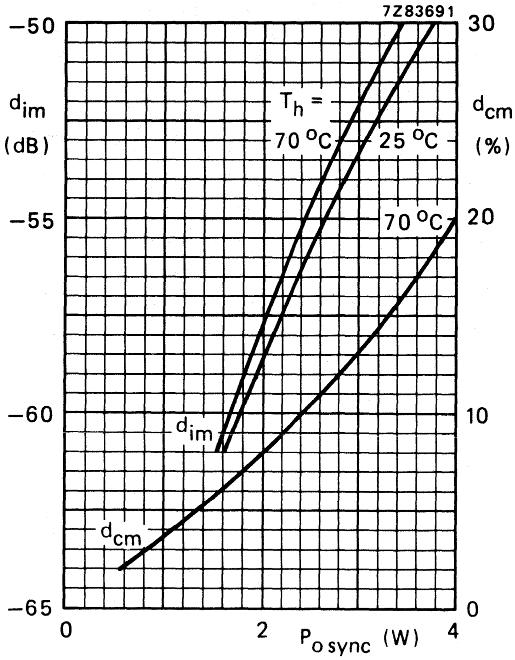


Fig. 10 Intermodulation distortion (d_{im}*) and cross-modulation distortion (d_{cm}**) as a function of output power.

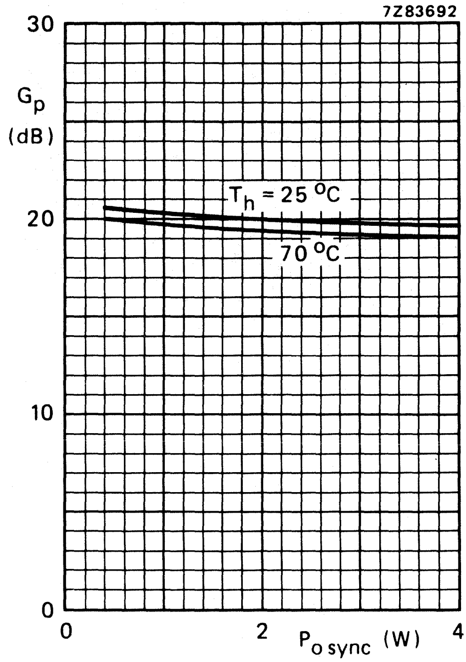


Fig. 11 Power gain as a function of output power.

Conditions for Figs 10 and 11:

Typical values; V_{CE} = 25 V; I_C = 0,46 A; f_{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.

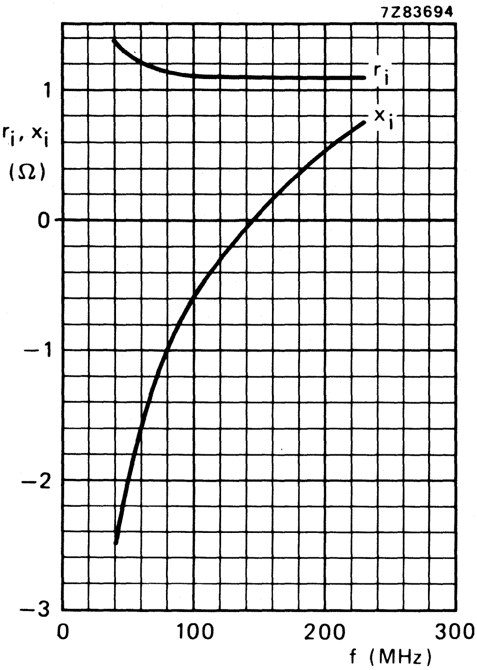


Fig. 12 Input impedance (series components).

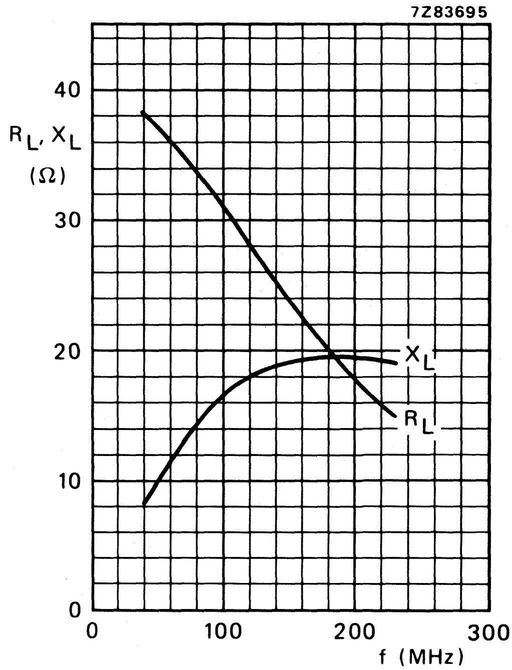


Fig. 13 Load impedance (series components).

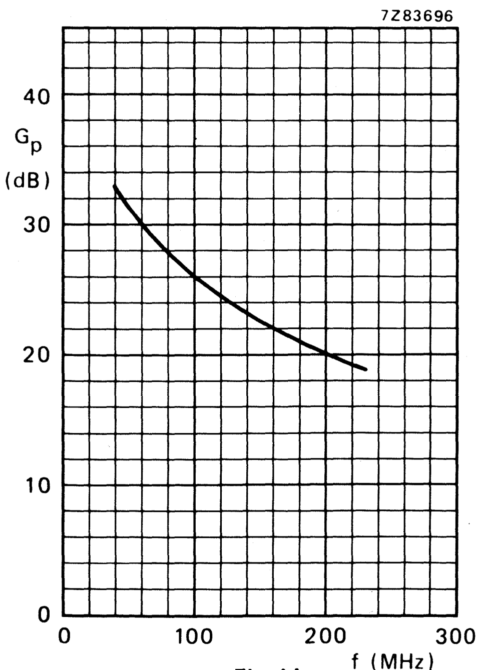


Fig. 14.

Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 25 V; I_C = 0,46 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 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 ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance

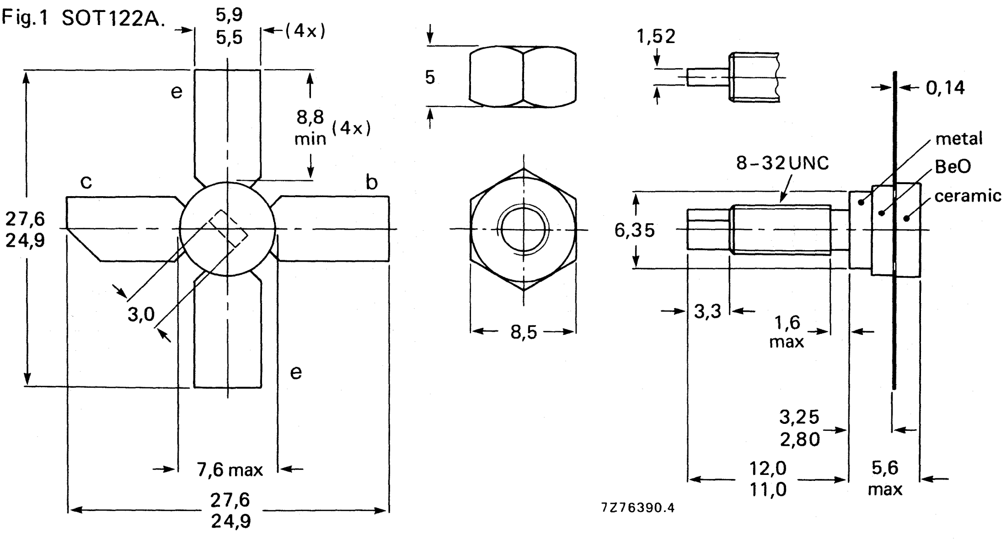
mode of operation	f_{vision} MHz	V_{CE} V	I_C A	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A; linear amplifier	224,25	25	0,8	70	−58	> 5	> 15
	224,25	25	0,8	25	−58	typ. 7	typ. 16,5

* 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 SOT122A.



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.

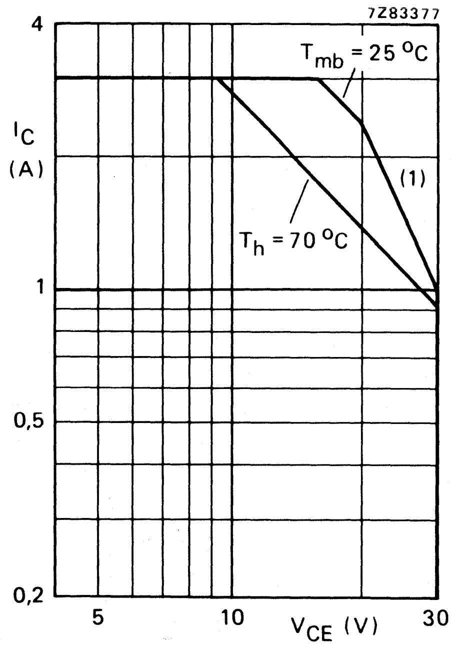
When locking is required an adhesive is preferred instead of a lock washer.

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.	3	A
(peak value); f > 1 MHz	I_{CM}	max.	6	A
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.

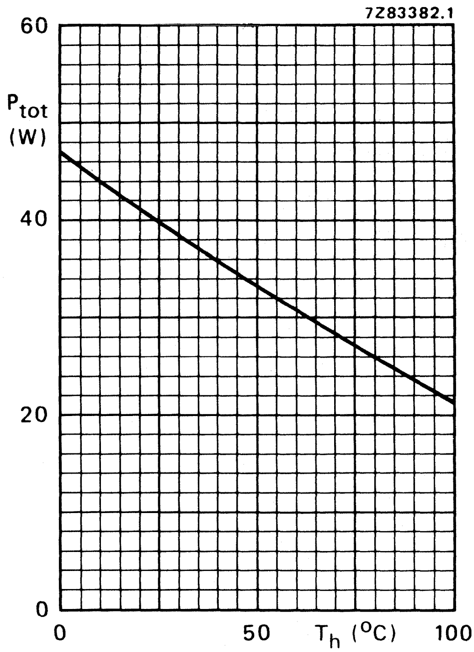


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 20 W; T_{mb} = 82 °C; i.e. T_h = 70 °)	$R_{th\ j\text{-}mb}$	=	3,45	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

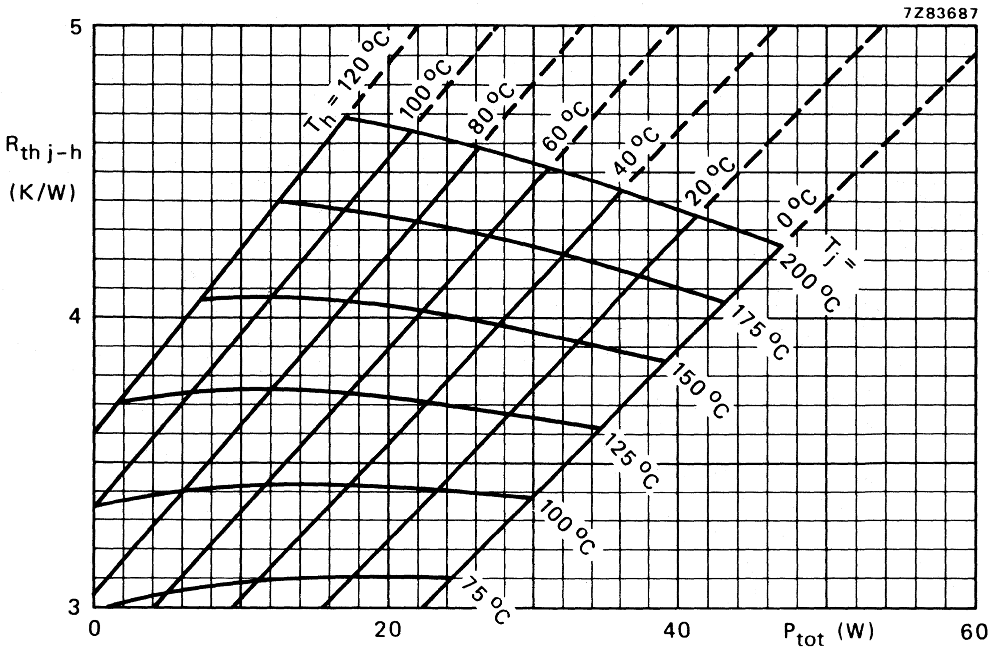


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,6 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 0,8 A; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j\text{-}h}$	max.	4,05 K/W
	T_j	max.	151 °C
Typical device:	$R_{th\ j\text{-}h}$	typ.	3,80 K/W
	T_j	typ.	146 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	60	V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	30	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	3	mJ
R_{BE} = 10 Ω	E_{SBR}	>	3	mJ
D.C. current gain *				
I_C = 0,8 A; V_{CE} = 25 V	h_{FE}	typ.	75	
			15 to 120	
Collector-emitter saturation voltage *				
I_C = 2,0 A; I_B = 0,2 A	V_{CEsat}	typ.	1,0	V
Transition frequency at f = 500 MHz **				
$-I_E$ = 0,8 A; V_{CB} = 25 V	f_T	typ.	1,0	GHz
$-I_E$ = 2,0 A; V_{CB} = 25 V	f_T	typ.	1,1	GHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	35	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 25 V	C_{re}	typ.	20	pF
Collector-stud capacitance	C_{cs}	typ.	1,2	pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

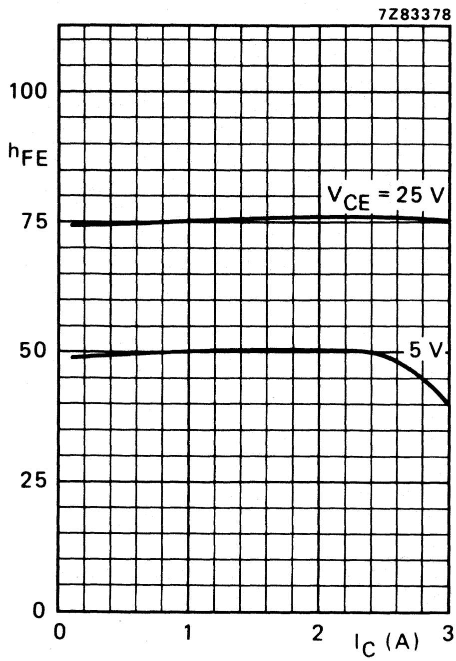


Fig. 5 Typical values; T_j = 25 °C.

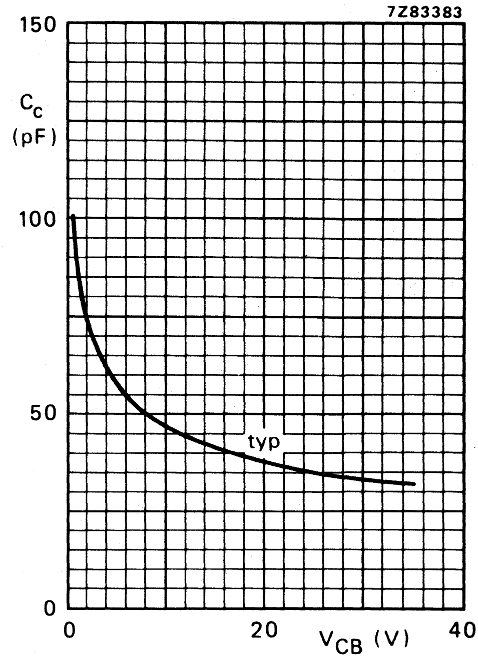


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

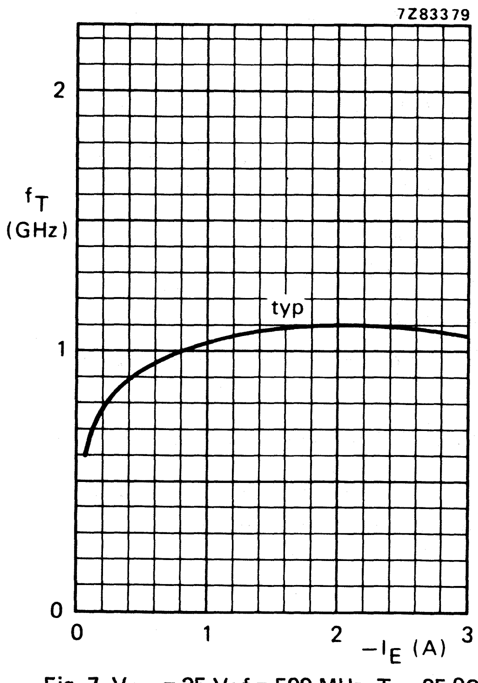


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

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 (°C)	d_{im} (dB)*	$P_{o\ sync}$ (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.

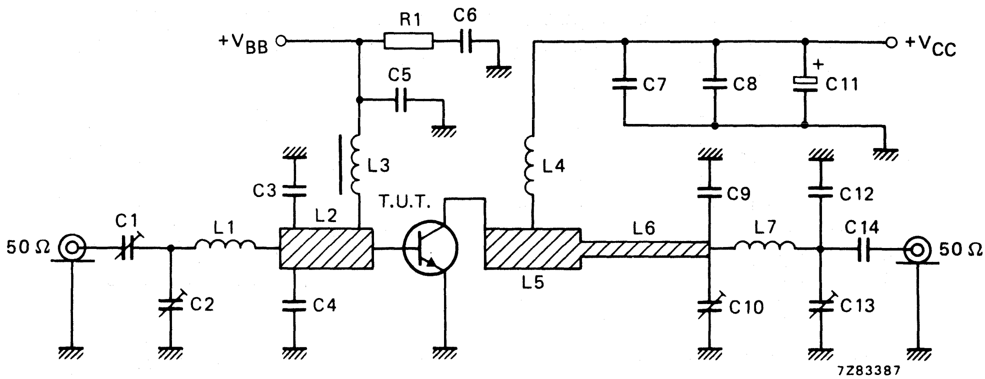


Fig. 8 Test circuit at f_{vision} = 224,25 MHz.

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 capacitor
C12 = 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.

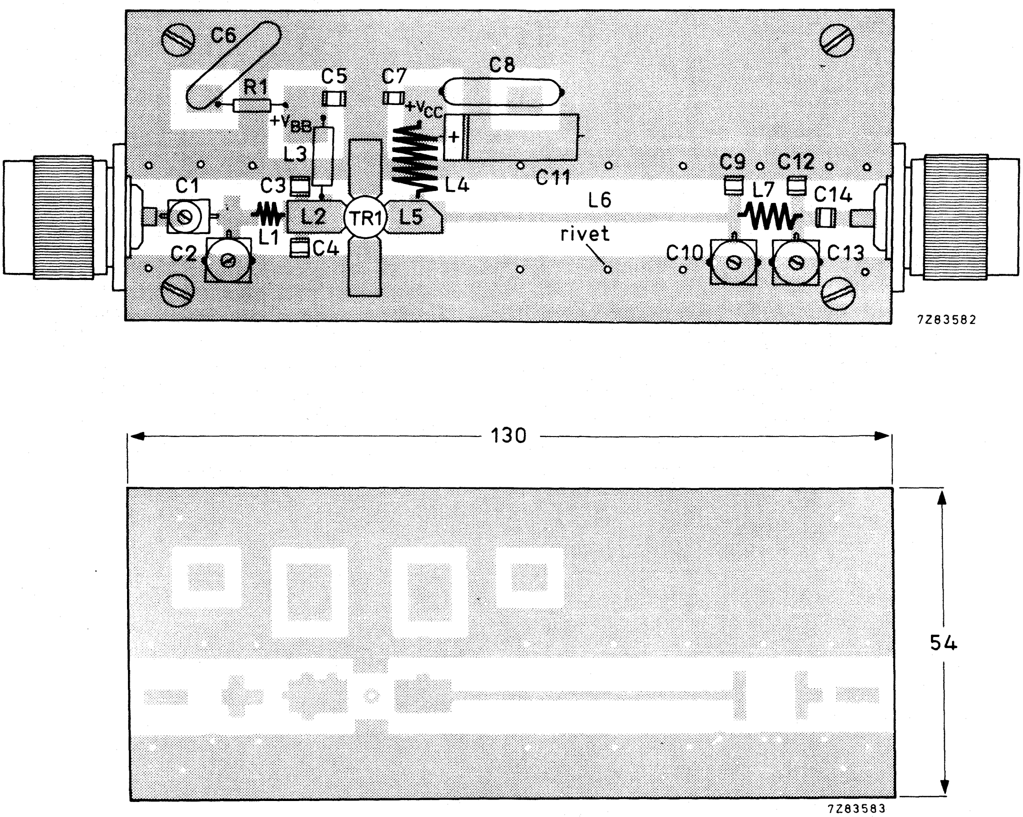


Fig. 9 Component layout and printed-circuit board for 224,25 MHz test circuit.

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.

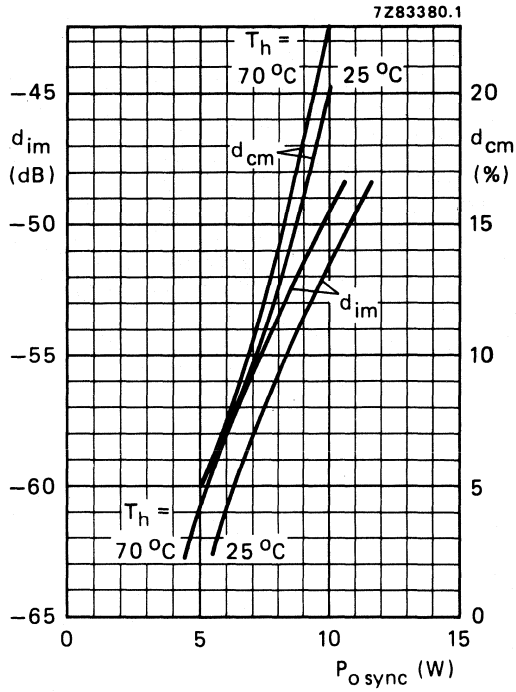


Fig. 10 Intermodulation distortion (d_{im}*) and cross-modulation distortion (d_{cm}**) as a function of output power.

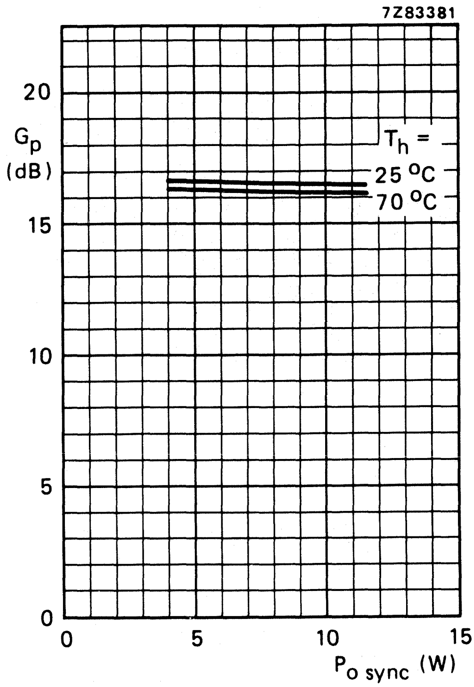


Fig. 11 Power gain as a function of output power.

Conditions for Figs 10 and 11:

Typical values; V_{CE} = 25 V; I_C = 0,8 A; f_{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.

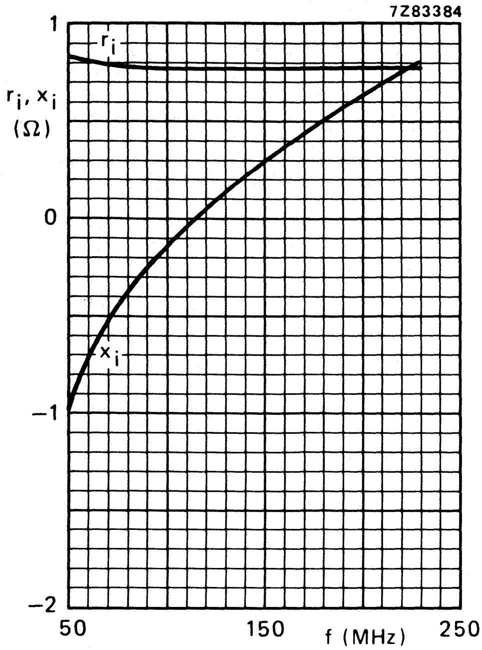


Fig. 12 Input impedance (series components).

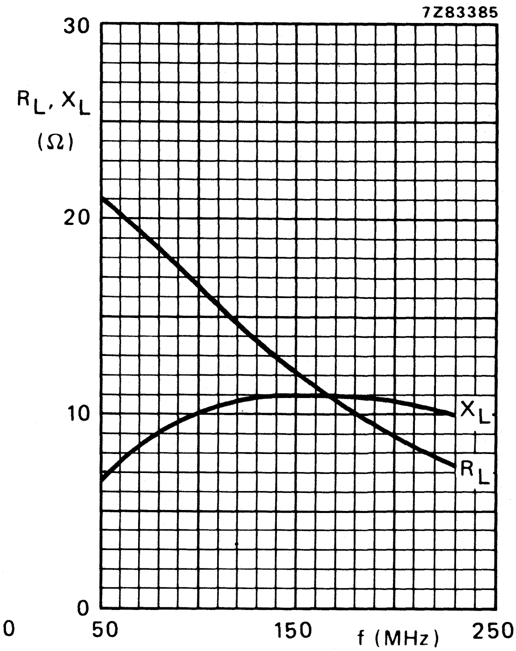


Fig. 13 Load impedance (series components).

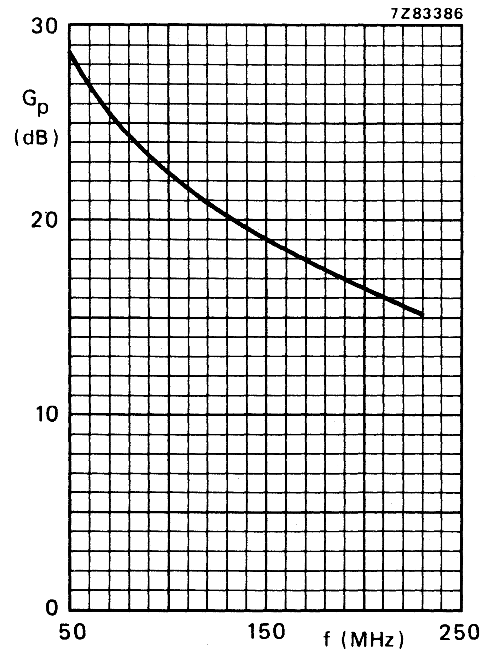


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 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 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	$P_{o\ sync}$* 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

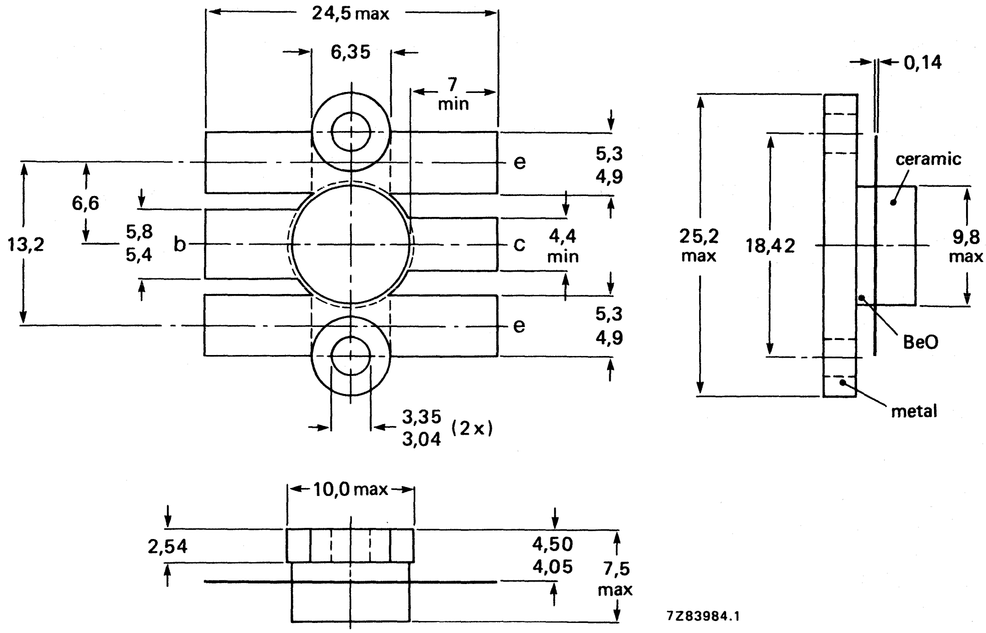
SOT-160 (see Fig. 1).

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

Dimensions in mm

Fig. 1 SOT-160.



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

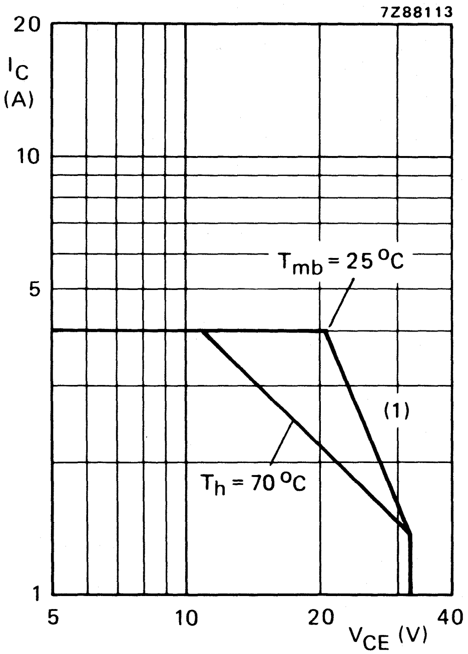
Recommended screw: cheese-head 4-40 UNC/2A

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			
d.c. or average	I_C; $I_{C(AV)}$	max.	4 A
(peak value); f > 1 MHz	I_{CM}	max.	12 A
Total power dissipation at $T_{mb} = 25$ °C	P_{tot}	max.	82 W
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



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

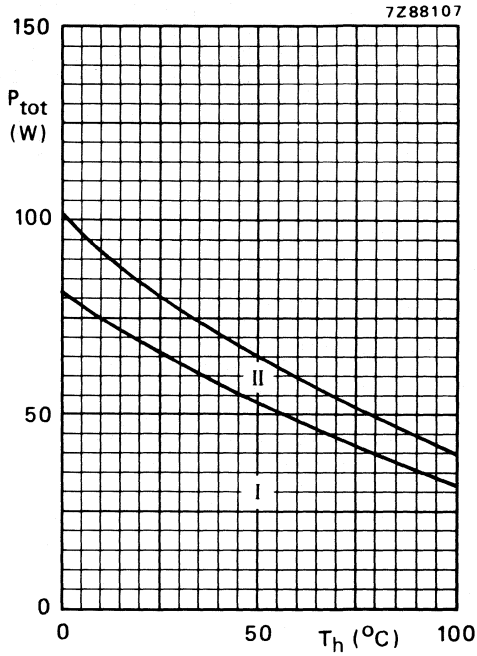


Fig. 3 Power derating curves vs. temperature.

I Continuous d.c. (including r.f. class-A) operation

II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 37,5 W; $T_{mb} = 82$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,55 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,10 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

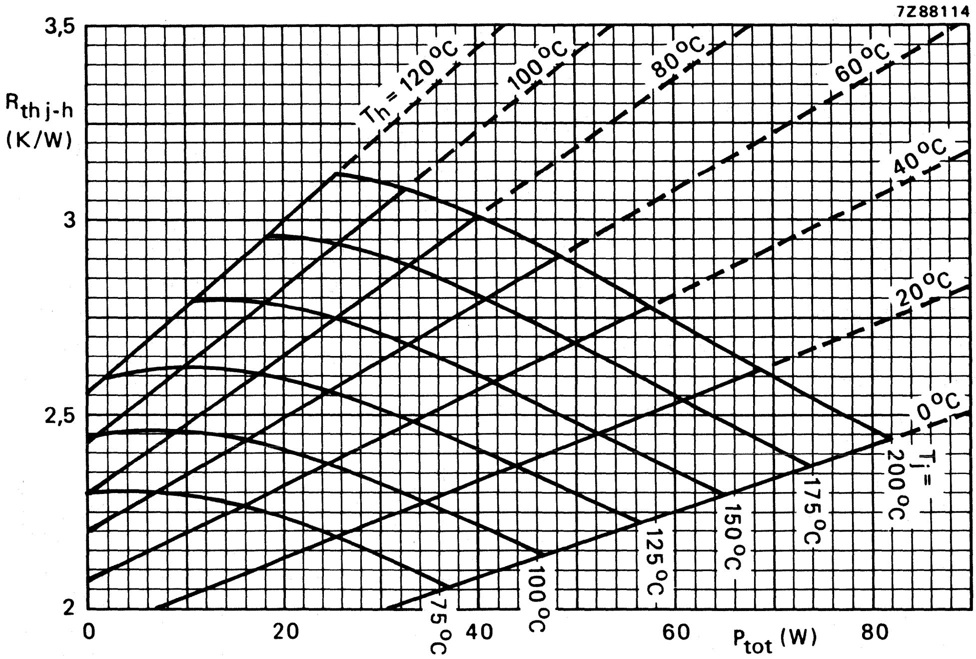


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\,mb\text{-}h}$ = 0,3 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 1,5 A; T_h = 70 °C.

Fig. 4 shows:	$R_{th\,j\text{-}h}$	max.	2,85 K/W
	T_j	max.	177 °C
Typical device:	$R_{th\,j\text{-}h}$	typ.	2,30 K/W
	T_j	typ.	156 °C

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage			
$V_{BE} = 0$; $I_C = 15$ mA	$V_{(BR)CES}$	>	60 V
open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	32 V
Emitter-base breakdown voltage			
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 32$ V	I_{CES}	<	5 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	4,5 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	4,5 mJ
D.C. current gain*			
$I_C = 1{,}6$ A; $V_{CE} = 25$ V	h_{FE}	typ.	50
			20 to 120
Collector-emitter saturation voltage*			
$I_C = 3{,}5$ A; $I_B = 0{,}35$ A	V_{CEsat}	typ.	1,4 V
Transition frequency at f = 500 MHz**			
$-I_E = 1{,}6$ A; $V_{CB} = 25$ V	f_T	typ.	2 GHz
$-I_E = 3{,}5$ A; $V_{CB} = 25$ V	f_T	typ.	2 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 25$ V	C_c	typ.	50 pF
Feedback capacitance at f = 1 MHz			
$I_C = 50$ mA; $V_{CE} = 25$ V	C_{re}	typ.	31 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.

** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

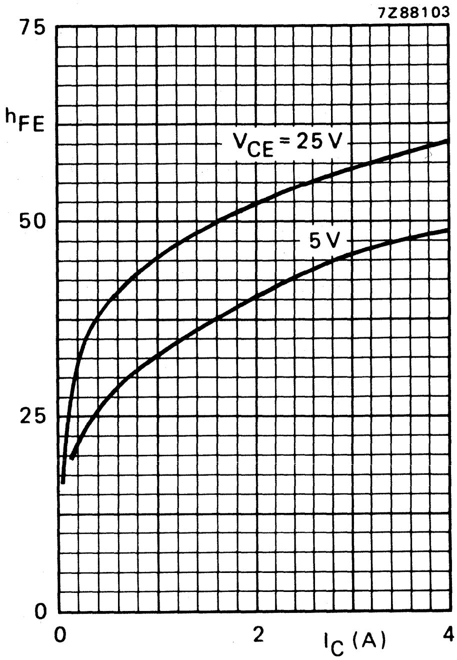


Fig. 5 Typical values; T_j = 25 °C.

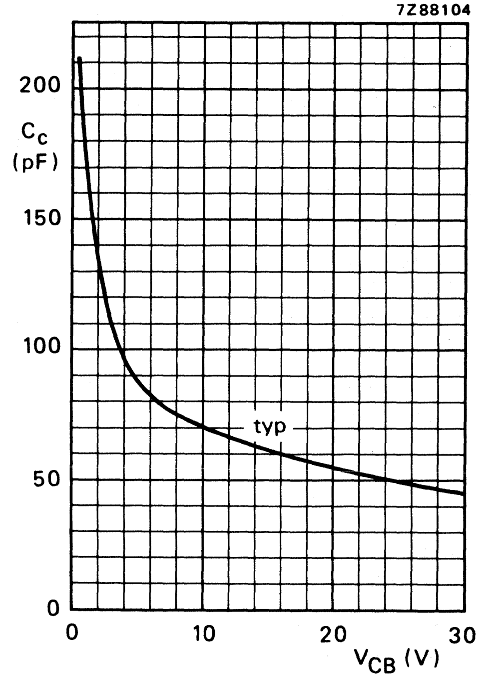


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

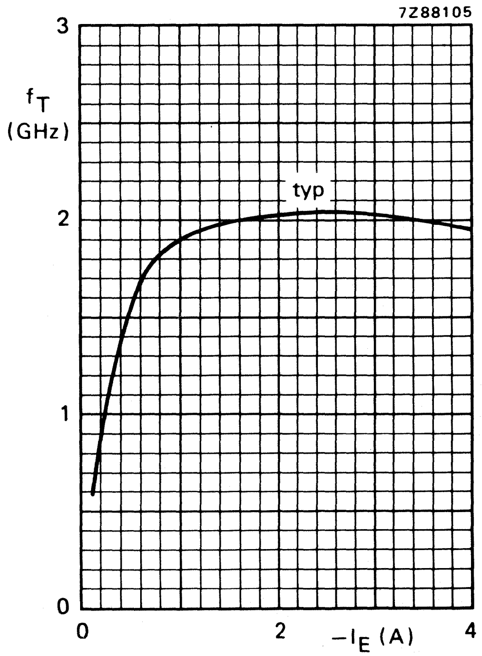


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

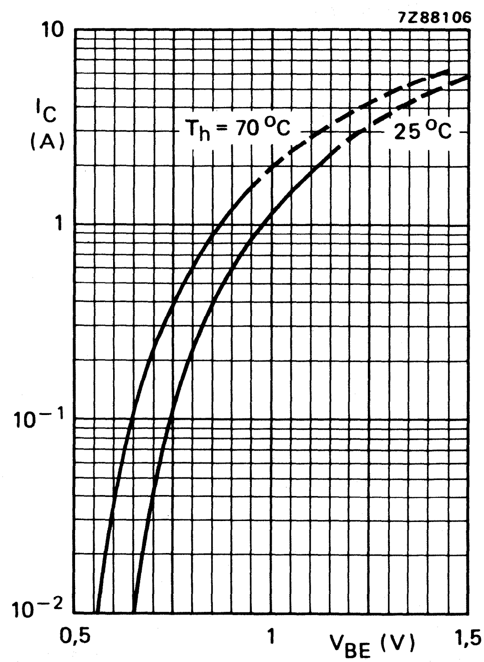


Fig. 8 Typical values; V_{CE} = 25 V.

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)**	$P_{o\,sync}$ (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 (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

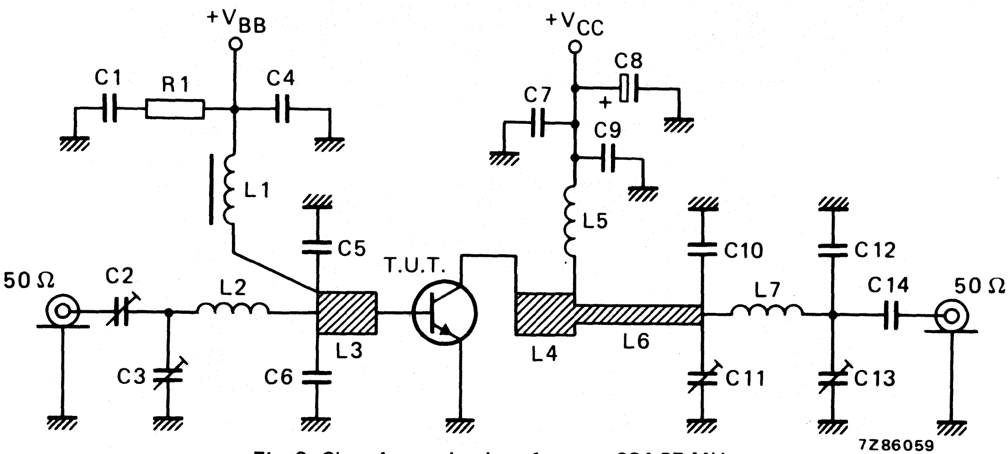


Fig. 9 Class-A test circuit at f_{vision} = 224,25 MHz.

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 μF/63 V solid tantalum capacitor
C10 = 82 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C12 = 30 pF (500 V) multilayer ceramic chip capacitor (ATC▲)

L1 = 1 μH 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.

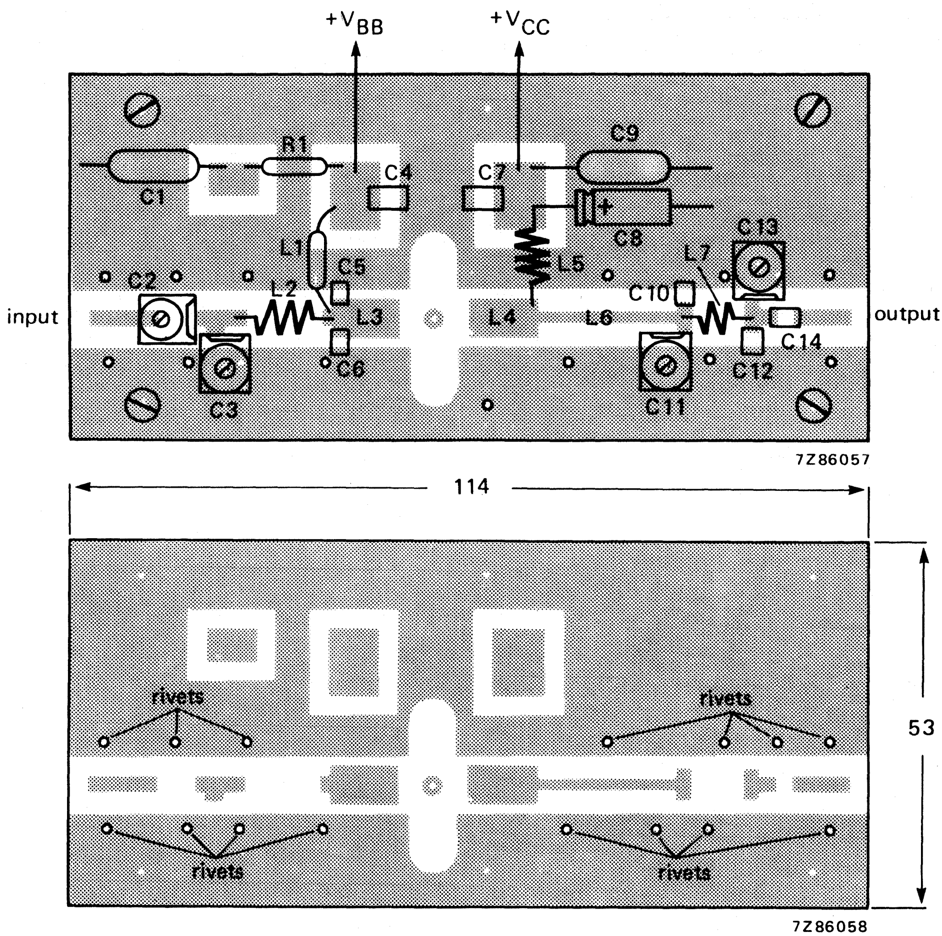


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

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.

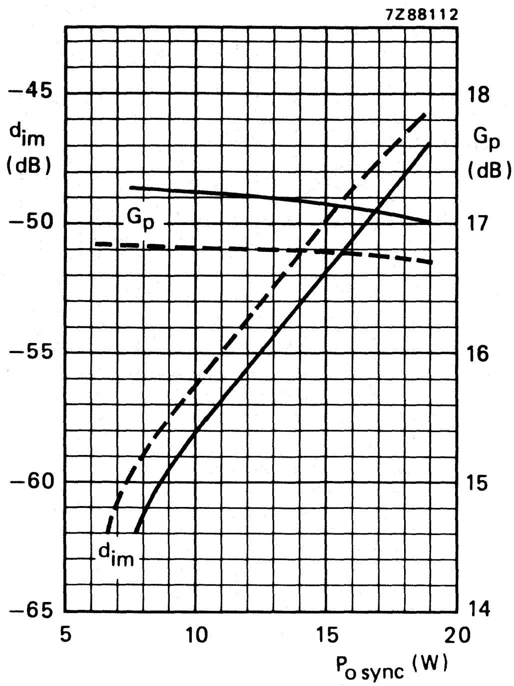


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

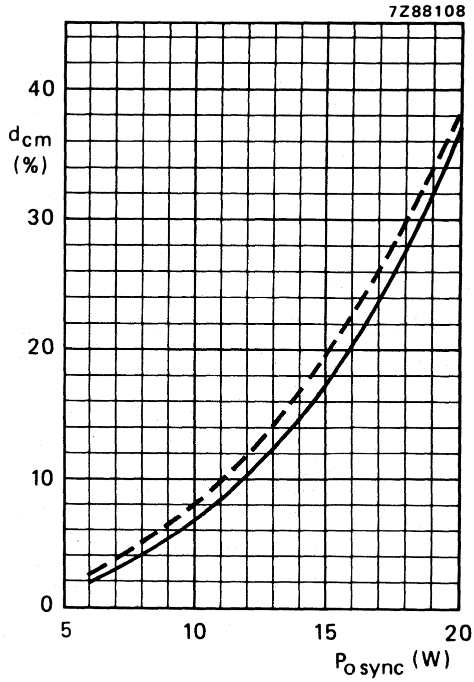


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; V_{CE} = 25 V; I_C = 1,5 A; —— T_h = 25 °C; – – – T_h = 70 °C; f_{vision} = 224,25 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 V; I_C = 1,5 A; T_h = 70 °C; f = 224,25 MHz; $R_{th\ mb\text{-}h}$ = 0,3 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.

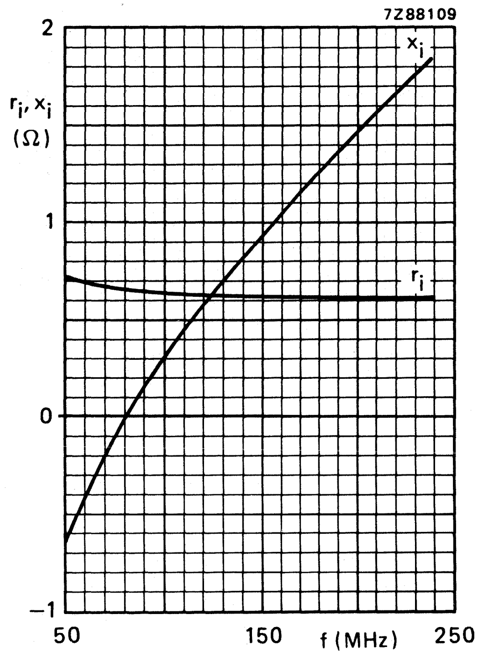


Fig. 13 Input impedance (series components).

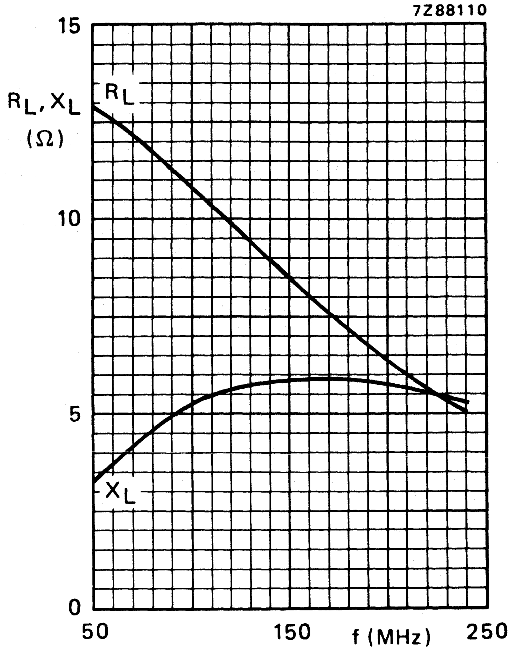


Fig. 14 Load impedance (series components).

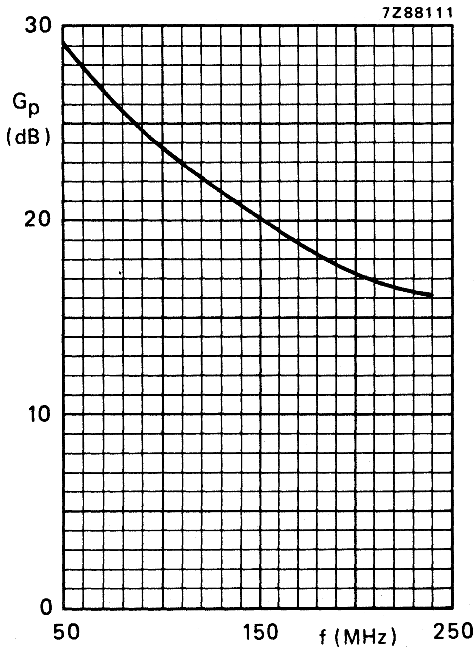


Fig. 15.

Conditions for Figs 13, 14 and 15:

Typical values; V_{CE} = 25 V; I_C = 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 ½" 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	−55	> 16.5	> 9	
				25	−55	typ. 26	typ. 9,7	
class-AB	224,25	28	0,10	70		typ. 90	typ. 6,5	30/25

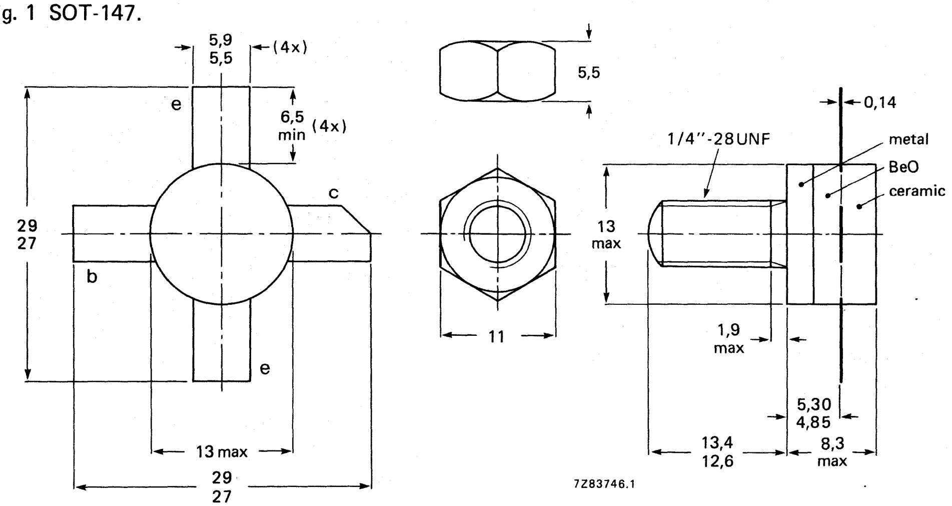
* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

** 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.

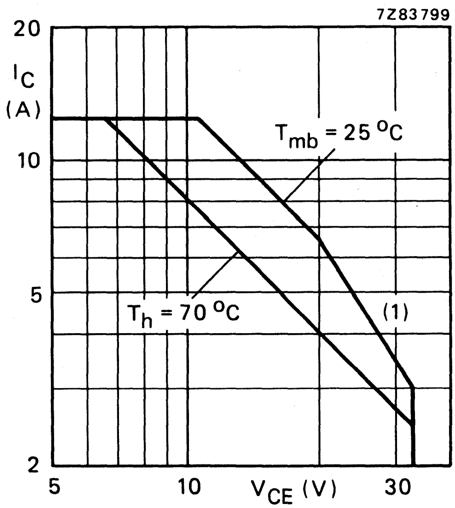
When locking is required an adhesive is preferred instead of a lock washer.

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); $V_{BE} = 0$	V_{CESM}	max.	65	V
open base	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 $T_{mb} = 25\ ^oC$	P_{tot}	max.	132	W
R.F. power dissipation (f > 1 MHz); $T_{mb} = 25\ ^oC$	P_{rf}	max.	165	W
Storage temperature	T_{stg}	−65 to + 150		^oC
Operating junction temperature	T_j	max.	200	^oC



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

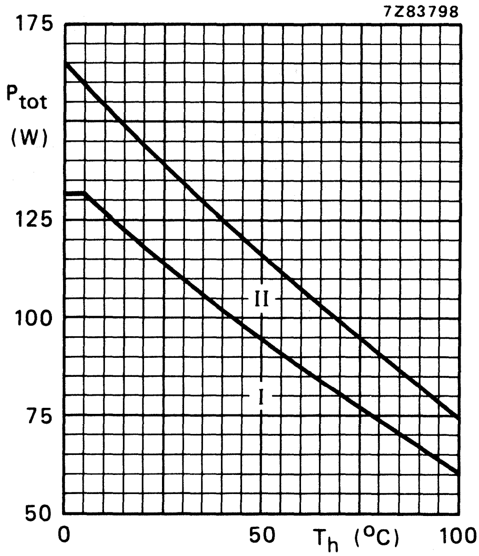


Fig. 3 Power derating curve vs. temperature.

I Continuous d.c. (including r.f. class-A) operation

II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 80 W; $T_{mb} = 82\ ^oC$, i.e. $T_h = 70\ ^oC$)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,46	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,17	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,15	K/W

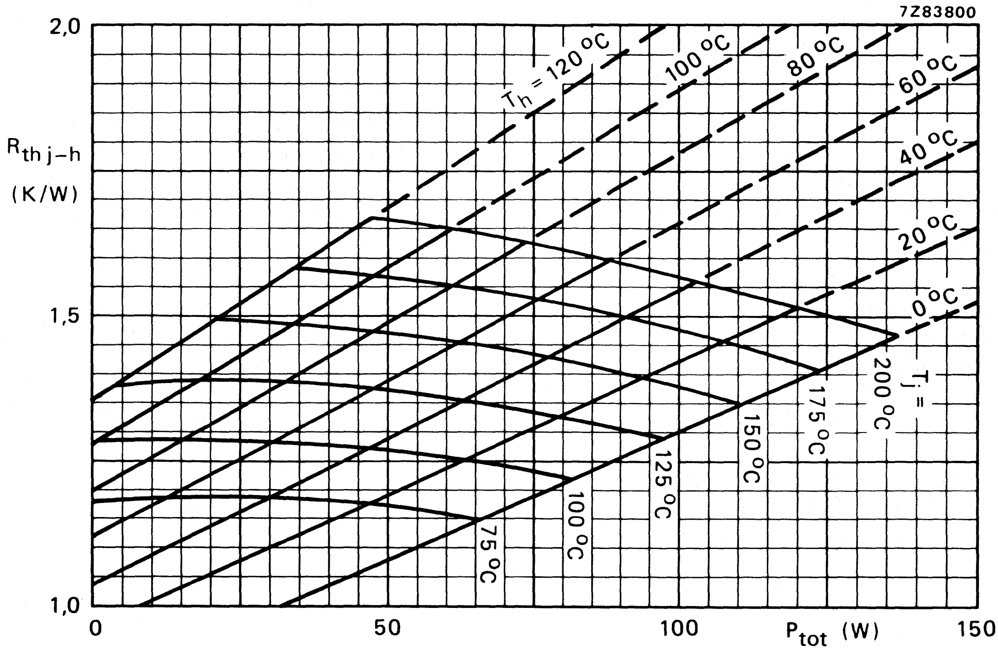


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,15 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 3,2 A; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j\text{-}h}$	max.	1,60 K/W
	T_j	max.	198 °C
Typical device:	$R_{th\ j\text{-}h}$	typ.	1,50 K/W
	T_j	typ.	190 °C

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65	V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	33	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	12,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	12,5	mJ
D.C. current gain*				
I_C = 3,0 A; V_{CE} = 25 V	h_{FE}	typ.	50	
			15 to 100	
Collector-emitter saturation voltage*				
I_C = 6,0 A; I_B = 0,6 A	V_{CEsat}	typ.	0,75	V
Transition frequency at f = 100 MHz**				
$-I_E$ = 3,0 A; V_{CB} = 25 V	f_T	typ.	680	MHz
$-I_E$ = 6,0 A; V_{CB} = 25 V	f_T	typ.	750	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	155	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 25 V	C_{re}	typ.	88	pF
Collector-stud capacitance	C_{cs}	typ.	3	pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

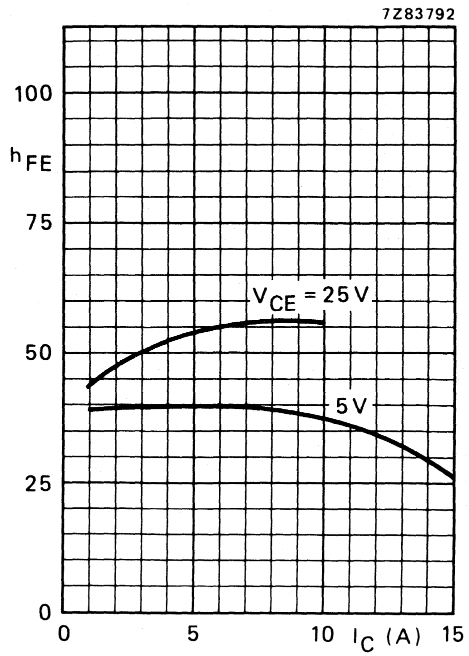


Fig. 5 Typical values; T_j = 25 °C.

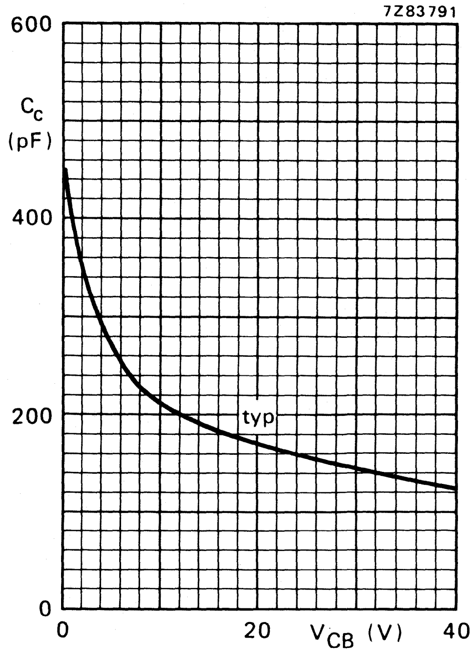


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

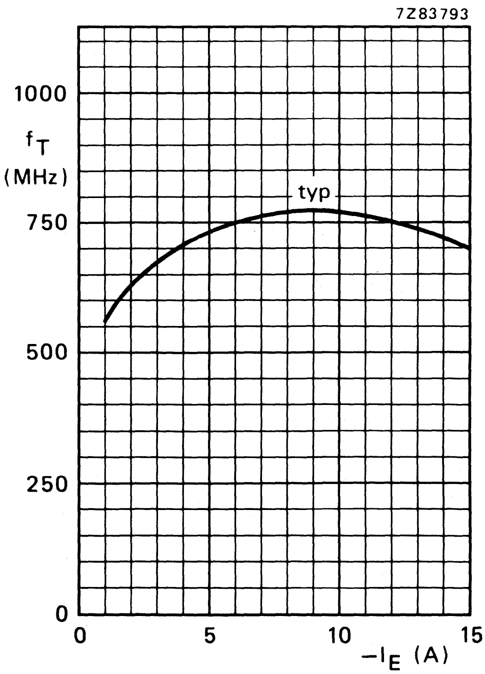


Fig. 7 V_{CB} = 25 V; f = 100 MHz; T_j = 25 °C.

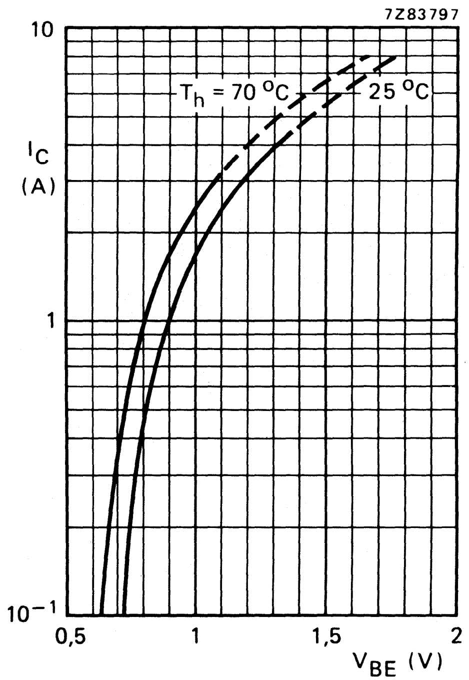


Fig. 8 Typical values; V_{CE} = 25 V.

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_o sync (W)*	G_p (dB)
224,25	25	3,2	70	−55	> 16.5	> 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.

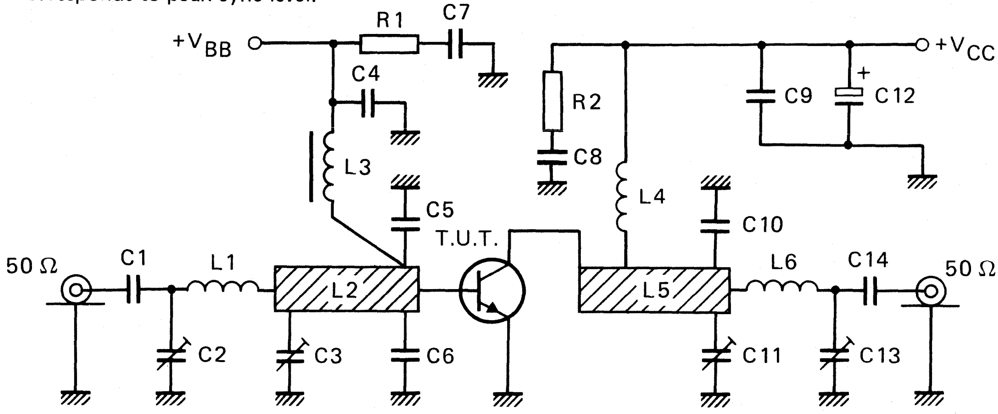


Fig. 9 Class-A test circuit at f_{vision} = 224,25 MHz.

List of components:

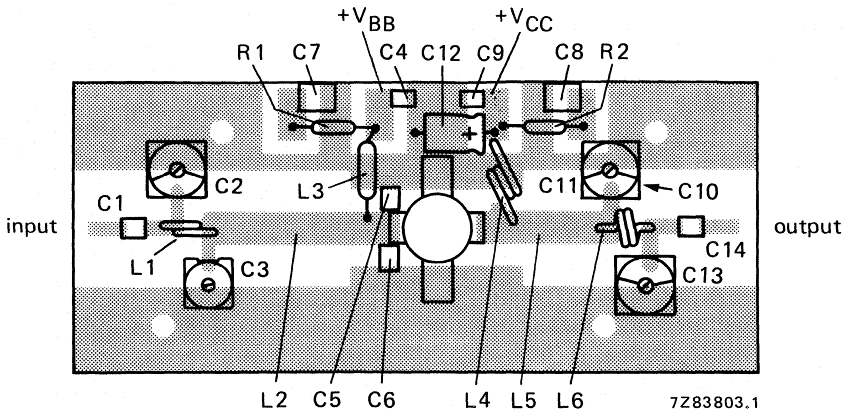
C1 = C14 = 680 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C2 = C11 = C13 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
C3 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C4 = C9 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
C5 = C6 = 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 μF/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 μH 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.



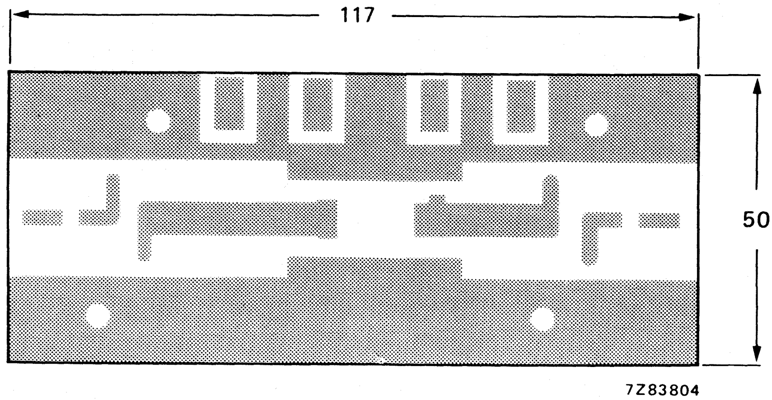


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is 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.

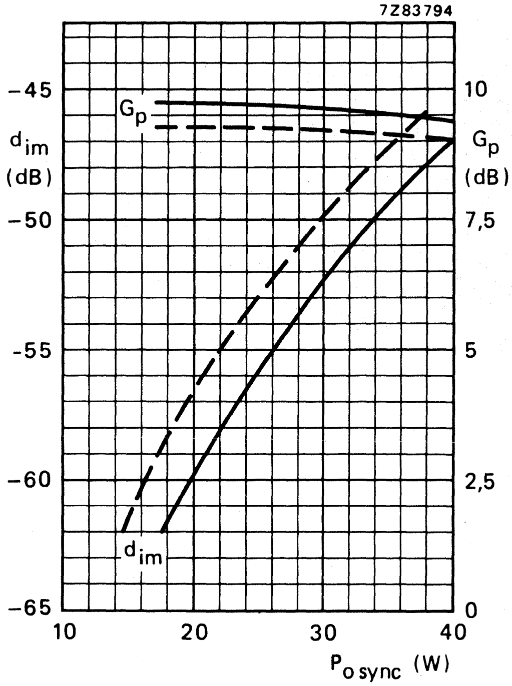


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

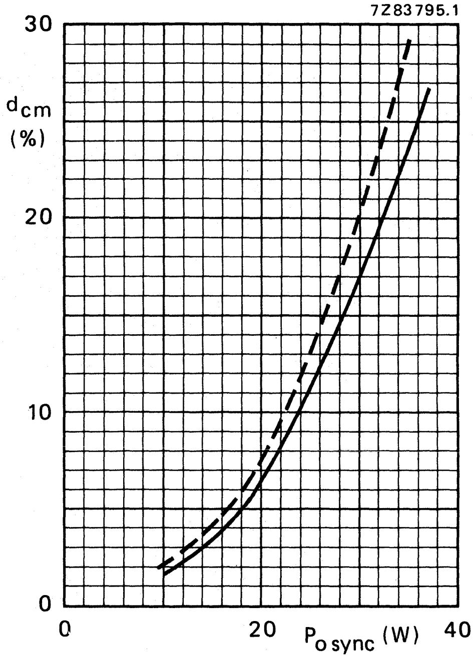


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; V_{CE} = 25 V; I_C = 3,2 A; —— T_h = 25 °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; $R_{th\,mb\text{-}h}$ = 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.

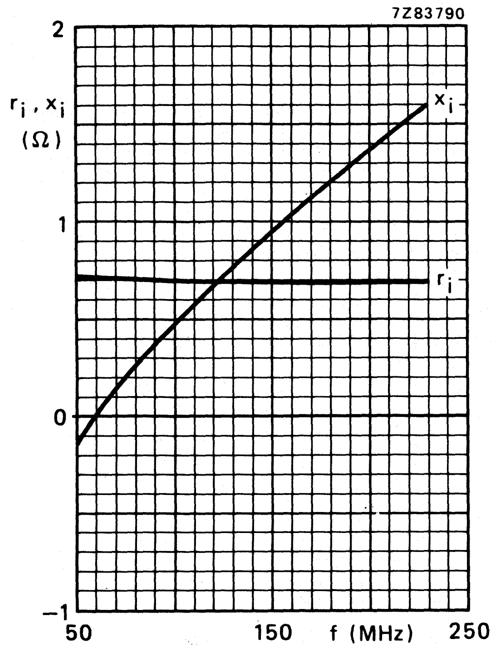


Fig. 13 Input impedance (series components).

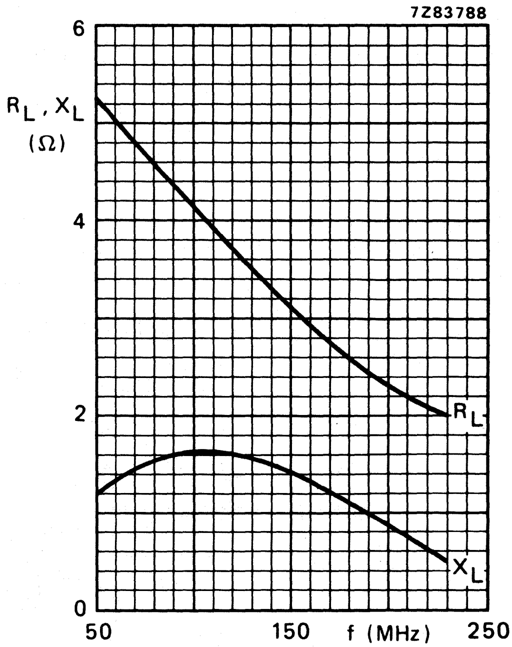


Fig. 14 Load impedance (series components).

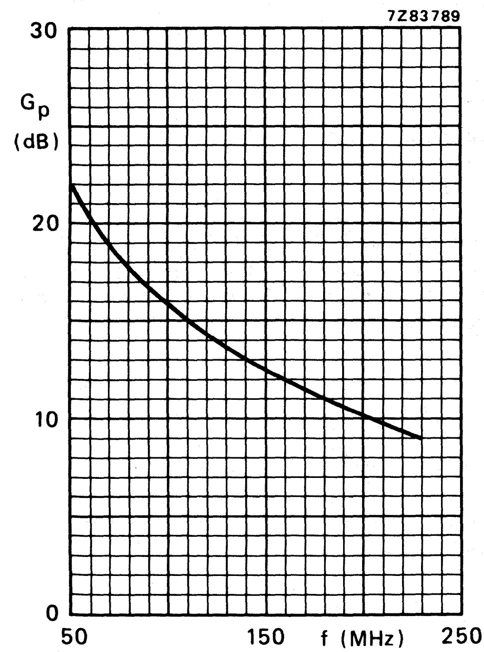


Fig. 15.

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)	$I_{C(ZS)}$ (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).

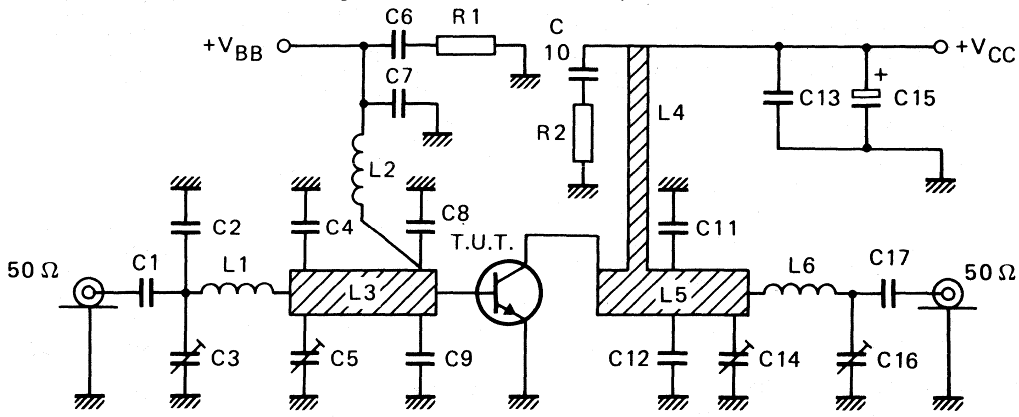


Fig. 16 Class-AB test circuit at f_{vision} = 224,25 MHz.

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 μF/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.

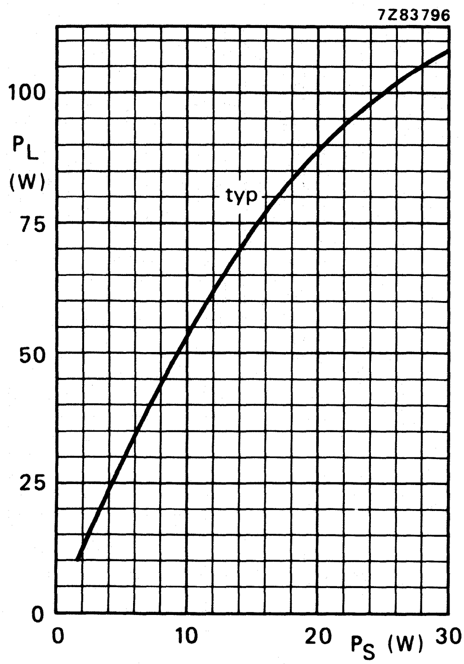


Fig. 17 V_{CE} = 28 V; $I_{C(ZS)}$ = 0,1 A; T_h = 70 °C; f_{vision} = 224,25 MHz.

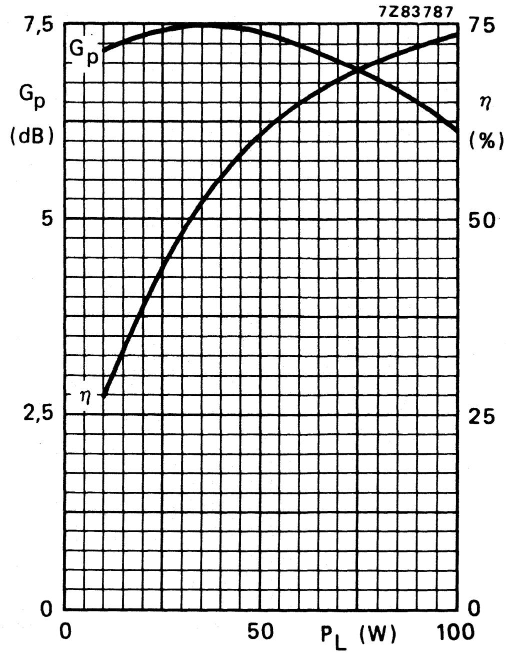


Fig. 18 V_{CE} = 28 V; $I_{C(ZS)}$ = 0,1 A; T_h = 70 °C; f_{vision} = 224,25 MHz; typical values.

Ruggedness in class-AB operation

The BLV33 is capable of withstanding a load mismatch (VSWR ⩽ 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 V; T_h = 70 °C; f = 224,25 MHz; $R_{th\ mb\text{-}h}$ = 0,15 K/W.

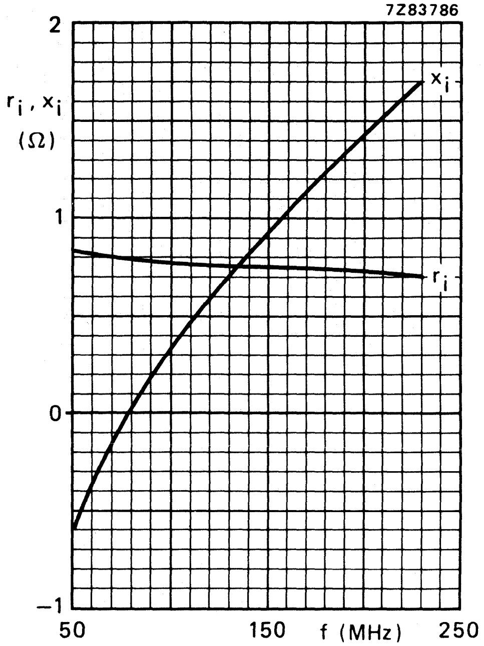


Fig. 19 Input impedance (series components).

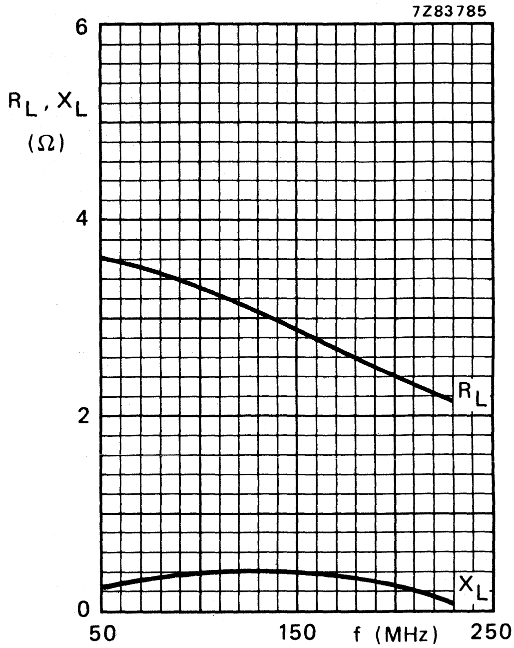


Fig. 20 Load impedance (series components).

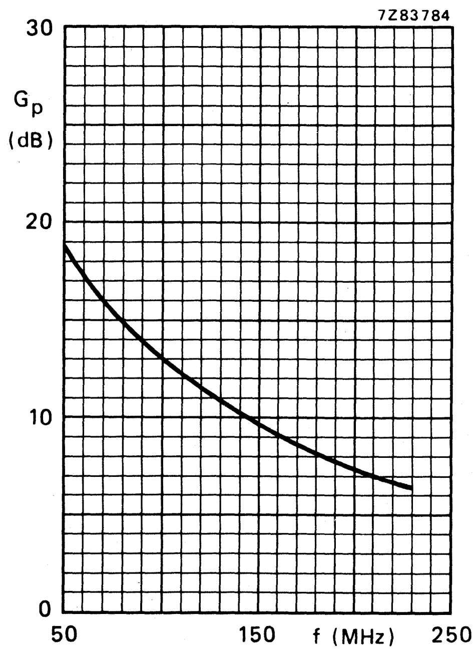


Fig. 21.

Conditions for Figs 19, 20 and 21:

Typical values; V_{CE} = 28 V; P_L = 80 W (P.E.P.); class-AB 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.

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 ½″ 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	−55	> 13	> 13,5	
				25	−55	typ. 22	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

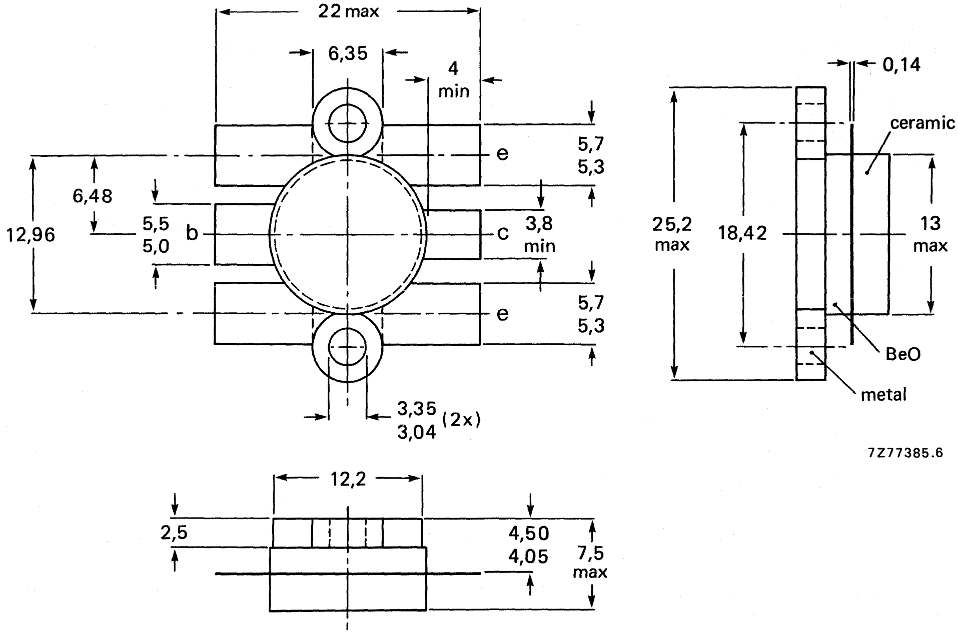
SOT-119 (see Fig. 1).

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

Dimensions in mm

Fig. 1 SOT-119.



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

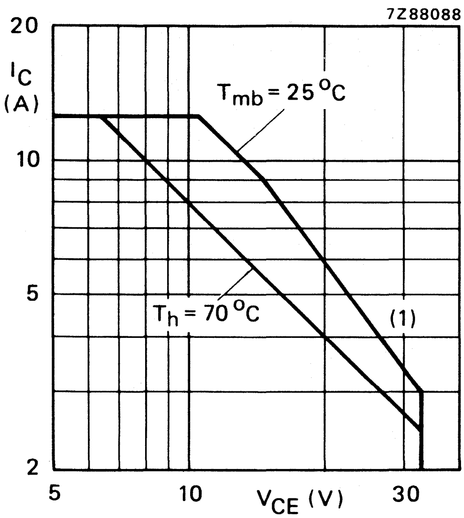
Recommended screw: cheese-head 4-40 UNC/2A

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.	65	V
open base	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.

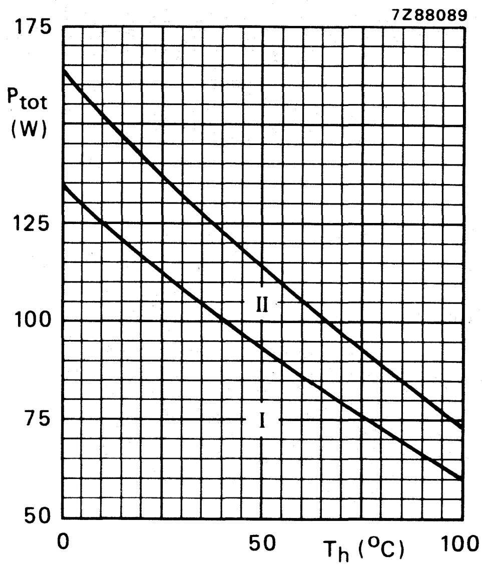


Fig. 3 Power derating curve vs. temperature.

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)	$R_{th\ j\text{-}mb(dc)}$	=	1,43	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,17	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2	K/W

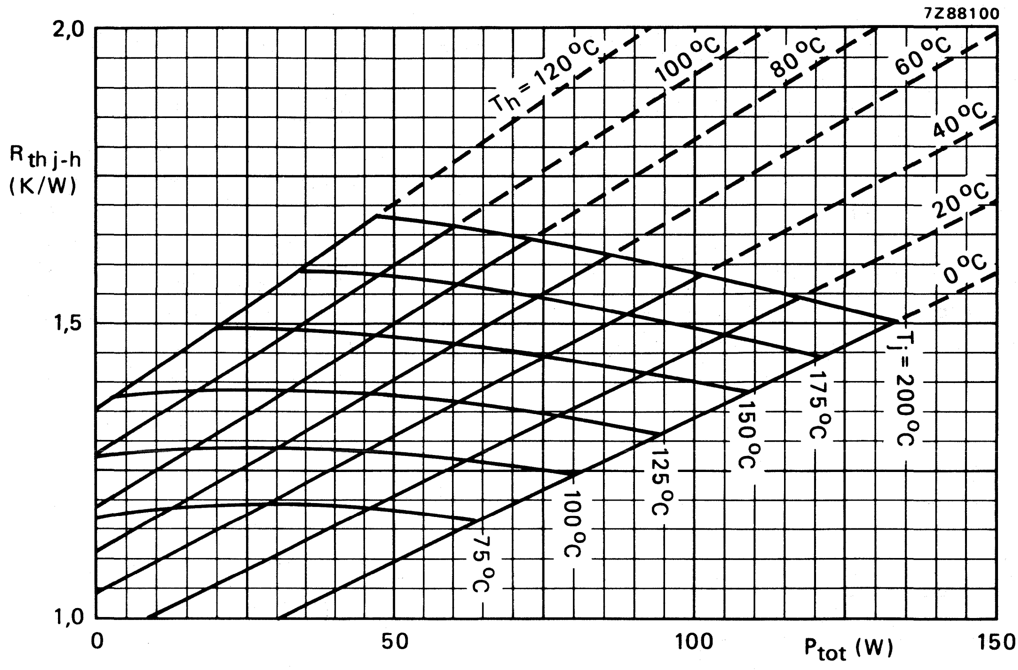


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h}$ = 0,2 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 3,2 A; T_h = 70 °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 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65	V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	33	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	12,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	12,5	mJ
D.C. current gain*				
I_C = 3,0 A; V_{CE} = 25 V	h_{FE}	typ.	50	
			15 to 100	
Collector-emitter saturation voltage*				
I_C = 6,0 A; I_B = 0,6 A	V_{CEsat}	typ.	0,75	V
Transition frequency at f = 100 MHz**				
$-I_E$ = 3,0 A; V_{CB} = 25 V	f_T	typ.	680	MHz
$-I_E$ = 6,0 A; V_{CB} = 25 V	f_T	typ.	750	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	155	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	88	pF
Collector-flange capacitance	C_{cf}	typ.	3	pF

* Measured under pulse conditions: $t_p \leq 300\ \mu s$; $\delta \leq 0{,}02$.

** Measured under pulse conditions: $t_p \leq 50\ \mu s$; $\delta \leq 0{,}01$.

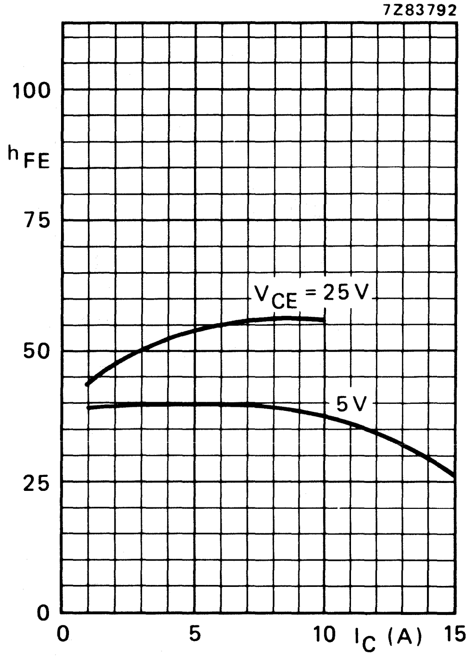


Fig. 5 Typical values; T_j = 25 °C.

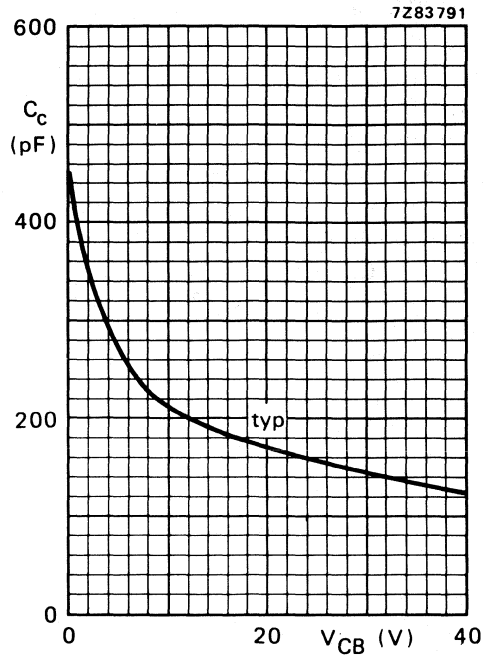


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

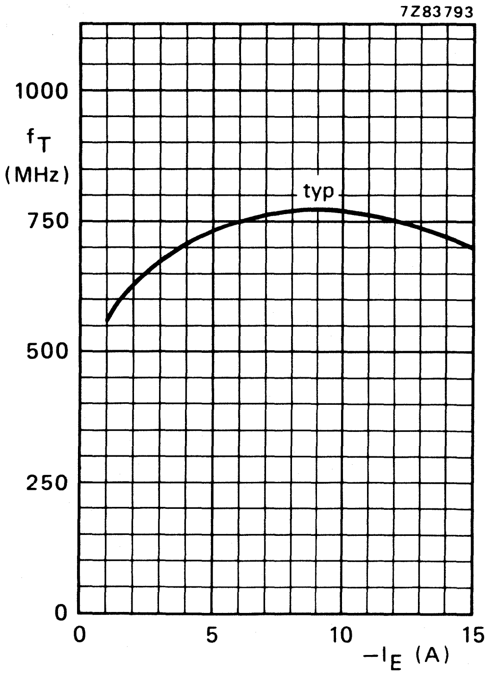


Fig. 7 V_{CB} = 25 V; f = 100 MHz; T_j = 25 °C.

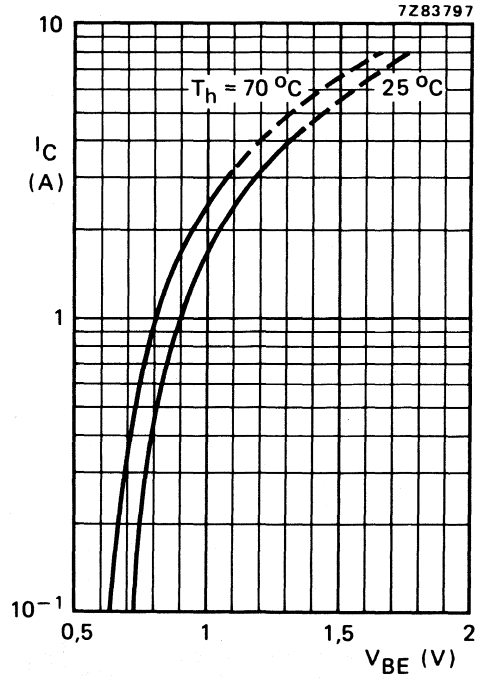


Fig. 8 Typical values; V_{CE} = 25 V.

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)*	$P_{o\ sync}$ (W)*	G_p (dB)
224,25	25	3,2	70	−55	> 13	> 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.

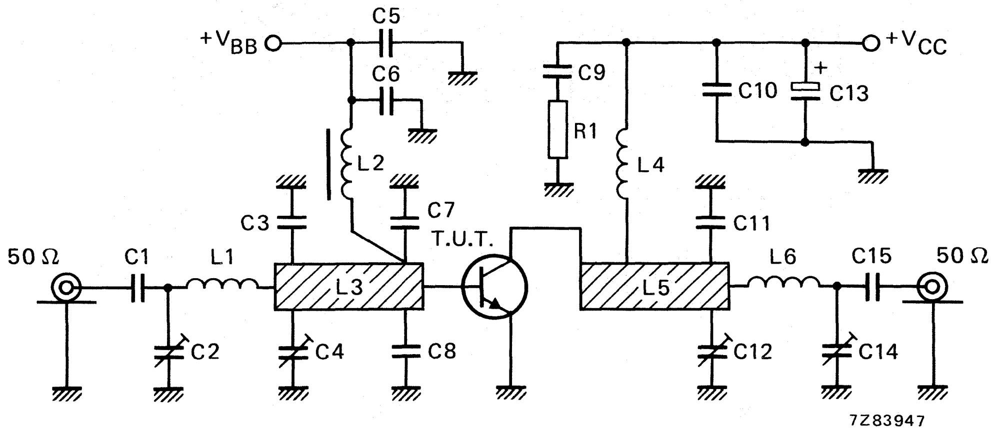


Fig. 9 Class-A test circuit at f_{vision} = 224,25 MHz.

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

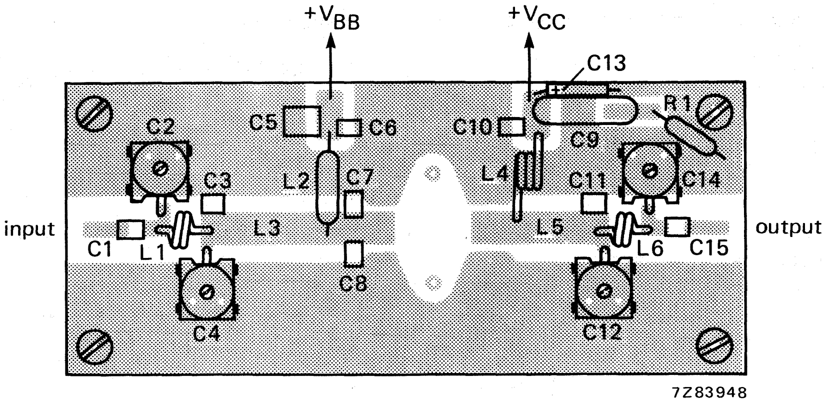
L1 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 5,0 mm; leads 2 x 3 mm
L2 = 1 μH microchoke (cat. no. 4322 057 01080)
L3 = 30 Ω stripline (6,0 mm x 32,7 mm)
L4 = 2 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 10 mm
L5 = 30 Ω stripline (6,0 mm x 24,0 mm)
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.



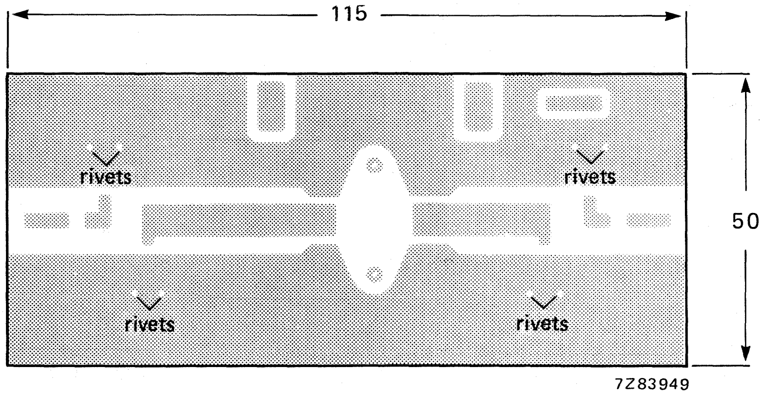


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

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.

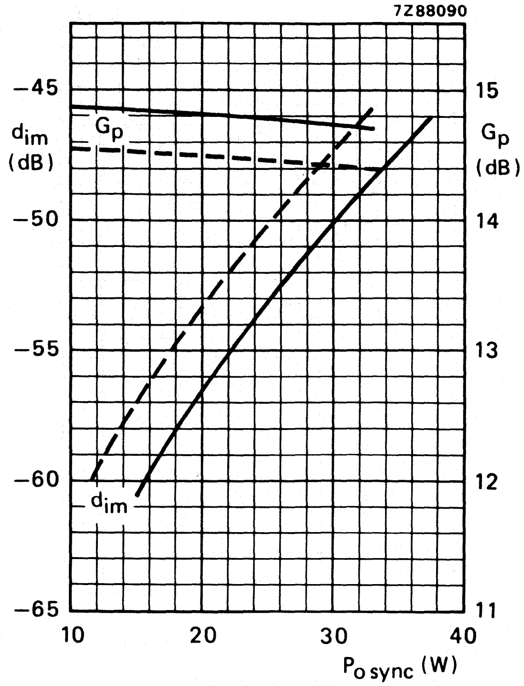


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

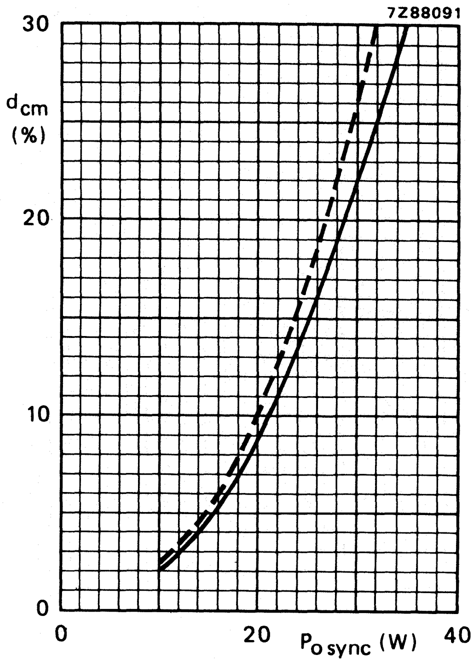


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; V_{CE} = 25 V; I_C = 3,2 A; ——— T_h = 25 °C; – – – T_h = 70 °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 °C; f = 224,25 MHz; $R_{th\ mb\text{-}h}$ = 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.

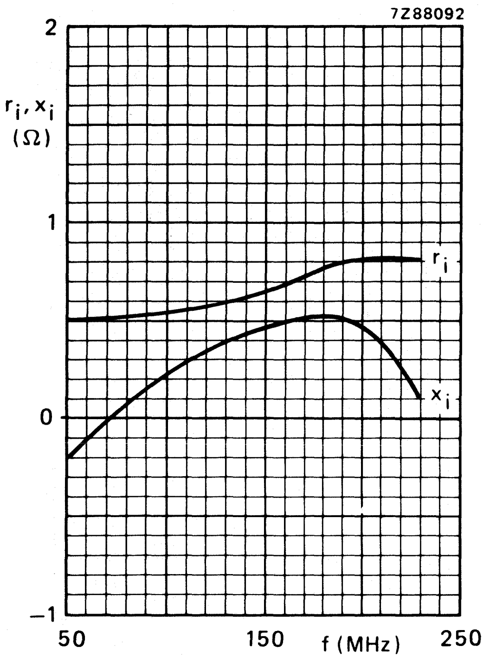


Fig. 13 Input impedance (series components).

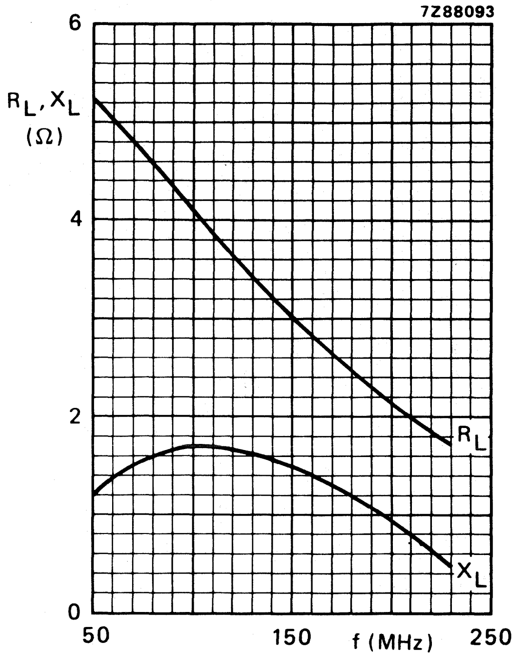


Fig. 14 Load impedance (series components).

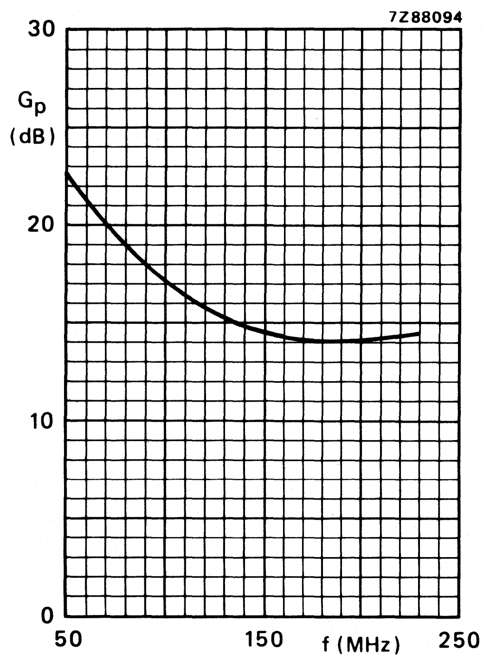


Fig. 15.

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)	$I_{C(ZS)}$ (A)	T_h (°C)	P_L (W)	I_C (A)	η (%)	G_p (dB)*
224,25	28	0,2	70	40 85	typ. 2,75 typ. 4,25	typ. 52 typ. 71	typ. 11,5 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).

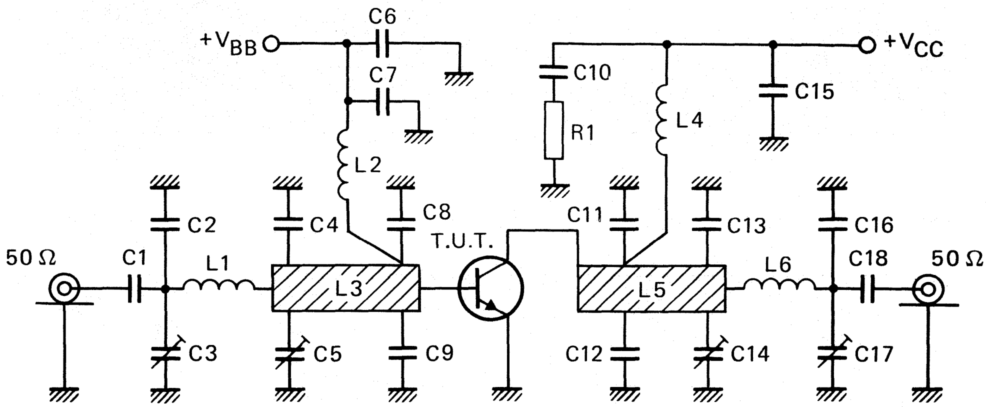


Fig. 16 Class-AB test circuit at f_{vision} = 224,25 MHz.

7Z83946

List of components (component layout and p.c.b. class-AB test circuit see Fig. 17):

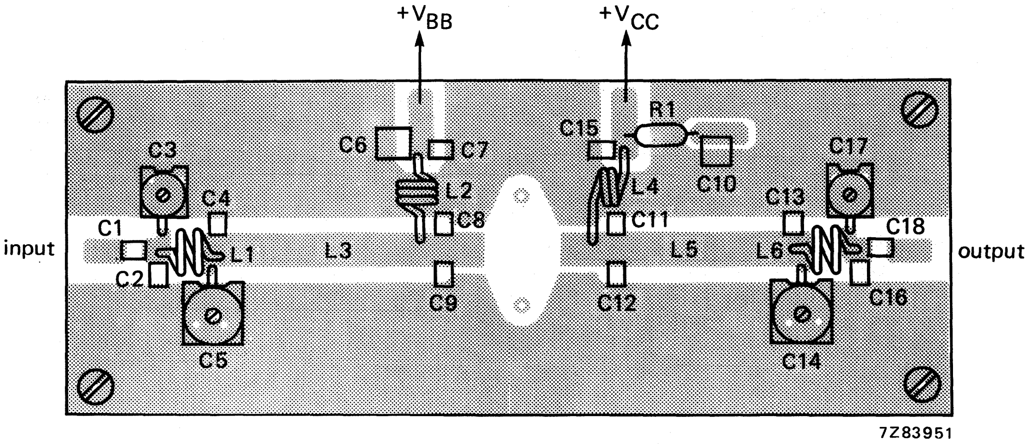
C1 = C18 = 620 pF (100 V) multilayer ceramic chip capacitor (ATC▲)
C2 = 27 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C3 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C4 = 30 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C5 = C14 = 4 to 40 pF film dielectric trimmer (cat. 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.



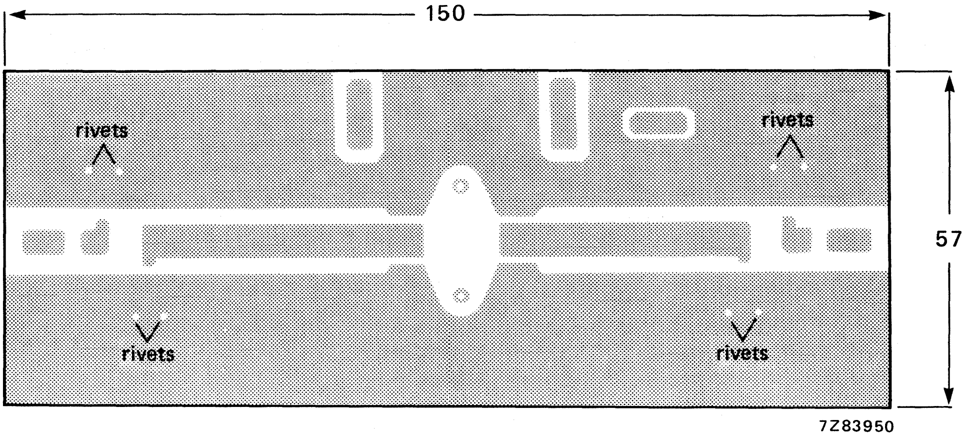


Fig. 17 Component layout and printed-circuit board for 224,25 MHz class-AB test circuit.

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.

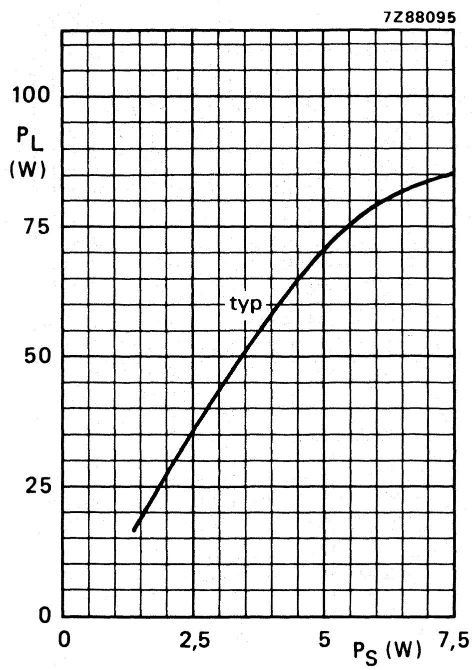


Fig. 18 V_{CE} = 28 V; $I_{C(ZS)}$ = 0,2 A; T_h = 70 °C; f_{vision} = 224,25 MHz.

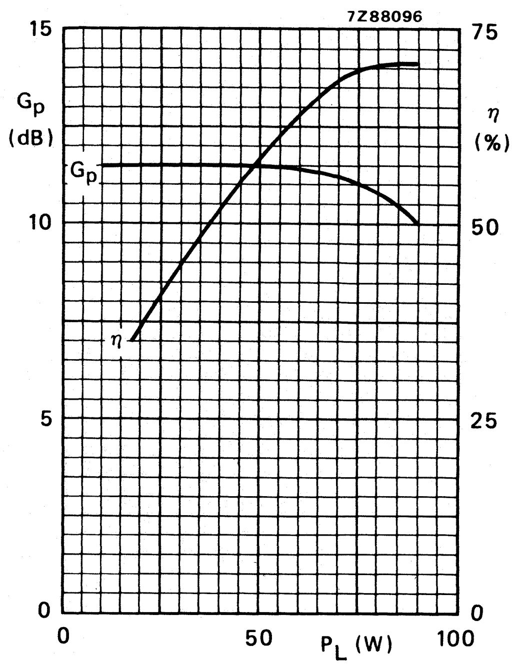


Fig. 19 V_{CE} = 28 V; $I_{C(ZS)}$ = 0,2 A; T_h = 70 °C; f_{vision} = 224,25 MHz; typical values.

Ruggedness in class-AB operation

The BLV33F is capable of withstanding a load mismatch (VSWR ≤ 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.

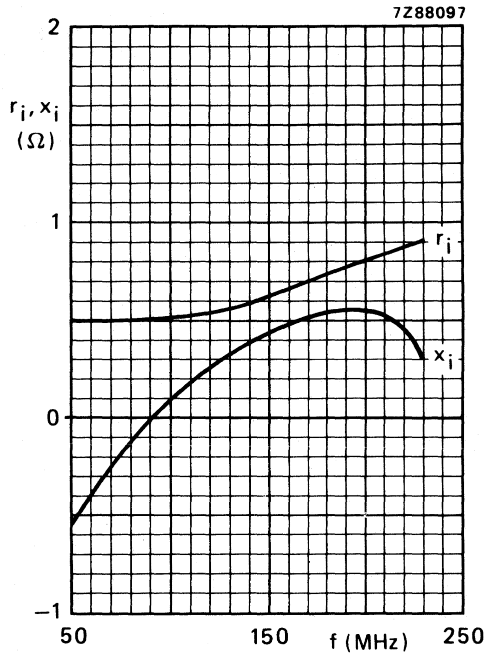


Fig. 20 Input impedance (series components).

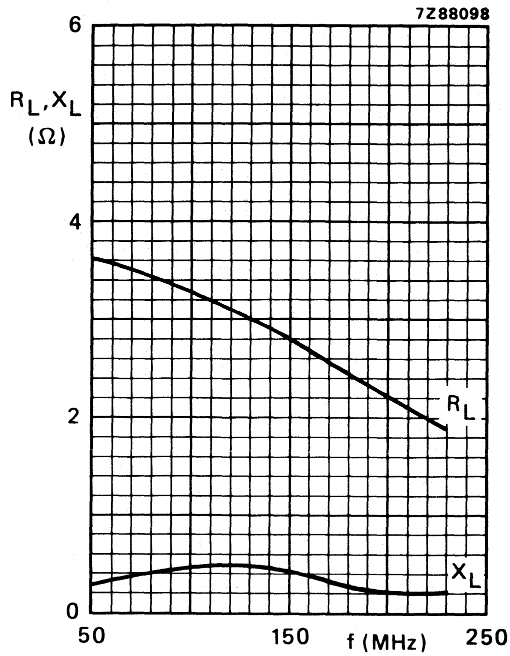


Fig. 21 Load impedance (series components).

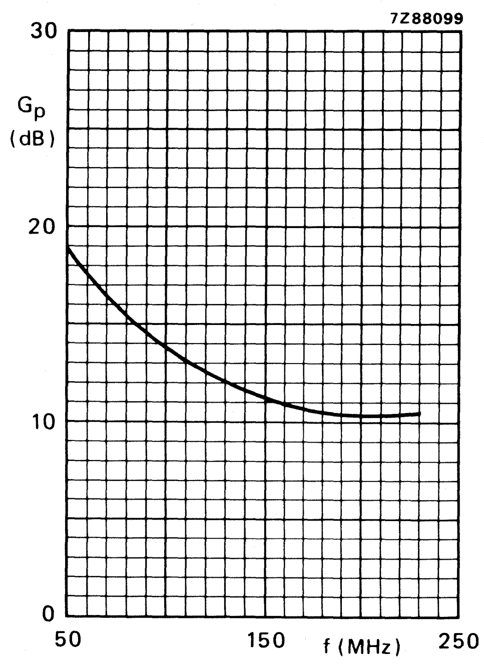


Fig. 22.

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.

VHF LINEAR PUSH-PULL POWER TRANSISTOR

Two NPN 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 VHF television transmitters and transposers (vision or sound amplifier).

Features

- Internally matched input for wideband operation and high power gain
- Internal midpoint (RF 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

RF 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
CW; 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, CCIR system).

MECHANICAL DATA

SOT161 (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.

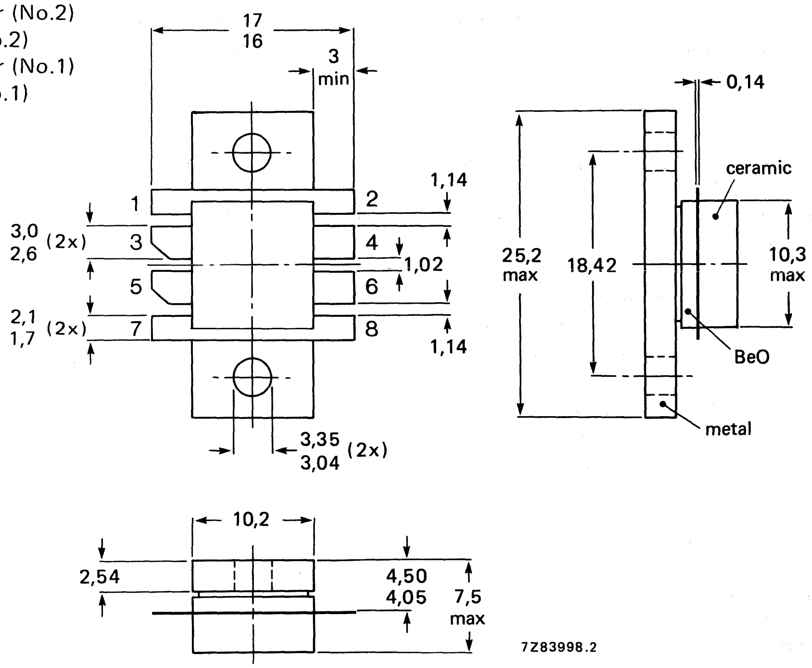
MECHANICAL DATA

Dimensions in mm

Fig.1 SOT161.

Pinning

1 = Emitter
2 = Emitter
3 = Collector (No.2)
4 = Base (No.2)
5 = Collector (No.1)
6 = Base (No.1)
7 = Emitter
8 = Emitter



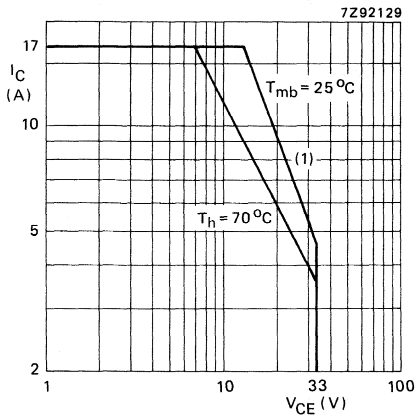
Torque on screw: min. 0.60 Nm
max. 0.75 Nm

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)

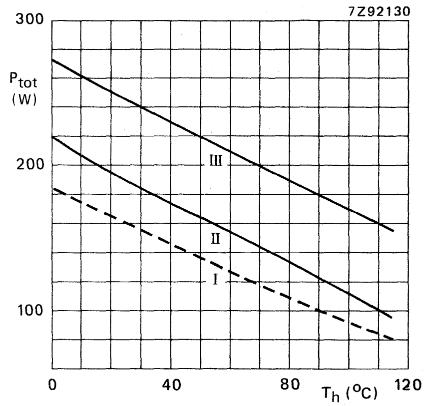
Collector-emitter voltage (peak value);				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	65	V
open base	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current per transistor section				
DC or average	I_C, $I_{C(AV)}$	max.	8.5	A
(peak value); f > 1 MHz	I_{CM}	max.	17.5	A
Total DC power dissipation; $T_{mb} = 25\ ^oC$	$P_{tot(DC)}$	max.	218	W*
RF power dissipation				
f > 1 MHz; $T_{mb} = 25\ ^oC$	$P_{tot(RF)}$	max.	270	W*
Storage temperature range	T_{stg}	−65 to +150		^oC
Operating junction temperature	T_j	max.	200	^oC



(1) Second breakdown limit.

Fig.2 DC SOAR.

Conditions for Figs 2 and 3:
$R_{th\ mb\text{-}h} = 0.25$ K/W; Total device*.



I Continuous DC operation
II Continuous RF operation; (f > 1 MHz)
III Short-time operation during mismatch; (f > 1 MHz)

Fig.3 Power/temperature derating curves.

THERMAL RESISTANCE

(dissipation = 180 W; $T_{mb} = 25\ ^oC$)**

From junction to mounting base (DC dissipation)	$R_{th\ j\text{-}mb(DC)}$	=	0.85	K/W
From junction to mounting base (RF dissipation)	$R_{th\ j\text{-}mb(RF)}$	=	0.64	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	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 °C.

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65	V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	33	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 33 V	I_{CES}	<	10	mA
Second-breakdown energy; L = 25 mH; f = 50 Hz				
R_{BE} = 10 Ω	E_{SBR}	>	10	mJ
DC current gain*				
I_C = 3.5 A; V_{CE} = 25 V	h_{FE}	typ.	45	
		15 to	100	
Transition frequency at f = 100 MHz*				
$-I_E$ = 3.3 A; V_{CB} = 25 V	f_T	typ.	575	MHz
$-I_E$ = 10 A; V_{CB} = 25 V	f_T	typ.	600	MHz
Collector capacitance at f = 1 MHz				
$I_E = i_e$ = 0; V_{CB} = 25 V	C_c	typ.	155	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	88	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0.02$.

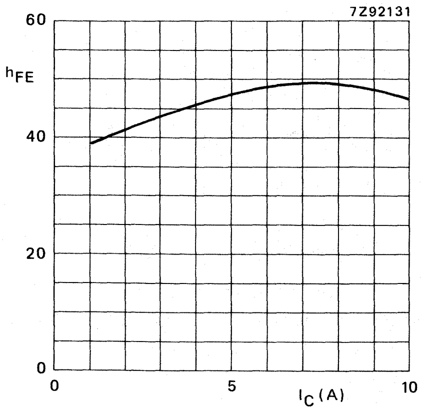


Fig.4 DC current gain as a function of collector current; V_{CE} = 25 V; T_j = 25 °C; typical values.

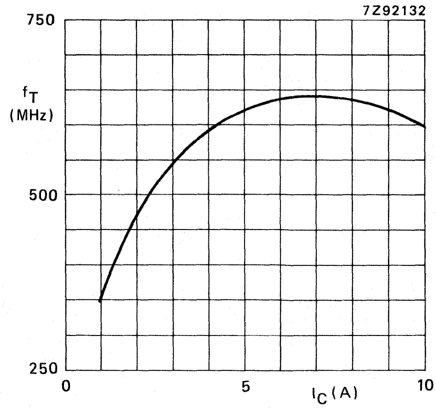


Fig.5 Transition frequency as a function of collector current; V_{CE} = 25 V; f = 100 MHz; T_j = 25 °C; typical values.

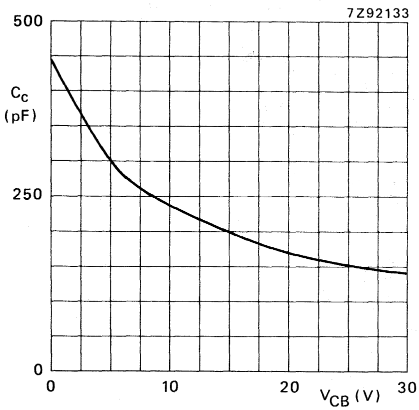


Fig.6 Collector capacitance as a function of collector-base voltage; I_E = i_e = 0; f = 1 MHz; typical values.

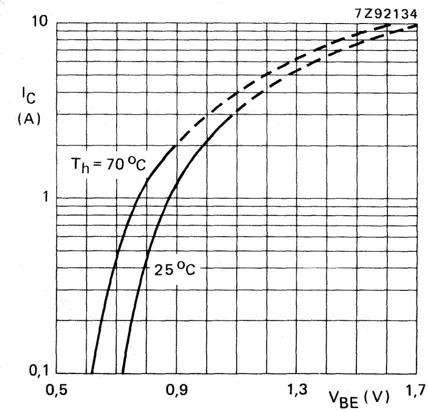


Fig.7 Collector current as a function of base-emitter voltage; V_{CE} = 25 V; typical values.

The above graphs apply to either transistor section.

APPLICATION INFORMATION

RF performance in VHF class-AB operation (linear push-pull power amplifier) V_{CE} = 28 V; T_h = 25 °C; f = 224.25 MHz.

mode of operation	P_L W	$I_{C(ZS)}$ A	G_P dB	η_C %	gain compression dB
class-AB; CW	115	2 x 0.15	⩾ 11.0 typ. 13.0	⩾ 48 typ. 55	⩽ 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).

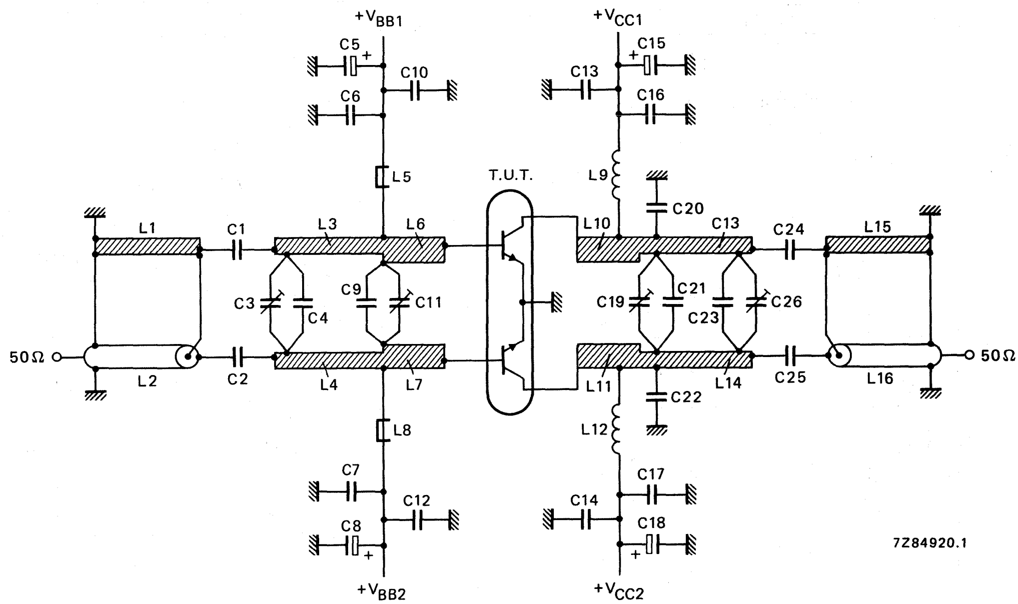


Fig.8 Class-AB test circuit at 224.25 MHz.

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 05003).
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.)

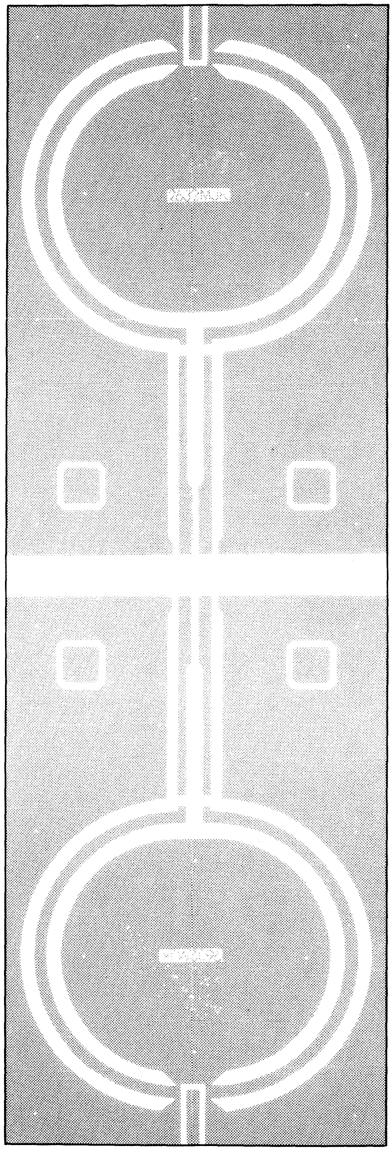
** American Technical Ceramics capacitor type 100A or capacitor of same quality.

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 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 printed circuit board with epoxy fibre-glass dielectric (ϵ_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.



7Z90217

Fig. 9 Printed circuit board for 224.25 MHz class-AB test circuit.

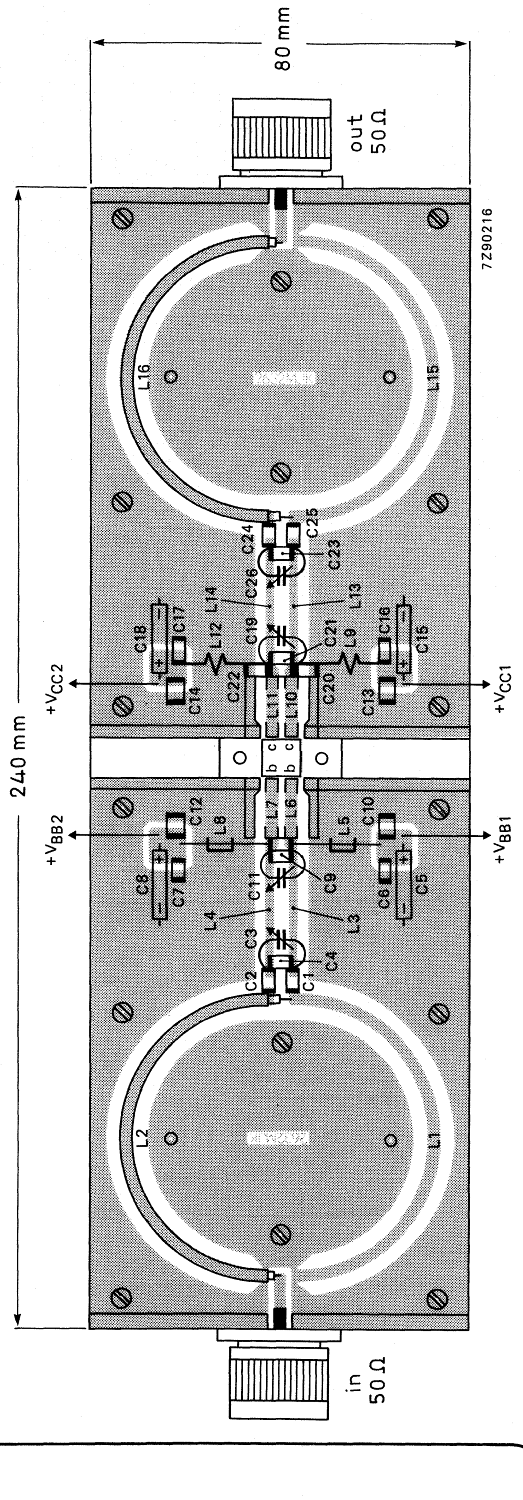


Fig. 10 Component layout of a 224.25 MHz class-AB test circuit.

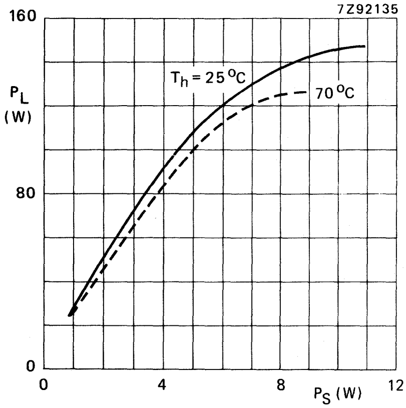


Fig.11 Load power as a function of source power; typical values.

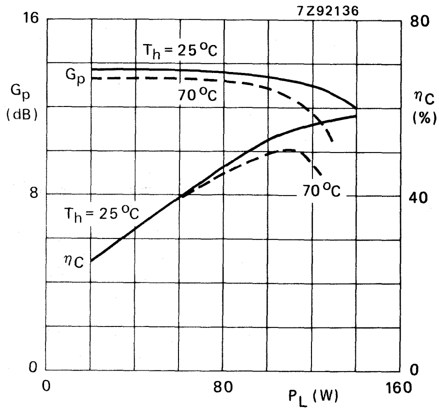


Fig.12 Power gain and efficiency as functions of load power; typical values.

Conditions for Figs 11 and 12:
V_{CE} = 28 V; $I_{C(ZS)}$ = 2 x 0.15 A; f = 224.25 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 V; $I_{C(ZS)}$ = 2 x 0.15 A; T_h = 25 °C; f = 224.25 MHz; $R_{th\ mb\text{-}h}$ = 0.25 K/W.

The instantaneous collector current should not exceed 10 A.

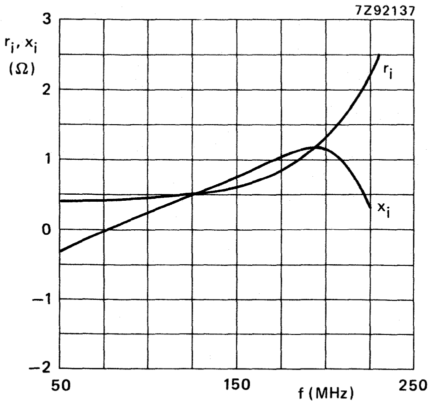


Fig.13 Input impedance (series components) as a function of frequency; typical values.

Conditions for Figs 13, 14 and 15:

The graphs apply to either transistor section assuming class-AB push-pull operation
V_{CE} = 28 V; $I_{C(ZS)}$ = 0.15 A; P_L = 70 W;
T_h = 25 °C.

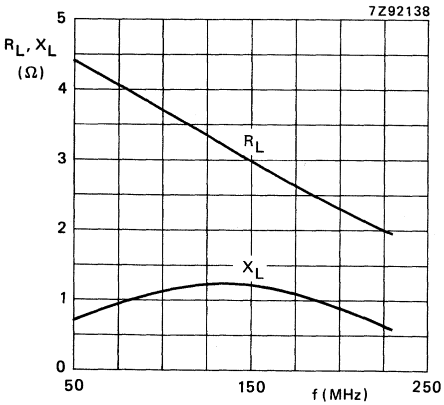


Fig.14 Load impedance (series components) as a function of frequency; typical values.

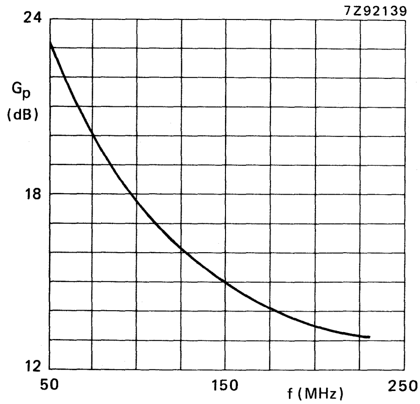


Fig.15 Power gain as a function of frequency; typical values.

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 °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

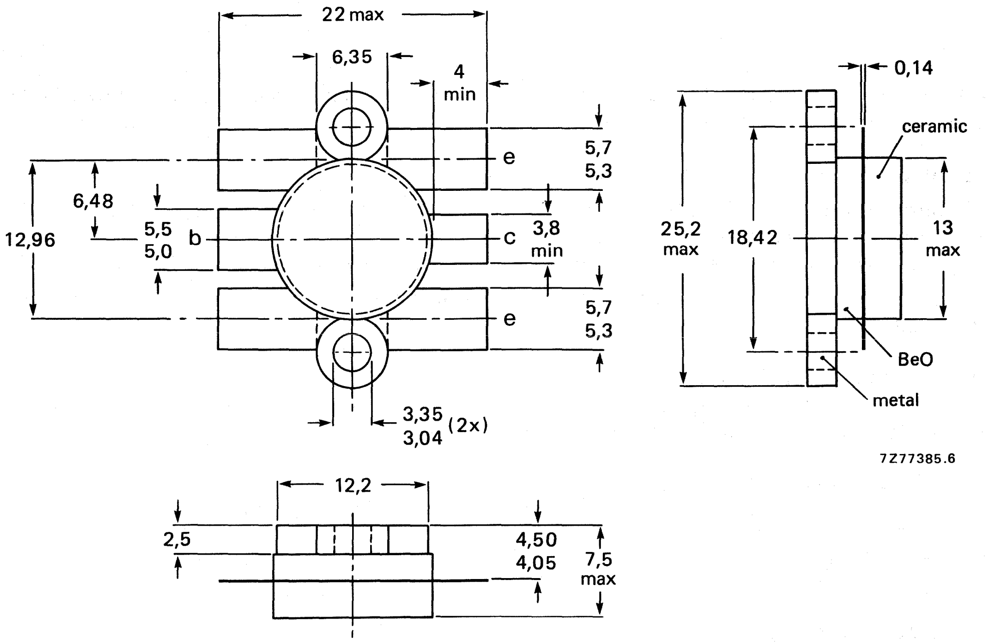
SOT-119 (see Fig. 1)

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

Dimensions in mm

Fig. 1 SOT-119.



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 °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

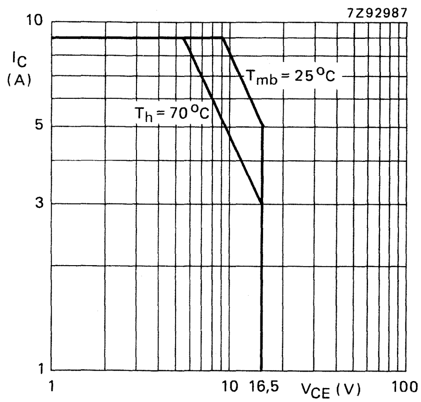


Fig. 2 D.C. soar.
$R_{th\ mb\text{-}h}$ = 0,2 K/W.

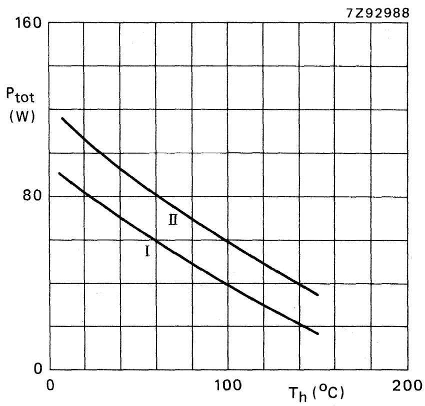


Fig. 3 Power/temperature derating curves; $R_{th\ mb\text{-}h}$ = 0,2 K/W.
I Continuous operation (f > 1 MHz)
II Short-time operation during mismatch; (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 68 W; T_{mb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j\text{-}mb}$	=	1,58 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 50 mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	16,5 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	22 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	12,5 mJ
D.C. current gain V_{CE} = 10 V; I_C = 6 A	h_{FE}	> typ.	15 55
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	130 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	80 pF

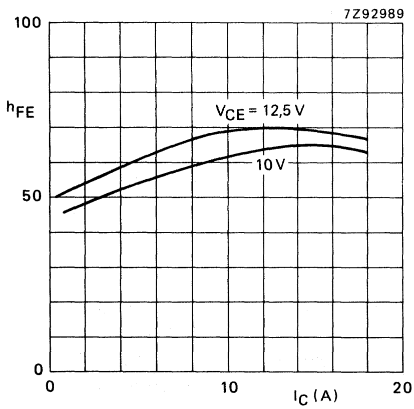


Fig. 4 D.C. current gain versus collector current; T_j = 25 °C.

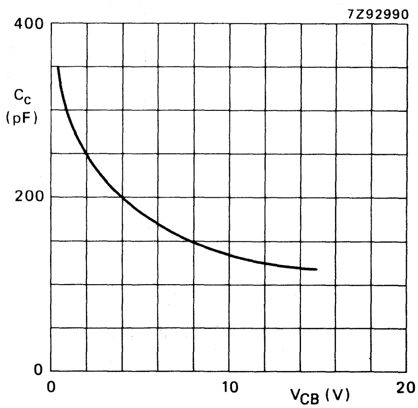


Fig. 5 Output capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1MHz; T_j = 25 °C

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B)
f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 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

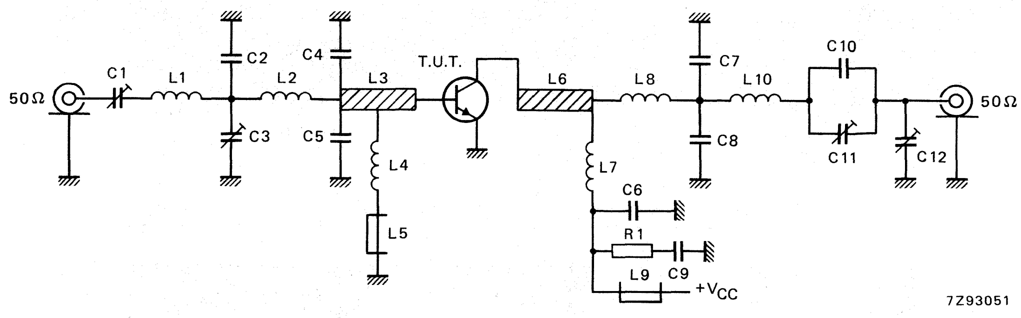


Fig. 6 Class-B test circuit at f = 175 MHz.

List of components:

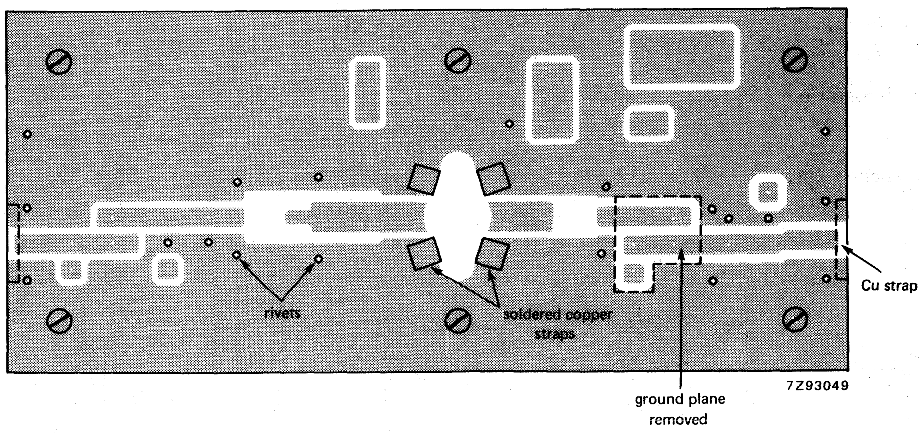
C1 = C11 = C12 = 4 to 40 film dielectric trimmer (cat.no. 2222 809 07008)
C2 = C10 = 10 pF multilayer ceramic chip capacitor *
C3 = 2,5 to 20 pF film dielectric trimmer (cat.no. 2222 809 07004)
C4 = C5 = 91 pF multilayer ceramic chip capacitor *
C6 = 820 pF multilayer ceramic chip capacitor *
C7 = C8 = 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 ± 10%, carbon resistor

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



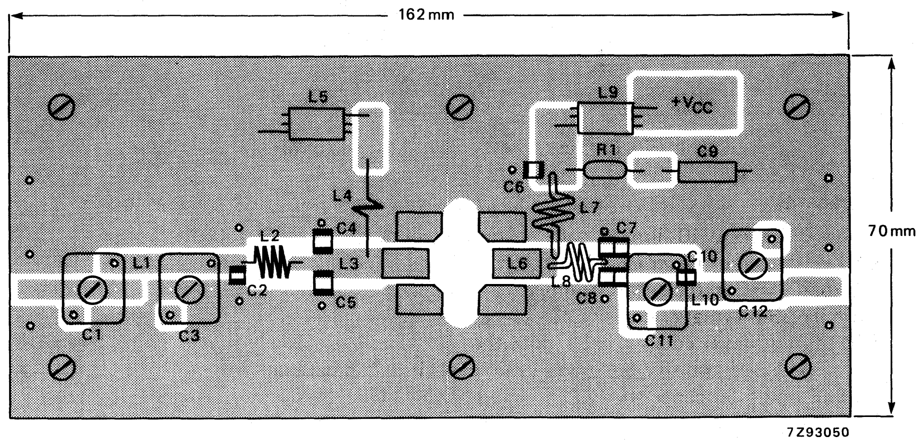


Fig. 7 Printed circuit board and component lay-out for 175 MHz class-B test circuit.

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 al 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.

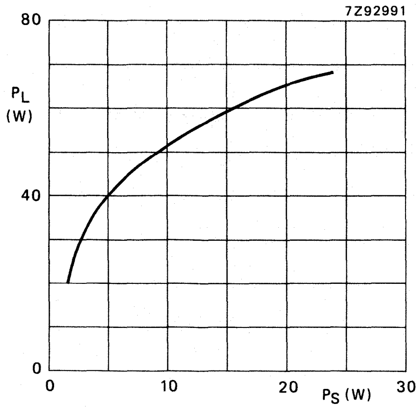


Fig. 8 Load power versus source power.

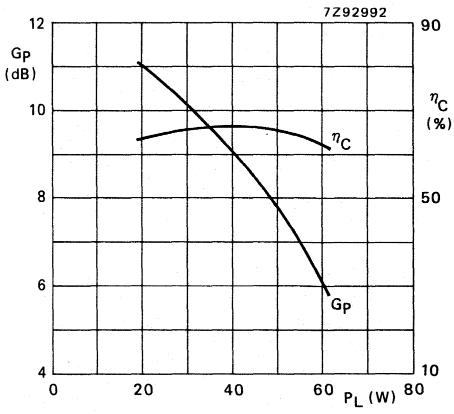


Fig. 9 Power gain and efficiency versus load power.

Condition for Figs 8 and 9:

Typical values; V_{CE} = 12,5 V; f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

Ruggedness in class-B operation

The BLV45/12 is capable of withstanding a load mismatch (VSWR = 20 through all phases) at rated load power up to a supply voltage of 15,5 V; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

Power slump

If T_h is increased from 25 °C to 70 °C the output power slump for constant P_S amounts to typ. 7 % (V_{CE} = 12,5; f = 175 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W).

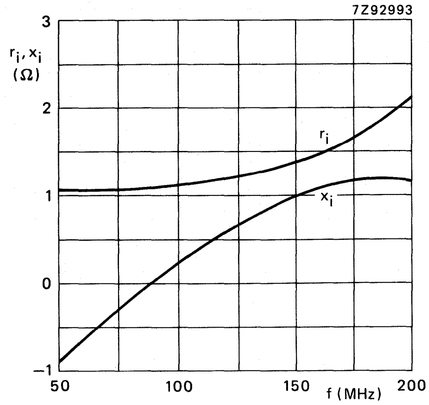


Fig. 10 Input impedance (series components).

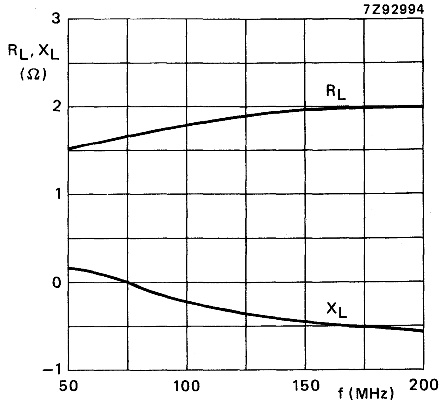


Fig. 11 Load impedance (series components).

Conditions for Figs 10, 11 and 12:

Typical values; V_{CE} = 12,5 V; P_L = 45 W; f = 50 to 200 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

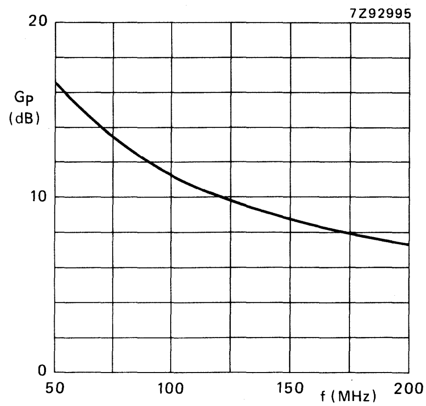


Fig. 12 Power gain versus frequency.

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	$I_{C1} = I_{C2}$ A	$I_{C(ZS)}$ A	T_h °C	d_{im}* dB	$P_{o\,sync}$* 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

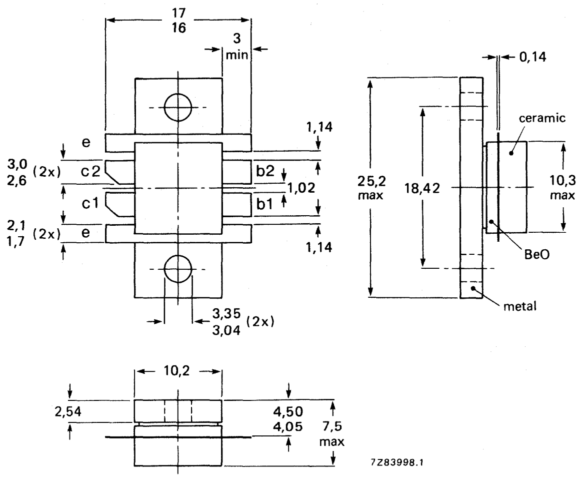
SOT-161 (see Fig. 1).

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)

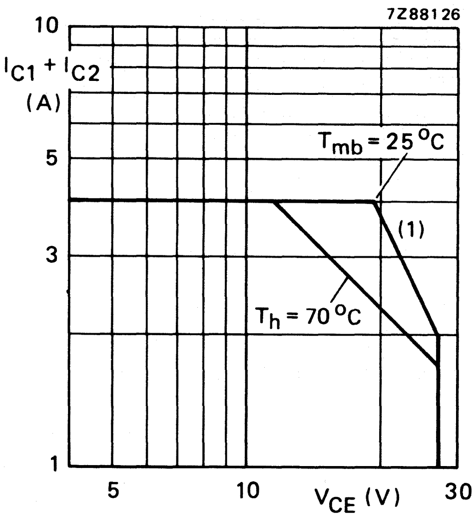
Recommended screw: cheese-head 4-40 UNC/2A

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); $V_{BE} = 0$	V_{CESM}	max.	50 V
open base	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 °C*	P_{tot}	max.	77 W*
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C*	P_{rf}	max.	93 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.*

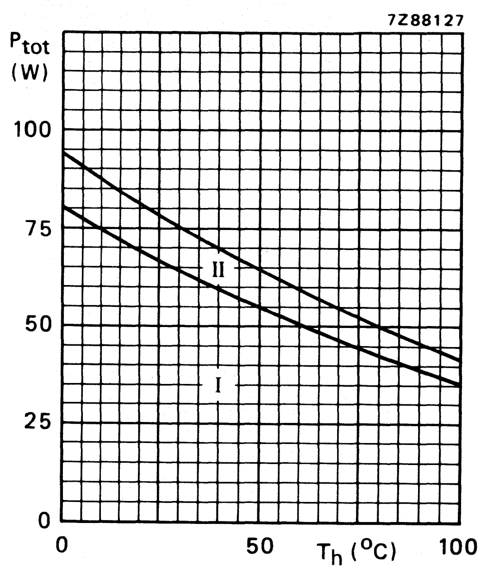


Fig. 3 Power derating curves vs. temperature.*

I Continuous d.c. (including r.f. class-A) operation

II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 42 W; T_{mb} = 80,5 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,43 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,91 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,25 K/W

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

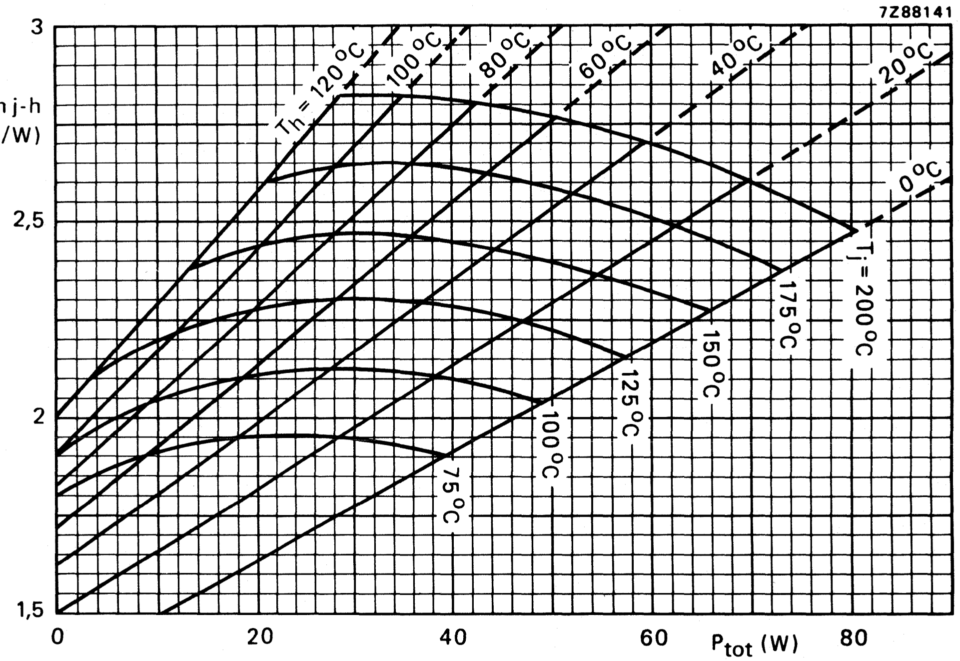


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,25 K/W.)

Example

Nominal class-A push-pull operation (without r.f. signal): V_{CE} = 25 V; I_{C1} = I_{C2} = 0,85 A; T_h = 70 °C.

Fig. 4 shows: $R_{th\ j\text{-}h}$ max. 2,68 K/W
T_j max. 184 °C

Typical device: $R_{th\ j\text{-}h}$ typ. 2,28 K/W
T_j typ. 167 °C

CHARACTERISTICS apply to either transistor section unless otherwise specified

T_j = 25 °C

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 25 mA	$V_{(BR)CEO}$	>	27 V
Emitter-base breakdown voltage			
open collector; I_E = 5 mA	$V_{(BR)EBO}$	>	3,5 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 27 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	2 mJ
R_{BE} = 10 Ω	E_{SBR}	>	2 mJ
D.C. current gain*			
I_C = 0,85 A; V_{CE} = 25 V	h_{FE}	> typ.	15 40
D.C. current gain ratio of transistor sections			
I_C = 0,85 A; V_{CE} = 25 V		0,67 to 1,5	
Collector-emitter saturation voltage*			
I_C = 1,7 A; I_B = 0,17 A	V_{CEsat}	typ.	0,75 V
Transition frequency at f = 100 MHz**			
$-I_E$ = 0,85 A; V_{CB} = 25 V	f_T	typ.	2,5 GHz
$-I_E$ = 1,7 A; V_{CB} = 25 V	f_T	typ.	2,5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ. <	24 pF 30 pF
Feedback capacitance at f = 1 MHz			
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	15 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leq 300\ \mu s$; $\delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\ \mu s$; $\delta \leq 0,01$.

The graphs apply to either transistor section.

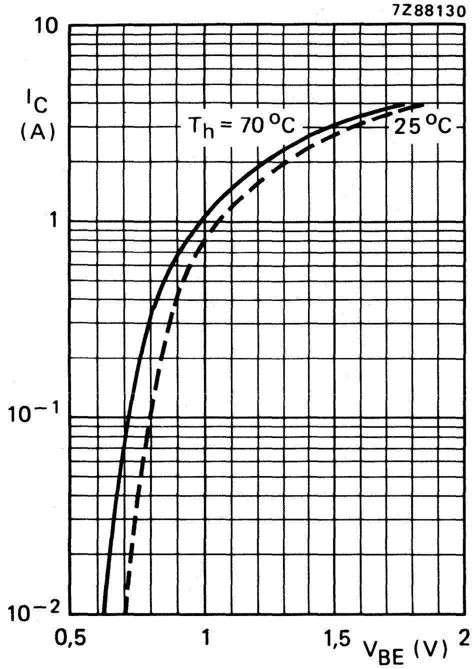


Fig. 5 Typical values; V_{CE} = 25 V.

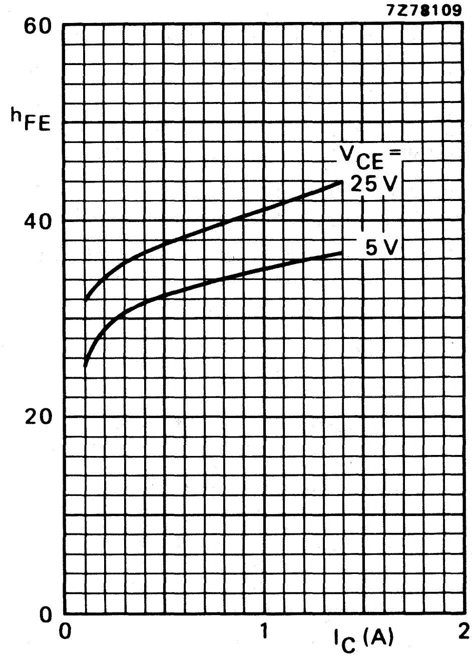


Fig. 6 Typical values; T_j = 25 °C.

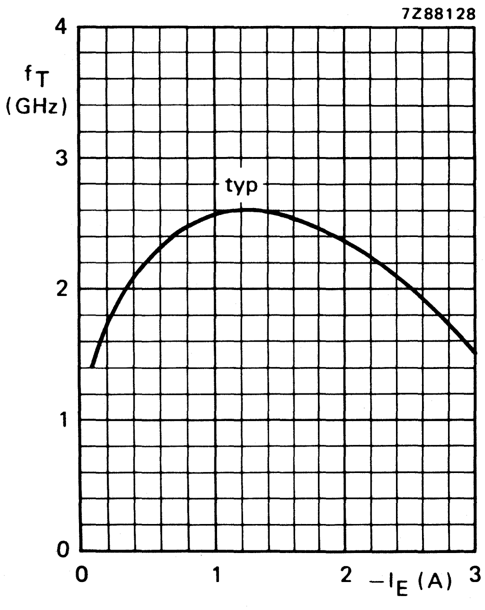


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

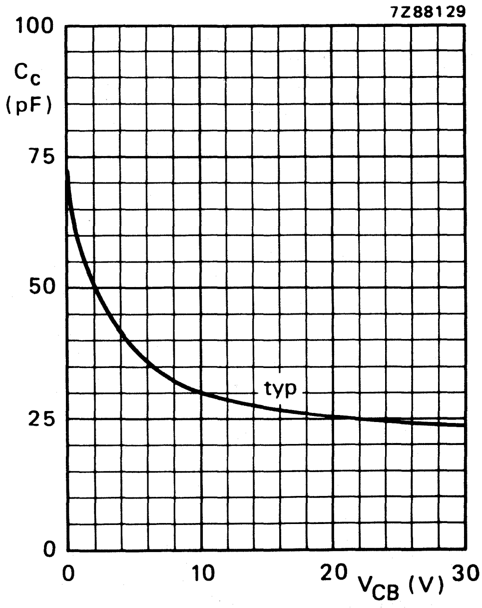


Fig. 8 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-A operation (linear push-pull power amplifier)

f_{vision} (MHz)	V_{CE} (V)	$I_{C1} = I_{C2}$ (A)	T_h (°C)	d_{im}* (dB)	$P_{o\,sync}$* (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.

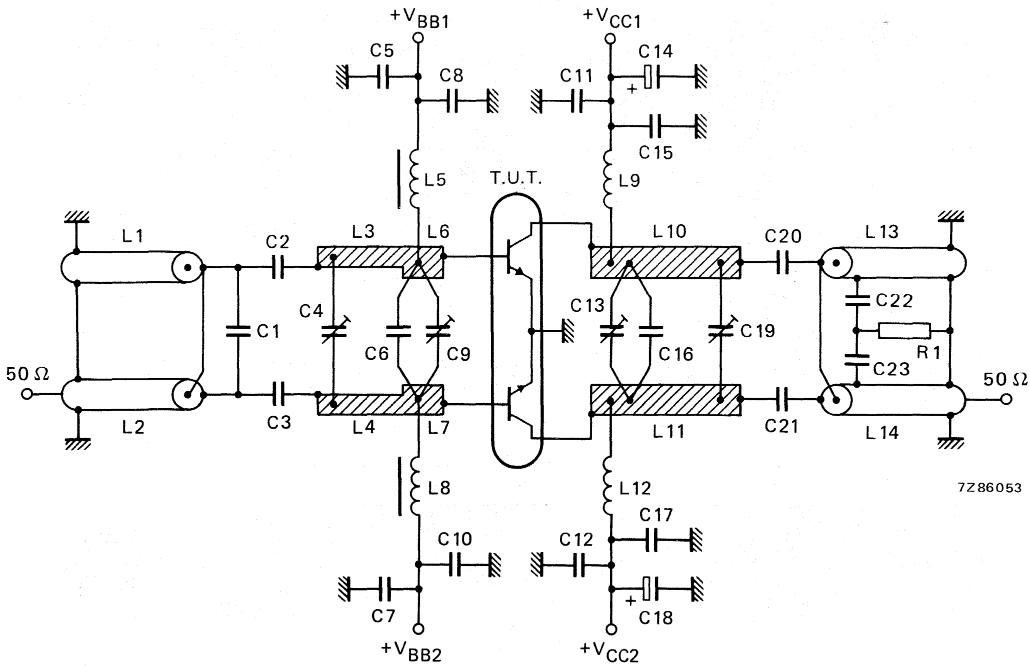


Fig. 9 Class-A test circuit at f_{vision} = 860 MHz.

List of components:

C1 = C6 = C16 = 4,7 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C2 = C3 = C20 = C21 = 33 pF multilayer ceramic chip capacitor (cat. no. 2222 851 13339)
C4 = C9 = C13 = C19 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
C5 = C7 = C15 = C17 = 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)
C14 = C18 = 6,8 μF/40 V solid aluminium electrolytic capacitor
C22 = C23 = 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 (ϵ_r = 2,74); thickness 1/32″.

R1 = 10 Ω carbon resistor

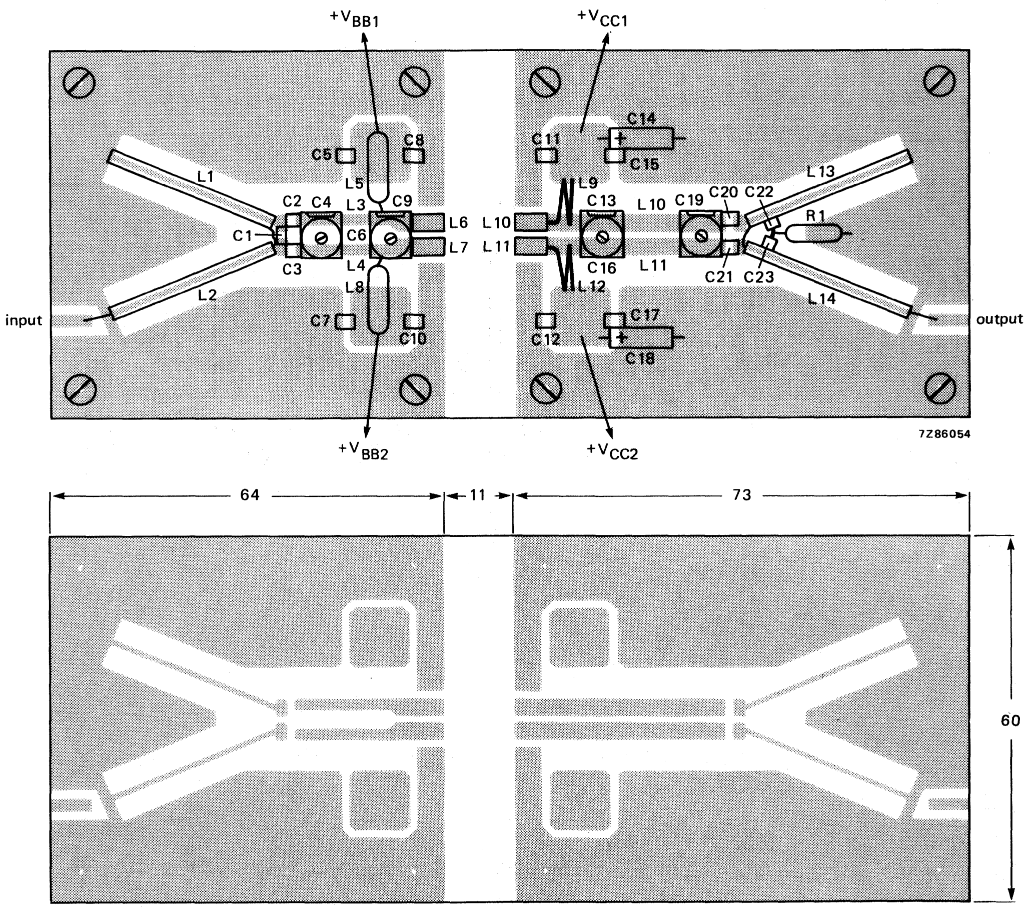


Fig. 10 Component layout and printed-circuit board for 860 MHz class-A test circuit.

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.

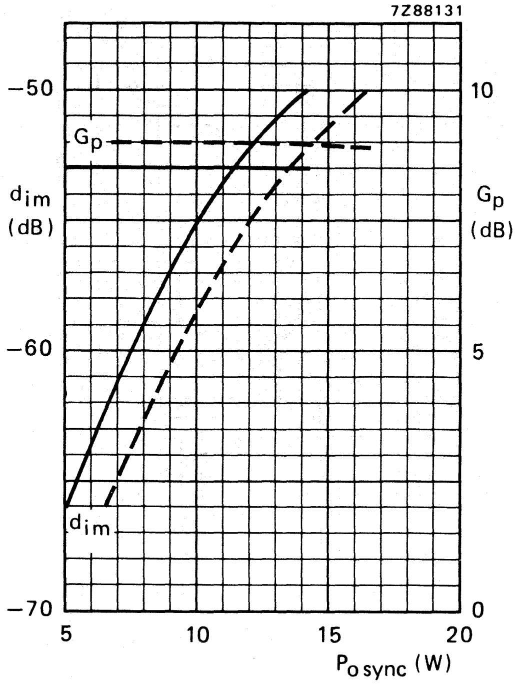


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

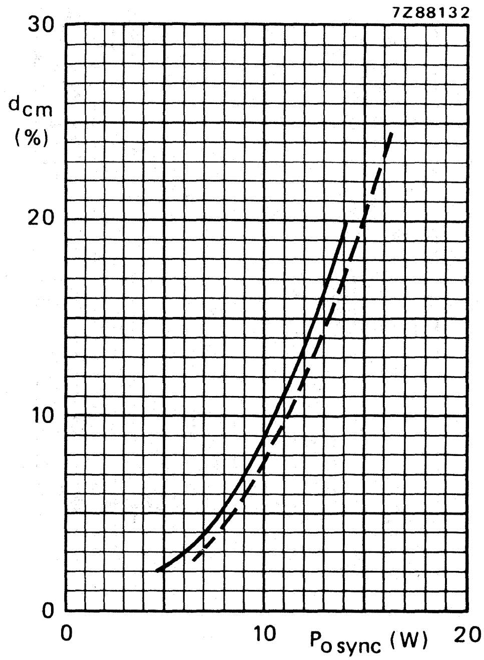


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; V_{CE} = 25 V; I_C = 2 x 0,85 A; – – – T_h = 25 °C; —— T_h = 70 °C; f_{vision} = 860 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 V; I_C = 2 x 0,85 A; T_h = 70 °C; $P_{o\,sync}$* $\leqslant$ 12,5 W; f = 860 MHz; $R_{th\,mb\text{-}h}$ = 0,25 K/W.
At any other composition of the output signal: P_L (r.m.s. value) $\leqslant$ 5 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 $\leqslant$ −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.

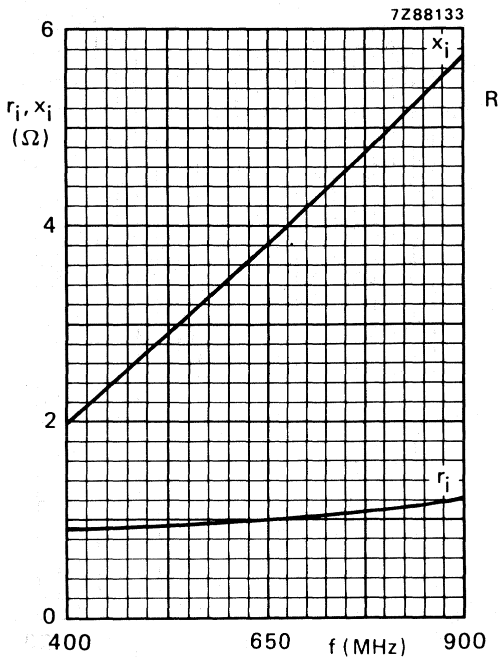


Fig. 13 Input impedance (series components).

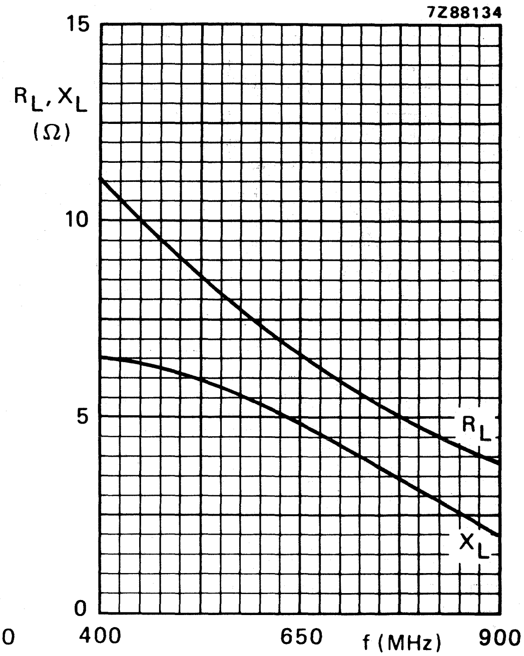


Fig. 14 Load impedance (series components).

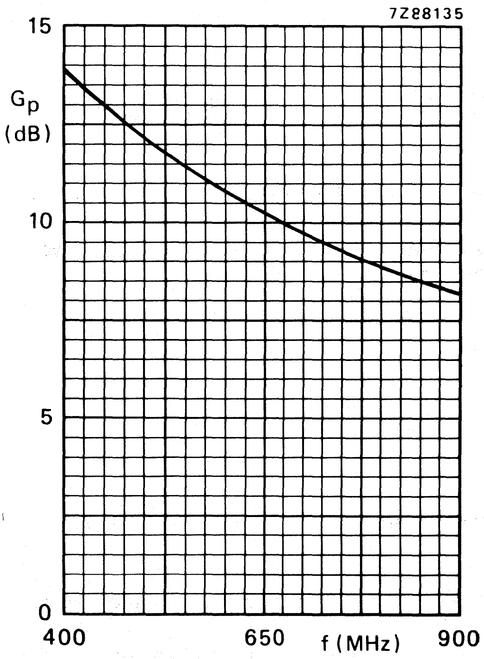


Fig. 15.

Conditions for Figs 13, 14 and 15:

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 ^{o}C.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-AB operation (c.w.)

f_{vision} (MHz)	V_{CE} (V)	$I_{C(ZS)}$ (A)	T_h (°C)	P_L (W)	$I_{C1} = I_{C2}$ (A)	η (%)	G_p* (dB)
860	25	2 x 0,1	25	12,5			typ. 7,5
				38	typ. 1,25	typ. 60	typ. 6,5
860	25	2 x 0,1	70	12,5			typ. 7,0
				30	typ. 1,10	typ. 55	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).

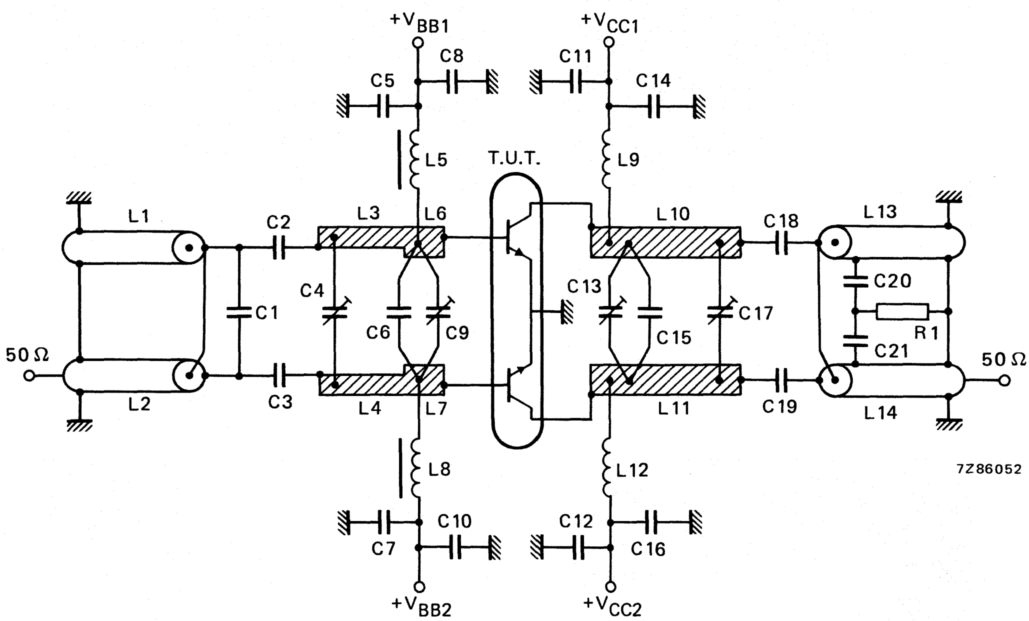


Fig. 16 Class-AB test circuit at f_{vision} = 860 MHz.

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 (ϵ_r = 2,74); thickness 1/32″

R1 = 10 Ω carbon resistor.

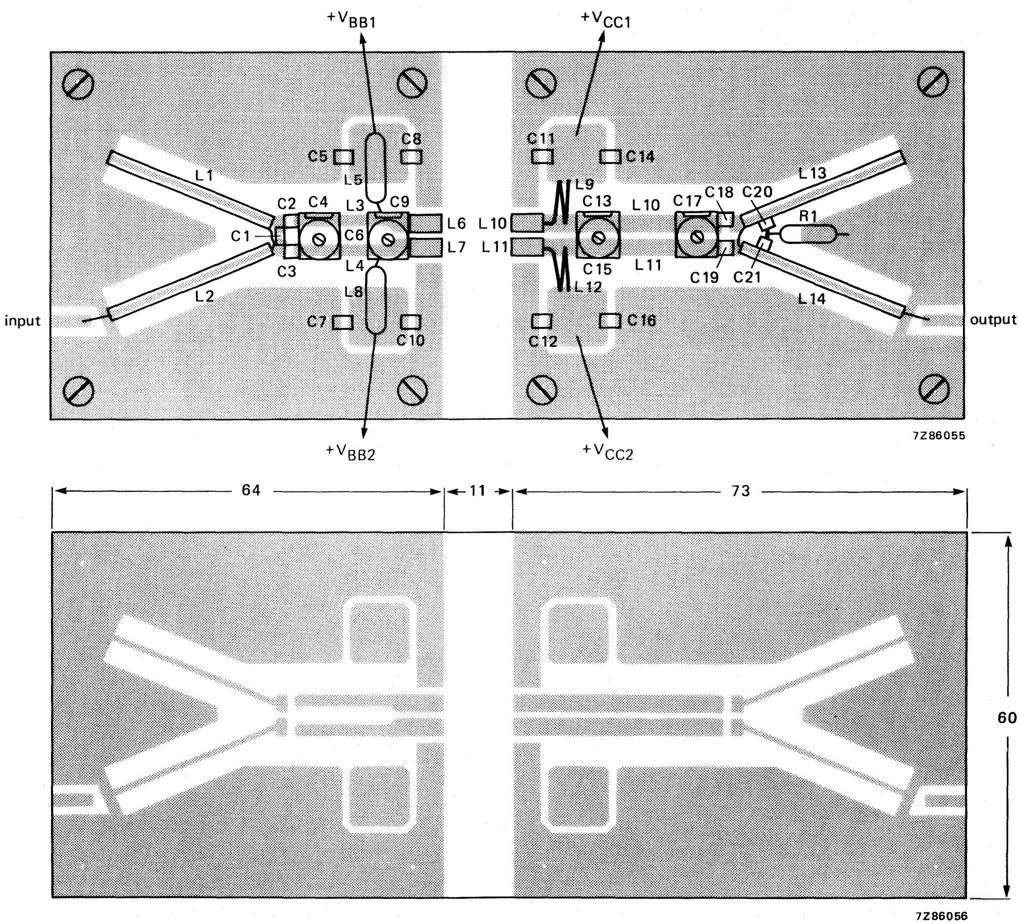


Fig. 17 Component layout and printed-circuit board for 860 MHz class-AB test circuit.

The circuit and the componenets 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.

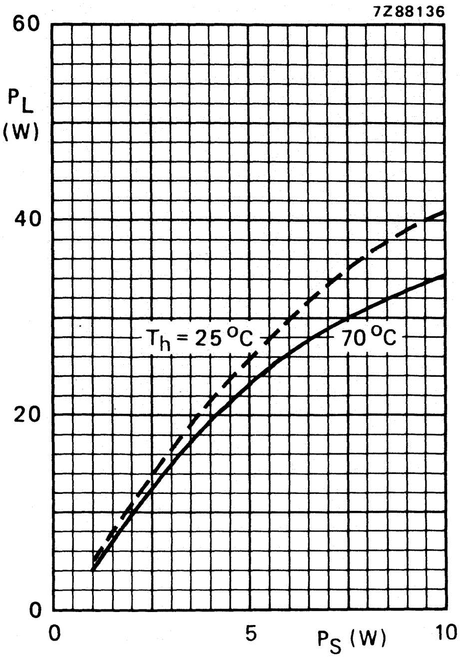


Fig. 18 Typical values; V_{CE} = 25 V; $I_{C(ZS)}$ = 2 x 0,1 A; f_{vision} = 860 MHz.

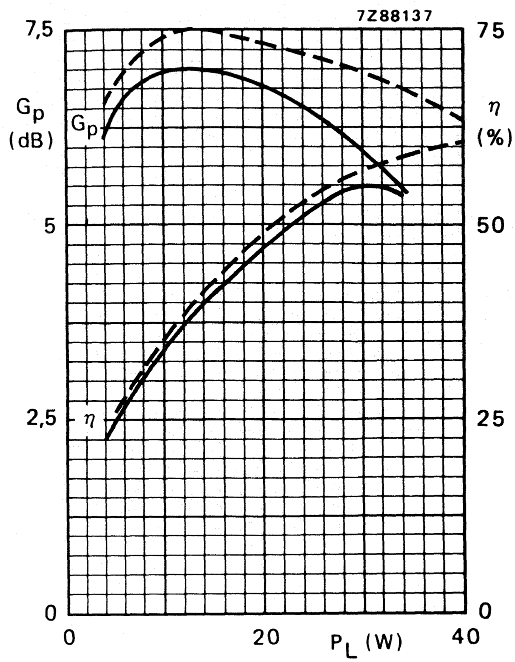


Fig. 19 Typical values; V_{CE} = 25 V; $I_{C(ZS)}$ = 2 x 0,1 A; – – – T_h = 25 °C; —— T_h = 70 °C; f_{vision} = 860 MHz.

Ruggedness in class-AB operation

The BLV57 is capable of withstanding a load mismatch (VSWR ⩽ 2 through all phases) up to 30 W (r.m.s. value) or (VSWR ⩽ 50 through all phases) up to 19 W under the following conditions: V_{CE} = 25 V; T_h = 70 °C; f = 860 MHz; $R_{th\ mb\text{-}h}$ = 0,25 K/W.

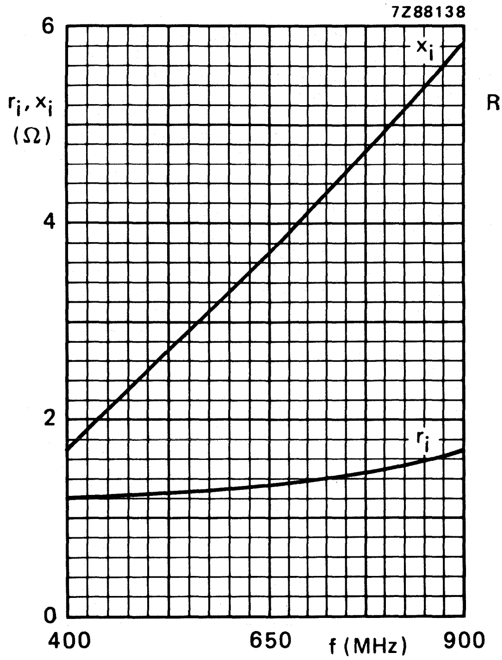


Fig. 20 Input impedance (series components).

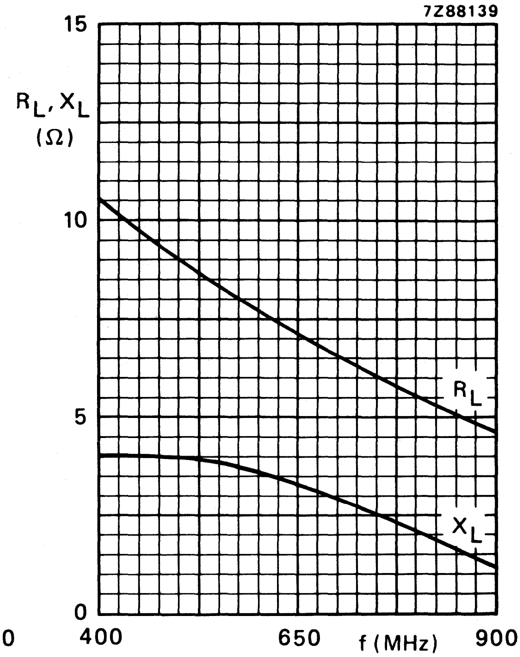


Fig. 21 Load impedance (series components).

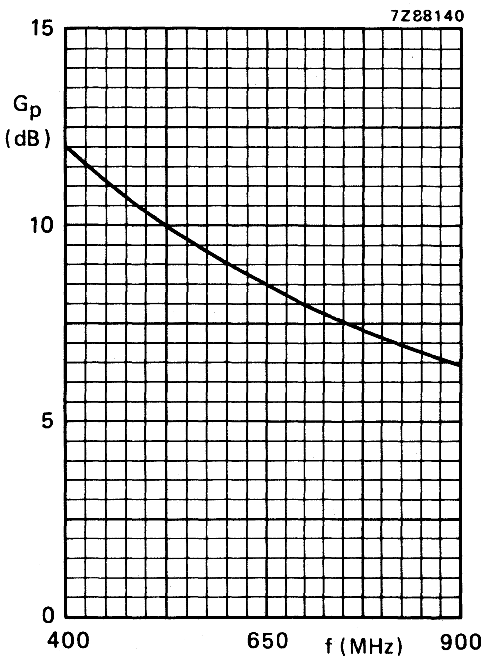


Fig. 22.

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 ^oC.

UHF linear push-pull power transistor

BLV58

FEATURES

- High power gain
- Double stage internal input matching for high input impedance
- Diffused emitter-ballasting resistors enhances ruggedness
- Gold metallization for high reliability.

DESCRIPTION

The BLV58 is a common emitter epitaxial npn silicon planar transistor designed for high linearity class-A operation in UHF (bands 4 and 5) TV transmitters and transposers.

The device is incorporated in a push-pull SOT289 flange envelope with a ceramic cap, which is utilized with the emitters connected to the flange.

PINNING - SOT289

PIN	DESCRIPTION
1	collector 1
2	collector 2
3	base 1
4	base 2
5	emitter

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f_{vision} (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)	d_{im} (dB) (note 1)
c.w. class-A	860	25	2 x 1.6	25	> 10	< −45

Note

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

PIN CONFIGURATION

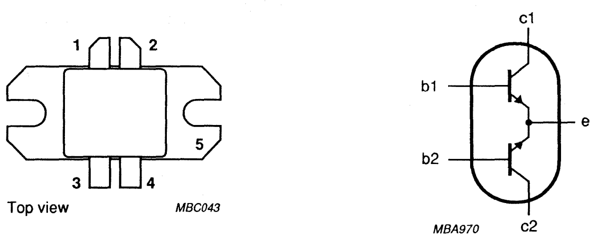


Fig.1 Simplified outline and symbol.

WARNING

Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

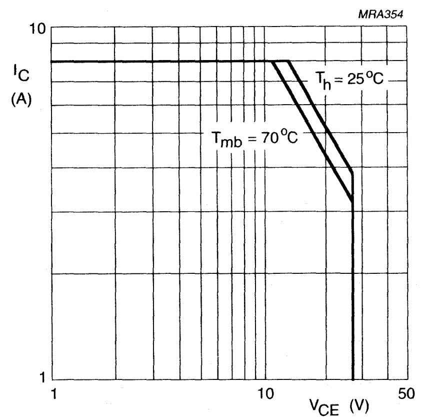
LIMITING VALUES (per transistor section unless otherwise specified)

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	50	V
V_{CEO}	collector-emitter voltage	open base	–	27	V
V_{EBO}	emitter-base voltage	open collector	–	3.5	V
I_C, $I_{C(AV)}$	collector current	DC or average value	–	4	A
I_{CM}	collector current	peak value; f > 1 MHz	–	8	A
P_{tot}	total power dissipation	DC operation; T_{mb} = 70 °C (note 1)	–	87	W
T_{stg}	storage temperature range		–65	150	°C
T_j	junction operating temperature		–	200	°C

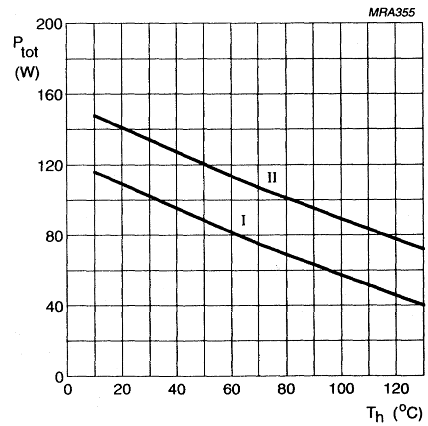
Note

1. Total device, both sections equally loaded.



Total device, both sections equally loaded.

Fig.2 DC SOAR.



(I) Continuous DC operation.

(II) Short time operation during mismatch.

Total device, both sections equally loaded.

Fig.3 Power derating curve.

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j\text{-}mb(DC)}$	from junction to mounting base	P_{dis} = 87 W; T_{mb} = 70 °C (note 1)	1.5	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink	note 1	0.2	K/W

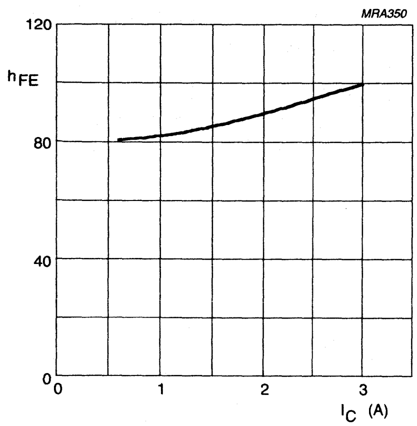
Note

1. Total device, both sections equally loaded.

CHARACTERISTICS

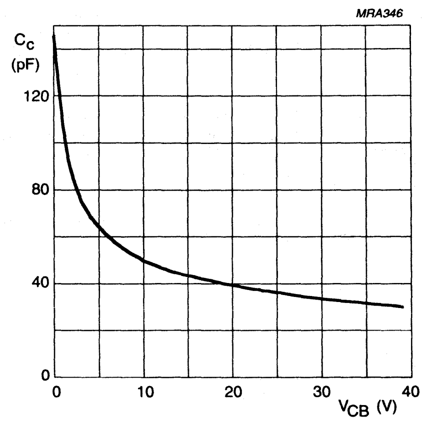
Values apply to either transistor section; T_j = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 20 mA	50	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 50 mA	27	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 10 mA	3.5	–	–	V
I_{CES}	collector-emitter leakage current	V_{BE} = 0; V_{CE} = 27 V	–	–	10	mA
h_{FE}	DC current gain	V_{CE} = 25 V; I_C = 1.6 A	30	–	–	
C_c	collector capacitance	V_{CB} = 25 V; I_E = I_e = 0; f = 1 MHz	–	36	45	pF



V_{CE} = 25 V.

Fig.4 DC current gain as a function of collector current, typical values.



$I_E = i_e = 0$; f = 1 MHz.

Fig.5 Collector capacitance as a function of collector-base voltage, typical values.

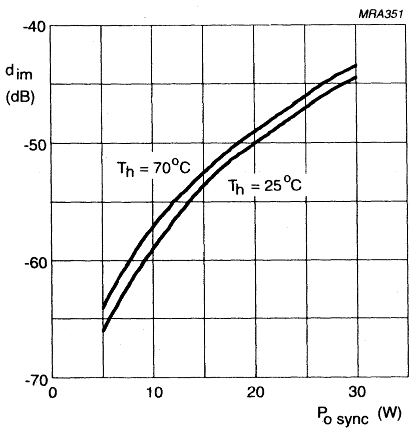
APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter push-pull test circuit; $R_{th\ mb-h}$ = 0.2 K/W.

MODE OF OPERATION	f_{vision} (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)	d_{im} (dB) (note 1)	d_{cm} (%) (note 2)
c.w. class-A	860	25	2 x 1.6	25	> 10 typ. 11.5	< −45 typ. −47	< 20

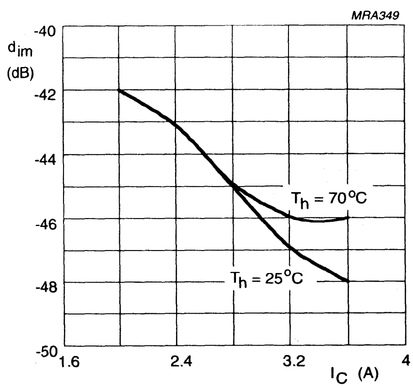
Notes

1. Three-tone test method: vision carrier −8 dB (860 MHz), sound carrier −7 dB (865.5 MHz), sideband signal −16 dB (861 MHz); zero dB corresponds to peak sync level.
2. Two-tone test method: vision carrier 0 dB (860 MHz), sound carrier −7 dB (865.5 MHz); zero dB corresponds to peak sync level. Cross-modulation distortion (d_{cm}) is the voltage variation (%) of the sound carrier when the vision carrier is switched from 0 dB to −20 dB.



Class-A operation; V_{CE} = 25 V; f = 860 MHz; 3-tone test (−8 dB, −16 dB, −7 dB); I_{CQ} = 2 x 1.6 A.

Fig.6 Intermodulation distortion as a function of output power.



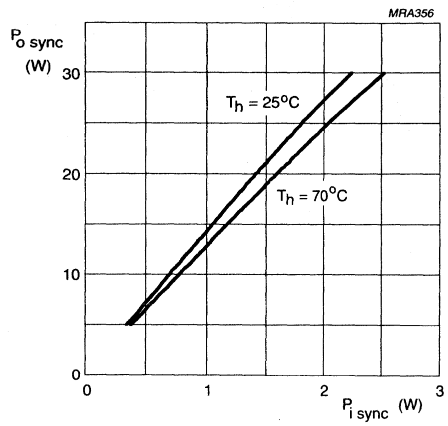
Class-A operation; V_{CE} = 25 V; f = 860 MHz; 3-tone test (−8 dB, −16 dB, −7 dB); $P_{o\ sync}$ = 25 W.

Fig.7 Intermodulation distortion as a function of collector current.

Ruggedness in class-A operation

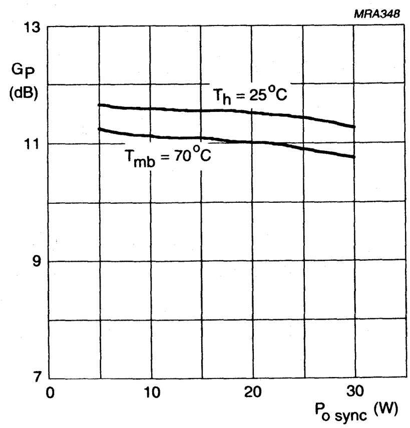
The BLV58 is capable of withstanding a full load mismatch corresponding to VSWR = 50:1 through all phases under the following conditions:

V_{CE} = 25 V, f = 860 MHz, T_h = 25 °C, $R_{th\ mb-h}$ = 0.2 K/W, I_{CQ} = 2 x 1.6 A, and rated output power.



Class-A operation; V_{CE} = 25 V; f = 860 MHz; 3-tone test (−8 dB, −16 dB, −7 dB); I_{CQ} = 2 x 1.6 A.

Fig.8 Output power as a function of input power.



Class-A operation; V_{CE} = 25 V; f = 860 MHz; 3-tone test (−8 dB, −16 dB, −7 dB); I_{CQ} = 2 x 1.6 A.

Fig.9 Gain as a function of output power, typical values.

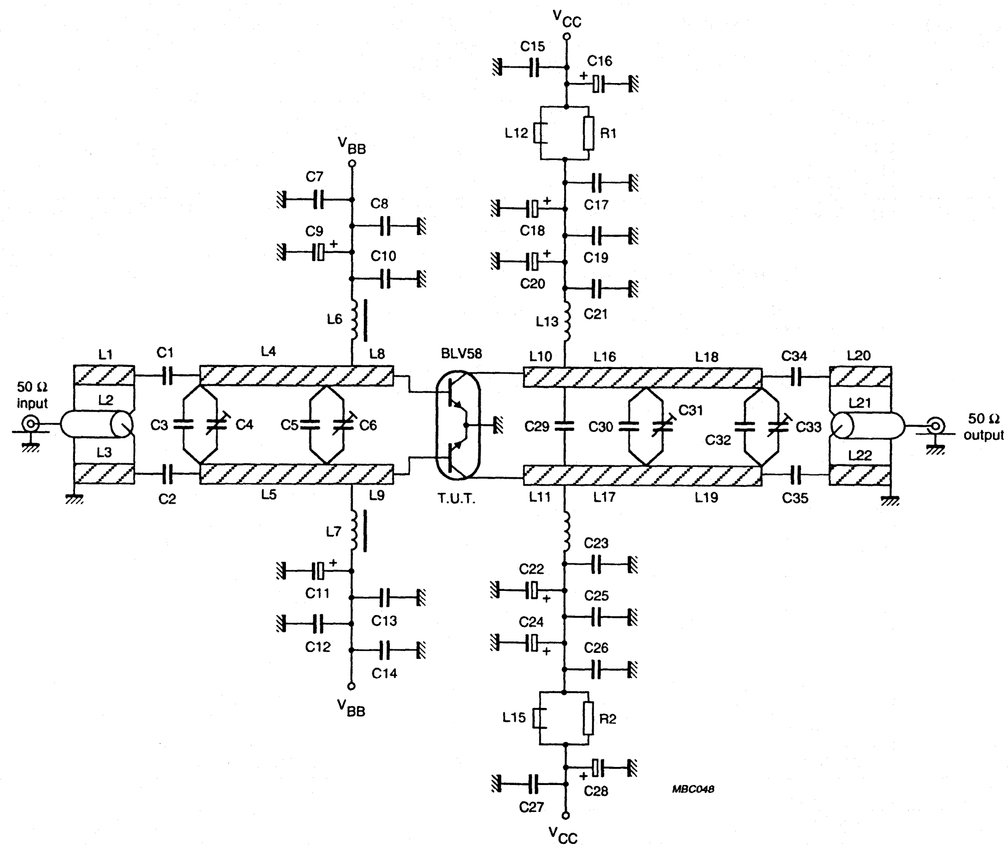


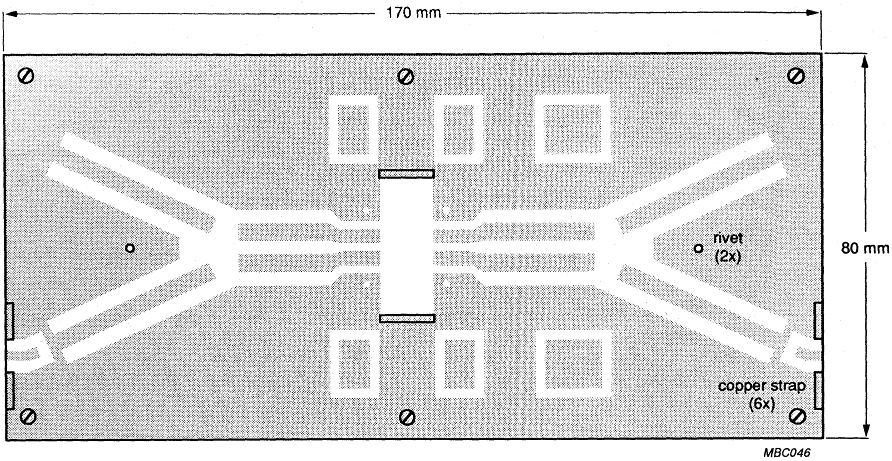
Fig.10 Class-A test circuit at f = 860 MHz.

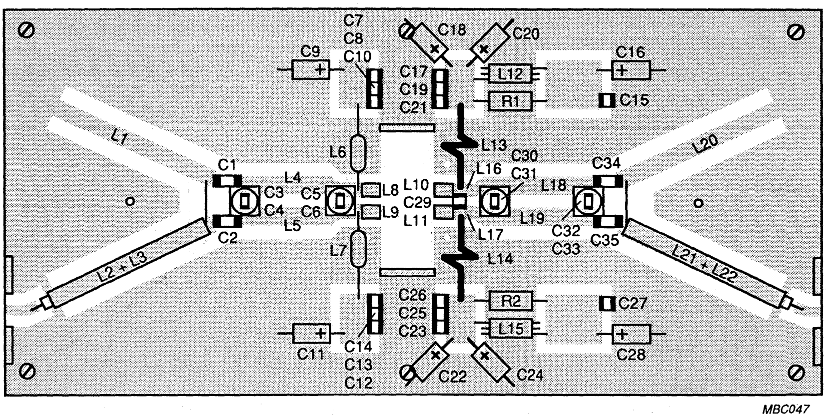
List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C34, C35	multilayer ceramic chip capacitor (note 1)	15 pF		
C3	multilayer ceramic chip capacitor (note 1)	3.9 pF		
C4, C6	film dielectric trimmer	5.5 pF		2222 809 09005
C5	multilayer ceramic chip capacitor (note 1)	7.5 pF		
C7, C12, C17, C26	multilayer ceramic chip capacitor	10 nF		2222 852 47103
C8, C14, C19, C25	multilayer ceramic chip capacitor	100 nF		2222 852 47104
C9, C11, C16, C20, C22, C28	63 V electrolytic capacitor	10 µF		
C10, C13, C15, C21, C23, C27	multilayer ceramic chip capacitor (note 1)	330 pF		
C18, C24	63 V electrolytic capacitor	1 µF		
C29	multilayer ceramic chip capacitor (note 1)	12 pF		
C30	multilayer ceramic chip capacitor (note 1)	5.6 pF		
C31, C33	film dielectric trimmer	3.5 pF		2222 809 05001
C32	multilayer ceramic chip capacitor (note 1)	2.7 pF		
L1, L3, L20, L22	stripline (note 2)	35 Ω	39 mm x 4 mm	
L2, L21	semi-rigid cable (note 3)	50 Ω	ext. dia. 3.6 mm; length 39 mm	
L4, L5	stripline (note 2)	38 Ω	19 mm x 3.5 mm	
L6, L7	RF choke	470 nH		
L8, L9	stripline (note 2)	38 Ω	7.5 mm x 3.5 mm	
L10, L11	stripline (note 2)	38 Ω	4.5 mm x 3.5 mm	
L12, L15	grade 3B RF choke			4312 020 36642
L13, L14	1 turn 1.5 mm copper wire	14 nH	int. dia 7 mm; leads 2 x 6 mm	
L16, L17	stripline (note 2)	38 Ω	7 mm x 3.5 mm	
L18, L19	stripline (note 2)	38 Ω	18 mm x 3.5 mm	
R1, R2	1 W metal film resistor	10 Ω		

Notes

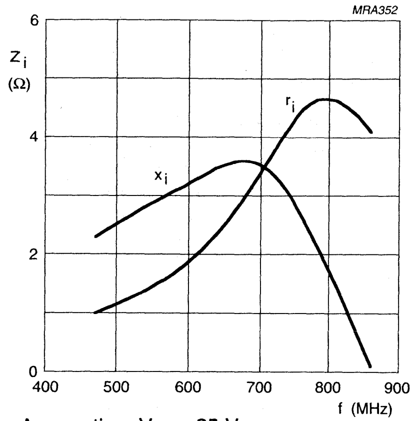
1. American Technical Ceramics type 100B or capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE microfibre-glass dielectric (ε_r = 2.2), thickness 1/32 inch, thickness of copper sheet 2 x 35 µm.
3. Cables L2 and L21 are soldered to striplines L1 and L20, respectively.





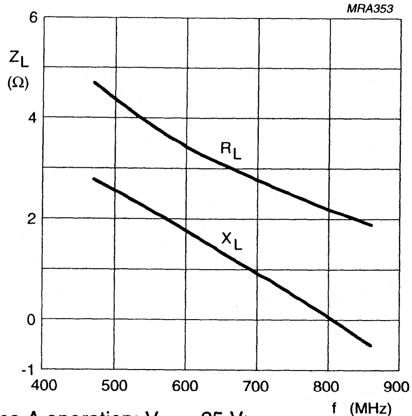
The components are mounted on one side of a copper clad PTFE microfibre-glass board; the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by hollow rivets and copper straps.

Fig.11 Component layout for 860 MHz class-A test circuit.



Class-A operation; V_{CE} = 25 V;
I_{CQ} = 1.6 A (per section); P_L = 25 W (total device);
T_h = 25 °C.

Fig.12 Input impedance per section (series components) as a function of frequency, typical values.



Class-A operation; V_{CE} = 25 V;
I_{CQ} = 1.6 A (per section); P_L = 25 W (total device);
T_h = 25 °C.

Fig.13 Load impedance per section (series components) as a function of frequency, typical values.

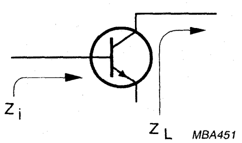
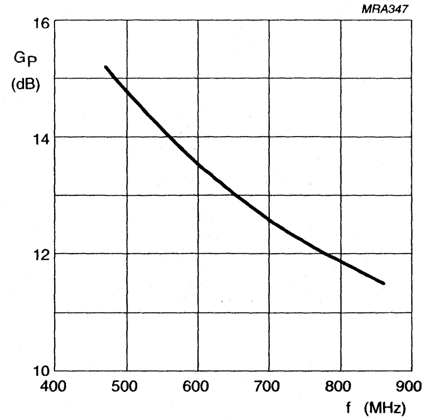


Fig.14 Definition of transistor impedance.



Class-A operation; V_{CE} = 25 V;
I_{CQ} = 1.6 A (per section); P_L = 25 W (total device);
T_h = 25 °C.

Fig.15 Power gain as a function of frequency, typical values.

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 °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

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.

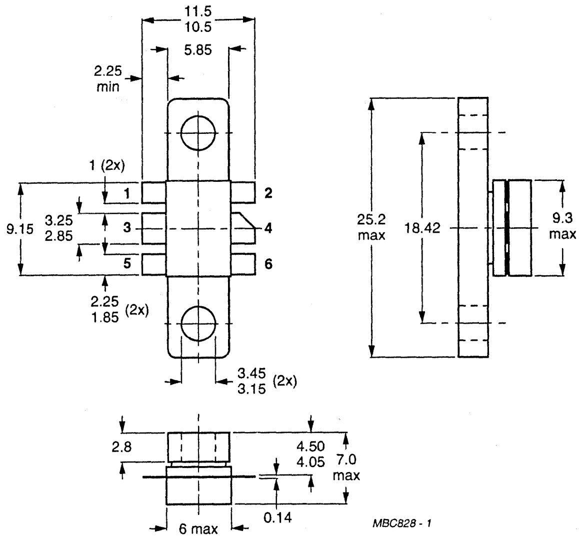
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-171.

Pinning:

1 = Emitter
2 = Emitter
3 = Base
4 = Collector
5 = Emitter
6 = Emitter



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 °C; f > 1 MHz	P_{tot}	max.	70 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

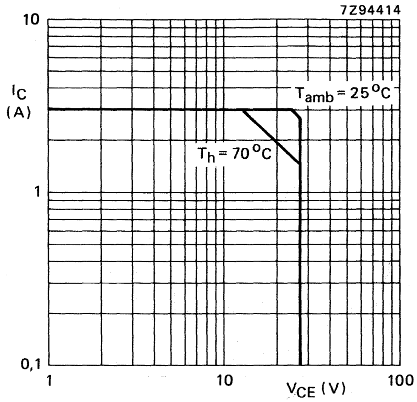


Fig. 2 D.C. SOAR; $R_{th\ mb\text{-}h}$ = 0,4 K/W.

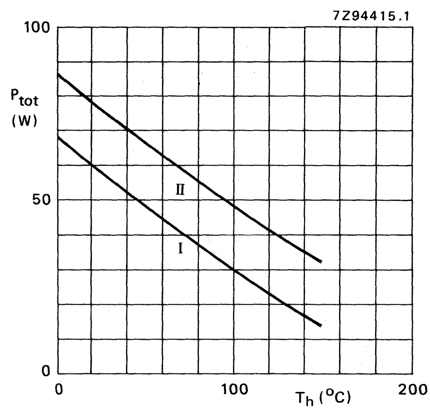


Fig. 3 Power/temperature derating curves versus heatsink temperature.

I Continuous operation (f > 1 MHz)

II Short-time operation during mismatch (f > 1 MHz)

MAXIMUM THERMAL RESISTANCE

Dissipation = 50 W; T_{amb} = 25 °C

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2,3 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,4 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 50 mA	$V_{(BR)CBO}$	min.	50 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	min.	27 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	min.	3,5 V
Collector leakage current V_{BE} = 0; V_{CE} = 27 V	I_{CES}	max.	10 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	4 mJ
D.C. current gain V_{CE} = 20 V; I_C = 2 A	h_{FE}	min.	15
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 25 V	C_c	typ.	44 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 25 V	C_{re}	typ.	30 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

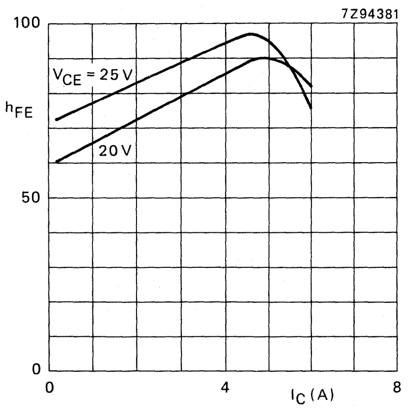


Fig. 4 D.C. current gain versus collector current; T_j = 25 °C.

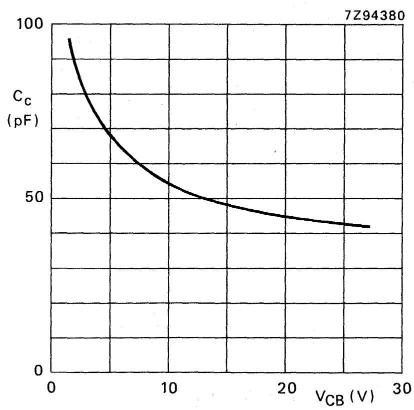


Fig. 5 Output capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1 MHz.

APPLICATION INFORMATION

R.F. performance up to T_h = 25 °C in common emitter class-AB circuit (c.w.); $R_{th\ mb\text{-}h}$ = 0,4 K/W

f (MHz)	V_{CE} (V)	$I_{C(ZS)}$(mA)	Gp (dB)	P_L (W)	η (%)	ΔGp (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).

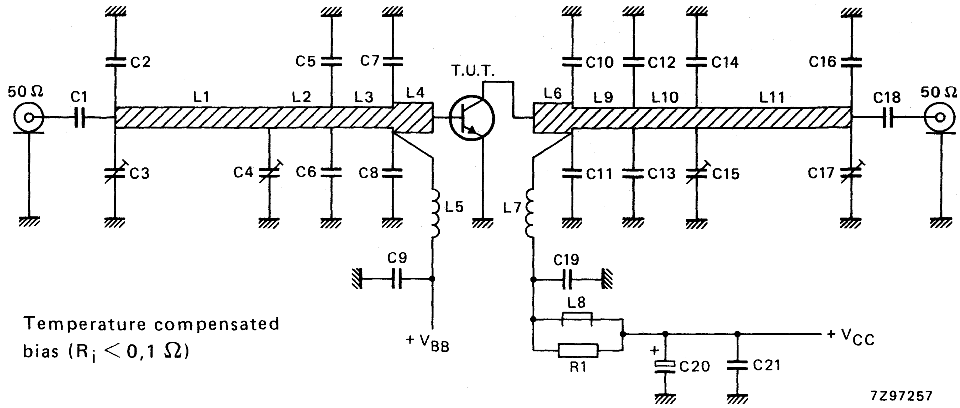


Fig. 6 Class-AB test circuit at f = 860 MHz.

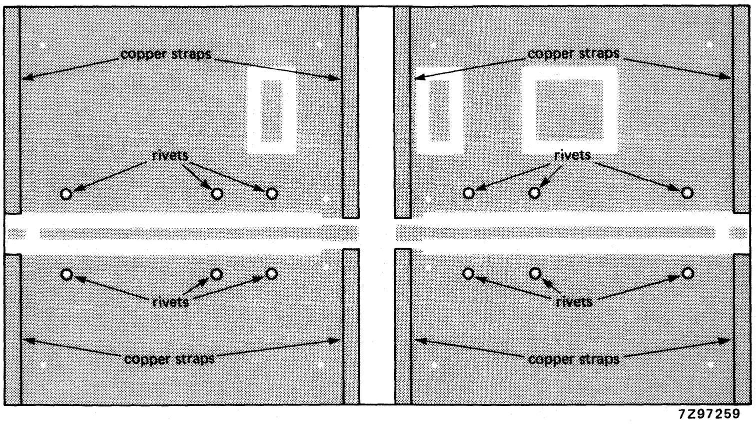
List of components:

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 Ω ± 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 (ϵ_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.



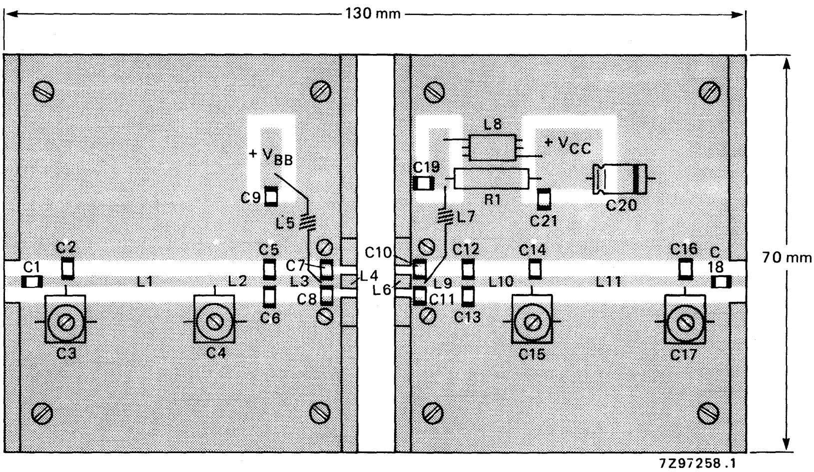


Fig. 7 Printed circuit board and component layout for 860 MHz class-AB test circuit.

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.

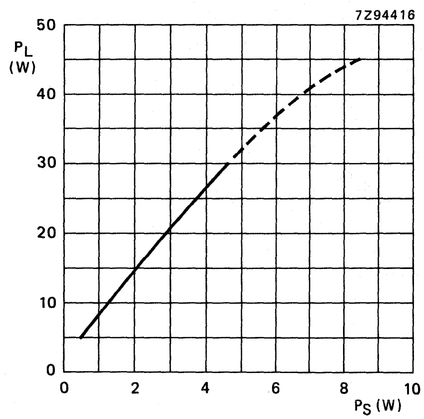


Fig. 8 Load power versus source power.

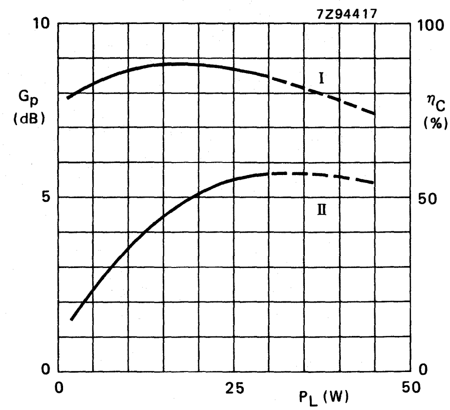


Fig. 9 Power gain (I) and efficiency versus load power (II).

Conditions for Figs 8 and 9:

Typical values; V_{CE} = 25 V; f = 860 MHz; $I_{C(ZS)}$ = 60 mA; T_h = 25 °C
$R_{th\ mb\text{-}h}$ = 0,4 K/W; class-AB operation.

RUGGEDNESS

The BLV59 is capable of withstanding load mismatch (VSWR = 10 through all phases) at rated load power under the following conditions; V_{CE} = 25 V; f = 860 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,4 K/W; $I_{C(ZS)}$ = 60 mA (class-AB operation).

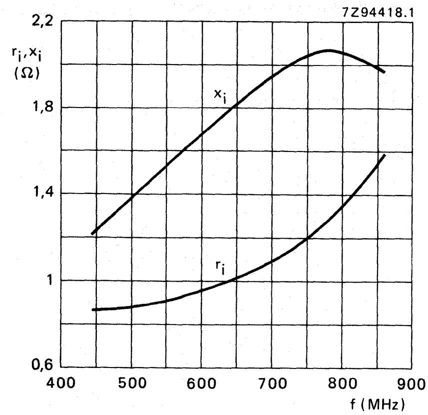


Fig. 10 Input impedance (series components).

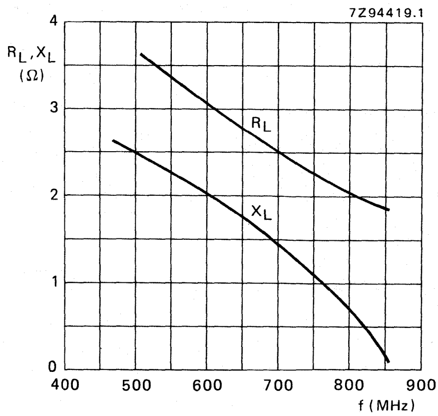


Fig. 11 Load impedance (series components).

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;
$R_{th\ mb\text{-}h}$ = 0,4 K/W; $I_{C(ZS)}$ = 60 mA; class-AB operation.

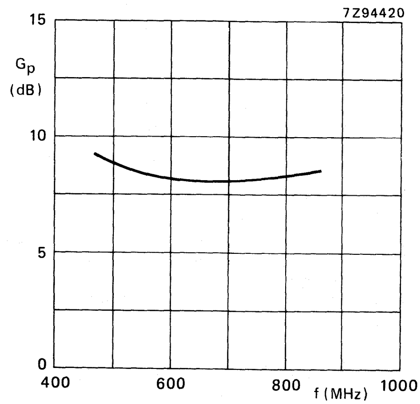


Fig. 12 Power gain versus frequency.

UHF linear push-pull power transistor

BLV62

FEATURES

- Internal matching for an optimum wideband capability and high gain
- Poly-silicon emitter-ballasting resistors for an optimum temperature profile
- Gold metallization ensures excellent reliability.

DESCRIPTION

Two npn silicon planar epitaxial sections in push-pull structure, intended for use in linear television transmitters (vision or sound).

The device is encapsulated in a 4-lead SOT262A2 flange envelope with 2 ceramic caps. The common emitter is connected to the flange.

PINNING - SOT262A2

PIN	DESCRIPTION
1	collector 1
2	collector 2
3	base 1
4	base 2
5	emitter

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)	ΔG_p (dB) (note 1)
c.w. class-AB	860	28	150	> 8.5 typ. 9.5	> 45 typ. 50	< 1 typ. 0.5

Note

1. 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, CCIR system).

PIN CONFIGURATION

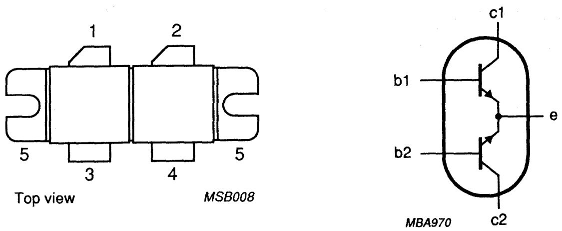


Fig.1 Simplified outline and symbol.

WARNING

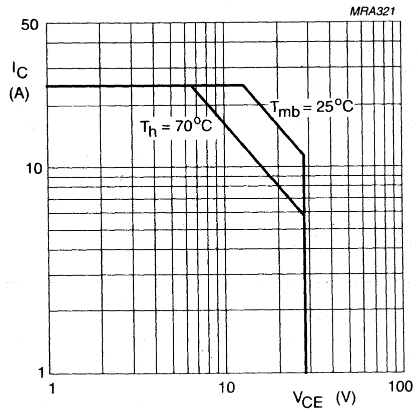
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

LIMITING VALUES (per transistor section unless otherwise specified)
In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	28	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C, $I_{C(AV)}$	collector current	DC or average value	–	12.5	A
P_{tot}	total power dissipation	DC operation; T_{mb} = 25 °C (note 1)	–	320	W
T_{stg}	storage temperature range		–65	150	°C
T_j	junction operating temperature		–	200	°C

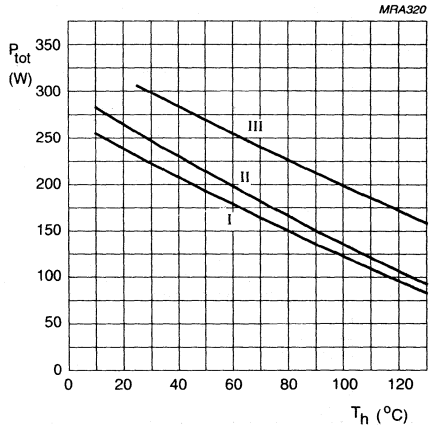
Note

1. Total device, both sections equally loaded.



Total device, both sections equally loaded.

Fig.2 DC SOAR.



Total device, both sections equally loaded.
(I) Continuous DC operation.
(II) Continuous RF operation.
(III) Short time operation during mismatch.

Fig.3 Power/temperature derating curve.

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j\text{-}mb(DC)}$	from junction to mounting base	P_{tot} = 320 W; T_{mb} = 25 °C (note 1)	0.55	K/W
$R_{th\ j\text{-}mb(RF)}$	from junction to mounting base	P_{tot} = 350 W; T_{mb} = 25 °C (note 1)	0.5	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink	(note 1)	0.15	K/W

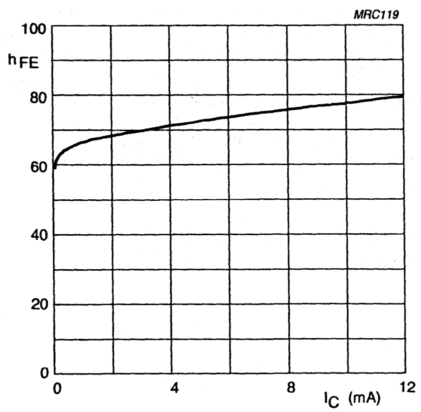
Note

1. Total device, both sections equally loaded.

CHARACTERISTICS

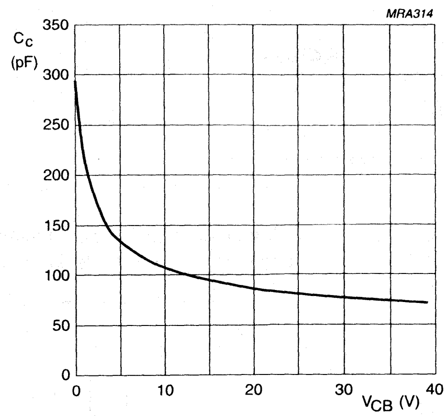
Values apply to either transistor section; T_j = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 60 mA	60	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 150 mA	28	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 3 mA	3	–	–	V
I_{CES}	collector-emitter leakage current	V_{BE} = 0; V_{CE} = 28 V	–	–	30	mA
h_{FE}	DC current gain	V_{CE} = 25 V; I_C = 4.5 A	30	–	–	
Δh_{FE}	DC current gain ratio of both sections	V_{CE} = 25 V; I_C = 4.5 A	0.67	–	1.5	
C_c	collector capacitance	V_{CB} = 28 V; $I_E = I_e$ = 0; f = 1 MHz	–	81	–	pF
$C_{c\text{-}f}$	collector-flange capacitance	f = 1 MHz	–	5.7	–	pF



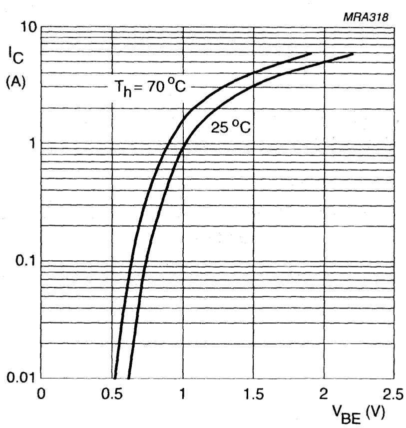
V_{CE} = 25 V.

Fig.4 DC current gain as a function of collector current, typical values.



$I_E = i_e = 0$; f = 1 MHz.

Fig.5 Collector capacitance as a function of collector-base voltage, typical values.



V_{CE} = 25 V.

Fig.6 Collector current as a function of base-emitter voltage, typical values.

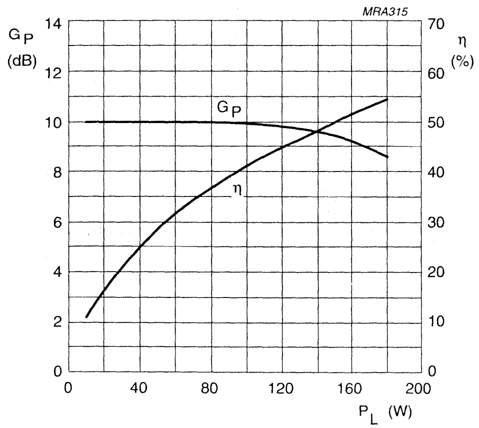
APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (mA)	P_L (W)	G_p (dB)	η_c (%)	ΔG_p (dB) (note 1)
c.w. class-AB	860	28	2 x 400	150	> 8.5 typ. 9.5	> 45 typ. 50	< 1 typ. 0.5

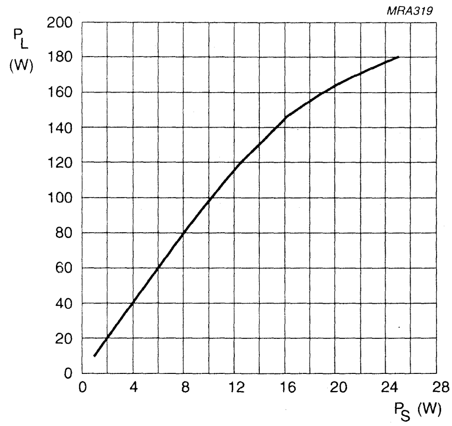
Note

1. 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, CCIR system).



Class-AB operation; V_{CE} = 28 V; f = 860 MHz; I_{CQ} = 2 x 0.4 A; $R_{th\ mb\text{-}h}$ = 0.15 K/W.

Fig.7 Gain and efficiency as functions of load power, typical values.



Class-AB operation; V_{CE} = 28 V; f = 860 MHz; I_{CQ} = 2 x 0.4 A; $R_{th\ mb\text{-}h}$ = 0.15 K/W.

Fig.8 Load power as a function of drive power, typical values.

Ruggedness in class-AB operation

The BLV62 is capable of withstanding a load mismatch corresponding to VSWR = 2:1 through all phases under the following conditions:

V_{CE} = 28 V, f = 860 MHz, T_h = 25 °C, $R_{th\ mb\text{-}h}$ = 0.15 K/W, and rated output power.

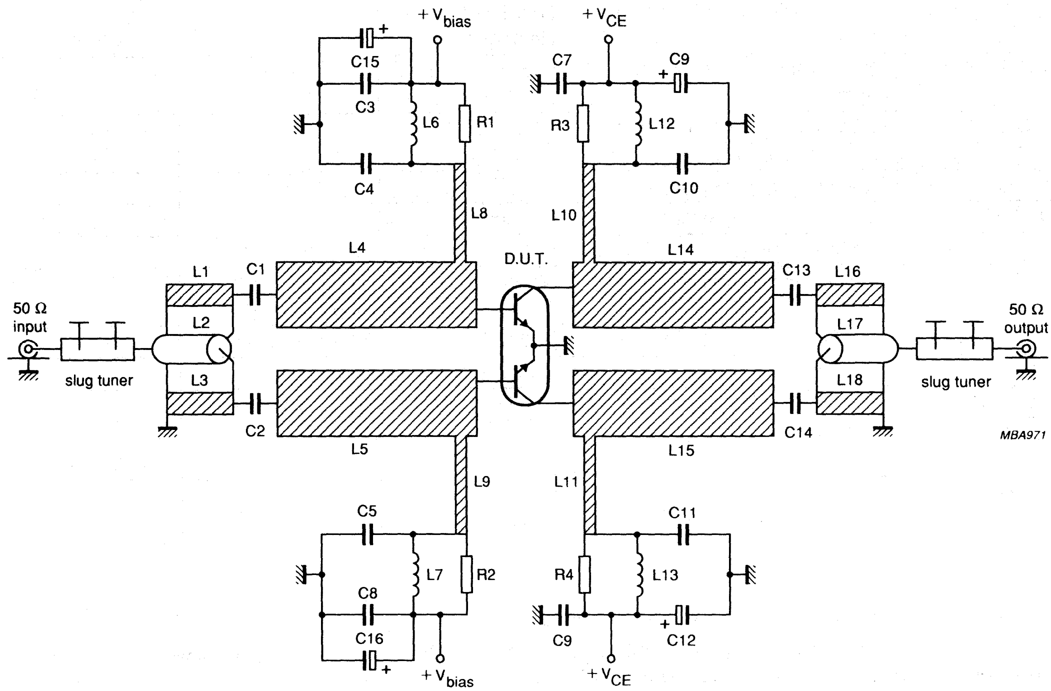


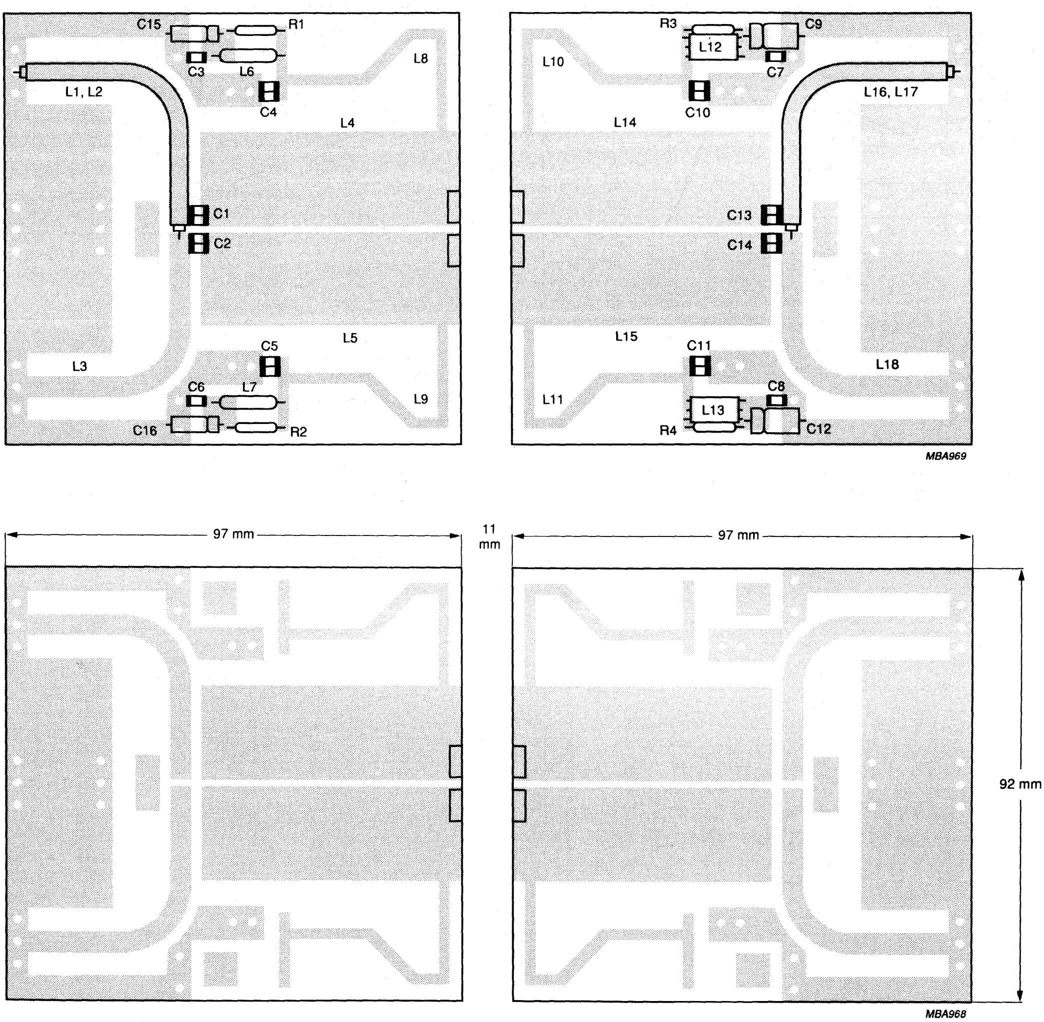
Fig.9 Class-AB test circuit at f = 860 MHz.

List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C13, C14	500 V multilayer ceramic chip capacitor (note 1)	2 x 100 pF in parallel		
C3, C6, C7, C8	50 V multilayer ceramic chip capacitor	100 nF		
C4, C5, C10, C11	500 V multilayer ceramic chip capacitor (note 1)	2 x 20 pF in parallel		
C9, C12	63 V electrolytic capacitor	10 μF		
C15, C16	63 V electrolytic capacitor	4.7 μF		
L1, L3, L16, L18	stripline (note 2)	29 Ω	59.6 mm x 5 mm	
L2, L17	semi-rigid cable (note 3)	50 Ω	ext. dia. 3.6 mm; length 59.6 mm	
L4, L5, L14, L15	stripline (note 2)	9.1 Ω	56 mm x 20 mm	
L6, L7	RF choke	2.2 μH		
L8, L9, L10, L11	stripline (note 2)	48.5 Ω	66 mm x 2.5 mm	
L12, L13	2 x 1 mm copper wires in parallel through bead			modified 4312 020 36640
R1, R2	0.4 W metal film resistor	10 Ω		
R3, R4	0.4 W metal film resistor	5.11 Ω		

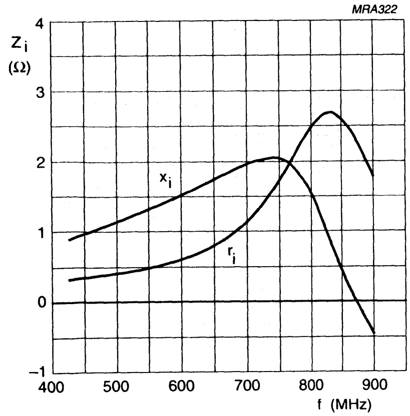
Notes

1. American Technical Ceramics type 100B or capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with PTFE microfibre-glass dielectric ($\varepsilon_r = 2.2$), thickness 1⁄32 inch, thickness of copper sheet 2 x 35 μm.
3. Cables L2 and L17 are soldered to striplines L1 and L16, respectively.



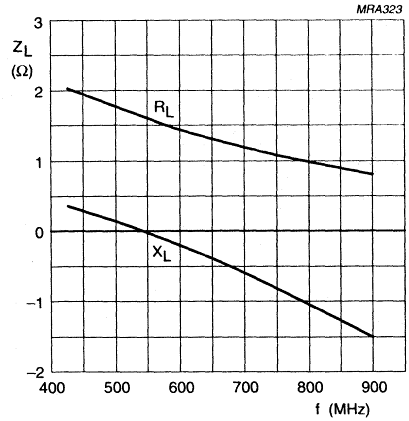
The components are mounted on one side of a copper clad PTFE microfibre-glass board; the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization, which is indicated above by holes.

Fig.10 Component layout for 860 MHz class-AB test circuit.



Class-AB operation; V_{CE} = 28 V;
I_{CQ} = 400 mA (per section);
P_L = 150 W (total device).

Fig.11 Input impedance per section (series components) as a function of frequency, typical values.



Class-AB operation; V_{CE} = 28 V;
I_{CQ} = 400 mA (per section);
P_L = 150 W (total device).

Fig.12 Load impedance per section (series components) as a function of frequency, typical values.

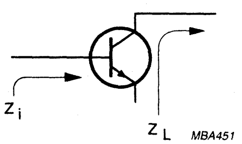
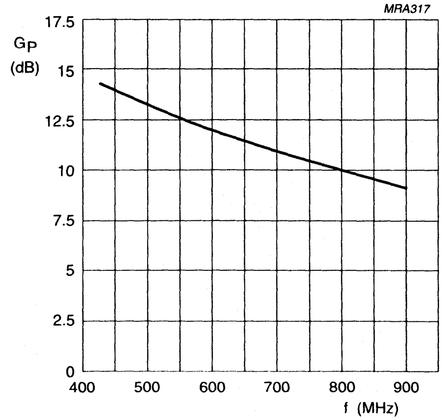


Fig.13 Definition of transistor impedance.



Class-AB operation; V_{CE} = 28 V;
I_{CQ} = 400 mA (per section);
P_L = 150 W (total device).

Fig.14 Power gain as a function of frequency, typical 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 °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

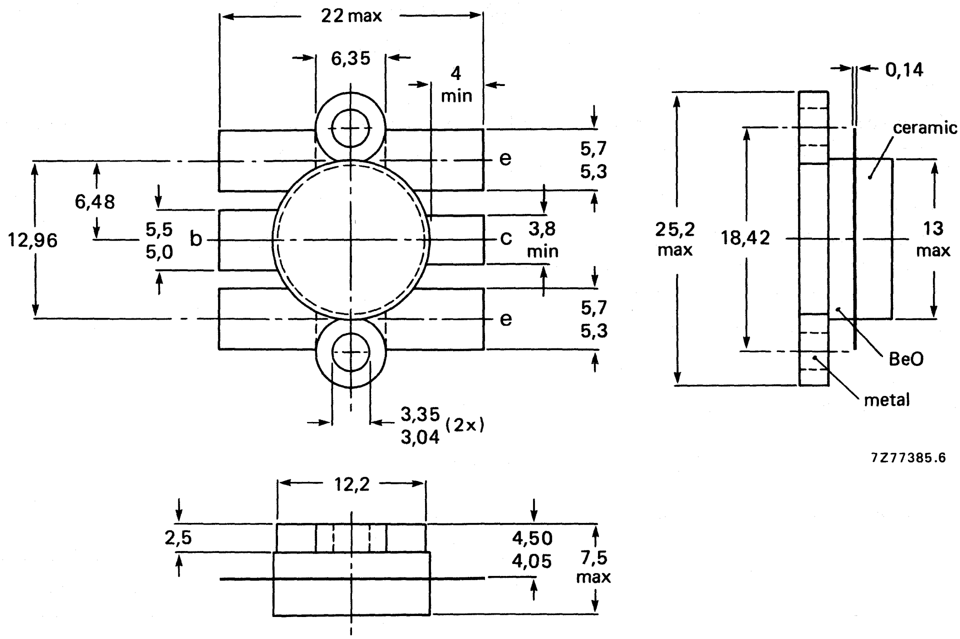
Fig. 1 SOT-119 (see Fig. 1)

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

Dimensions in mm

Fig. 1 SOT-119.



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 °C; f > 1 MHz	P_{tot}	max.	150	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

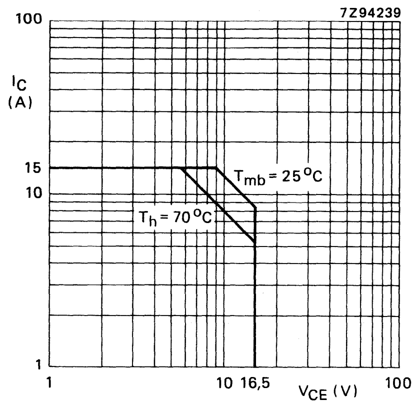


Fig. 2 D.C. soar.
$R_{th\ mb-h}$ = 0,2 K/W.

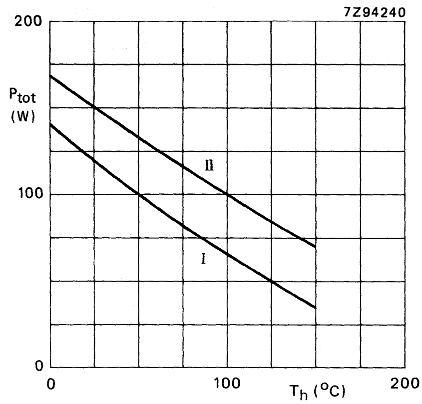


Fig. 3 Power/temperature derating curves; $R_{th\ mb-h}$ = 0,2 K/W.
I Continuous operation (f > 1 MHz)
II Short-time operation during mismatch; (f > 1 MHz).

THERMAL RESISTANCE

Dissipation = 96 W; T_{mb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j-mb}$	=	1,05	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 100 mA	$V_{(BR)CBO}$	min.	36 V
Collector-emitter breakdown voltage open base; I_C = 200 mA	$V_{(BR)CEO}$	min.	16,5 V
Emitter-base breakdown voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	min.	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	max.	44 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	20 mJ
D.C. current gain V_{CE} = 10 V; I_C = 10 A	h_{FE}	min.	15
		typ.	55
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	240 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	150 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

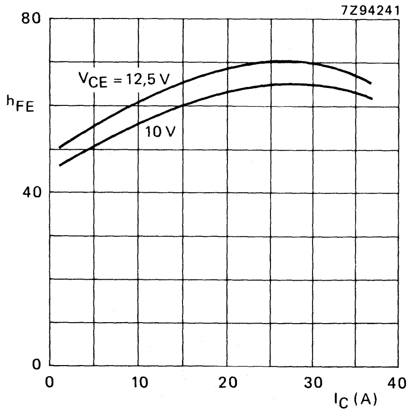


Fig. 4 D.C. current gain versus collector current; T_j = 25 °C.

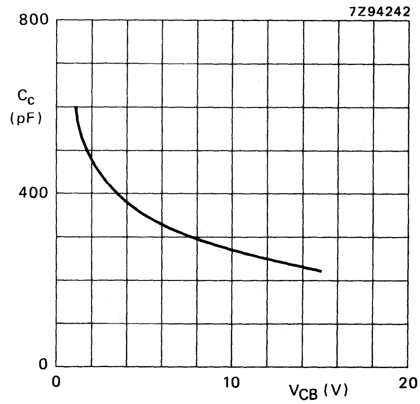


Fig. 5 Output capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

APPLICATION

R.F. performance in c.w. operation (common-emitter circuit; class-B)
f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 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

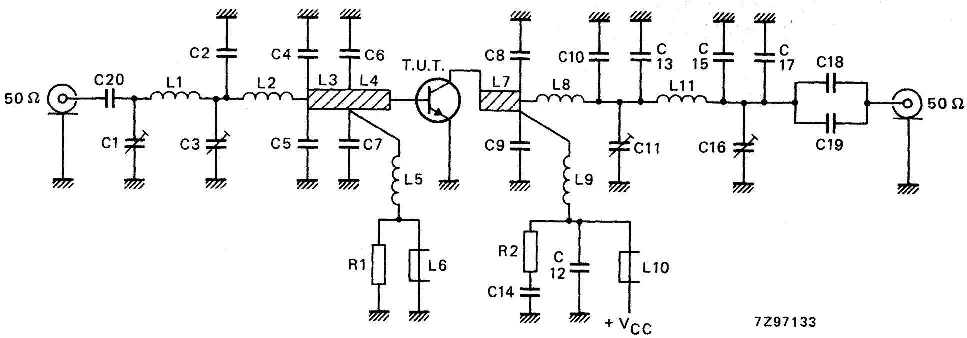


Fig. 6 Class-B test circuit at f = 175 MHz.

List of components:

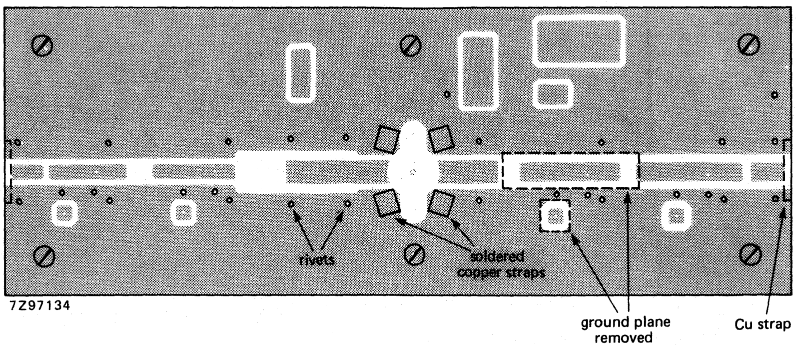
C1 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C2 = 10 pF multilayer ceramic chip capacitor*
C3 = C16 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C4 = C5 = 75 pF multilayer ceramic chip capacitor
C6 = C7 = 100 pF multilayer ceramic chip capacitor*
C8 = C9 = 2 x 75 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, (ϵ_r = 4,5) thickness 1/16 inch).

R1 = 10 Ω ± 10%, carbon resistor
R2 = 4,7 Ω ± 10%, carbon resistor



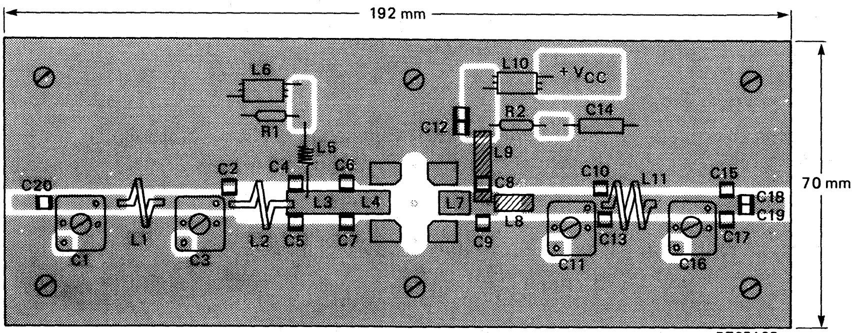


Fig. 7 Printed circuit board and component lay-out for 175 MHz class-B test circuit.

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.

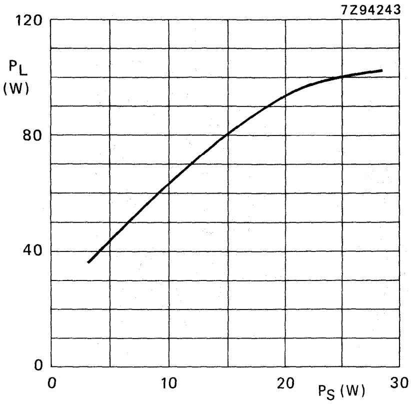


Fig. 8 Load power versus source power.

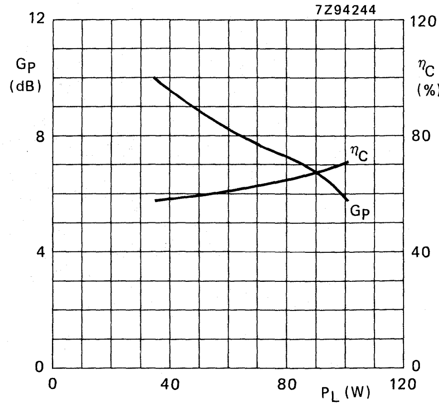


Fig. 9 Power gain and efficiency versus load power.

Condition for Figs 8 and 9:

Typical values; V_{CE} = 12,5 V; f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

Ruggedness in class-B operation

The BLV75/12 is capable of withstanding a load mismatch (VSWR = 20 through all phases) at rated load power up to a supply voltage of 12,5 V; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

Power slump

If T_h is increased from 25 °C to 70 °C the output power slump for constant P_S amounts to typ. 7% (V_{CE} = 12,5; f = 175 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W).

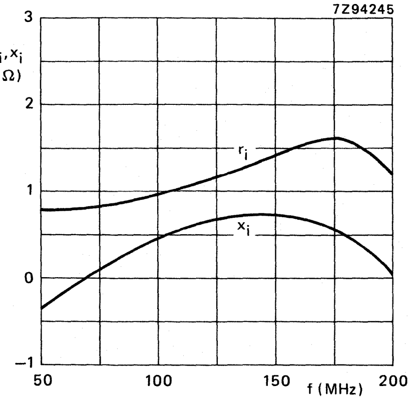


Fig. 10 Input impedance (series components).

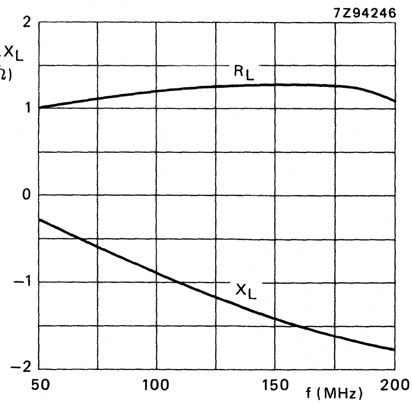


Fig. 11 Load impedance (series components).

Conditions for Figs 10, 11 and 12:

Typical values; V_{CE} = 12,5 V; P_L = 75 W; f = 50 to 200 MHz; class-B operation; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

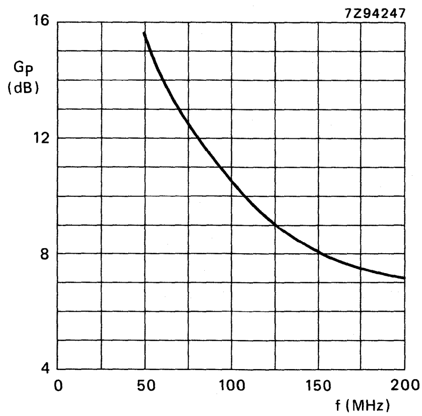


Fig. 12 Power gain versus frequency.

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 °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

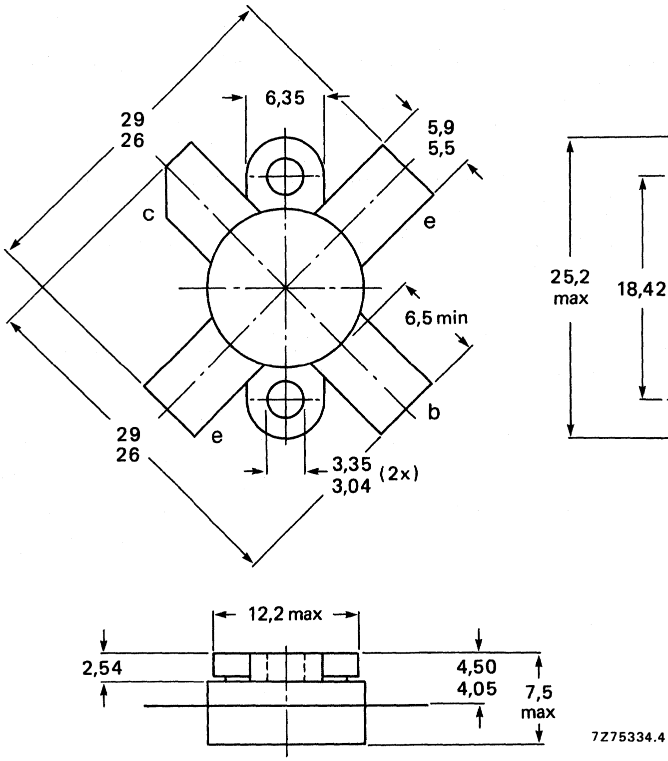
SOT-121 (see Fig. 1)

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)

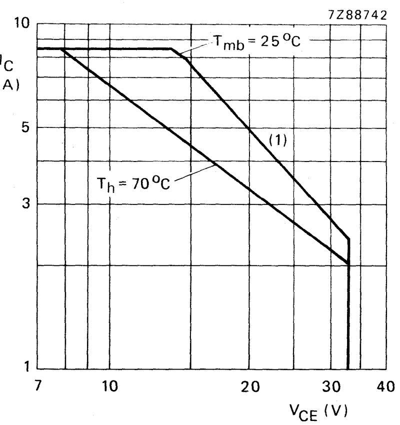
Recommended screw: cheese-head 4-40 UNC/2A

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);			
$V_{BE} = 0$	V_{CESM}	max.	65 V
open base	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 $T_{mb} = 25\ ^oC$	P_{tot}	max.	116 W
R.F. power dissipation			
f > 1 MHz; $T_{mb} = 25\ ^oC$	P_{rf}	max.	144 W
f > 1 MHz; $T_h = 70\ ^oC$	P_{rf}	max.	80 W
Storage temperature	T_{stg}	−65 to +150	^oC
Operating junction temperature	T_j	max.	200 ^oC



(1) Second breakdown limit.

Fig. 2 D.C. SOAR.

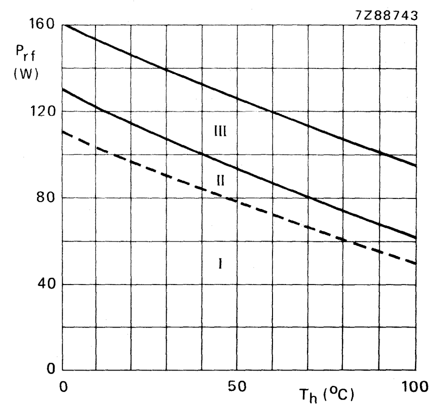


Fig. 3 Power derating curve vs. temperature.

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; $T_{mb} = 60\ ^oC$, i.e. $T_h = 33\ ^oC$)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,50 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,30 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage			
$V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	65 V
open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	33 V
Emitter-base breakdown voltage			
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 33$ V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	10 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	10 mJ
D.C. current gain*			
$I_C = 3{,}5$ A; $V_{CE} = 25$ V	h_{FE}	typ.	45
			15 to 100
Collector-emitter saturation voltage*			
$I_C = 10$ A; $I_B = 2$ A	V_{CEsat}	typ.	1,6 V
Transition frequency at f = 100 MHz*			
$-I_E = 3{,}5$ A; $V_{CB} = 25$ V	f_T	typ.	575 MHz
$-I_E = 10$ A; $V_{CB} = 25$ V	f_T	typ.	600 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 25$ V	C_c	typ.	155 pF
Feedback capacitance at f = 1 MHz			
$I_C = 50$ mA; $V_{CE} = 25$ V	C_{re}	typ.	88 pF
Collector-flange capacitance	C_{cf}	typ.	4,5 pF

* Measured under pulse conditions: $t_p > 300\ \mu s$; $\delta < 0{,}02$.

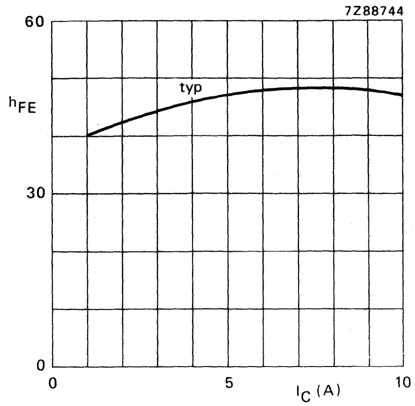


Fig. 4 V_{CE} = 25 V; T_j = 25 °C.

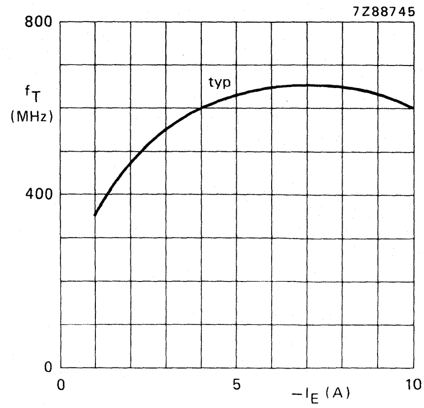


Fig. 5 V_{CB} = 25 V; f = 100 MHz; T_j = 25°C.

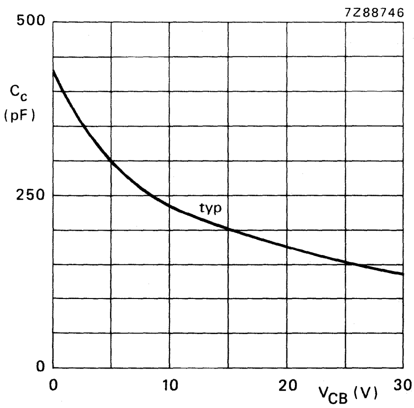


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter class-B circuit)
f = 175 MHz; T_h = 25 °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

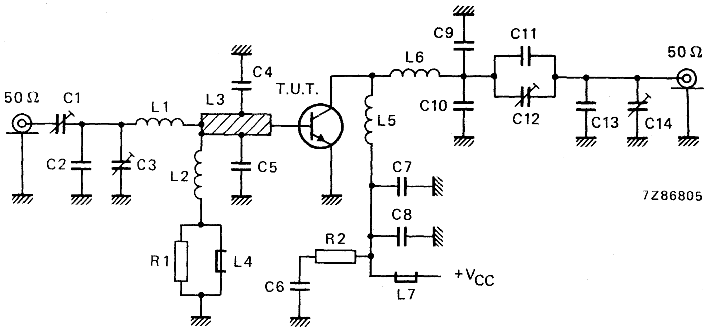


Fig. 7 Class-B test circuit at f = 175 MHz.

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 (± 10%) carbon resistor (0,25 W)

* American Technical Ceramics capacitors or capacitors of same quality.

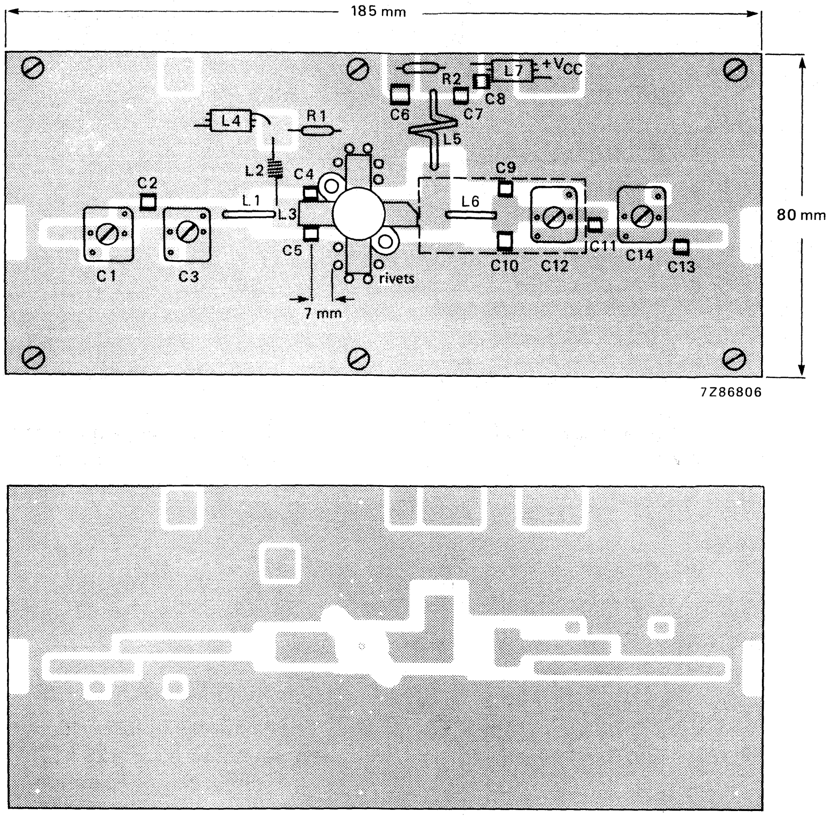


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Fig. 8 Component layout and printed-circuit board for 175 MHz.

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.

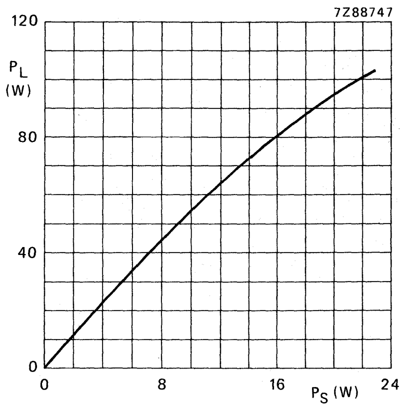


Fig. 9 Load power as a function of source power.

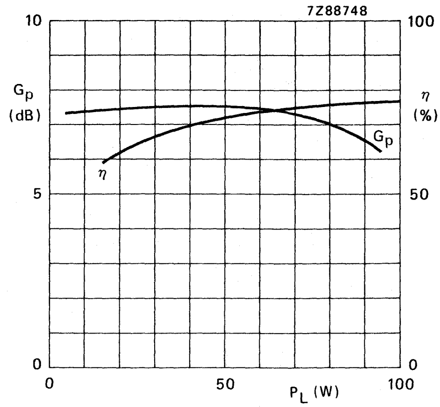


Fig. 10 Power gain and efficiency as a function of load power.

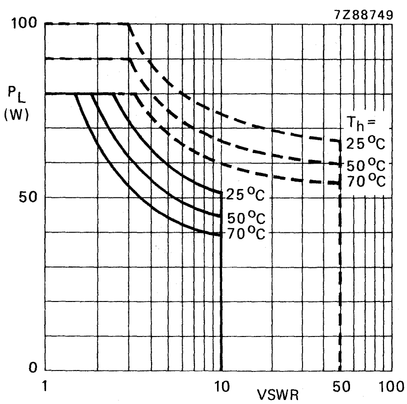


Fig. 11 R.F. SOAR at V_{CE} = 28 V.
——— f > 1 MHz (continuous);
- - - - short time operation during mismatch (f > 1 MHz).

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.

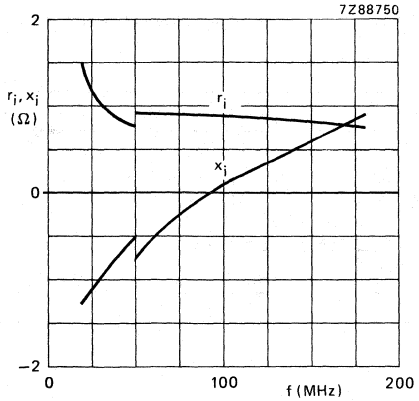


Fig. 12 Input impedance (series components).

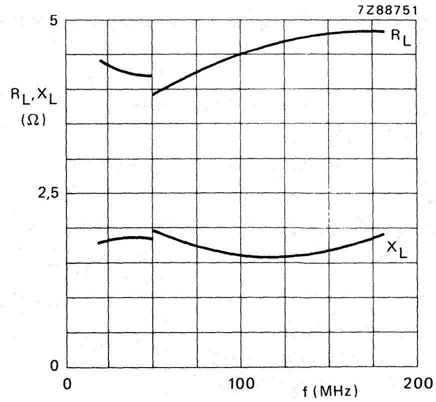


Fig. 13 Load impedance (series components).

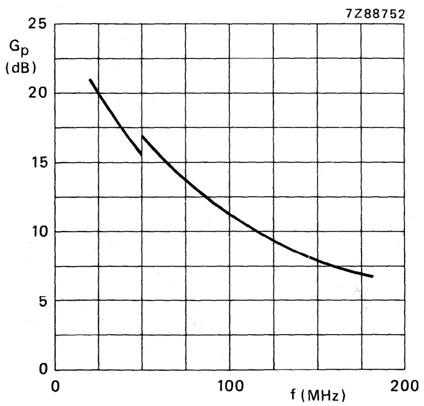


Fig. 14 Power gain as a function of frequency.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 28 V; P_L = 80 W; T_h = 25 °C; class-B operation.

OPERATING NOTE for Figs 12, 13 and 14:

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.

UHF linear push-pull power transistor — BLV857

FEATURES

- Internal input matching for an optimum wideband capability and high gain
- Polysilicon emitter ballasting resistors for an optimum temperature profile
- Gold metallization ensures excellent reliability.

APPLICATION

- Common emitter class-A operation in linear transposers/transmitters (television) in the 470 to 860 MHz frequency band.

DESCRIPTION

NPN silicon planar epitaxial transistor with two sections in push-pull configuration. The device is encapsulated in a SOT324B 4-lead rectangular flange package with a ceramic cap. The common emitters are connected to the flange.

PINNING SOT324B

PIN	DESCRIPTION
1	collector 1
2	collector 2
3	base 1
4	base 2
5	emitter (connected to flange)

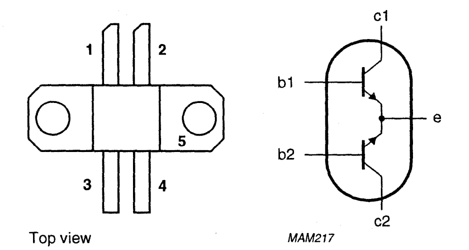


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common emitter push-pull test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)
CW class-A	860	25	2 × 1.1	10(1)	≥10(1)

Note

1. Three-tone test signal (−8, −16, or −7 dB), d_{im} = −51 dB.

WARNING
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	28	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C	collector current (DC)		–	7.4	A
$I_{C(AV)}$	average collector current		–	7.4	A
P_{tot}	total power dissipation	note 1	–	65	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting-base	P = 65 W; note 1	1.5	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting-base to heatsink	note 1	0.5	K/W

Note to Limiting values and Thermal characteristics

1. Total device; T_h = 70 °C; both sections equally loaded.

CHARACTERISTICS

Values apply to either transistor section; T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 15 mA; I_E = 0	60	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 30 mA; I_B = 0	28	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 0.6 mA; I_C = 0	3	–	–	V
I_{CBO}	collector-base leakage current	V_{CB} = 27 V	–	–	1.5	mA
I_{CEO}	collector-emitter leakage current	V_{CE} = 20 V	–	–	3	mA
h_{FE}	DC current gain	V_{CE} = 25 V; I_C = 1.1 A	30	–	100	–
C_c	collector capacitance	V_{CE} = 25 V; $I_E = i_e$ = 0; f = 1 MHz	–	18	–	pF
C_{re}	feedback capacitance	V_{CE} = 25 V; I_C = 0; f = 1 MHz	–	11	–	pF

APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter class-A test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)	d_{im} (dB)
CW class-A	860	25	2 × 1.1	10	≥10(1)	<−51(1)

Note

1. Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), 0 dB corresponds to peak sync level.

Ruggedness in class-A operation

The BLV857 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases under the conditions: V_{CE} = 25 V; I_{CQ} = 2 × 1.1 A; T_h = 25 °C; $P_{o\ sync}$ = 10 W.

UHF linear push-pull power transistor BLV859

FEATURES

- Double internal input and output matching for an optimum wideband capability and high gain
- Polysilicon emitter ballasting resistors for an optimum temperature profile
- Gold metallization ensures excellent reliability.

APPLICATION

- Common emitter class-A operation in linear transposers/transmitters (television) in the 470 to 860 MHz frequency band.

DESCRIPTION

NPN silicon planar transistor with two sections in push-pull configuration. The device is encapsulated in a SOT262B 4-lead rectangular flange package, with two ceramic caps. It delivers a $P_{o\ sync}$ = 20 W in class-A operation at 860 MHz and a supply voltage of 25 V.

PINNING SOT262B

PIN	SYMBOL	DESCRIPTION
1	c1	collector 1
2	c2	collector 2
3	b1	base 1
4	b2	base 2
5	e	emitter

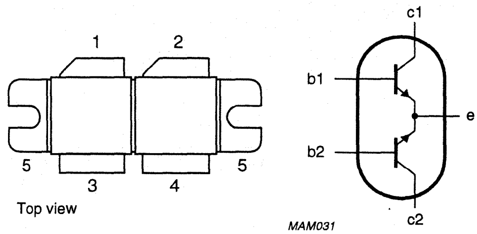


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common emitter push-pull test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)	ΔG_p (dB)
CW class-A	860	25	2 × 2.25	≥20(1)	≥10(1)	≤1(2)

Notes

1. Three-tone test signal (−8, −16 or −7 dB); d_{im} = −51 dB.
2. Single-tone test; P_L = 35 W.

WARNING
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	28	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	15	A
$I_{C(AV)}$	average collector current		–	15	A
P_{tot}	total power dissipation	note 1	–	130	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting-base	P = 130 W; note 1	0.85	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting-base to heatsink	note 1	0.15	K/W

Note to Limiting values and Thermal characteristics

1. Total device; T_h = 70 °C; both sections equally loaded.

CHARACTERISTICS

Values apply to either transistor section; T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 30 mA; I_E = 0	60	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 60 mA; I_B = 0	28	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 1.2 mA; I_C = 0	2.5	–	–	V
I_{CBO}	collector-base leakage current	V_{CB} = 27 V; V_{BE} = 0	–	–	3	mA
I_{CEO}	collector-emitter leakage current	V_{CE} = 20 V	–	–	6	mA
h_{FE}	DC current gain	V_{CE} = 25 V; I_C = 2.25 A	30	–	140	–
C_c	collector capacitance	V_{CE} = 25 V; I_E = i_e = 0; f = 1 MHz	–	36[(1)]	–	pF
C_{re}	feedback capacitance	V_{CE} = 25 V; I_C = 0; f = 1 MHz	–	22	–	pF

Note

1. The value of C_c is that of the die only; it is not measurable, because of the internal matching network.

APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter class-A test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\,sync}$ (W)	G_p (dB)	d_{im} (dB)	P_L (W)
CW class-A	860	25	2 × 2.25	≥20(1)	≥10(1)	≤–51(1)	≥35(3)
CW class-A	860	25	2 × 2.25	≥20(2)	≥10(2)	≤–54(2)	≥35(3)

Notes

1. Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), 0 dB corresponds to peak sync level.
2. Three-tone test method (vision carrier –8 dB, sound carrier –10 dB, sideband signal –16 dB), 0 dB corresponds to peak sync level.
3. Single-tone test method at 1 dB gain compression.

Ruggedness in class-A operation

The BLV859 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases under the conditions: V_{CE} = 25 V; I_{CQ} = 2 × 2.25 A; f = 860 MHz; T_h = 25 °C; $P_{o\,sync}$ = 10 W.

UHF linear push-pull power transistor | BLV862

FEATURES

- Double stage internal input and output matching networks for an optimum wideband capability and high gain
- Polysilicon emitter ballasting resistors for an optimum temperature profile
- Gold metallization ensures excellent reliability.

APPLICATION

- Common emitter class-AB operation in output stages in band 4 and 5 (470 to 860 MHz) TV transmitter amplifiers (vision or sound).

DESCRIPTION

NPN silicon planar epitaxial transistor with two sections in push-pull configuration. The device is encapsulated in a SOT262B 4-lead rectangular flange package, with two ceramic caps.

PINNING SOT262B

PIN	SYMBOL	DESCRIPTION
1	c1	collector 1
2	c2	collector 2
3	b1	base 1
4	b2	base 2
5	e	emitter

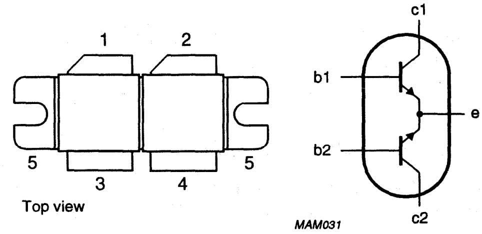


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common emitter configuration.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η (%)	ΔG_p (dB)
CW class-AB	860	28	150	≥8.5 typ. 10	≥45 typ. 53	≤1 typ. 0.5

WARNING
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	65	V
V_{CEO}	collector-emitter voltage	open base	–	30	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C	collector current (DC)		–	12.5	A
$I_{C(AV)}$	average collector current		–	12.5	A
P_{tot}	total power dissipation	note 1	–	350	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting-base	P = 350 W; note 1	0.5	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting-base to heatsink	note 1	0.15	K/W

Note to Limiting values and Thermal characteristics

1. Total device; T_{mb} = 25 °C; both sections equally loaded.

CHARACTERISTICS

Values apply to either transistor section; T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 60 mA; I_E = 0	65	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 150 mA; I_B = 0	30	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 3 mA; I_C = 0	3	–	–	V
I_{CES}	collector leakage current	V_{CE} = 28 V; V_{BE} = 0	–	–	10	mA
h_{FE}	DC current gain	V_{CE} = 10 V; I_C = 4.5 A	30	–	100	–
Δh_{FE}	DC current gain ratio of both sections	V_{CE} = 10 V; I_C = 4.5 A	0.67	–	1.5	–
C_c	collector capacitance	V_{CE} = 28 V; I_E = i_e= 0; f = 1 MHz	–	75[1]	–	pF

Note

1. The value of C_c is that of the die only, it is not measurable because of the internal matching network.

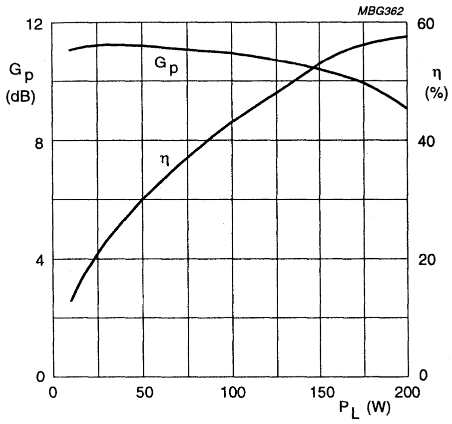
APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (mA)	P_L (W)	G_p (dB)	η (%)	ΔG_p (dB)
CW class-AB	860	28	2 × 400	150	≥8.5 typ. 10	≥45 typ. 53	≤1 typ. 0.5

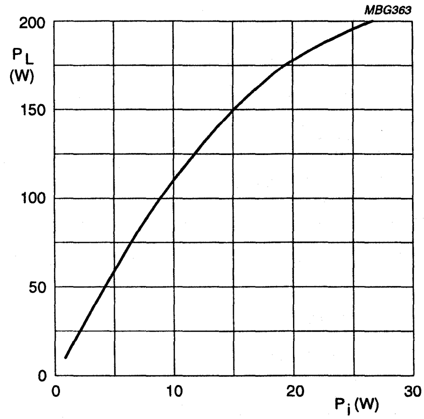
Ruggedness in class-AB operation

The BLV862 is capable of withstanding a load mismatch corresponding to VSWR = 2 : 1 through all phases under the conditions: V_{CE} = 28 V; I_{CQ} = 2 × 400 mA; f = 860 MHz; T_h = 25 °C; P_L = 150 W; $R_{th\ mb-h}$ = 0.15 K/W.



V_{CE} = 28 V.
I_{CQ} = 2 × 400 mA.
f = 850 MHz.

Fig.2 Power gain and efficiency as functions of load power; typical values.



V_{CE} = 28 V.
I_{CQ} = 2 × 400 mA.
f = 850 MHz.

Fig.3 Load power as a function of input power; 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

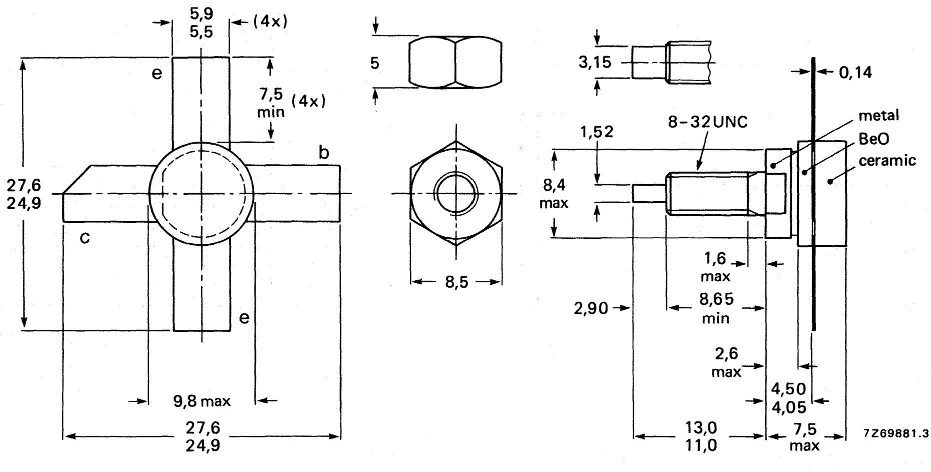
R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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

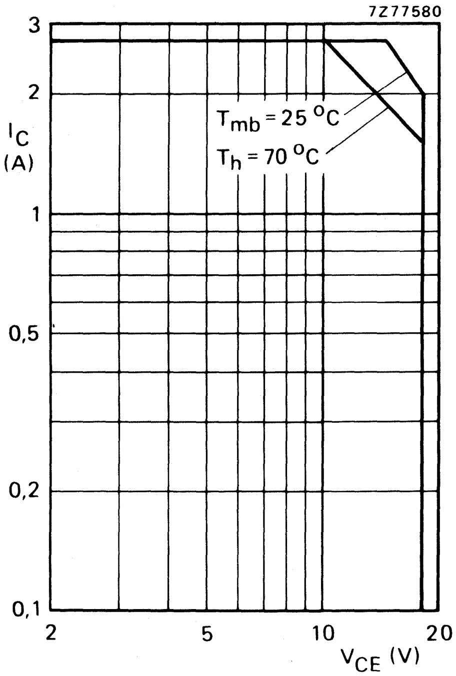


Fig. 2 D.C. SOAR.

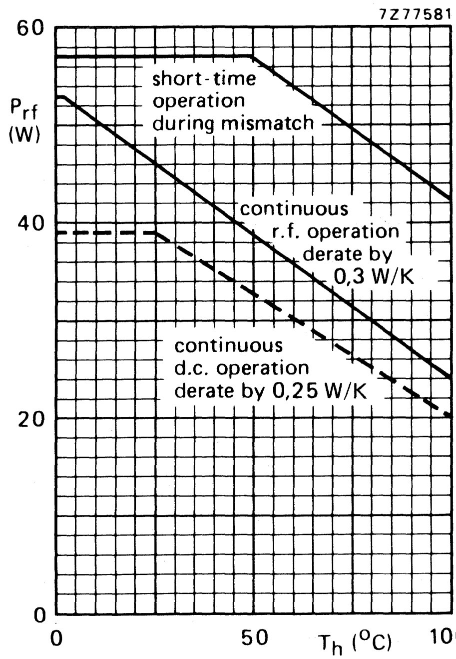


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 16,5$ V; f ⩾ 1 MHz.

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

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

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 15$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; $I_E = 5$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	5 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	4 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	4 mJ
D.C. current gain* $I_C = 1{,}75$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40
			10 to 80
Collector-emitter saturation voltage* $I_C = 5$ A; $I_B = 1$ A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz* $-I_E = 1{,}75$ A; $V_{CB} = 13{,}5$ V	f_T	typ.	900 MHz
$-I_E = 5$ A; $V_{CB} = 13{,}5$ V	f_T	typ.	825 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13{,}5$ V	C_c	typ.	43 pF
Feedback capacitance at f = 1 MHz $I_C = 100$ mA; $V_{CE} = 13{,}5$ V	C_{re}	typ.	27 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

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

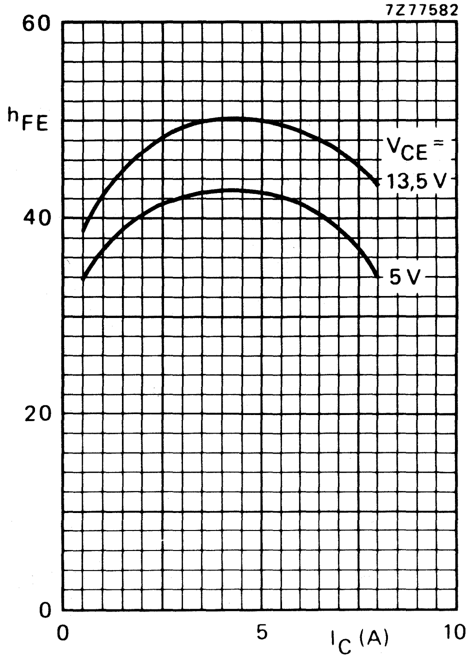


Fig. 4 Typical values; T_j = 25 °C.

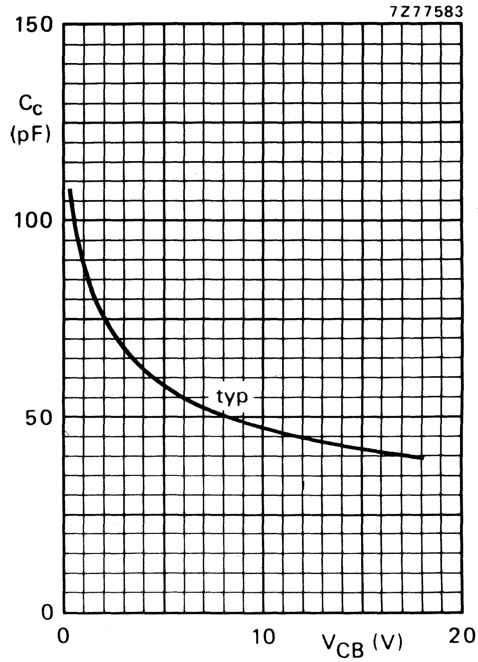


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

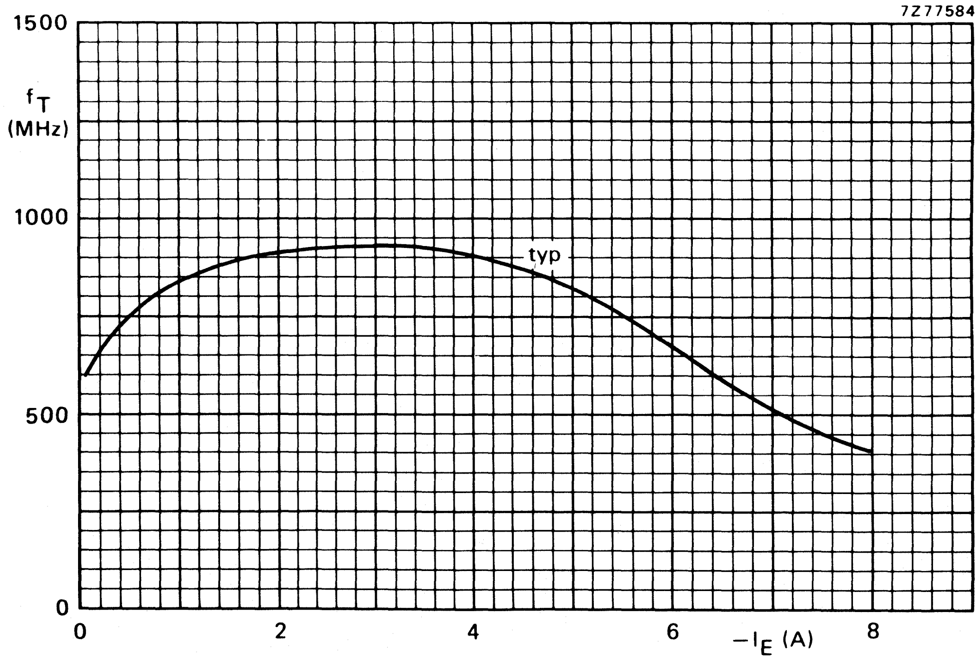


Fig. 6 V_{CB} = 13,5 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	–	–

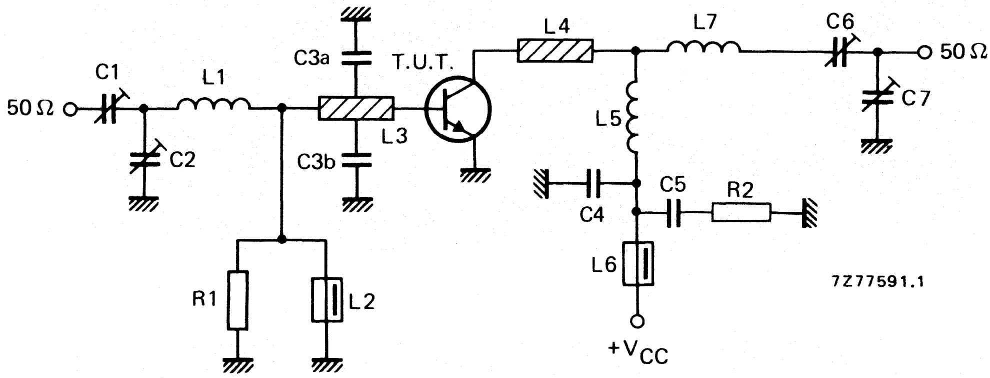


Fig. 7 Test circuit; c.w. class-B.

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 = ½ 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 = 4½ 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)

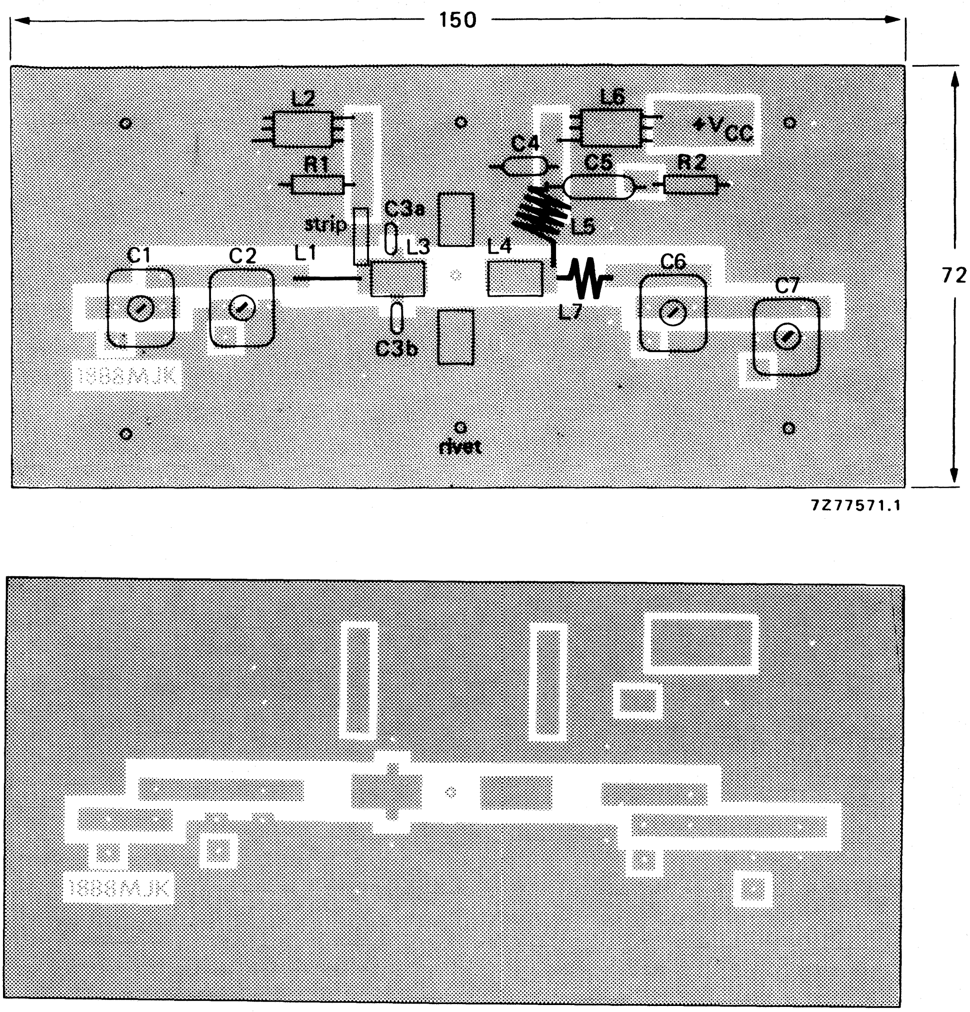


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

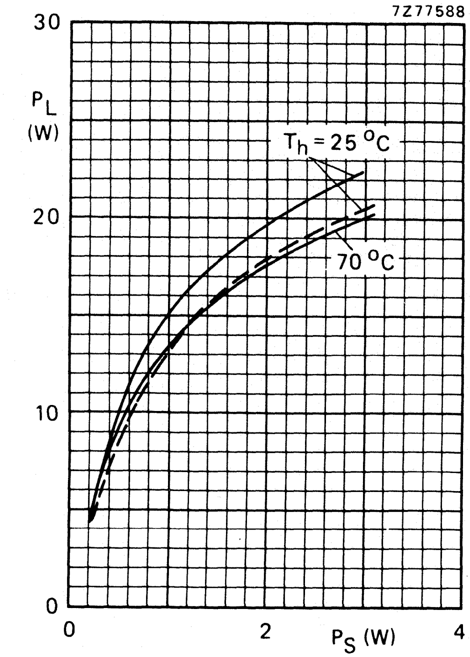


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

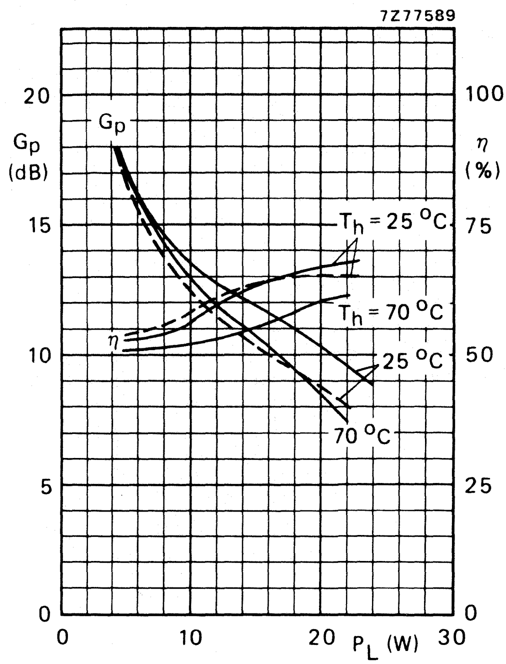


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

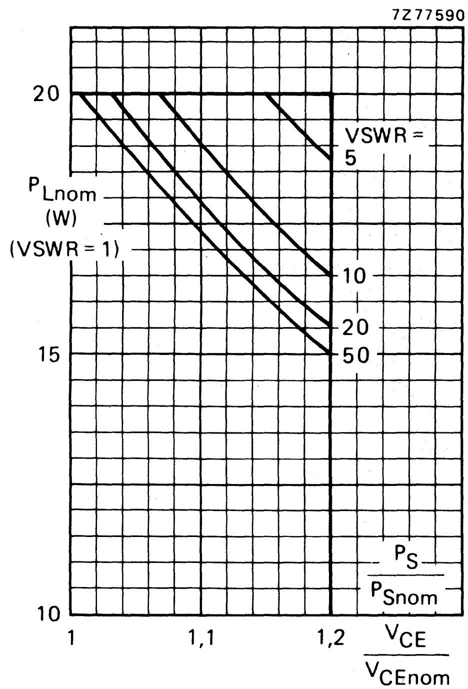


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,45 K/W ; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1

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

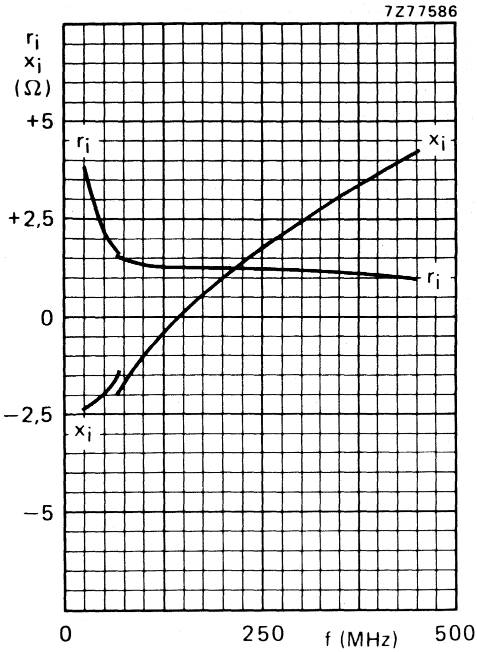


Fig. 12.

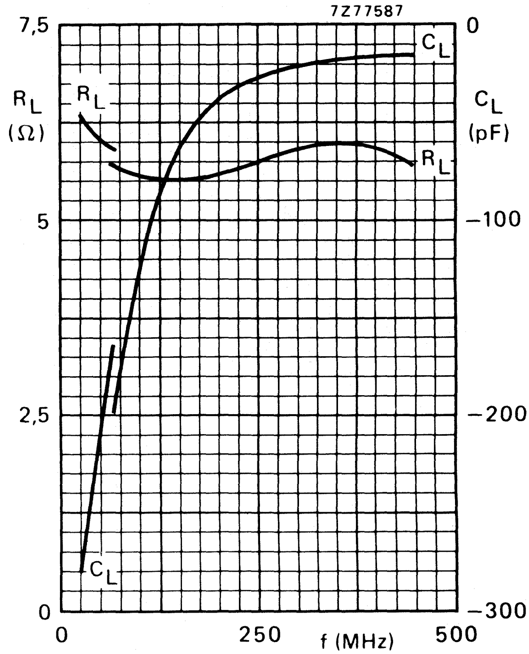
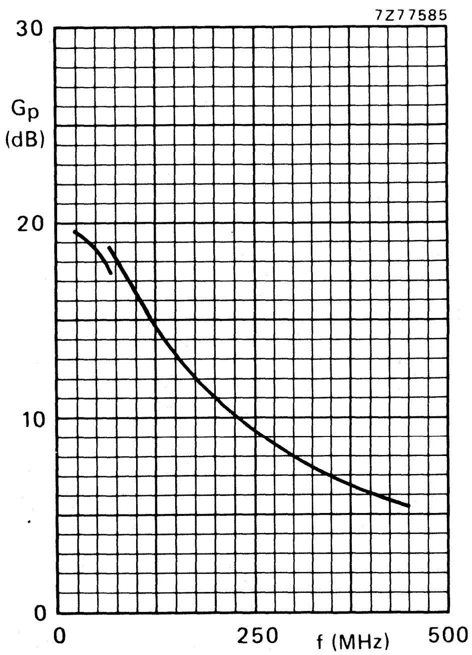


Fig. 13.



Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 15 W; T_h = 25 °C.

Fig. 14.

VHF power transistor BLW30

FEATURES

- Emitter-ballasting resistors for an optimum temperature profile
- Excellent reliability
- Withstands full load mismatch.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a 4-lead 3/8 inch SOT120 capstan envelope with a ceramic cap. It is designed for common emitter, class-B operation in mobile VHF transmitters with a supply voltage of 12.5 V. All leads are isolated from the stud.

PINNING - SOT120

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. class-B	175	12.5	30	> 10	> 55

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

PIN CONFIGURATION

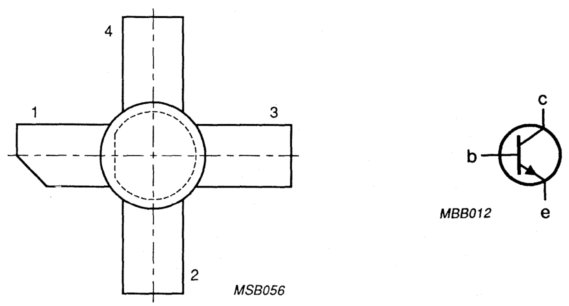
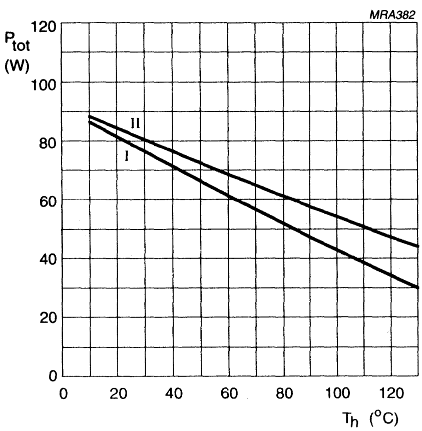


Fig.1 Simplified outline and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	36	V
V_{CEO}	collector-emitter voltage	open base	–	16	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C, $I_{C(AV)}$	collector current	DC or average value	–	6	A
I_{CM}	collector current	peak value f > 1 MHz	–	18	A
P_{tot}	total power dissipation	RF operation; f > 1 MHz; T_{mb} = 25 °C	–	100	W
T_{stg}	storage temperature range		–65	150	°C
T_j	junction operating temperature		–	200	°C



(I) Continuous RF operation (f > 1 MHz).

(II) Short time operation during mismatch (f > 1 MHz).

Fig.2 Power/temperature derating curve.

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j\text{-}mb(RF)}$	from junction to mounting base	P_{tot} = 100 W; T_{mb} = 25 °C	1.75	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink		0.45	K/W

CHARACTERISTICS

T_j = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 10 mA	36	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 25 mA	16	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 2 mA	3	–	–	V
I_{CES}	collector-emitter leakage current	V_{BE} = 0; V_{CE} = 16 V	–	–	10	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 4 A	25	35	–	
f_T	transition frequency	V_{CE} = 12.5 V; I_E = 4 A; f = 500 MHz	–	1.6	–	GHz
C_c	collector capacitance	V_{CB} = 12.5 V; $I_E = I_e$ = 0; f = 1 MHz	–	90	100	pF
C_{re}	feedback capacitance	V_{CE} = 12.5 V; I_C = 0; f = 1 MHz	–	60	70	pF
C_{c-s}	collector-stud capacitance	f = 1 MHz	–	2	–	pF

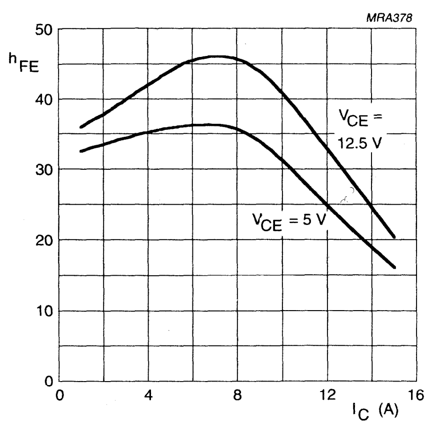
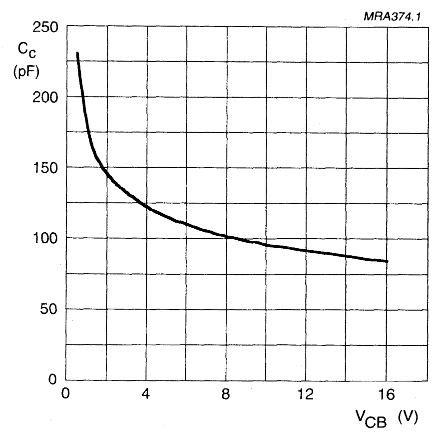
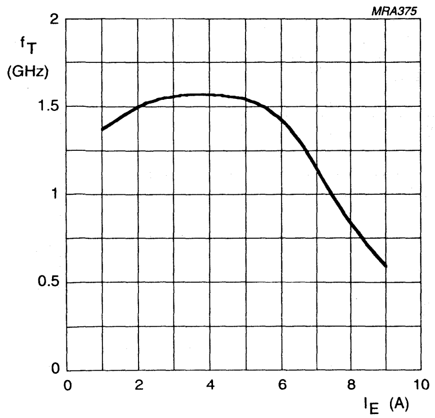


Fig.3 DC current gain as a function of collector current, typical values.



$I_E = i_e = 0$; f = 1 MHz.

Fig.4 Collector capacitance as a function of collector-base voltage, typical values.



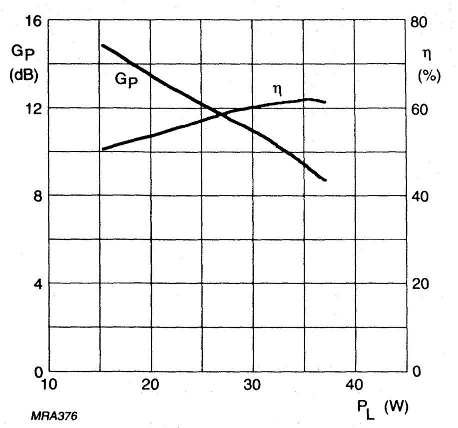
V_{CB} = 12.5 V.

Fig.5 Transition frequency as a function of emitter current, typical values.

APPLICATION INFORMATION

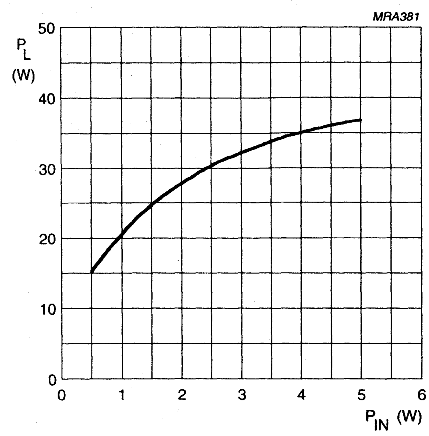
RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. class-B	175	12.5	30	> 10 typ. 11	> 55 typ. 60



Class-B operation; V_{CE} = 12.5 V; f = 175 MHz.

Fig.6 Gain and efficiency as functions of load power, typical values.



Class-B operation; V_{CE} = 12.5 V; f = 175 MHz.

Fig.7 Load power as a function of drive power, typical values.

Ruggedness in class-B operation

The BLW30 is capable of withstanding a full load mismatch corresponding to VSWR = 50:1 through all phases at rated output power, up to a supply voltage of 15.5 V, and f = 175 MHz.

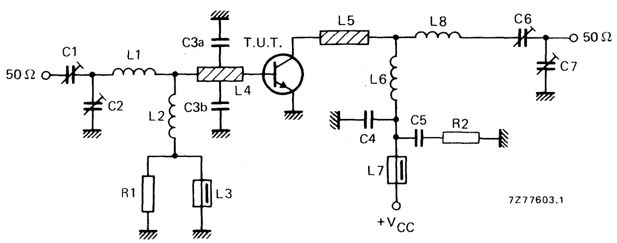


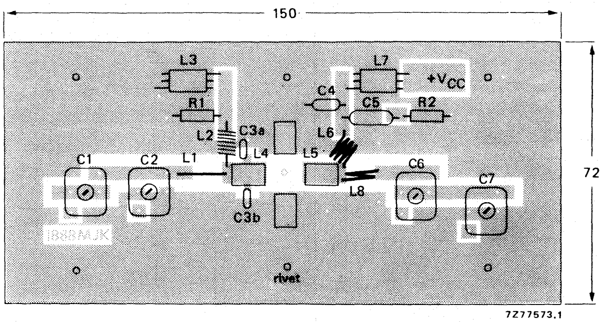
Fig.8 Class-B test circuit at f = 175 MHz.

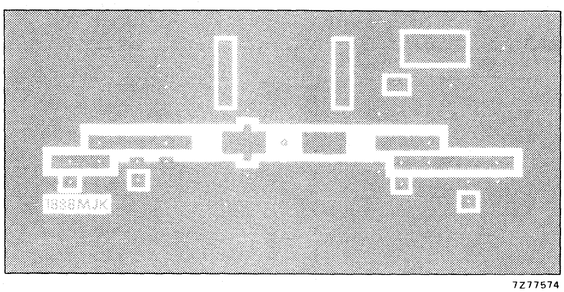
List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	2.5 to 20 pF		2222 809 07004
C2, C7	film dielectric trimmer	4 to 40 pF		2222 809 07008
C3a, C3b	500 V ceramic capacitor	47 pF		
C4	ceramic capacitor	120 pF		
C5	polyester capacitor	100 nF		
C6	film dielectric trimmer	7 to 100 pF		2222 809 07015
L1	½ turn enamelled 1.6 mm copper wire		int. dia. 6 mm; leads 2 x 5 mm	
L2	7 turns closely wound enamelled 0.5 mm copper wire	100 nH	int. dia. 3 mm; leads 2 x 5 mm	
L3, L7	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4, L5	stripline (note 1)		12 mm x 6 mm; note 2	
L6	3½ turns closely wound enamelled 1.6 mm copper wire		int. dia. 6 mm; leads 2 x 5 mm	
L8	1 turn enamelled 1.6 mm copper wire		int. dia. 6 mm; leads 2 x 5 mm	
R1, R2	0.25 W carbon resistor	10 Ω, 5%		

Notes

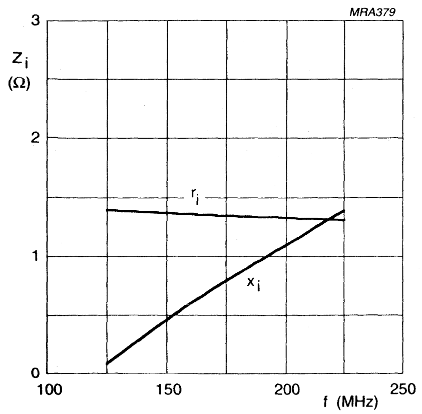
1. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric, thickness 1⁄16 inch.
2. Taps for capacitors C3a and C3b are situated 5 mm from the transistor.





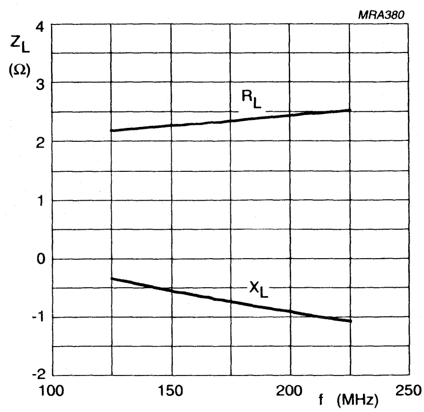
The circuit and components are situated on one side of an epoxy fibre-glass board; the other side is unetched and serves as a ground plane. Earth connections are made by means of hollow rivets and copper straps under the emitters, to provide a direct contact between the component side and the ground plane.

Fig.9 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.10 Input impedance (series components) as a function of frequency, typical values.



Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.11 Load impedance (series components) as a function of frequency, typical values.

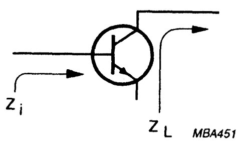
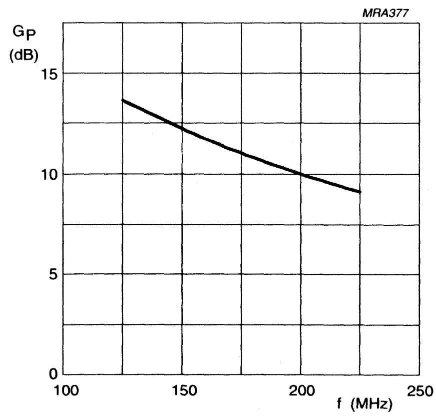


Fig.12 Definition of transistor impedance.



Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.13 Power gain as a function of frequency, 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 BFQ43 driver stage, the chain can deliver 28 W with a maximum drive power of 250 mW at 175 MHz. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

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

QUICK REFERENCE DATA

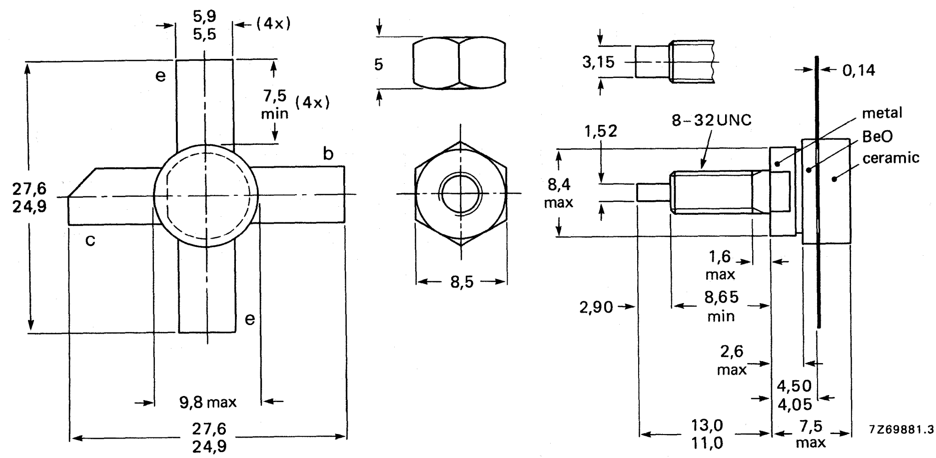
R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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

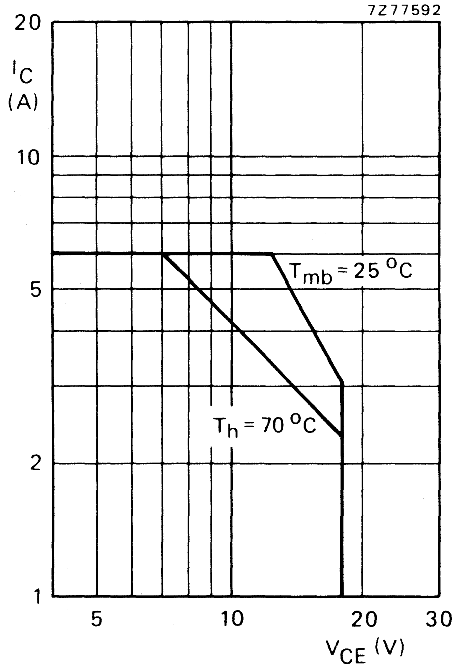


Fig. 2 D.C. SOAR.

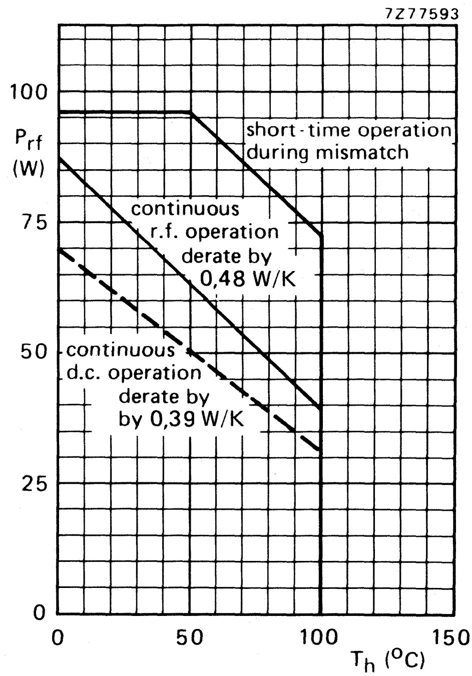


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; f ≥ 1 MHz.

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

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,4	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,85	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	8	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	8	mJ
D.C. current gain* $I_C = 3,5$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40 10 to 80	
Collector-emitter saturation voltage* $I_C = 10$ A; $I_B = 2$ A	V_{CEsat}	typ.	1,8	V
Transition frequency at f = 100 MHz* $-I_E = 3,5$ A; $V_{CB} = 13,5$ V	f_T	typ.	850	MHz
$-I_E = 10$ A; $V_{CB} = 13,5$ V	f_T	typ.	700	MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c	typ.	92	pF
Feedback capacitance at f = 1 MHz $I_C = 100$ mA; $V_{CE} = 13,5$ V	C_{re}	typ.	58	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

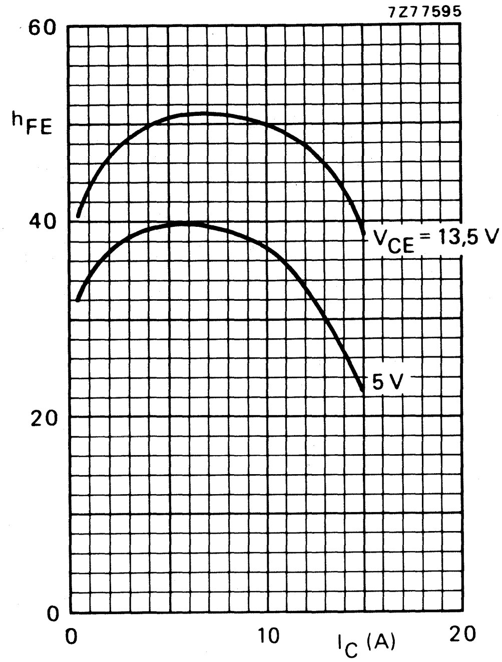


Fig. 4 Typical values; T_j = 25 °C.

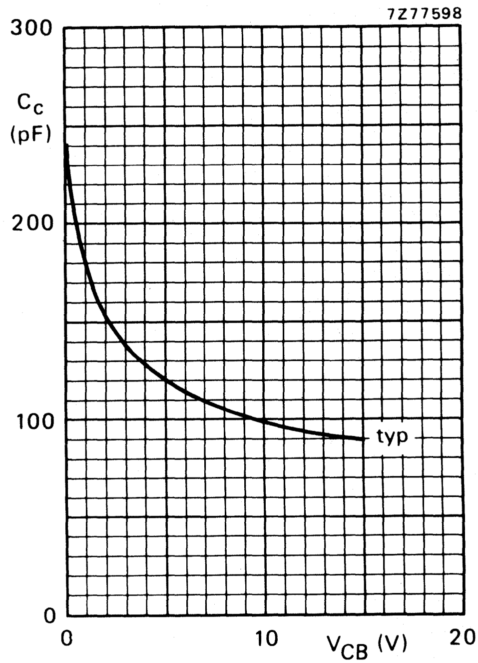


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

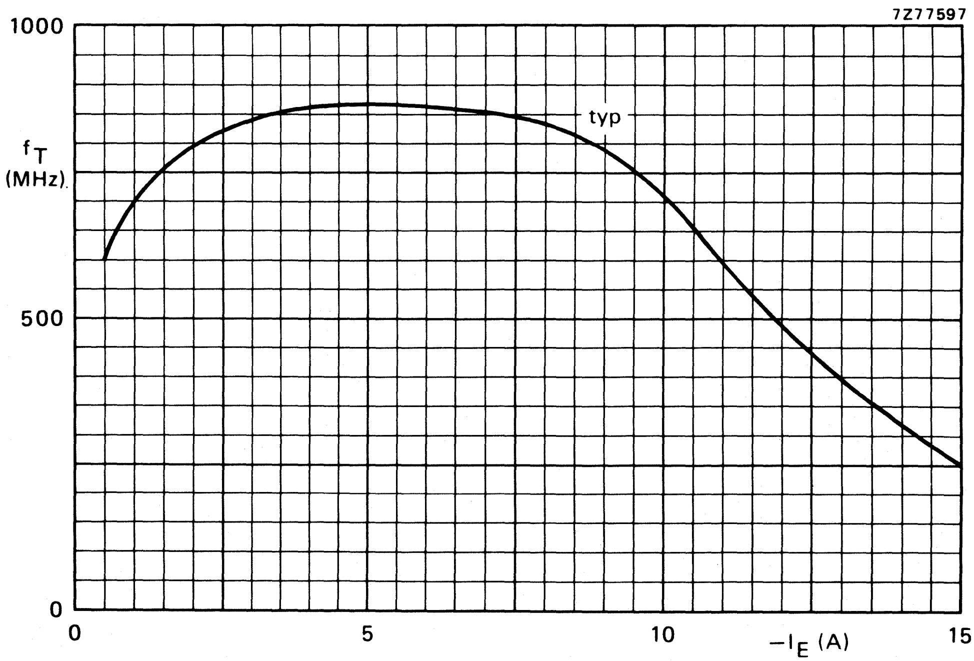


Fig. 6 V_{CB} = 13,5 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

$T_h = 25\ ^oC$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	–	–

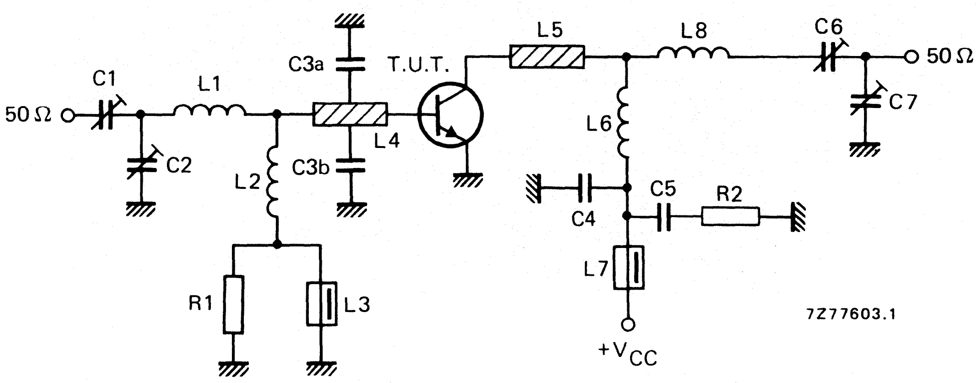


Fig. 7 Test circuit; c.w. class-B.

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)

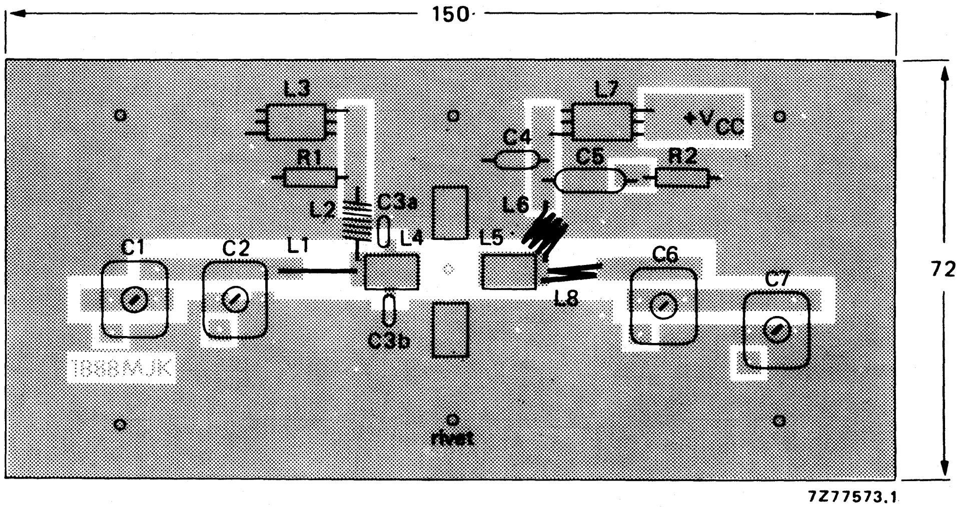
L1 = ½ turn Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from 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)



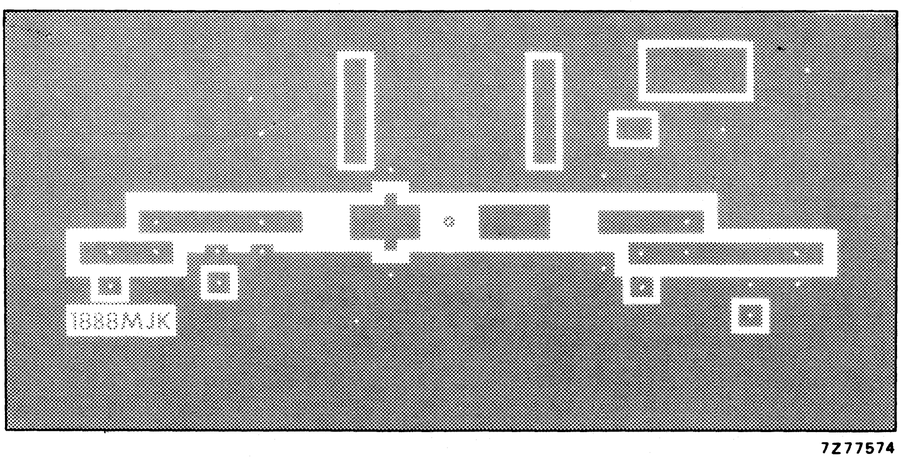


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

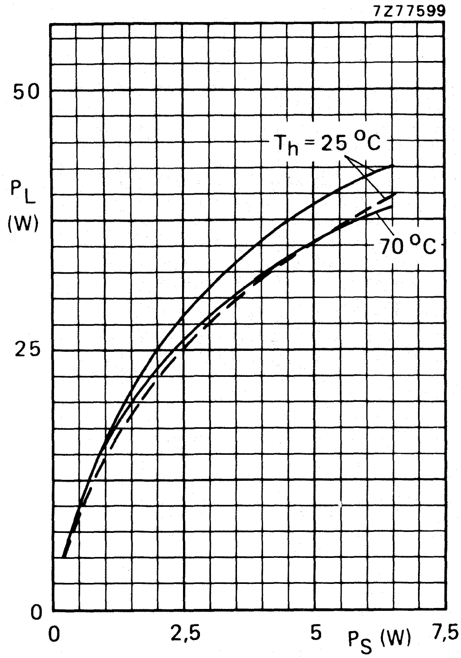


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

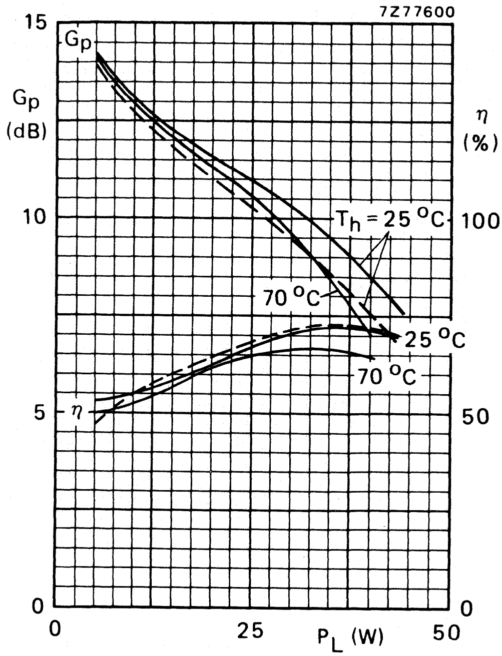


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

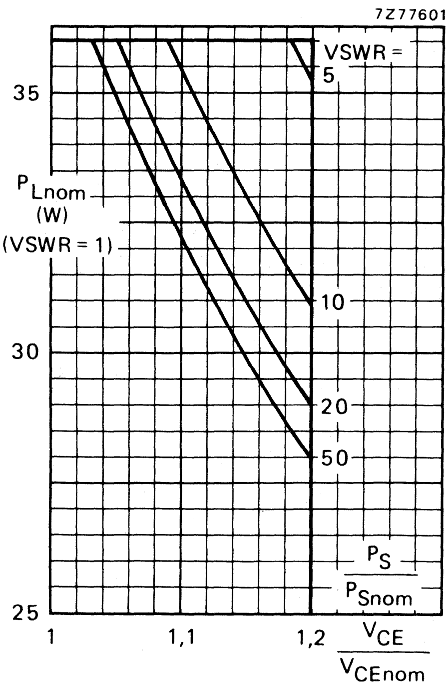


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,45 K/W; V_{CEnom} = 13,5 V or 12,5 V; P_S = P_{Snom} at V_{CEnom} and VSWR = 1

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

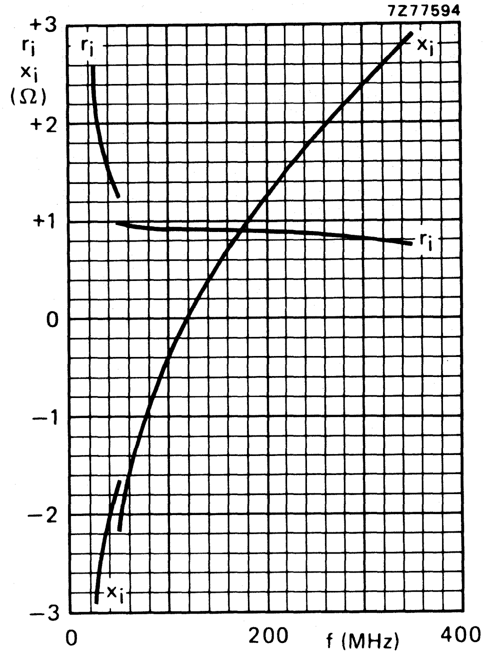


Fig. 12.

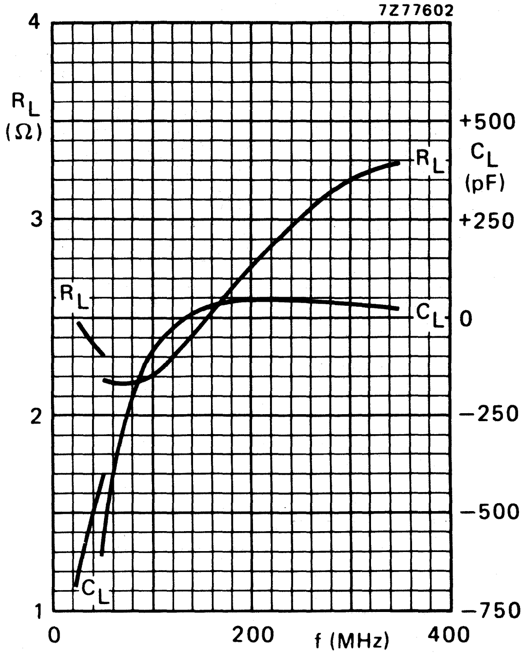
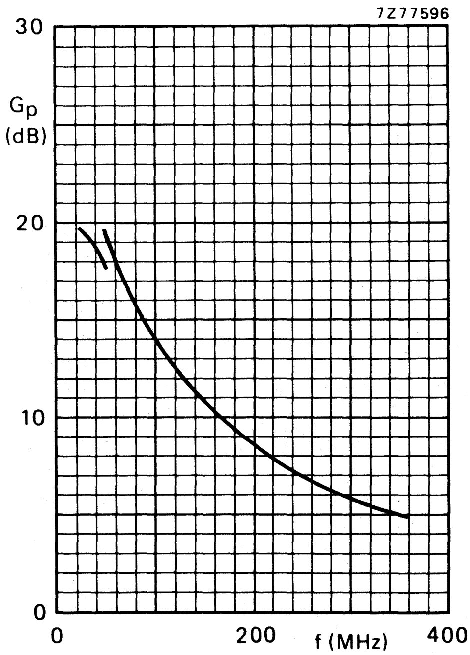


Fig. 13.



Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 13,5 V; P_L = 28 W;
T_h = 25 °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

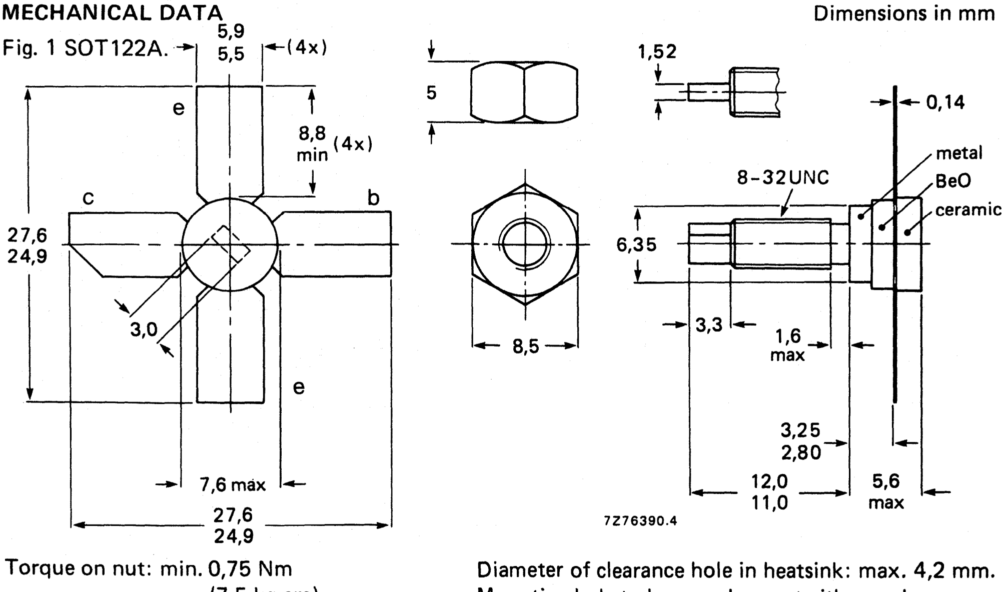
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im} * dB	$P_{o\ sync}$ * W	G_p dB
class-A; linear amplifier	860	25	150	70	−60	> 0,5	> 11
	860	25	150	25	−60	typ. 0,63	typ. 12,2

* 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

Dimensions in mm

Fig. 1 SOT122A.



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.

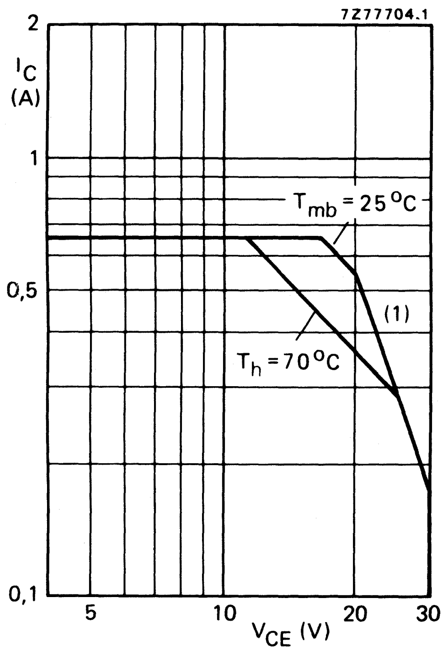
When locking is required an adhesive is preferred instead of a lock washer.

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.	50	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	max.	650	mA
(peak value); f > 1 MHz	I_{CM}	max.	1000	mA
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	10,8	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.

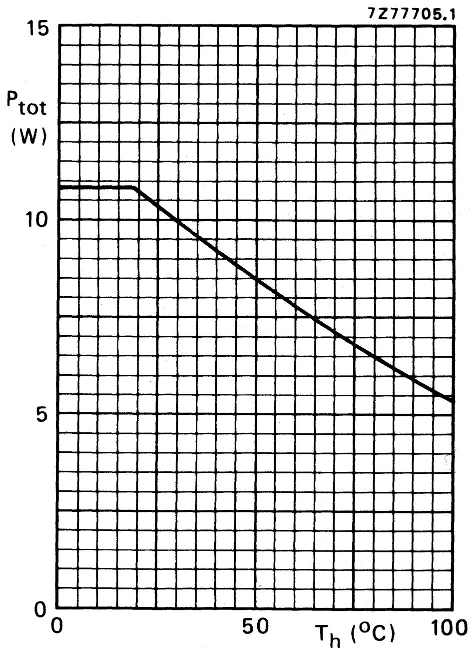


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 3,75 W; T_{mb} = 72,3 °C; i.e. T_h = 70 °C)	$R_{th\ j\text{-}mb}$	=	15,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

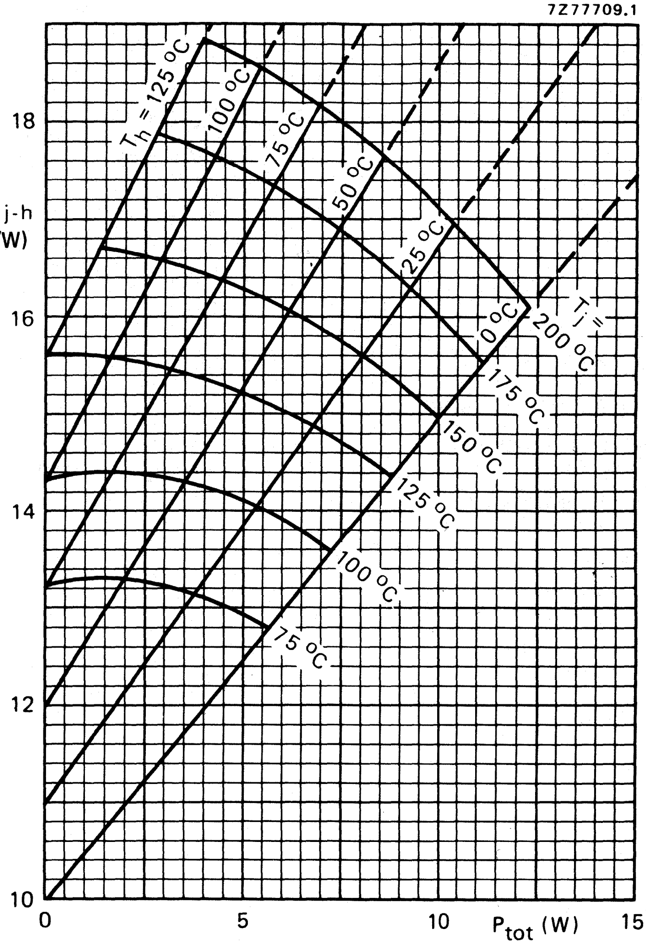


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\,mb\text{-}h}$ = 0,6 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 150 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\,j\text{-}h}$	max.	15,6	K/W
	T_j	max.	130	°C
Typical device:	$R_{th\,j\text{-}h}$	typ.	13,5	K/W
	T_j	typ.	120	°C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 2 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 15 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	0,5 mA
V_{BE} = 0; V_{CE} = 30 V; T_j = 175 °C	I_{CES}	<	1,2 mA
D.C. current gain *			
I_C = 150 mA; V_{CE} = 25 V	h_{FE}	> typ.	20 40
I_C = 150 mA; V_{CE} = 25 V; T_j = 175 °C	h_{FE}	<	120
Collector-emitter saturation voltage *			
I_C = 300 mA; I_B = 30 mA	V_{CEsat}	typ.	500 mV
Transition frequency at f = 500 MHz **			
$-I_E$ = 150 mA; V_{CB} = 25 V	f_T	typ.	3,5 GHz
$-I_E$ = 300 mA; V_{CB} = 25 V	f_T	typ.	3,4 GHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	3,7 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 25 V	C_{re}	typ.	1,9 pF
Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

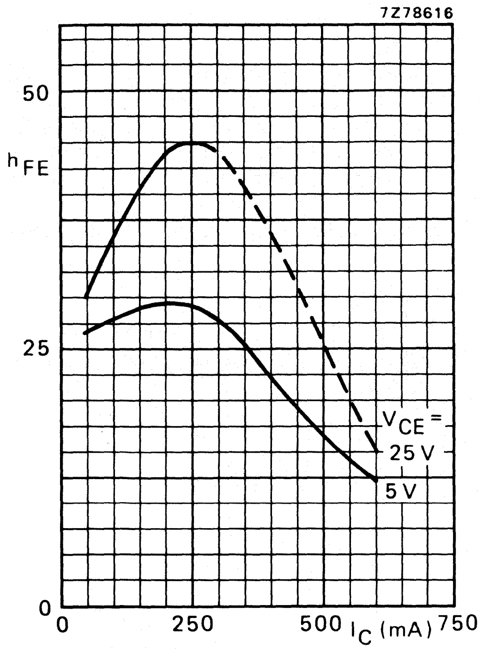


Fig. 5 Typical values; T_j = 25 °C.

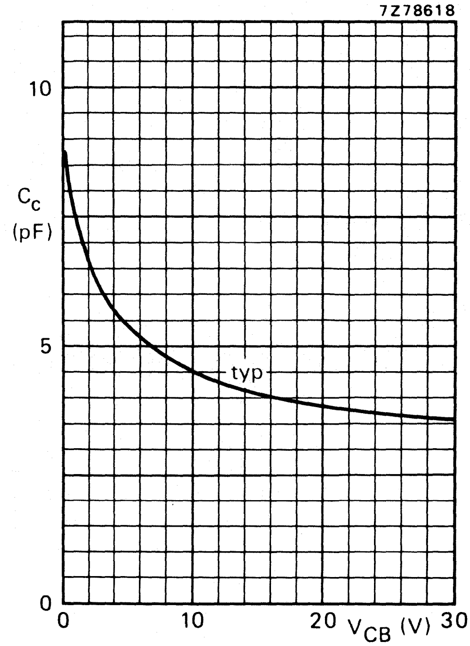


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

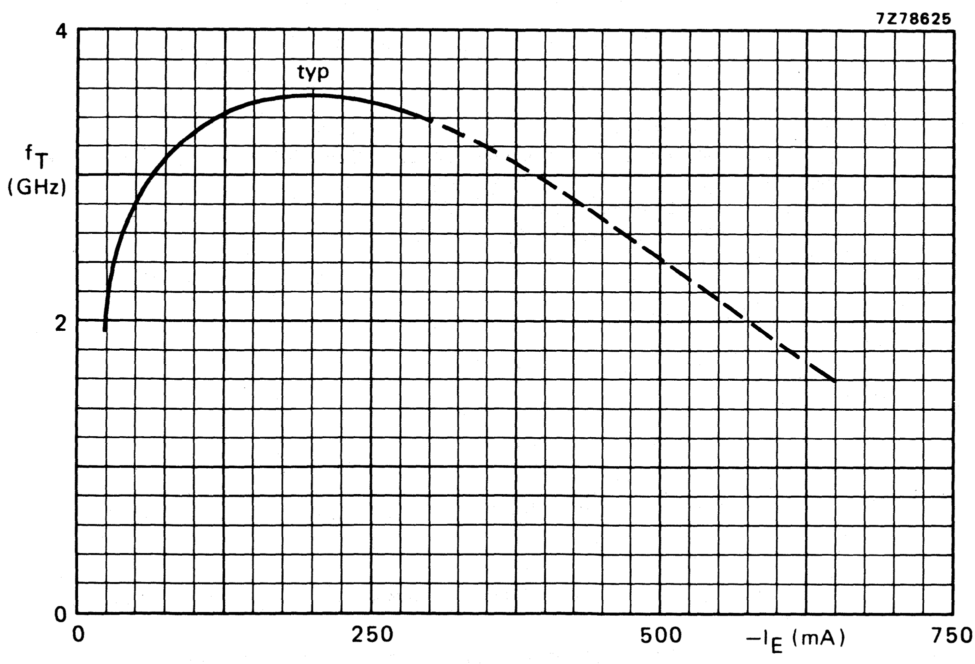


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im} (dB) *	$P_{o\,sync}$ (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.

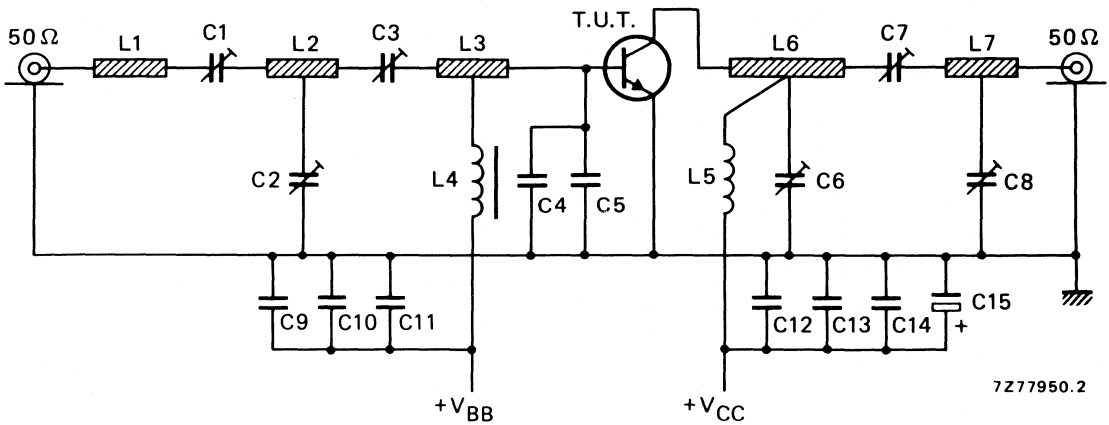


Fig. 8 Test circuit at f_{vision} = 860 MHz.

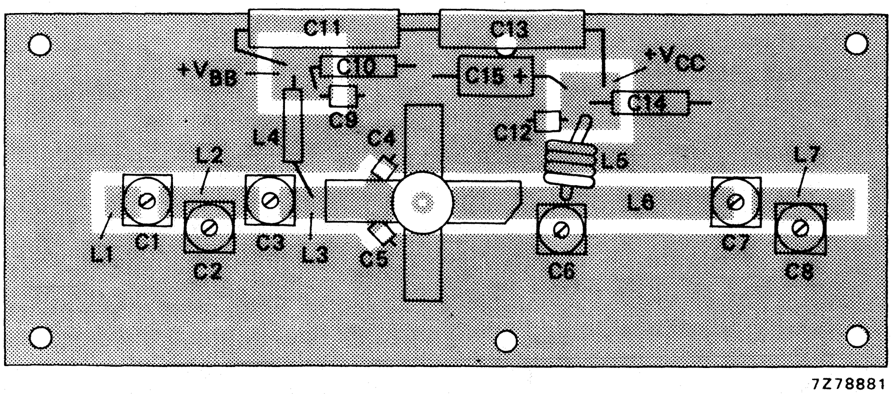
List of components:

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 μF/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 (ϵ_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.



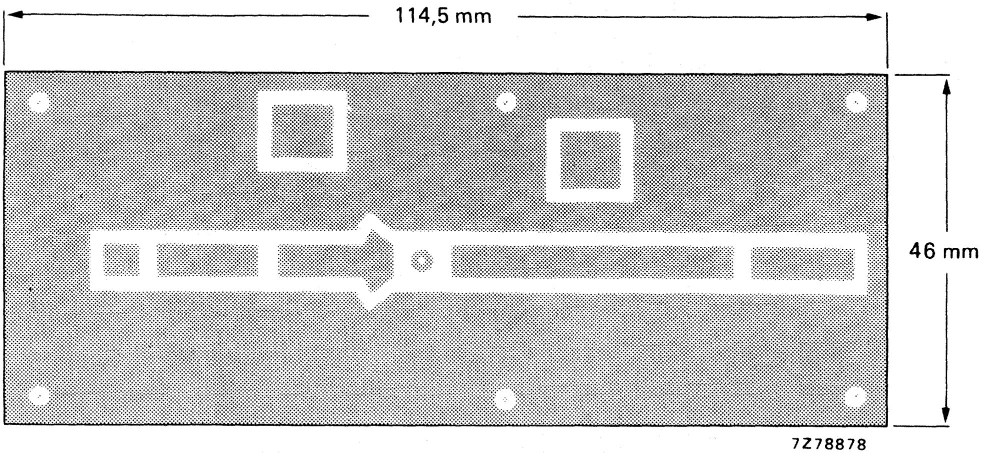


Fig. 9 Component layout and printed-circuit board for 860 MHz test circuit.

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.

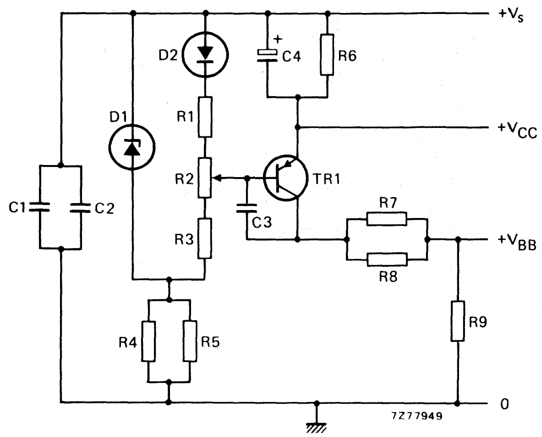


Fig. 10 Bias circuit for class-A amplifier at f_{vision} = 860 MHz.

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

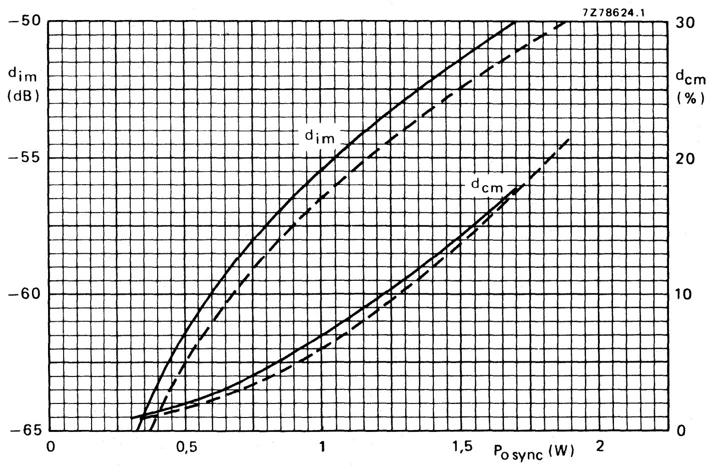


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; V_{CE} = 25 V; I_C = 150 mA; f_{vision} = 860 MHz; ––– T_h = 25 °C; —— T_h = 70 °C.

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.

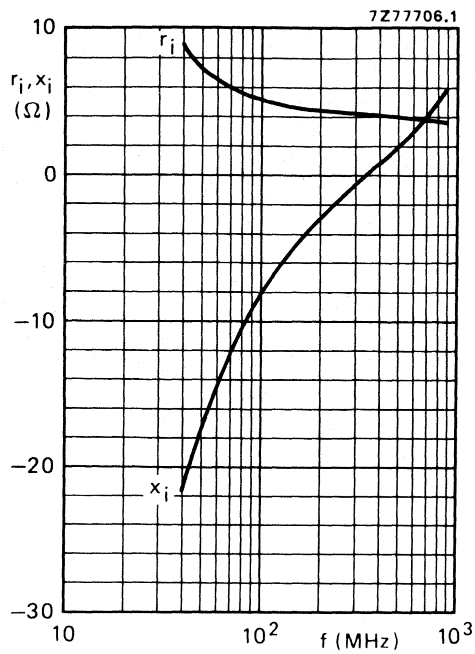


Fig. 12 Input impedance (series components).

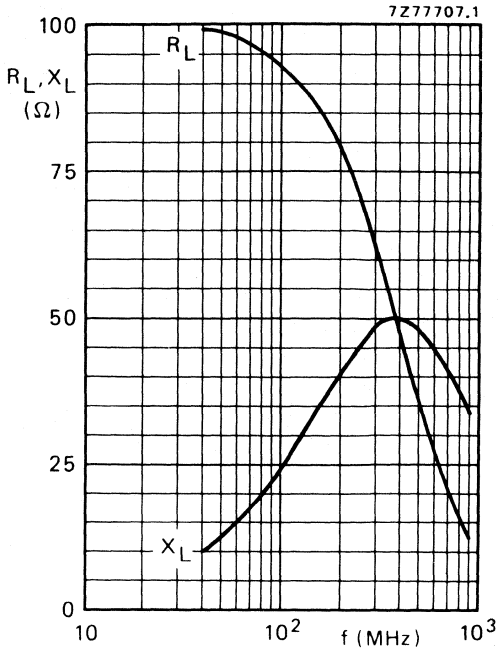


Fig. 13 Load impedance (series components).

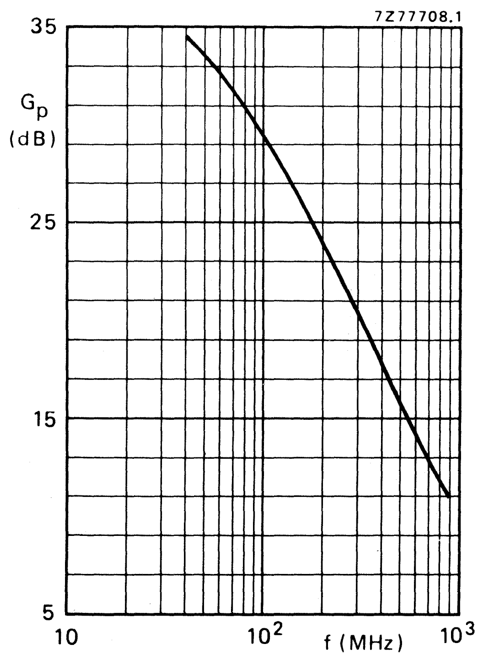


Fig. 14.

Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 25 V; I_C = 150 mA;
T_h = 70 °C.

Ruggedness

The BLW32 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 = 150 mA;
T_h = 70 °C and P_L = 1 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

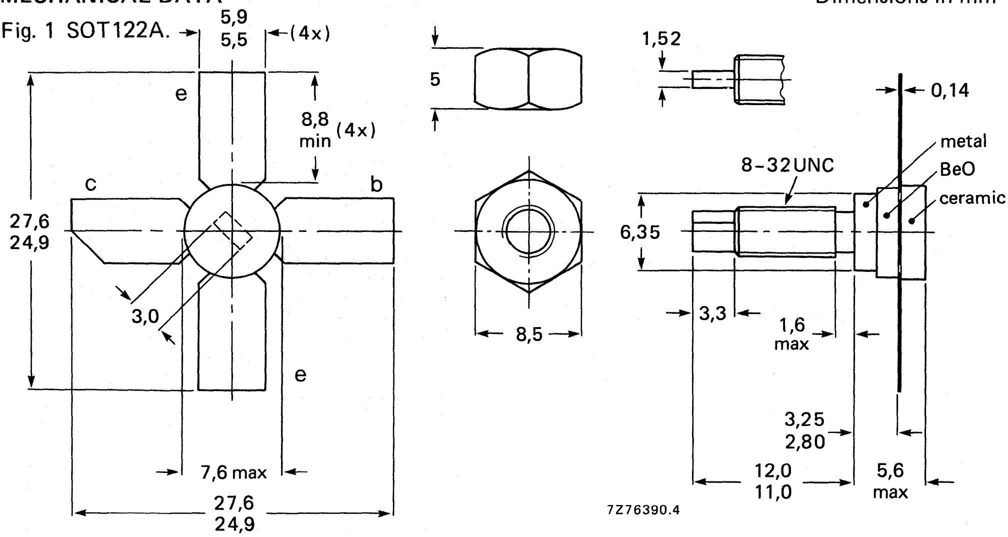
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im} * dB	$P_{o\ sync}$ * W	G_p dB
class-A; linear amplifier	860	25	300	70	−60	> 1,0	> 10,0
	860	25	300	25	−60	typ. 1,15	typ. 10,5

* 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 SOT122A.



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.

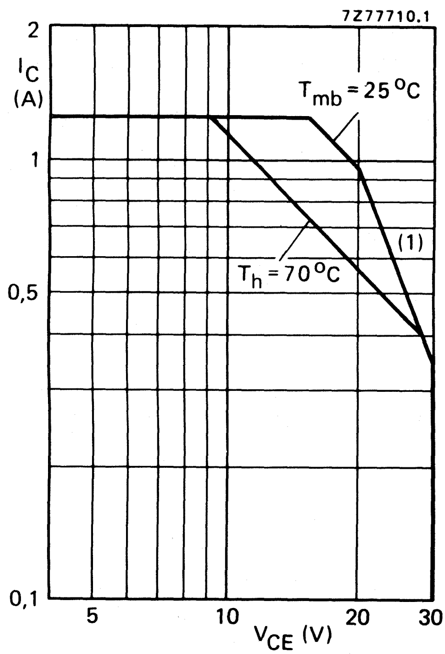
When locking is required an adhesive is preferred instead of a lock washer.

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.	50	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	max.	1,25	A
(peak value); $f > 1$ MHz	I_{CM}	max.	1,9	A
Total power dissipation up to $T_{mb} = 25\ ^oC$	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.

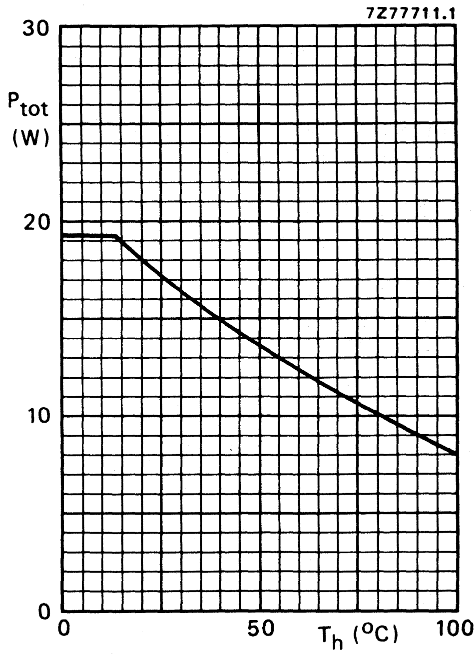


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 7,5 W; $T_{mb} = 74,5\ ^oC$; i.e. $T_h = 70\ ^oC$)	$R_{th\ j\text{-}mb}$	=	10,1	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

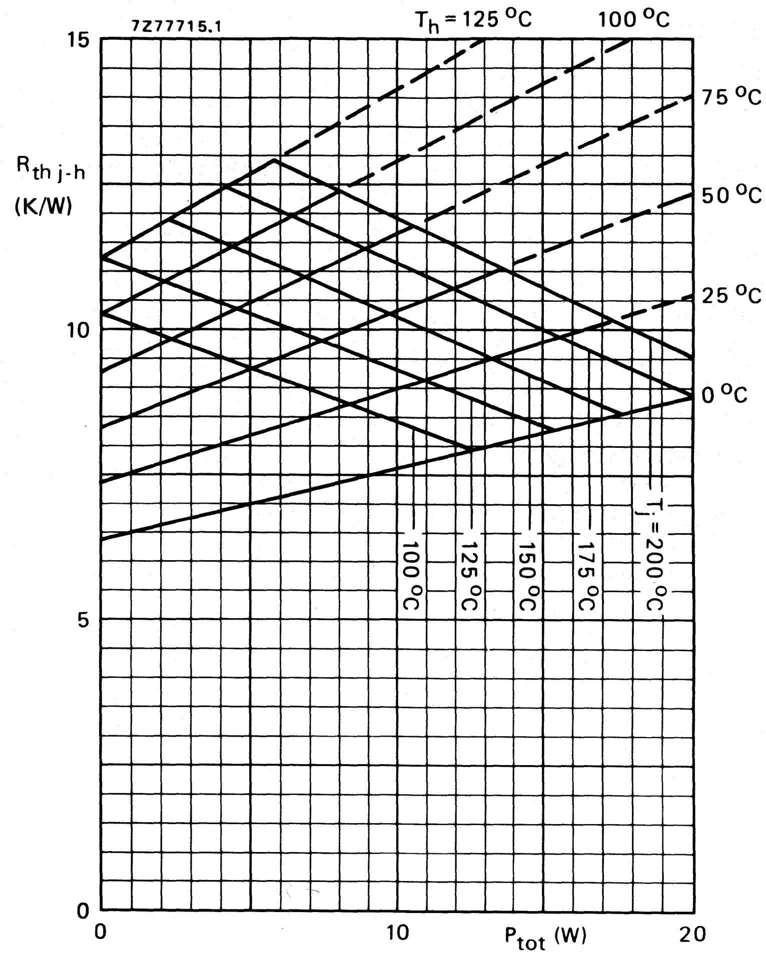


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h}$ = 0,6 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 300 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j-h}$	max.	10,7	K/W
	T_j	max.	150	°C
Typical device:	$R_{th\ j-h}$	typ.	8,25	K/W
	T_j	typ.	132	°C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 4 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 30 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	1,0 mA
V_{BE} = 0; V_{CE} = 30 V; T_j = 175 °C	I_{CES}	<	2,5 mA
D.C. current gain			
I_C = 300 mA; V_{CE} = 25 V	h_{FE}	>	20
		typ.	40
I_C = 300 mA; V_{CE} = 25 V; T_j = 175 °C	h_{FE}	<	120
Collector-emitter saturation voltage *			
I_C = 600 mA; I_B = 60 mA	V_{CEsat}	typ.	450 mV
Transition frequency at f = 500 MHz **			
$-I_E$ = 300 mA; V_{CB} = 25 V	f_T	typ.	3,4 GHz
$-I_E$ = 600 mA; V_{CB} = 25 V	f_T	typ.	3,1 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ.	6,6 pF
Feedback capacitance at f = 1 MHz			
I_C = 20 mA; V_{CE} = 25 V	C_{re}	typ.	3,5 pF
Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.

** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

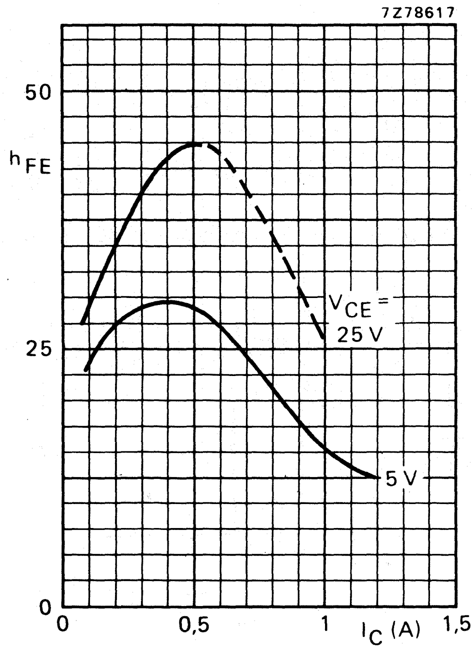


Fig. 5 Typical values; T_j = 25 °C.

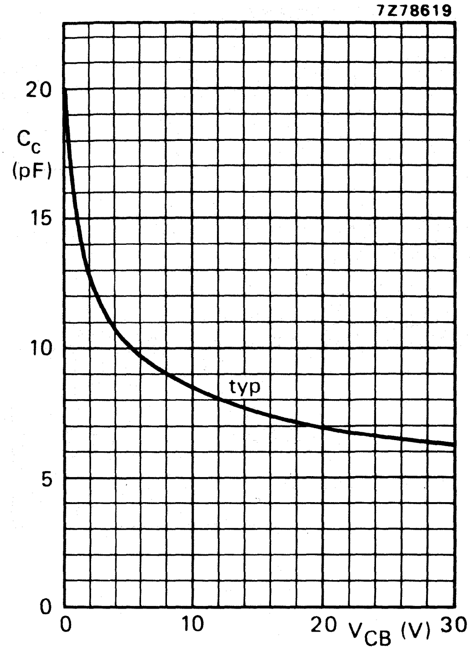


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

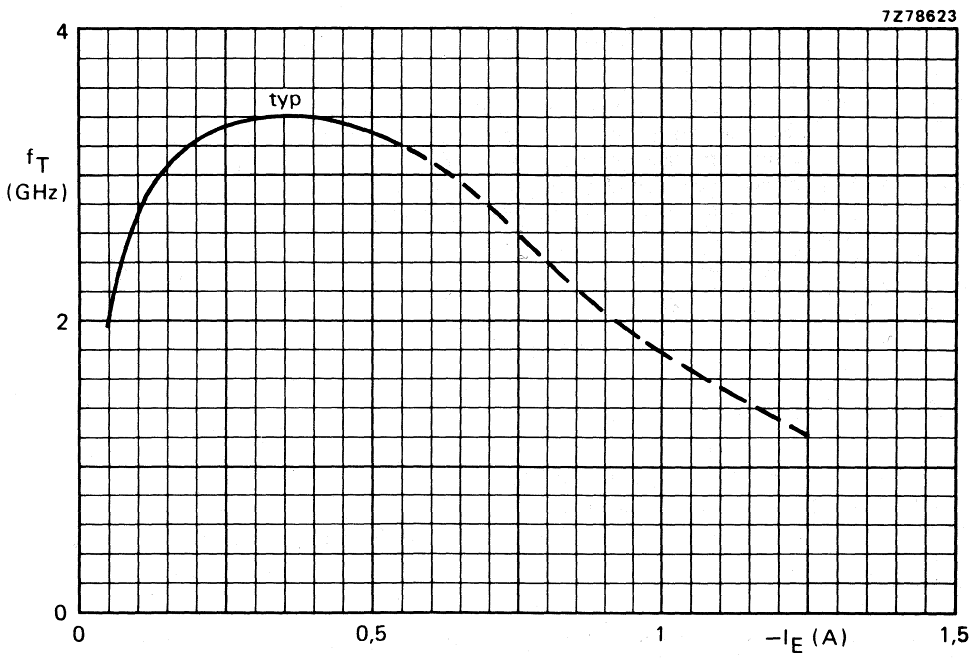


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im} (dB) *	$P_{o\,sync}$ (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.

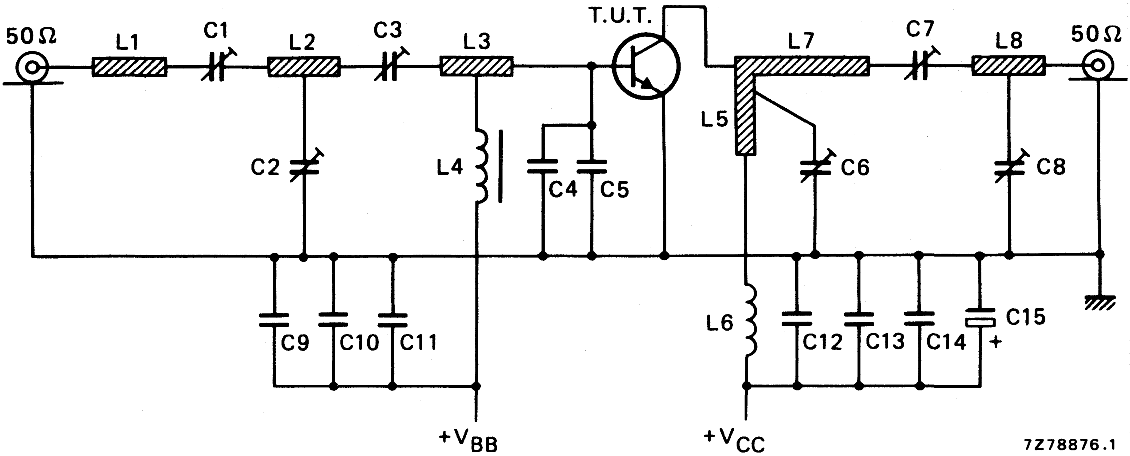


Fig. 8 Test circuit at f_{vision} = 860 MHz.

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 μF/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 (ϵ_r = 2,74); thickness 1/16″.

For bias circuit see Fig. 10.

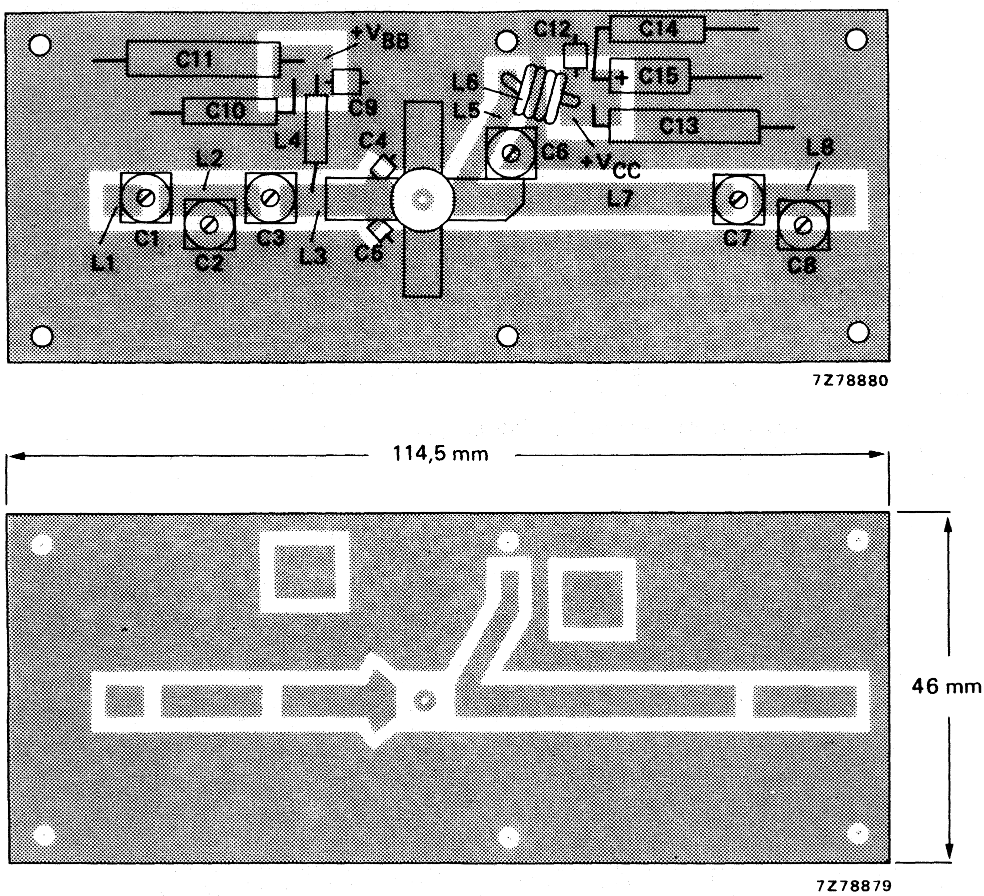
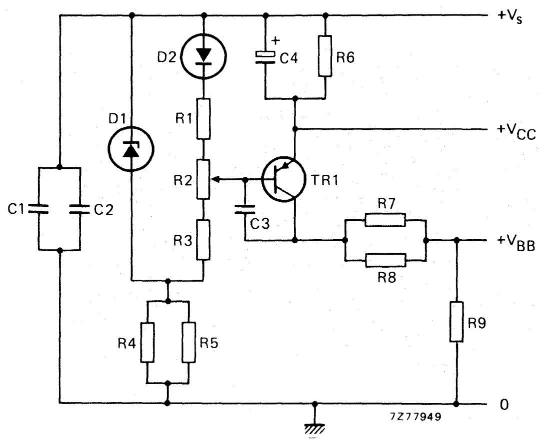


Fig. 9 Component layout and printed-circuit board for 860 MHz test circuit.

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_{vision} = 860 MHz.

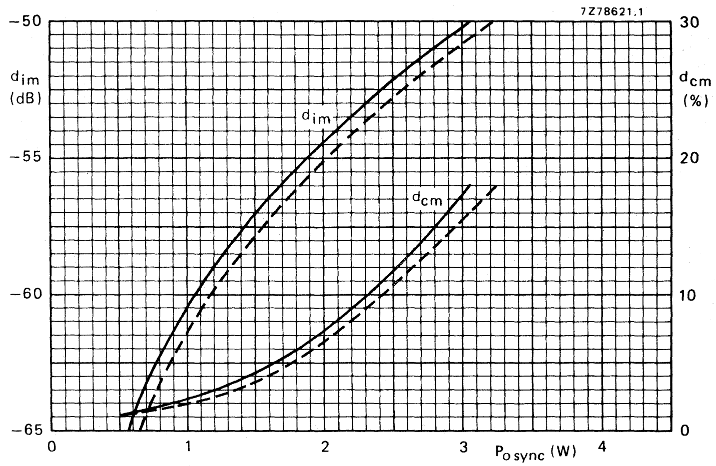


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; V_{CE} = 25 V; I_C = 300 mA; f_{vision} = 860 MHz; – – – T_h = 25 °C; —— T_h = 70 °C.

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.

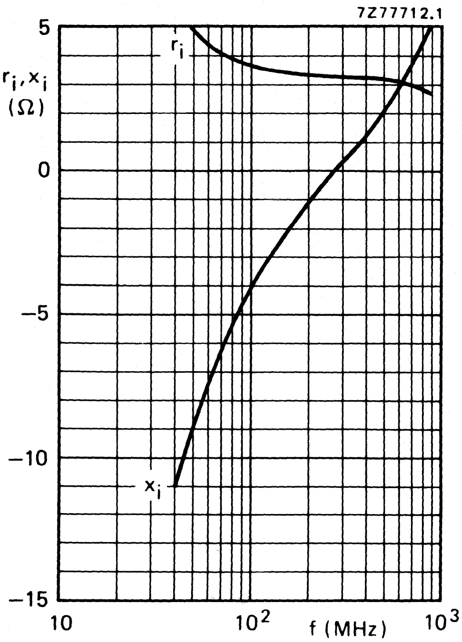


Fig. 12 Input impedance (series components).

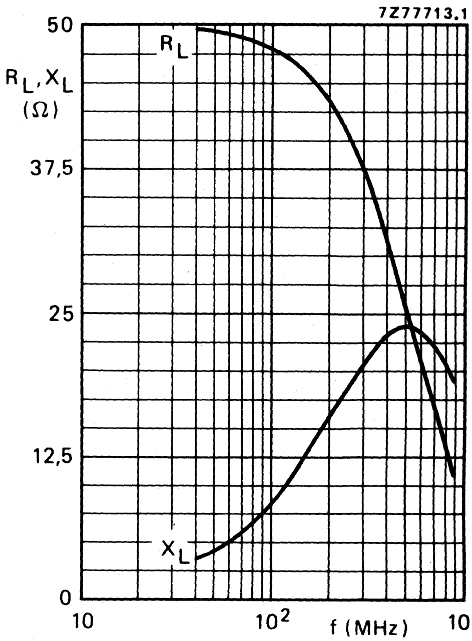


Fig. 13 Load impedance (series components).

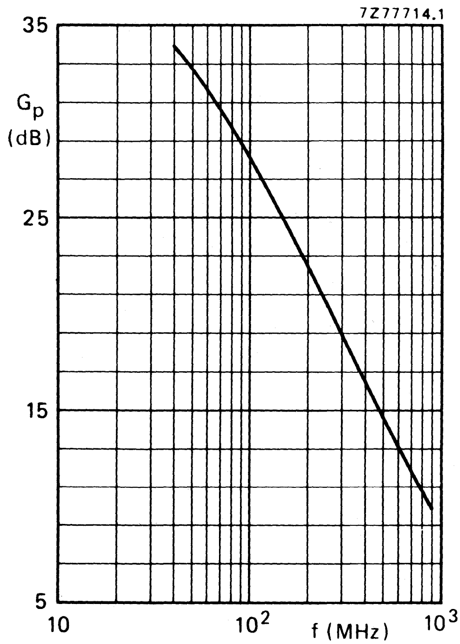


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 V; I_C = 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

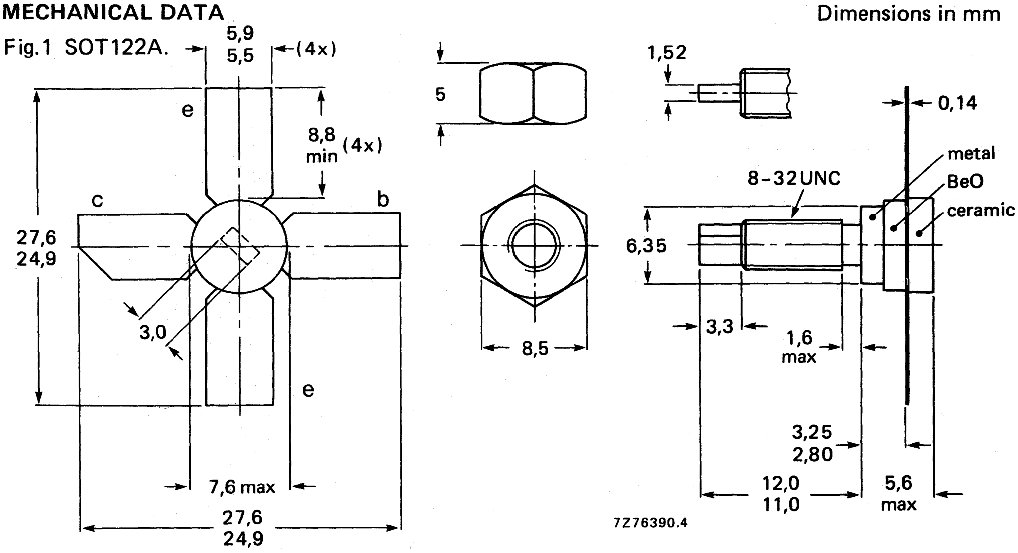
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im} * dB	$P_{o\ sync}$ * W	G_p dB
class-A; linear amplifier	860	25	600	70	−60	> 1,8	> 9
	860	25	600	25	−60	typ. 2,15	typ. 10,2

* 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

Dimensions in mm

Fig.1 SOT122A.



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.

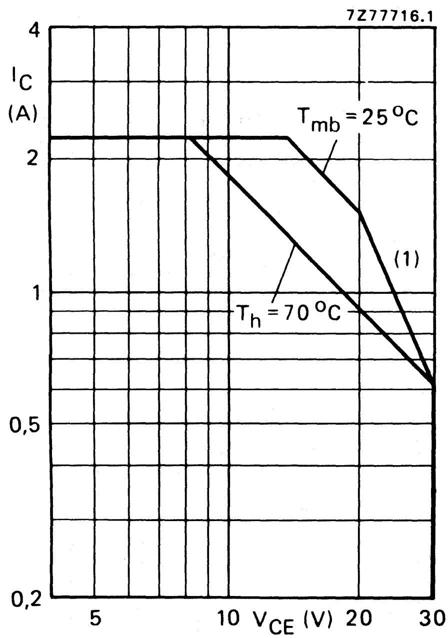
When locking is required an adhesive is preferred instead of a lock washer.

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.	50	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	max.	2,25	A
(peak value); f > 1 MHz	I_{CM}	max.	3,5	A
Total power dissipation at $T_{mb} = 25\ ^oC$	P_{tot}	max.	31	W
Storage temperature	T_{stg}		−65 to +150	^oC
Operating junction temperature	T_j	max.	200	^oC



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

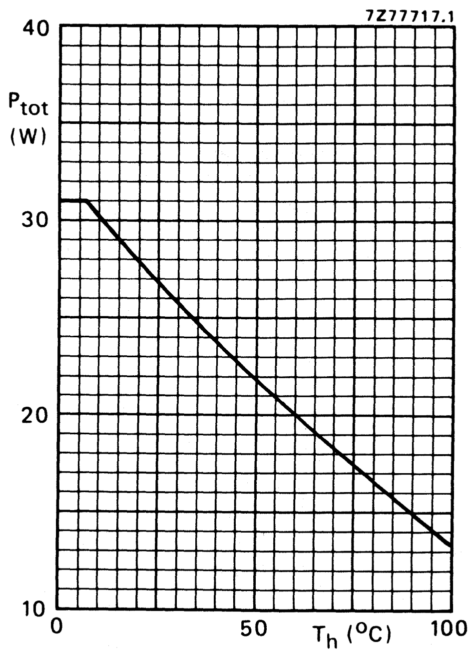


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 15 W; $T_{mb} = 79\ ^oC$; i.e. $T_h = 70\ ^oC$)	$R_{th\ j\text{-}mb}$	=	6,2	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

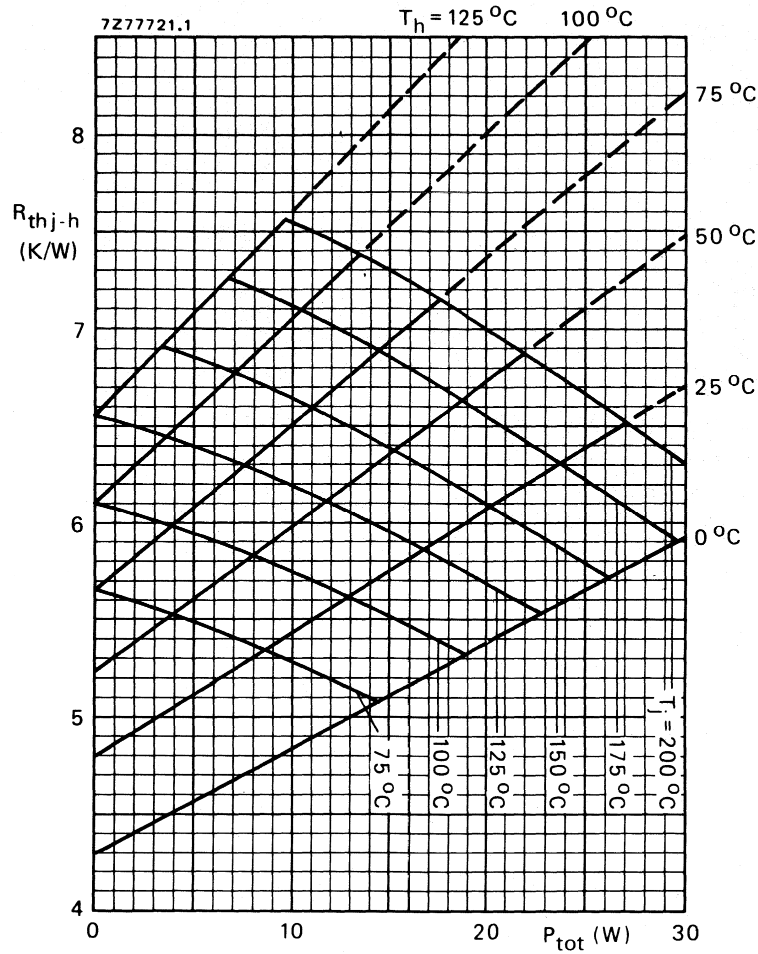


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\,mb-h}$ = 0,6 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 600 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\,j-h}$	max.	6,75	K/W
	T_j	max.	170	°C
Typical device:	$R_{th\,j-h}$	typ.	5,45	K/W
	T_j	typ.	152	°C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 8 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 60 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 4 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	2,0 mA
V_{BE} = 0; V_{CE} = 30 V; T_j = 175 °C	I_{CES}	<	5,0 mA
D.C. current gain			
I_C = 600 mA; V_{CE} = 25 V	h_{FE}	>	20
		typ.	40
I_C = 600 mA; V_{CE} = 25 V; T_j = 175 °C	h_{FE}	<	120
Collector-emitter saturation voltage *			
I_C = 1,2 A; I_B = 0,12 A	V_{CEsat}	typ.	450 mV
Transition frequency at f = 500 MHz **			
$-I_E$ = 0,6 A; V_{CB} = 25 V	f_T	typ.	3,3 GHz
$-I_E$ = 1,2 A; V_{CB} = 25 V	f_T	typ.	3,0 GHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	13,5 pF
Feedback capacitance at f = 1 MHz			
I_C = 40 mA; V_{CE} = 25 V	C_{re}	typ.	8,4 pF
Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leq 300\ \mu s$; $\delta \leq 0{,}02$.
** Measured under pulse conditions: $t_p \leq 50\ \mu s$; $\delta \leq 0{,}01$.

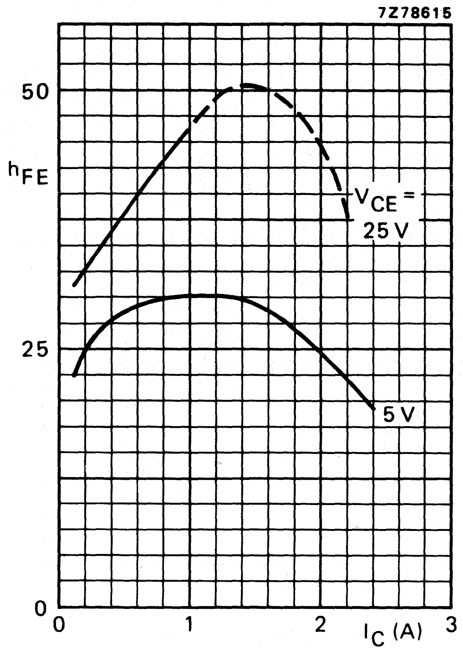


Fig. 5 Typical values; T_j = 25 °C.

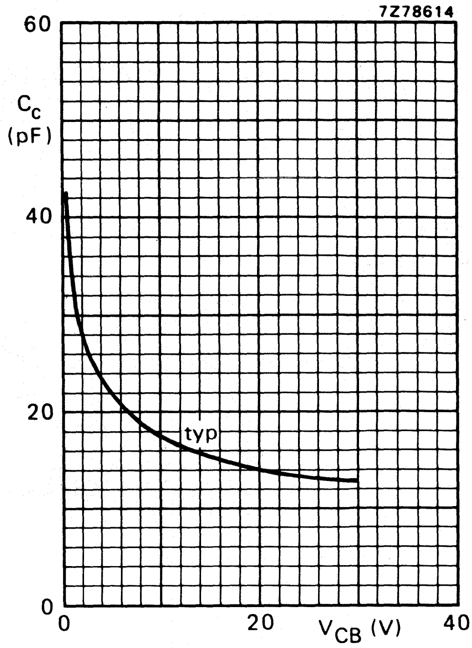


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

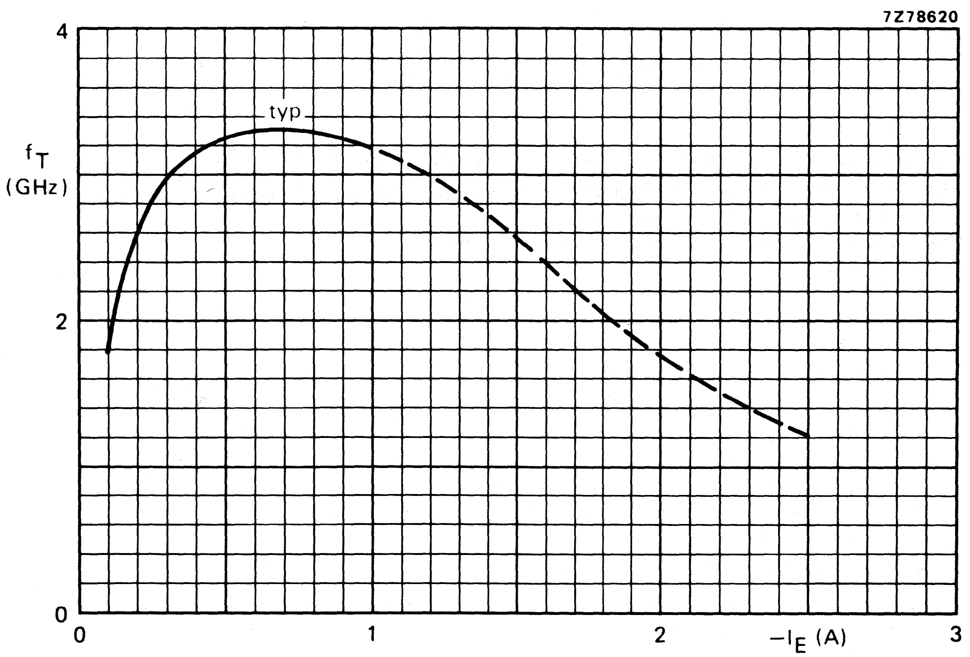


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im} (dB) *	$P_{o\,sync}$ (W) *	G_p (dB)
860	25	600	70	−60	> 1,8	> 9
860	25	600	70	−60	typ. 1,9	typ. 10,2
860	25	600	25	−60	typ. 2,15	typ. 10,2

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

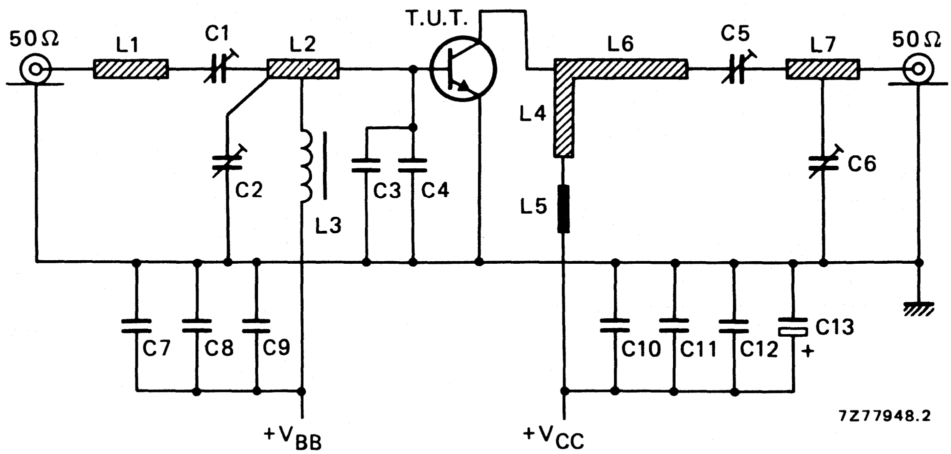


Fig. 8 Test circuit at f_{vision} = 860 MHz.

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 μF/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 (ϵ_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.

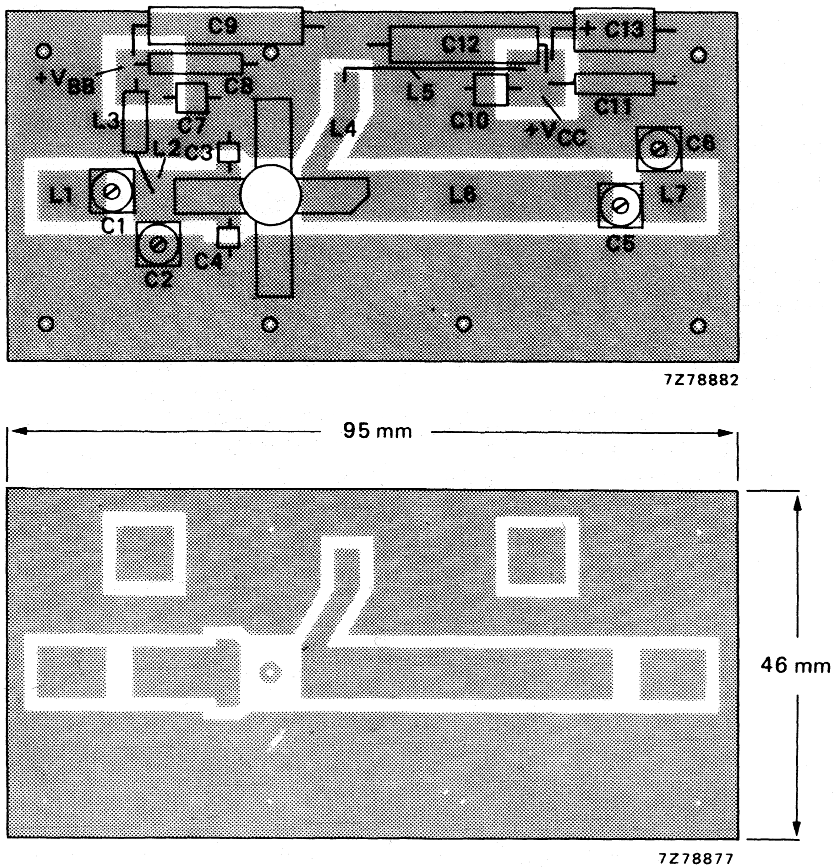
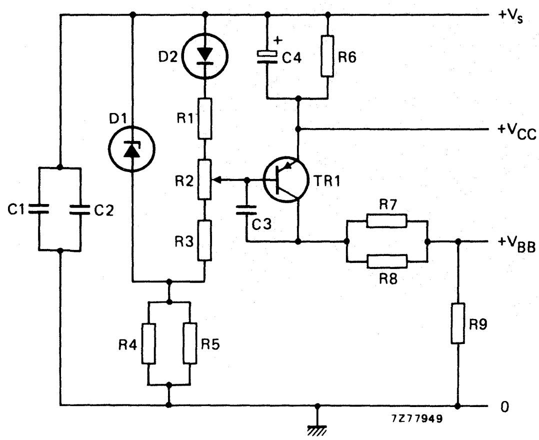


Fig. 9 Component layout and printed-circuit board for 860 MHz test circuit.

The circuit and the components are situated on one sode 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 = 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_{vision} = 860 MHz.

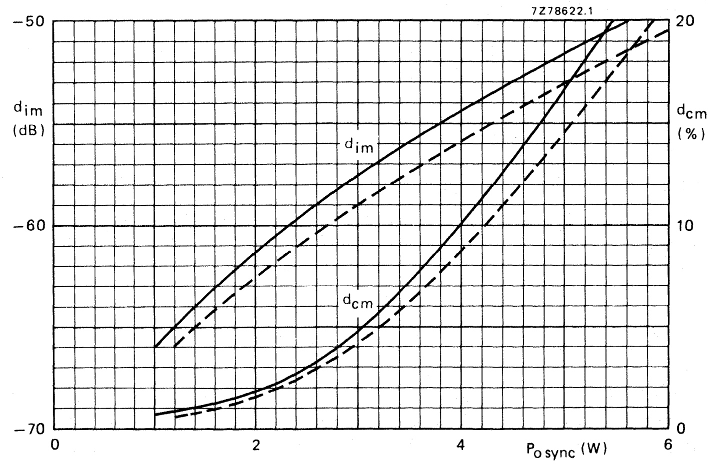


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; V_{CE} = 25 V; I_C = 600 mA; f_{vision} = 860 MHz; ---- T_h = 25 °C; —— T_h = 70 °C.

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.

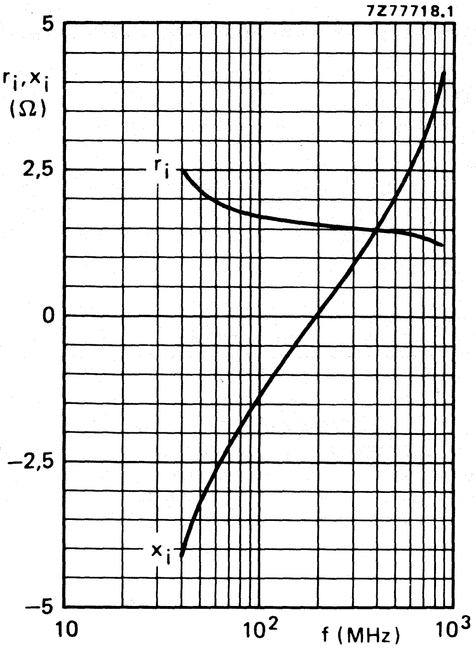


Fig. 12 Input impedance (series components).

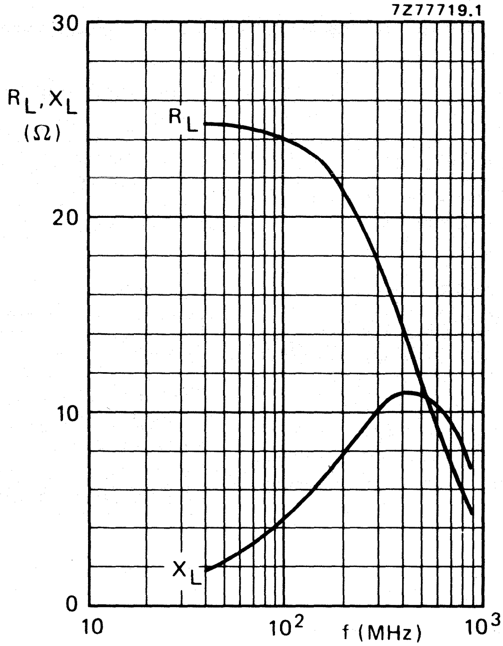


Fig. 13 Load impedance (series components).

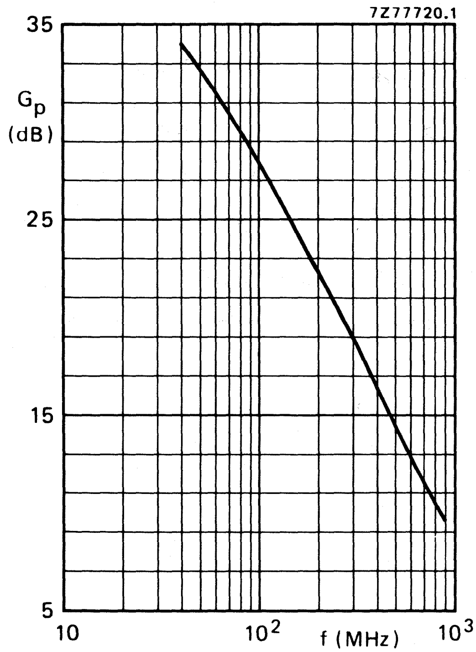


Fig. 14.

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.

VHF power transistor | BLW40

FEATURES

- Emitter-ballasting resistors for an optimum temperature profile
- Gold metallization ensures excellent reliability.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a 4-lead SOT120 stud envelope with a ceramic cap. It is designed for common emitter, class-B operation in mobile VHF transmitters with a supply voltage of 12.5 V. All leads are isolated from the mounting flange.

PINNING - SOT120

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. class-B	175	12.5	40	> 10	> 55

WARNING

Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

PIN CONFIGURATION

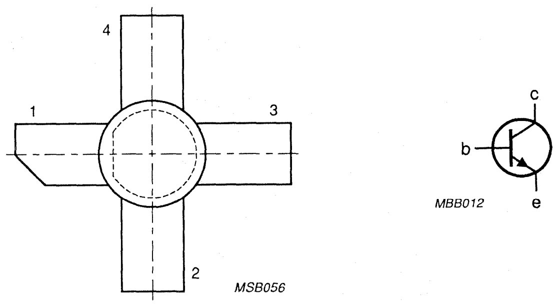


Fig.1 Simplified outline and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	36	V
V_{CEO}	collector-emitter voltage	open base	–	16.5	V
V_{EBO}	emitter-base voltage	open collector	–	4	V
I_C, $I_{C(AV)}$	collector current	DC or average value	–	8	A
I_{CM}	collector current	peak value f > 1 MHz	–	25	A
P_{tot}	total power dissipation	RF operation; f > 1 MHz; T_{mb} = 25 °C	–	106	W
T_{stg}	storage temperature range		–65	150	°C
T_j	junction operating temperature		–	200	°C

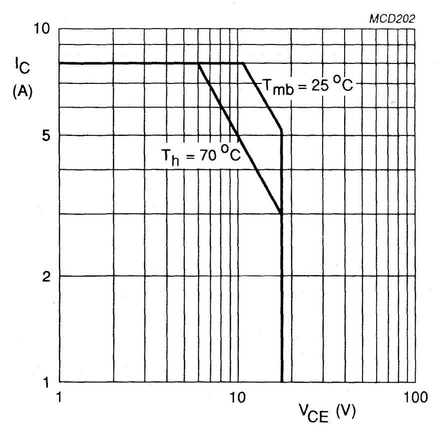
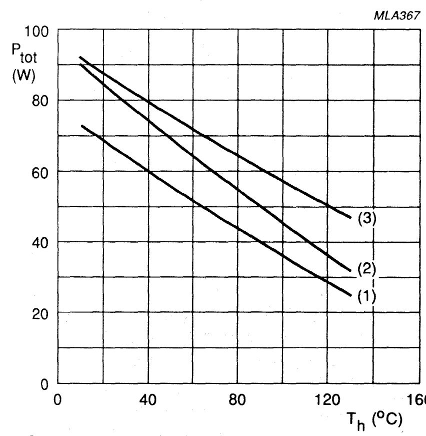


Fig.2 DC SOAR.



(1) Continuous DC operation.

(2) Continuous RF operation (f > 1 MHz).

(3) Short time operation during mismatch (f > 1 MHz).

Fig.3 Power derating curve.

THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j\text{-}mb(RF)}$	from junction to mounting base	1.65	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink	0.45	K/W

CHARACTERISTICS

T_j = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 50 mA	36	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 100 mA	16.5	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 10 mA	4	–	–	V
I_{CES}	collector-emitter leakage current	V_{BE} = 0; V_{CE} = 20 V	–	–	25	mA
h_{FE}	DC current gain	V_{CE} = 10 V; I_C = 5.4 A	15	60	–	
f_T	transition frequency	V_{CE} = 12.5 V; I_E = 5 A	–	1.65	–	GHz
C_c	collector capacitance	V_{CB} = 12.5 V; $I_E = I_e$ = 0; f = 1 MHz	–	105	–	pF
C_{re}	feedback capacitance	V_{CE} = 12.5 V; I_C = 0; f = 1 MHz	–	65	–	pF
$C_{c\text{-}s}$	collector-stud capacitance	f = 1 MHz	–	2	–	pF

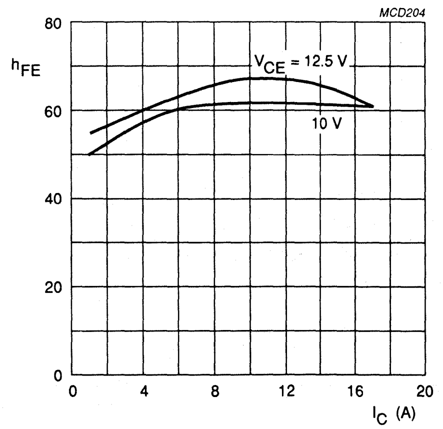
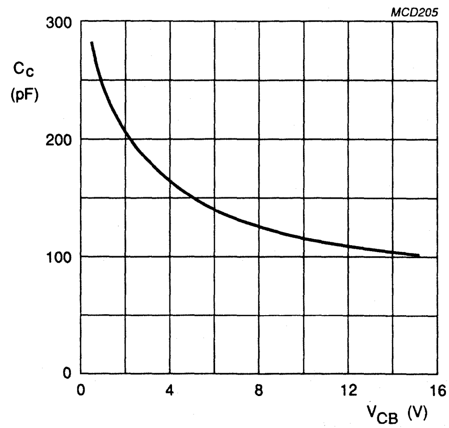
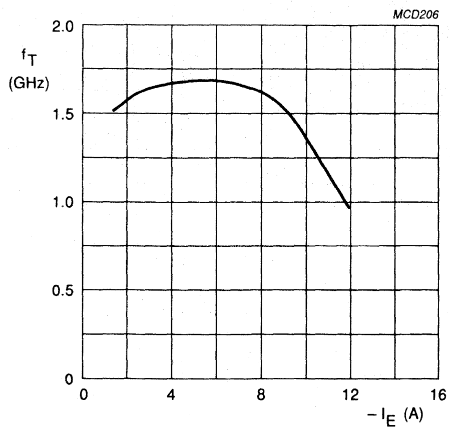


Fig.4 DC current gain as a function of collector current, typical values.



$I_E = i_e$ = 0; f = 1 MHz.

Fig.5 Collector capacitance as a function of collector-base voltage, typical values.



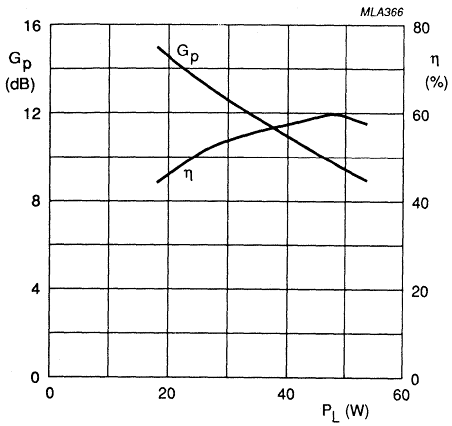
V_{CB} = 12.5 V.

Fig.6 Transition frequency as a function of emitter current, typical values.

APPLICATION INFORMATION

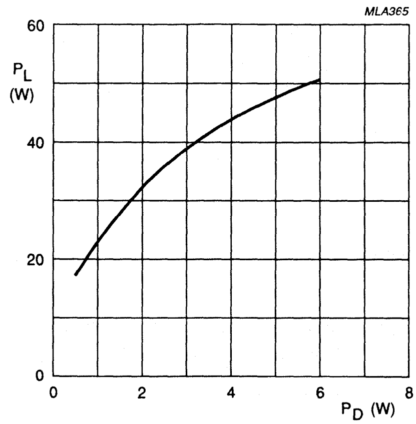
RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. class-B	175	12.5	40	> 10 typ. 11	> 55 typ. 57



Class-B operation; V_{CE} = 12.5 V; f = 175 MHz.

Fig.7 Gain and efficiency as functions of load power, typical values.



Class-B operation; V_{CE} = 12.5 V; f = 175 MHz.

Fig.8 Load power as a function of drive power, typical values.

Ruggedness in class-B operation

The BLW40 is capable of withstanding a load mismatch corresponding to VSWR = 10:1 through all phases at rated output power, up to a supply voltage of 15.5 V, and f = 175 MHz.

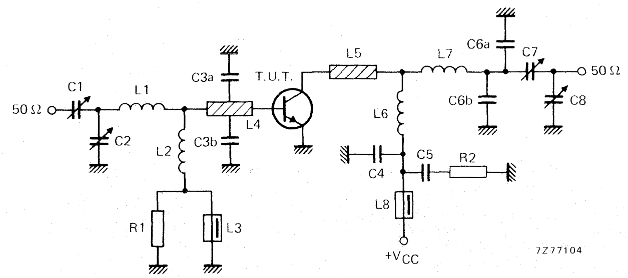


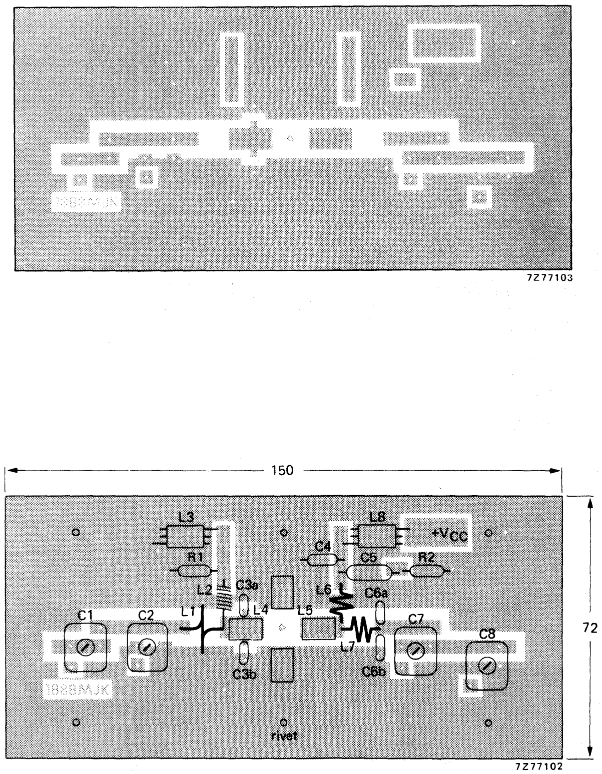
Fig.9 Class-B test circuit at f = 175 MHz.

List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	2.5 to 20 pF		2222 809 07004
C2, C8	film dielectric trimmer	4 to 40 pF		2222 809 07008
C3a, C3b	500 V ceramic capacitor	47 pF		
C4	500 V ceramic capacitor	120 pF		
C5	polyester capacitor	100 nF		
C6a, C6b	500 V ceramic capacitor	8.2 pF		
C7	film dielectric trimmer	5 to 60 pF		2222 809 07011
L1	1 turn enamelled 1.6 mm copper wire		int. dia. 9 mm; leads 2 x 5 mm	
L2	7 turns closely wound enamelled 0.5 mm copper wire	100 nH	int. dia. 3 mm; leads 2 x 5 mm	
L3, L8	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4, L5	stripline (note 1)		12 mm x 6 mm; note 2	
L6	2 turns enamelled 1.6 mm copper wire		int. dia. 5 mm; length 6 mm; leads 2 x 5 mm	
L7	2 turns enamelled 1.6 mm copper wire		int. dia. 4.5 mm; length 6 mm; leads 2 x 5 mm	
R1	0.25 W carbon resistor	10 Ω, 5%		
R2	0.25 W carbon resistor	4.7 Ω, 5%		

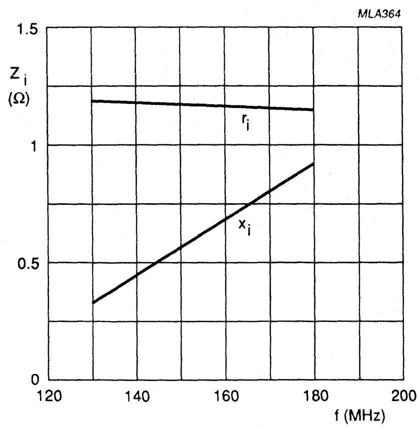
Notes

1. The striplines are mounted on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric, thickness 1⁄16 inch.
2. Taps for capacitors C3a and C3b are situated 5 mm from the transistor.



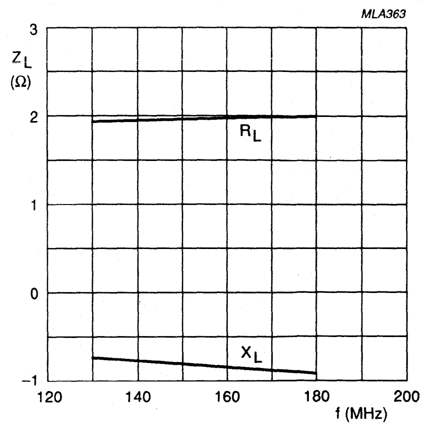
The circuit and components are situated on one side of an epoxy fibre-glass board; the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by means of hollow rivets and copper straps under the emitters.

Fig.10 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{CE} = 12.5 V; P_L = 40 W.

Fig.11 Input impedance (series components) as a function of frequency, typical values.



Class-B operation; V_{CE} = 12.5 V; P_L = 40 W.

Fig.12 Load impedance (series components) as a function of frequency, typical values.

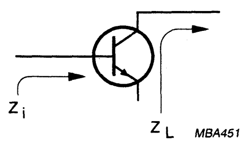
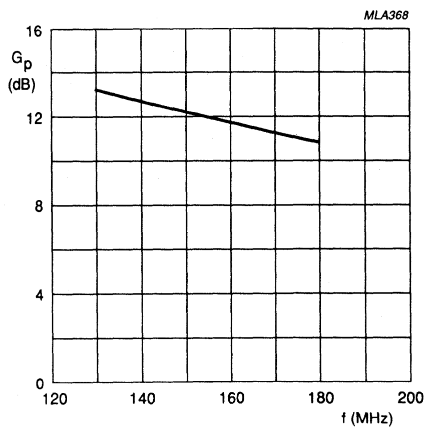


Fig.13 Definition of transistor impedance.



Class-B operation; V_{CE} = 12.5 V; P_L = 40 W.

Fig.14 Power gain as a function of frequency, typical values.

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

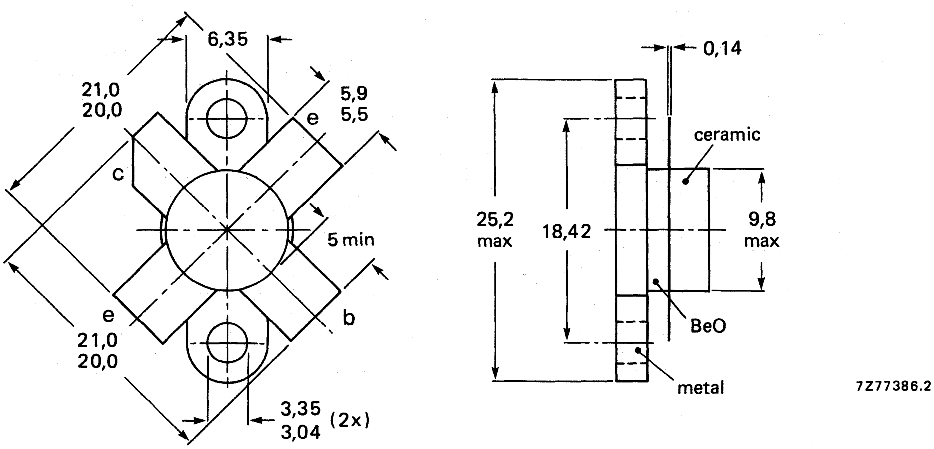
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_{dt} %	I_C A	$I_{C(ZS)}$ mA	d_3 dB	T_h °C
s.s.b. (class-A)	45	1,6 - 28	0 - 16 (P.E.P.)	> 19,5	–	1,2	–	< −40	70
s.s.b. (class-AB)	50	1,6 - 28	10 - 65 (P.E.P.)	typ. 18	typ. 45*	1,45	50	typ. −30	25

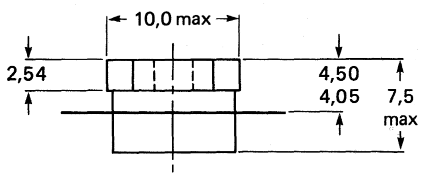
* At 65W P.E.P.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





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

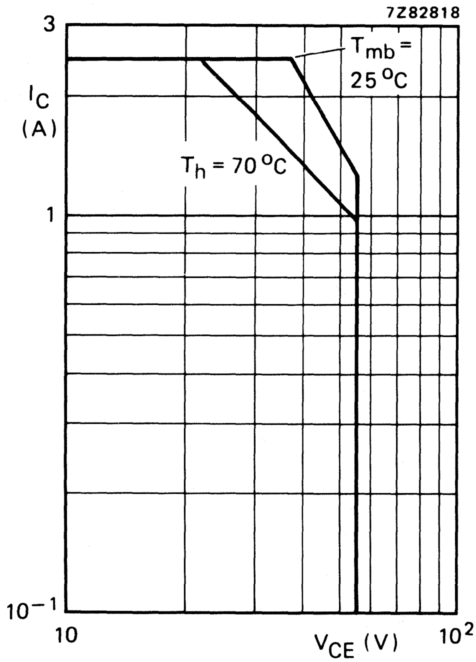


Fig. 2 D.C. SOAR.

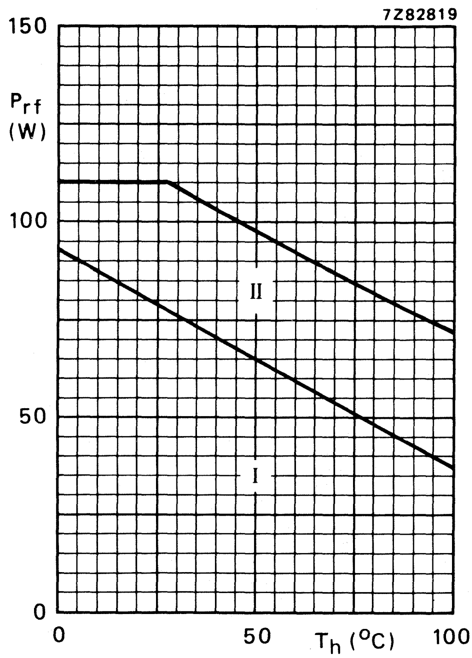


Fig. 3 Power derating curves vs. temperature.
I Continuous d.c. and r.f. operation
II Short-time operation during mismatch

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)	$R_{th\ j\text{-}mb}$	=	2,1	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	110	V
Collector-emitter breakdown voltage open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	55	V
Emitter-base breakdown voltage open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 55$ V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	8	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	8	mJ
D.C. current gain* $I_C = 1,2$ A; $V_{CE} = 5$ V	h_{FE}	typ.	25 15 to 100	
D.C. current gain ratio of matched devices* $I_C = 1,2$ A; $V_{CE} = 5$ V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage* $I_C = 3,0$ A; $I_B = 0,6$ A	V_{CEsat}	typ.	1,2	V
Transition frequency at f = 100 MHz* $-I_E = 1,2$ A; $V_{CB} = 45$ V	f_T	typ.	490	MHz
$-I_E = 4,0$ A; $V_{CB} = 45$ V	f_T	typ.	540	MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 45$ V	C_c	typ.	53	pF
Feedback capacitance at f = 1 MHz $I_C = 50$ mA; $V_{CE} = 45$ V	C_{re}	typ.	35	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

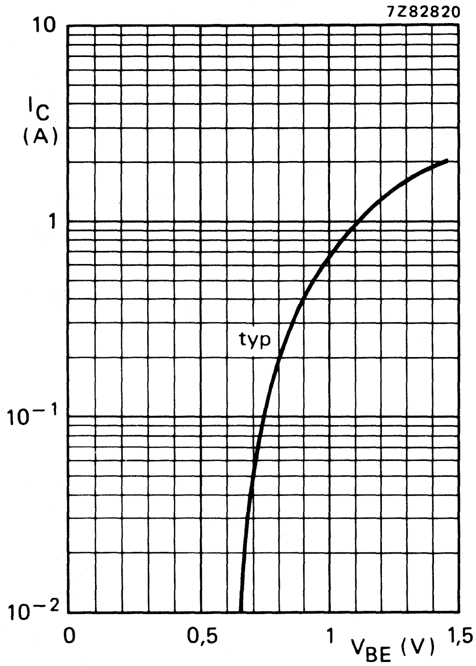


Fig. 4 V_{CE} = 40 V; T_{mb} = 25 °C.

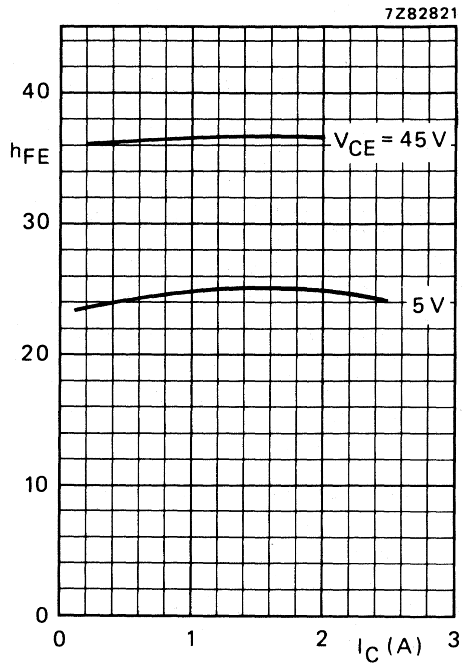


Fig. 5 Typical values; T_j = 25 °C.

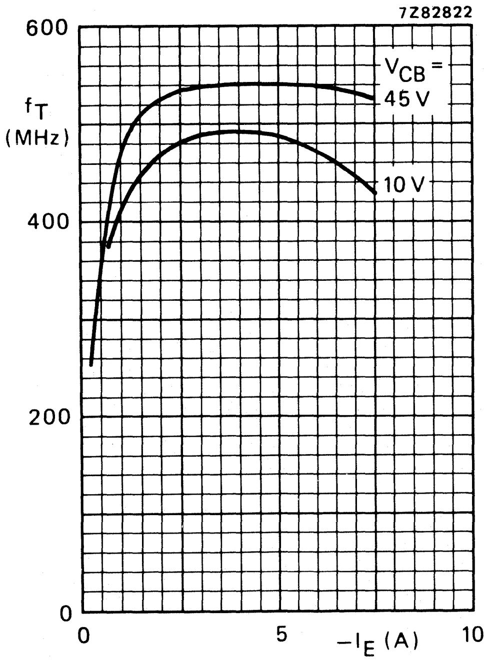


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

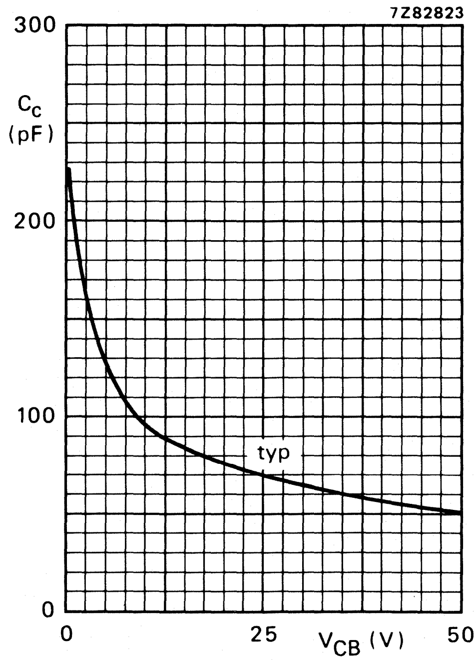


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 45 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3* dB	d_5* dB	T_h °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

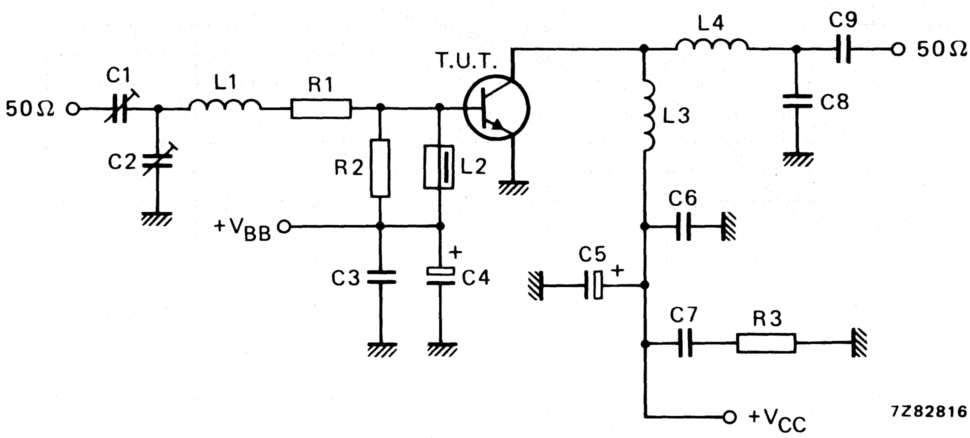


Fig. 8 Test circuit; s.s.b. class-A.

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 capacitor
C5 = 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 (± 5%; 0,125 W)
R2 = 47 Ω carbon resistor (± 5%; 0,25 W)
R3 = 4,7 Ω carbon resistor (± 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.

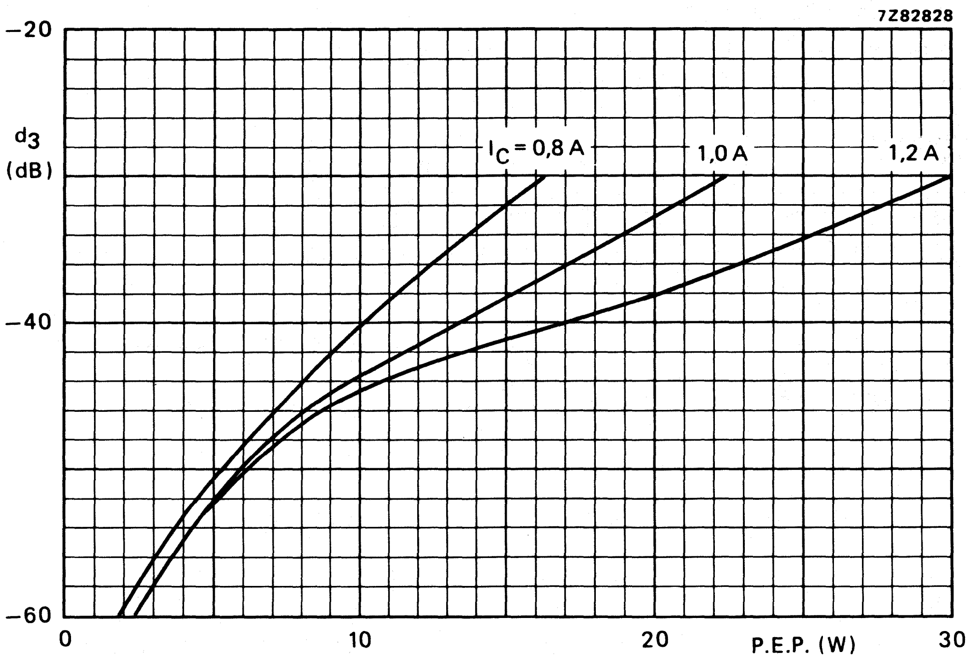


Fig. 9 Intermodulation distortion (see note on page 5) as a function of output power. Typical values; V_{CE} = 45 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 70 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 50 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 65 W P.E.P.	I_C (A) at 65 W P.E.P.	d_3* dB	d_5* dB	$I_{C(ZS)}$ mA	T_h °C
10 to 65 (P.E.P.)	typ. 18	typ. 45	typ. 1,45	typ. −30	< −30	50	25

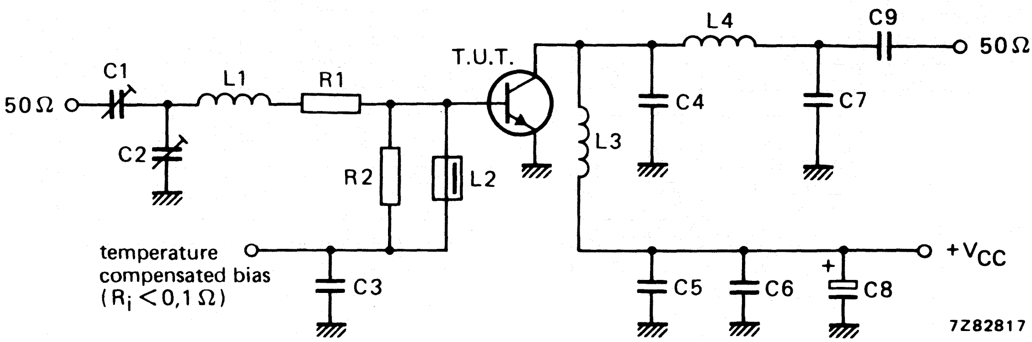


Fig. 10 Test circuit; s.s.b. class-AB.

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 μF/63 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.

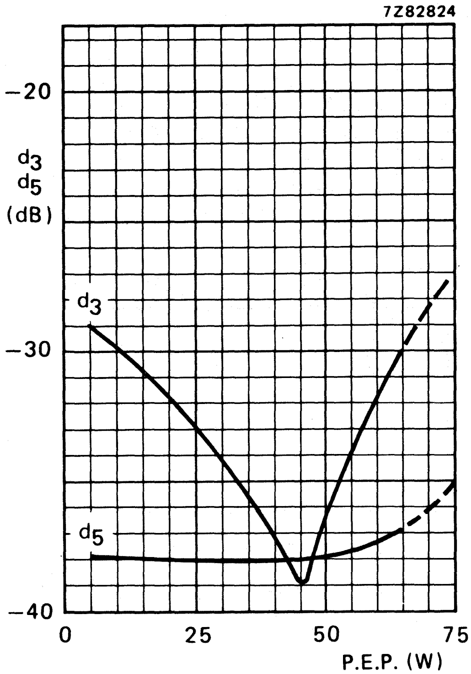


Fig. 11 Intermodulation distortion as a function of output power*.

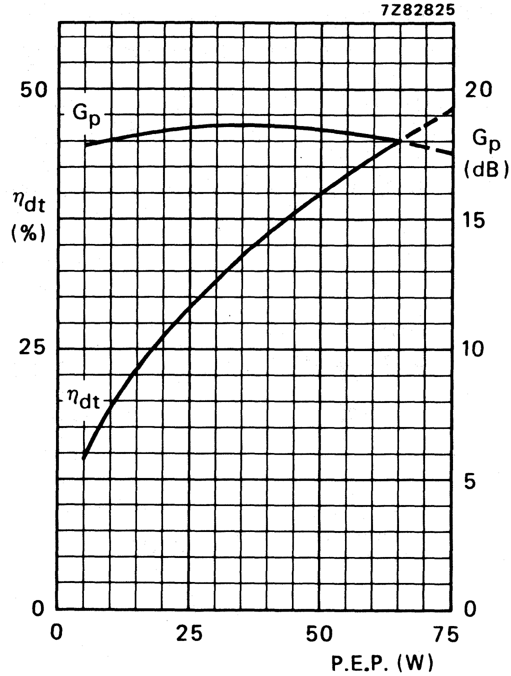


Fig. 12 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 11 and 12:

V_{CE} = 50 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °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 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,3 K/W.

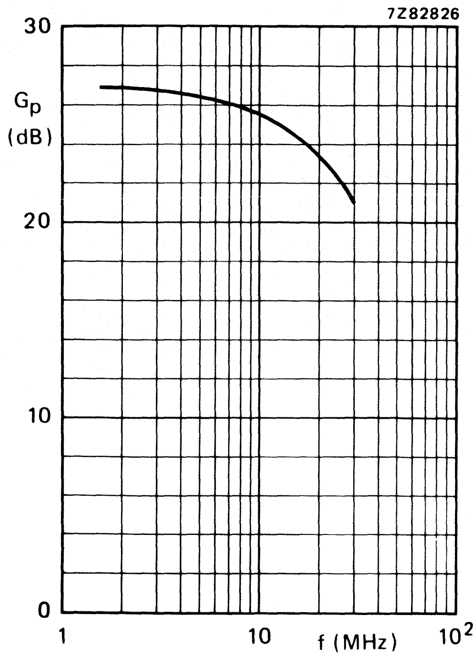


Fig. 13 Power gain as a function of frequency.

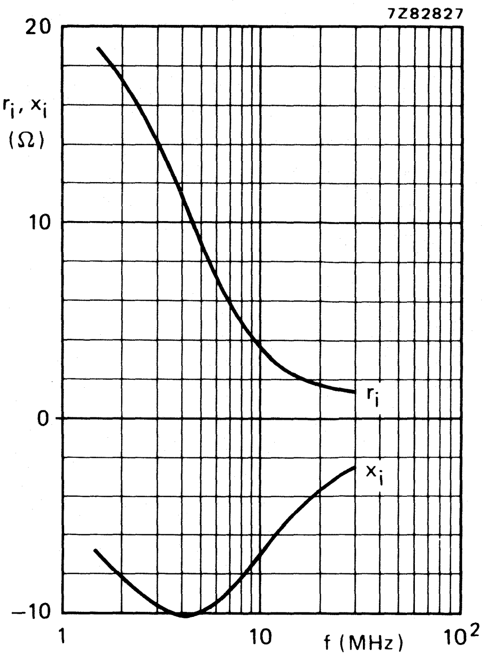


Fig. 14 Input impedance (series components) as a function of frequency.

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 V; $I_{C(ZS)}$ = 50 mA; P_L = 60 W; T_h = 25 ^oC; Z_L = 16 Ω.

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

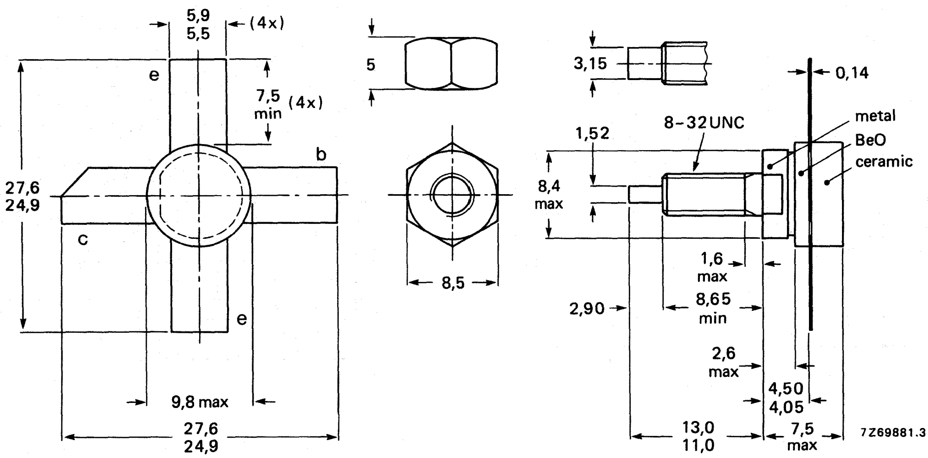
R.F. performance up to T_h = 25 °C

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.	16	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

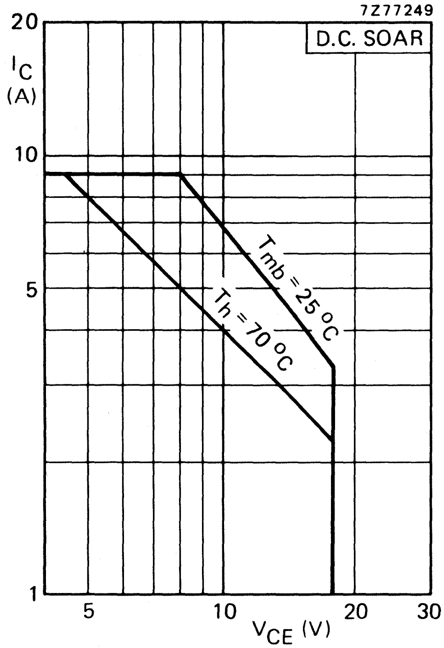


Fig. 2 D.C. SOAR.

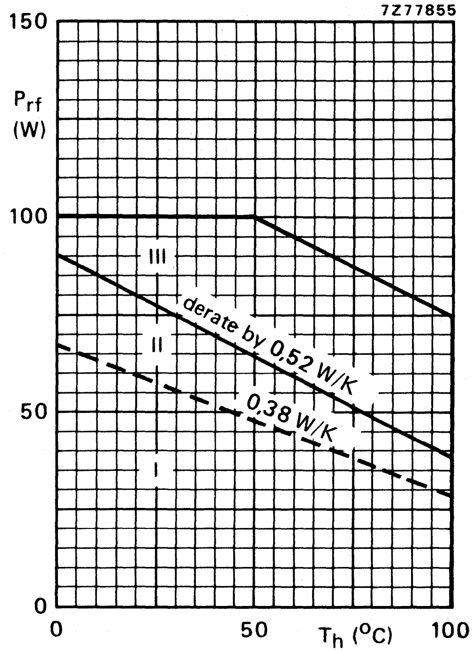


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 16,5 V; f > 1 MHz.

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)	$R_{th\ j\text{-}mb(dc)}$	=	2,8	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,05	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Breakdown voltage			
Collector-emitter voltage $V_{BE} = 0$; $I_C = 50$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	16 V
Emitter-base voltage open collector; $I_E = 25$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 15$ V	I_{CES}	<	25 mA
Transient energy			
L = 25 mH; f = 50 Hz			
open base	E	>	8 ms
$-V_{BE} = 1{,}5$ V; $R_{BE} = 33\ \Omega$	E	>	8 ms
D.C. current gain *			
$I_C = 4$ A; $V_{CE} = 5$ V	h_{FE}	typ	50
			10 to 80
D.C. current gain ratio of matched devices *			
$I_C = 4$ A; $V_{CE} = 5$ V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage *			
$I_C = 12{,}5$ A; $I_B = 2{,}5$ A	V_{CEsat}	typ	1,5 V
Transition frequency at f = 100 MHz *			
$I_C = 4$ A; $V_{CE} = 12{,}5$ V	f_T	typ	650 MHz
$I_C = 12{,}5$ A; $V_{CE} = 12{,}5$ V	f_T	typ	600 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ	120 pF
		<	160 pF
Feedback capacitance at f = 1 MHz			
$I_C = 200$ mA; $V_{CE} = 15$ V	C_{re}	typ	80 pF
Collector-stud capacitance	C_{cs}	typ	2 pF

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

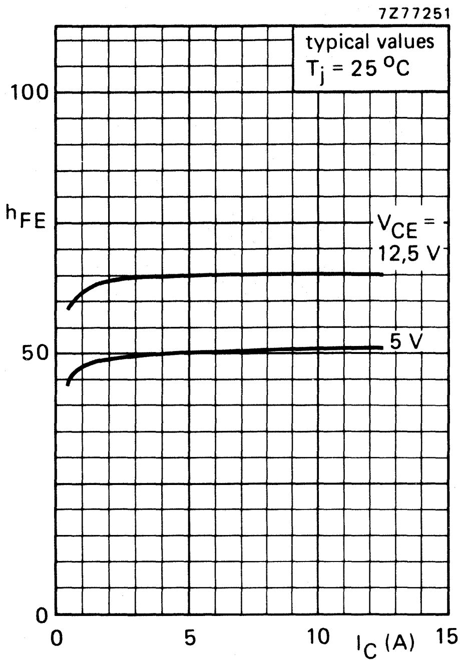


Fig.4 DC current gain as a function of collector current.

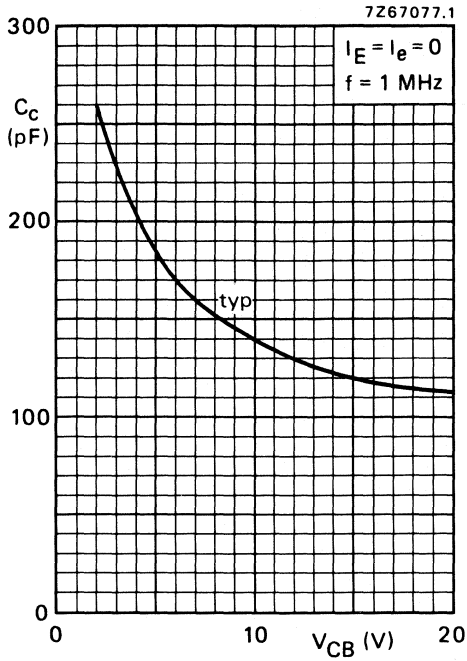


Fig.5 Collector capacitance as a function of collector-base voltage.

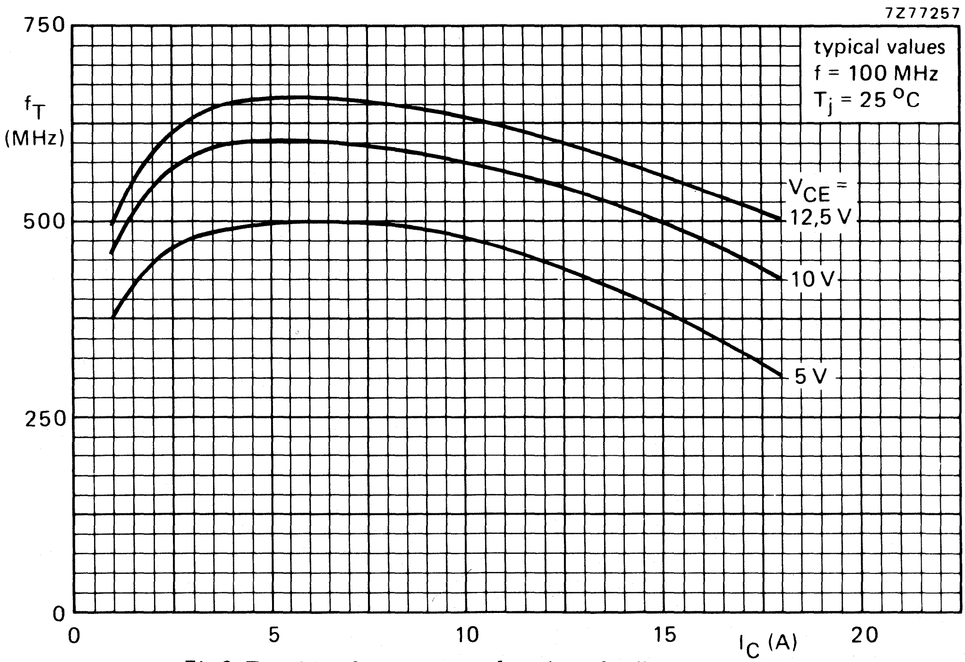


Fig.6 Transition frequency as a function of collector current.

APPLICATION INFORMATION

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

$T_h = 25\ ^oC$

f (MHz)	V_{CC} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Z_L}$ (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

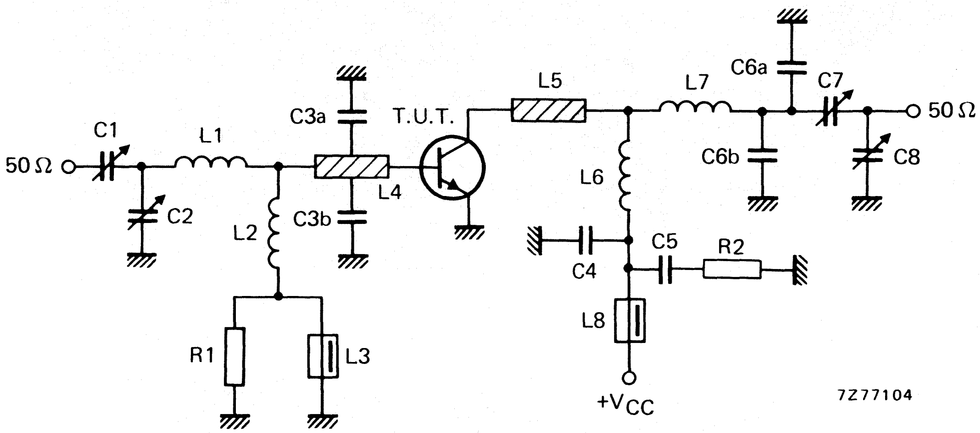


Fig. 7 Class-B test circuit at f = 175 MHz.

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)

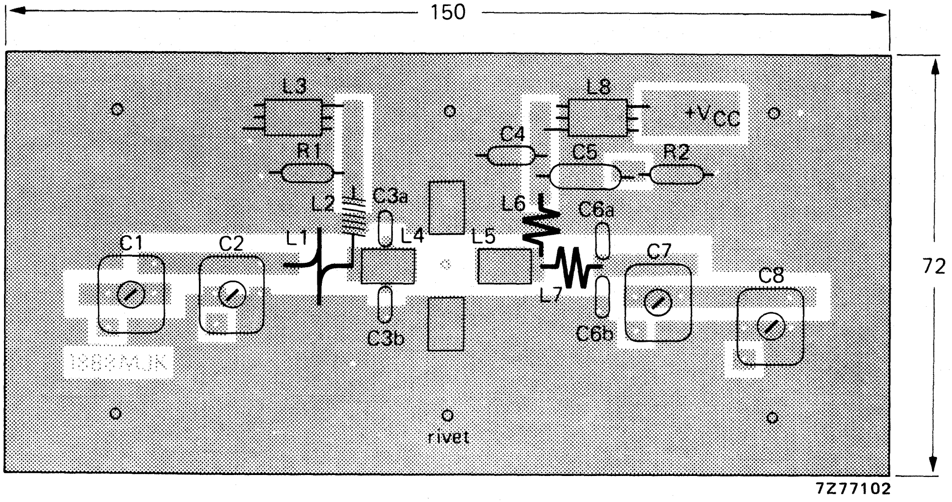
L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from 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

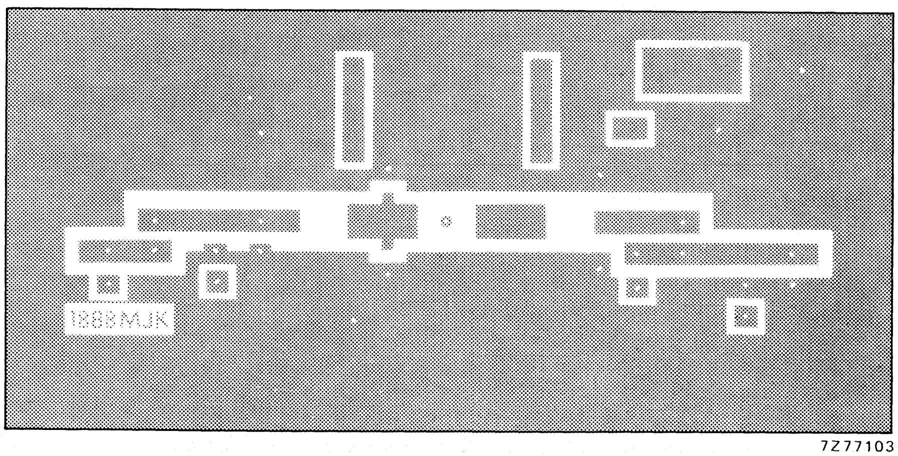
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω (±10%) carbon resistor
R2 = 4,7 Ω (±5%) carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit on

APPLICATION INFORMATION (continued)





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

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

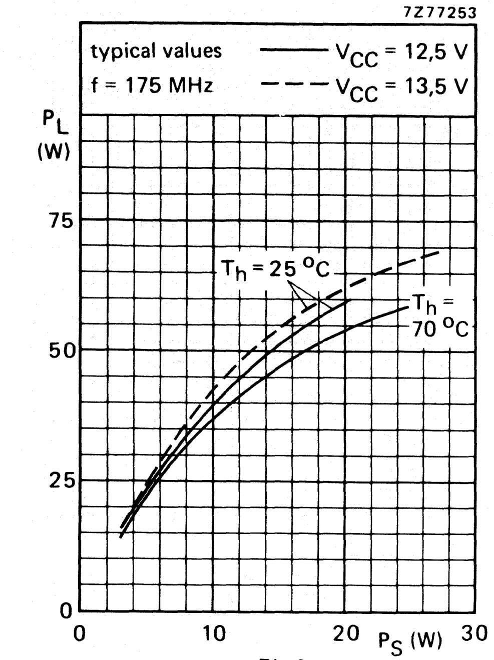


Fig.9.

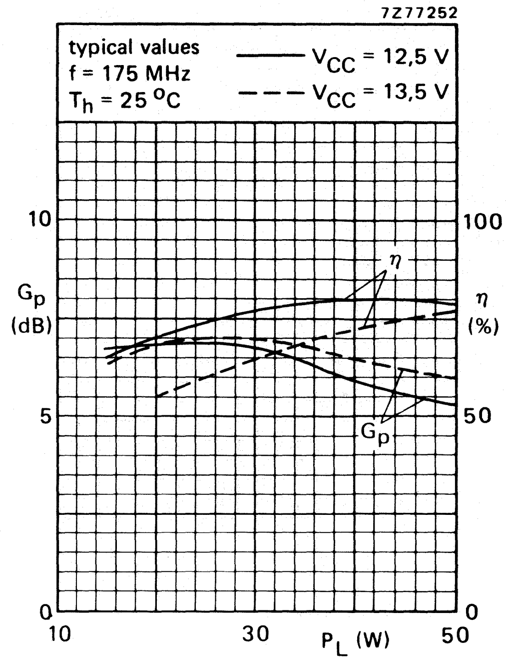


Fig.10.

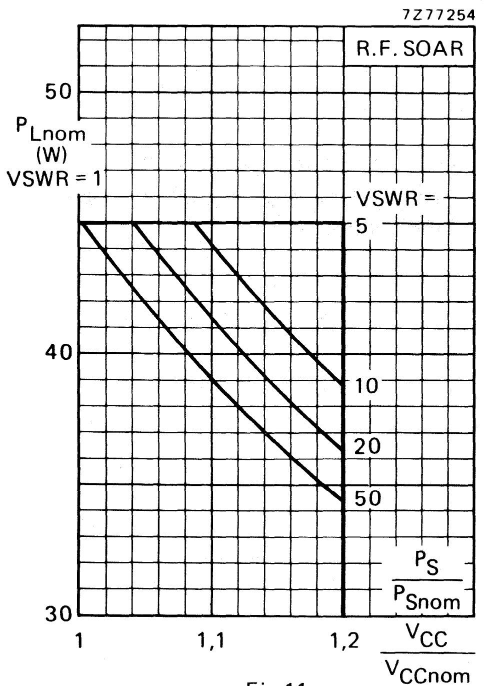


Fig.11.

Conditions for R.F. SOAR

f = 175 MHz

T_h = 70 °C

$R_{th\ mb\text{-}h}$ = 0,45 K/W

V_{CCnom} = 12,5 V or 13,5 V

$P_S = P_{Snom}$ at V_{CCnom} and VSWR = 1 measured in circuit of Fig.7.

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.

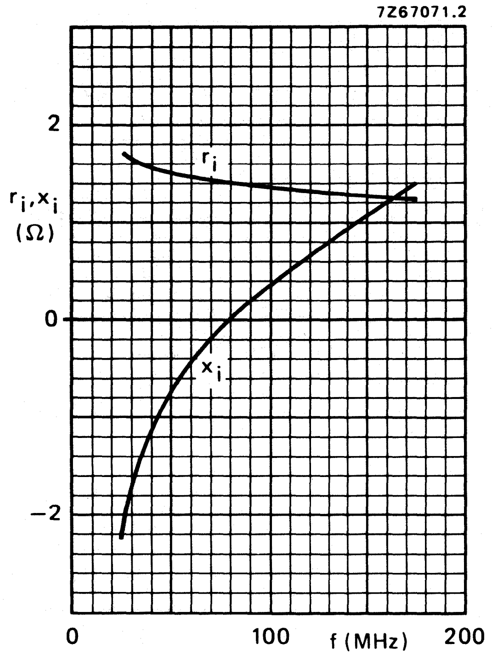


Fig. 12 Input impedance (series components).

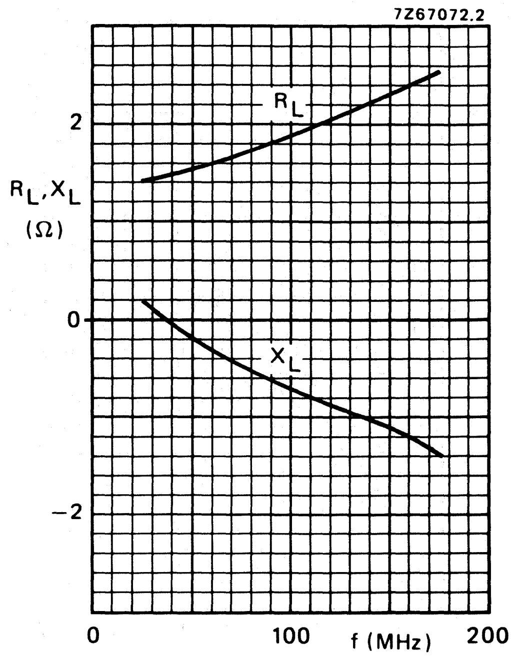


Fig. 13 Load impedance (series components).

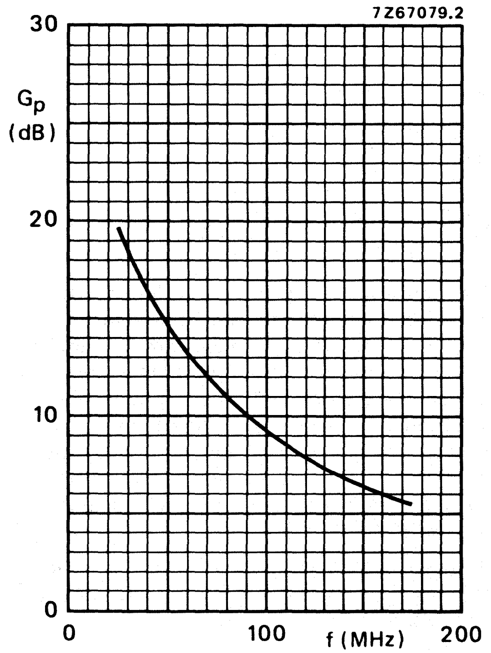


Fig. 14.

Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 12,5 V; P_L = 45 W; class-B operation; T_h = 25 °C.

APPLICATION INFORMATION (continued)

R.F. performance in s.s.b. class-AB operation

V_{CE} = 12,5 V; T_h up to 25 °C; $R_{th\ mb-h} \leq$ 0,45 K/W
f_1 = 28,000 MHz; f_2 = 28,001 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

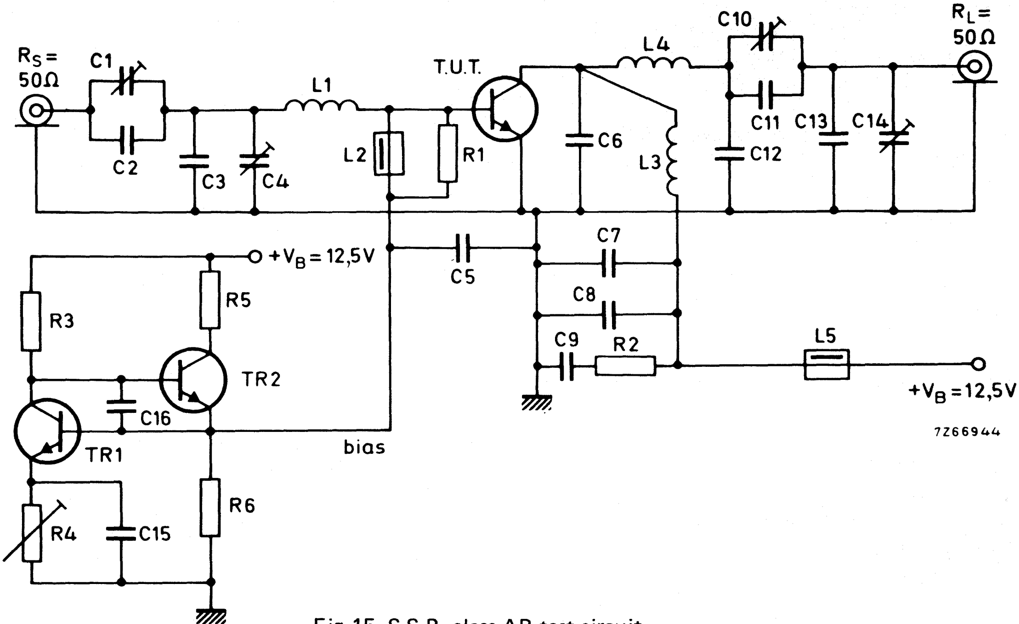


Fig.15 S.S.B. class-AB test circuit.

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 (±5%) carbon resistor
R2 = 4,7 Ω (±5%) carbon resistor
R3 = 1,5 kΩ (±5%) carbon resistor
R4 = 10 Ω wirewound potentiometer (3 W)
R5 = 47 Ω wirewound resistor (5,5 W)
R6 = 150 Ω (±5%) carbon resistor

Measuring conditions for Figs 16 and 17:

V_{CC} = 12,5 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
$R_{th\ mb\text{-}h} \leqslant$ 0,45 °K/W
$I_{C(ZS)}$ = 25 mA
typical values

Measuring conditions for Figs 18 and 19:

V_{CC} = 13,5 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
$R_{th\ mb\text{-}h} \leqslant$ 0,45 °K/W
$I_{C(ZS)}$ = 25 mA
typical values

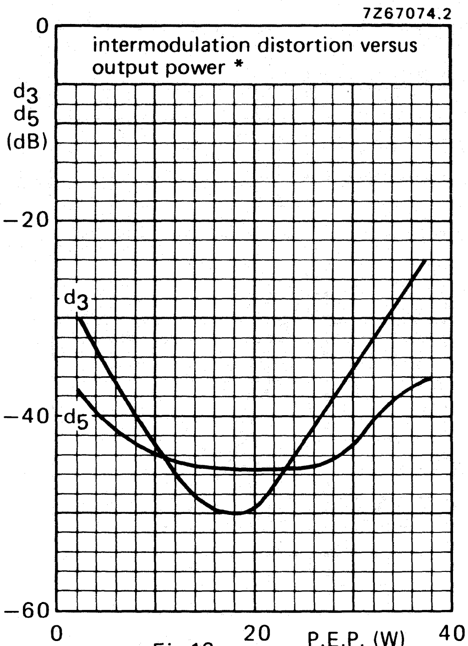


Fig.16.

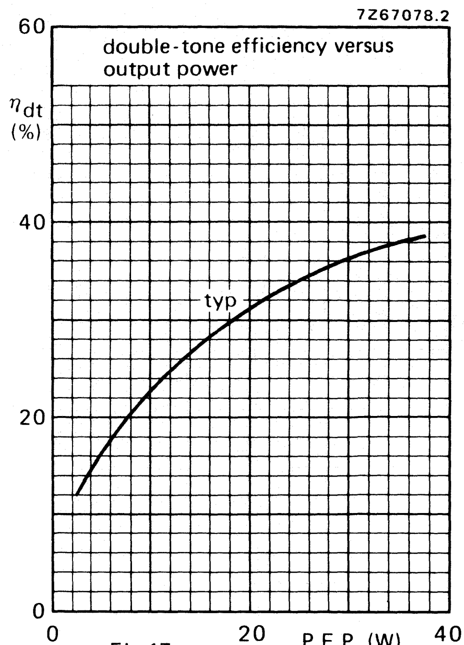


Fig.17.

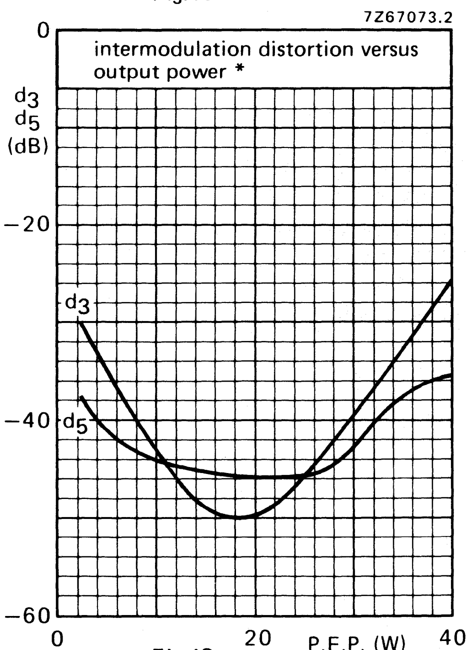


Fig.18.

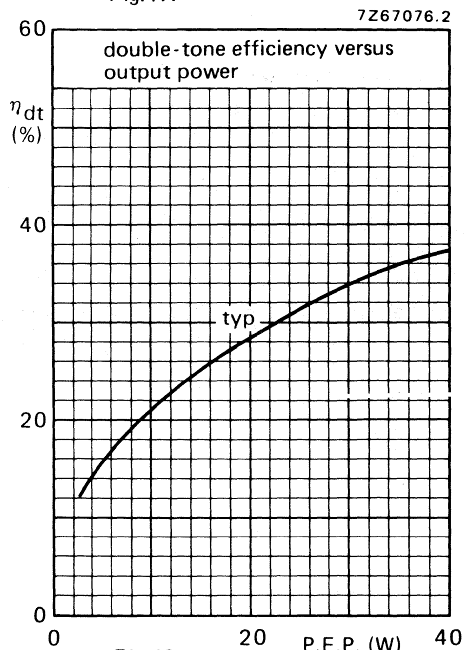


Fig.19.

* 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.

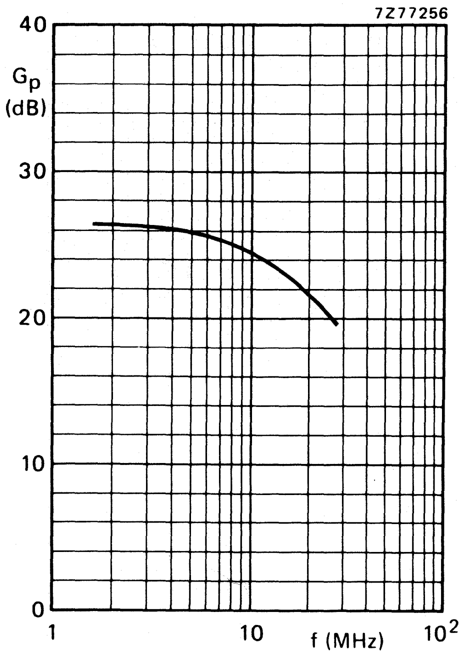


Fig.20.

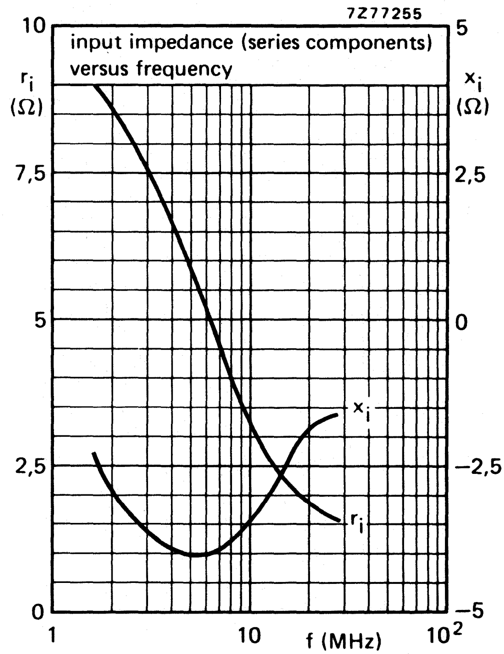


Fig.21.

S.S.B. class-AB operation

Conditions for Figs 20 and 21:

V_{CC} = 12,5 V
P_L = 30 W (P.E.P.)
T_h = 25 °C
$R_{th\ mb\text{-}h} \leqslant$ 0,45 K/W
$I_{C(ZS)}$ = 25 mA
Z_L = 1,9 Ω

V_{CC} = 13,5 V
P_L = 35 W (P.E.P.)
T_h = 25 °C
$R_{th\ mb\text{-}h} \leqslant$ 0,45 K/W
$I_{C(ZS)}$ = 25 mA
Z_L = 1,9 Ω

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 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 °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

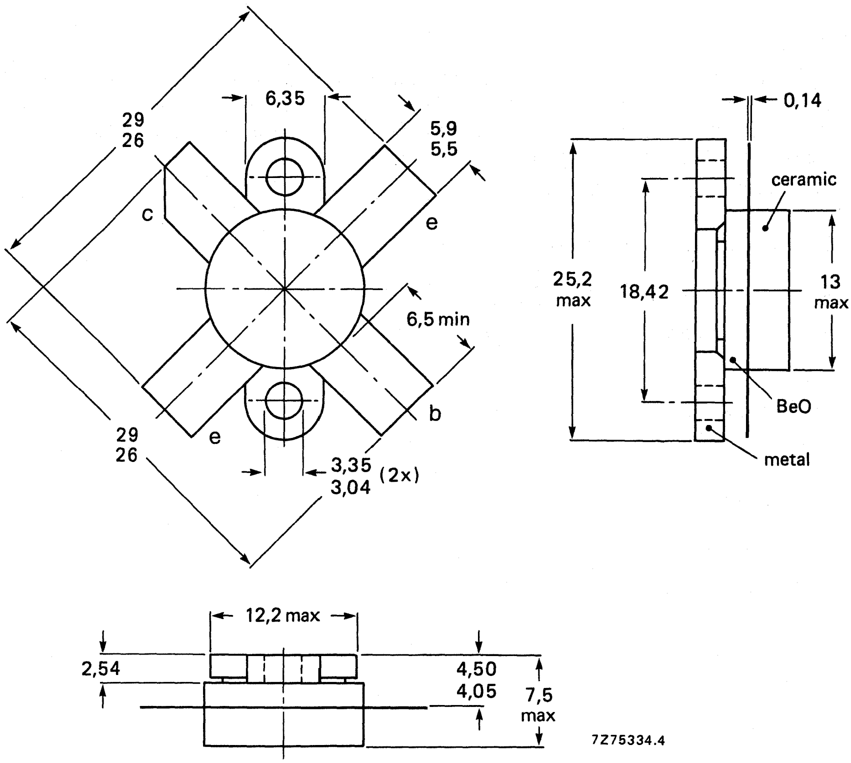
SOT-121 (see Fig.1).

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

Dimensions in mm

Fig. 1 SOT-121.



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

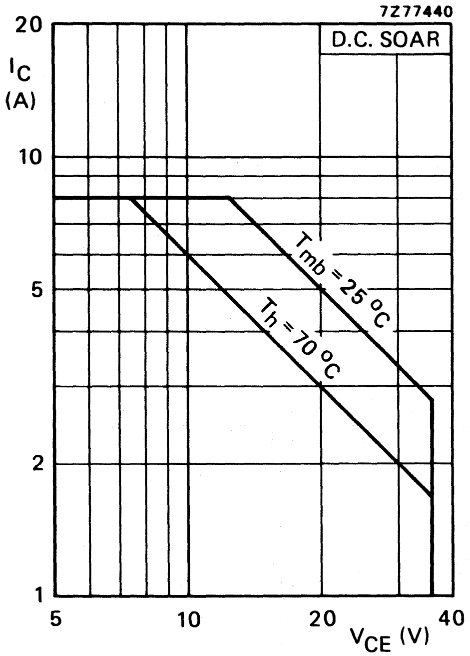


Fig. 2 D.C. SOAR.

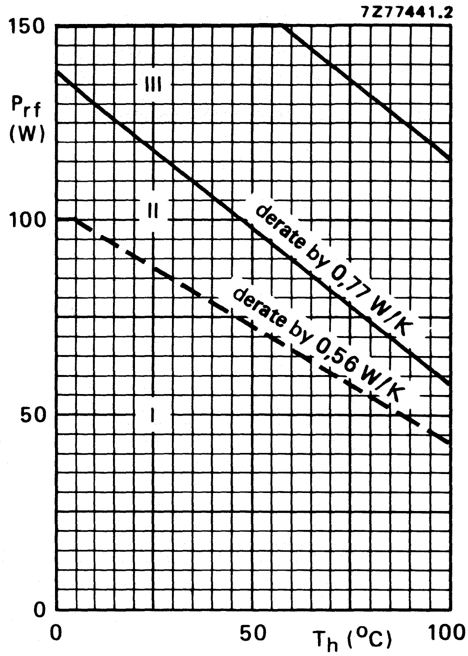


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f > 1 MHz.

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)	$R_{th\ j\text{-}mb(dc)}$	=	1,92	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,33	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	70 V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	35 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 35 V	I_{CES}	<	10 mA
D.C. current gain* I_C = 4 A; V_{CE} = 5 V	h_{FE}		15 to 80
D.C. current gain ratio of matched devices* I_C = 4 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage* I_C = 12,5 A; I_B = 2,5 A	V_{CEsat}	typ.	2,5 V
Transition frequency at f = 100 MHz** $-I_E$ = 4 A; V_{CB} = 28 V	f_T	typ.	315 MHz
$-I_E$ = 12,5 A; V_{CB} = 28 V	f_T	typ.	305 MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	125 pF
Feedback capacitance at f = 1 MHz I_C = 50 mA; V_{CE} = 28 V	C_{re}	typ.	85 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

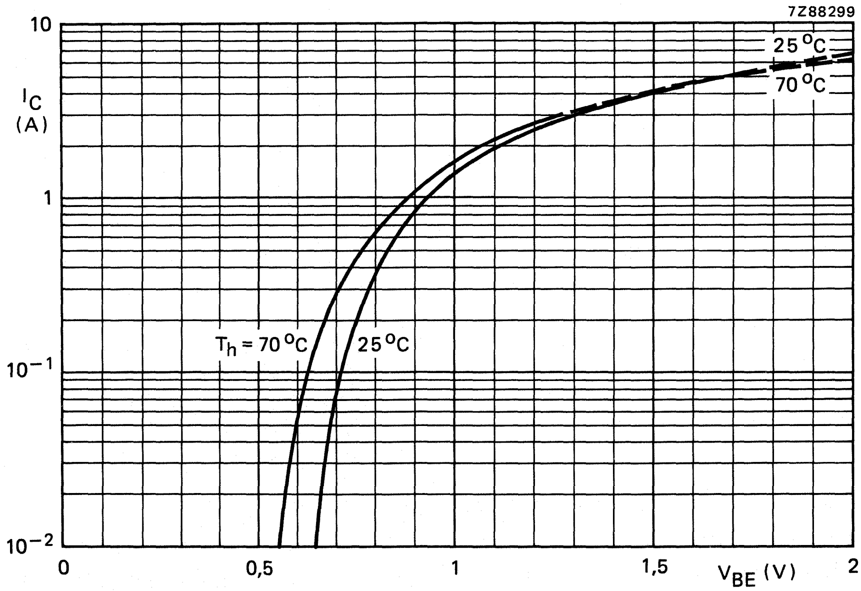


Fig. 4 Typical values; V_{CE} = 20 V.

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.

** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

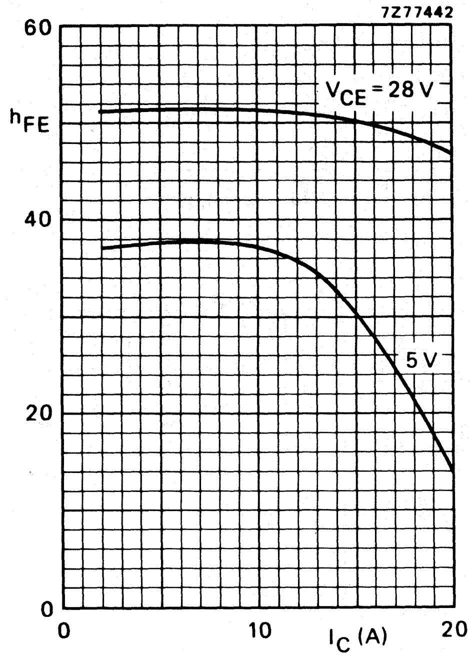


Fig. 5 Typical values; T_j = 25 °C.

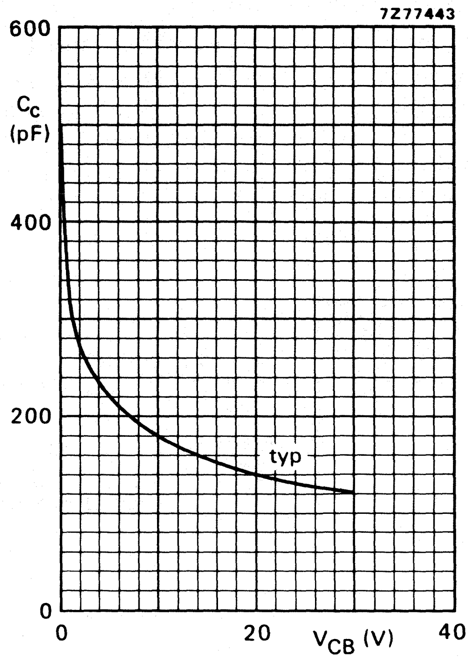


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

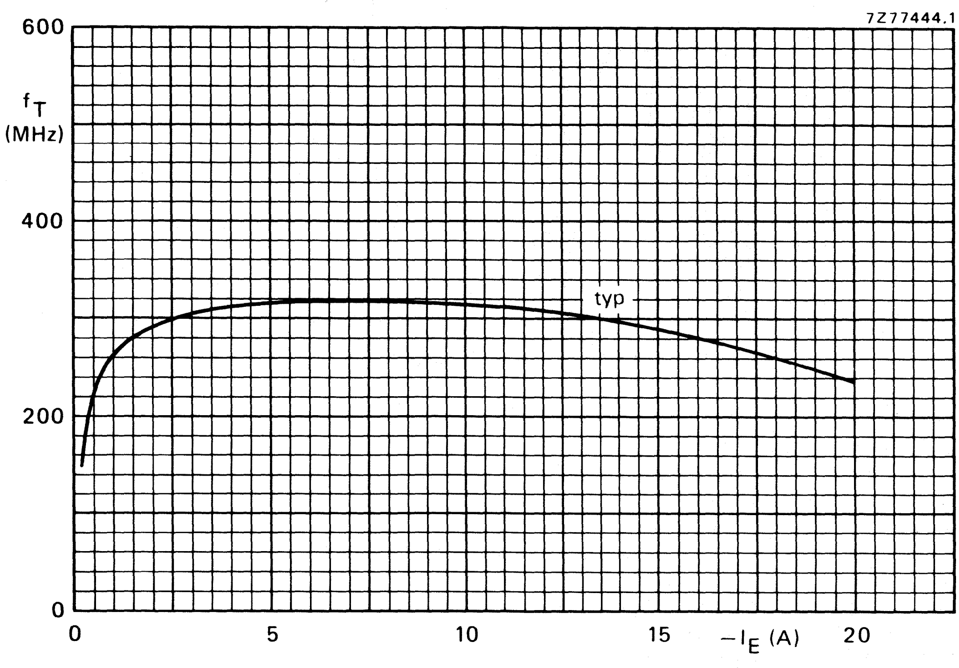


Fig. 7 V_{CB} = 28 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 80 W P.E.P.	I_C(A) at 80 W P.E.P.	d_3 dB	d_5 dB	$I_{C(ZS)}$ A
8 to 80 (P.E.P.)	**> 13**	**> 35**	**< 4,1**	**< –30**	**< –30**	**0,05**

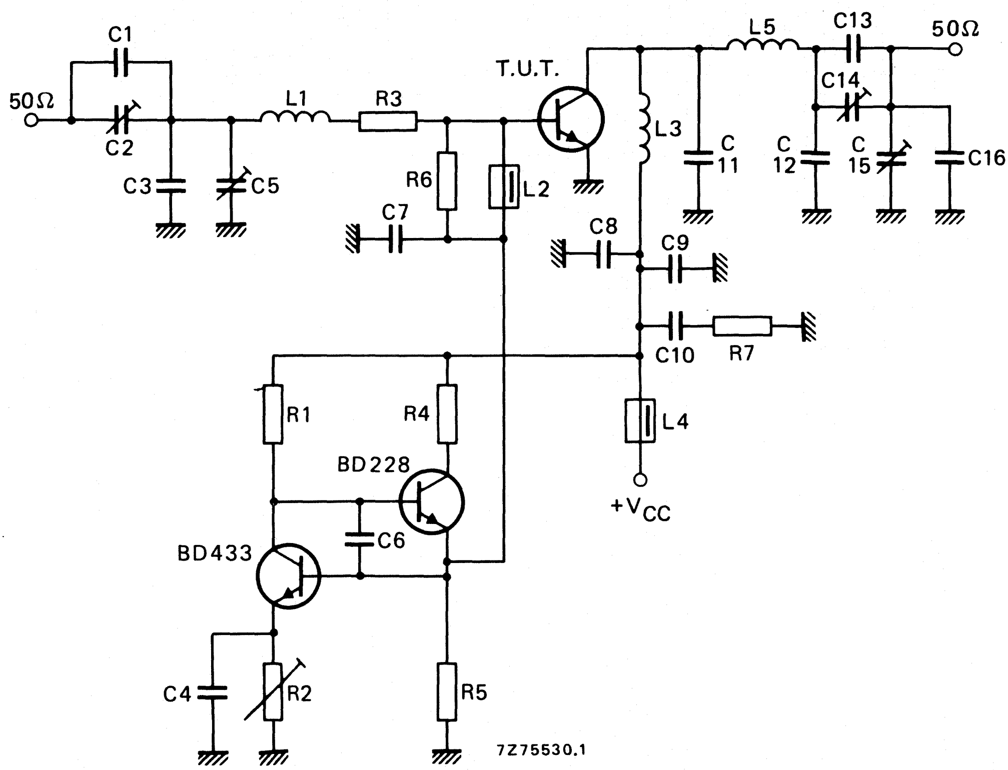


Fig. 8 Test circuit; s.s.b. class-AB.

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 kΩ (± 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 (± 5%; 0,5 W each)
R4 = 60 Ω; parallel connection of 2 x 120 Ω wirewound resistors (5,5 W each)
R5 = 56 Ω (± 5%) carbon resistor (0,5 W)
R6 = 33 Ω (± 5%) carbon resistor (0,5 W)
R7 = 4,7 Ω (± 5%) carbon resistor (0,5 W)

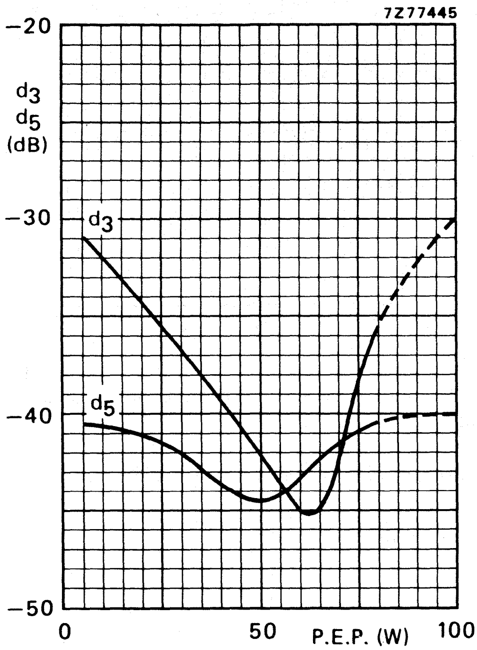


Fig. 9 Intermodulation distortion as a function of output power.*

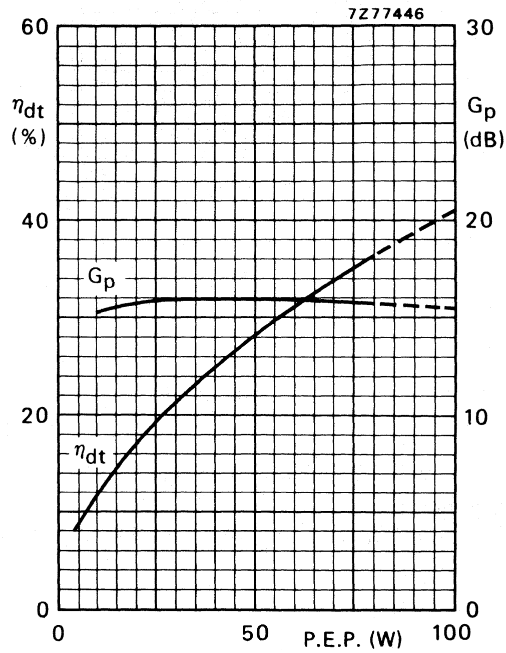


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 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)

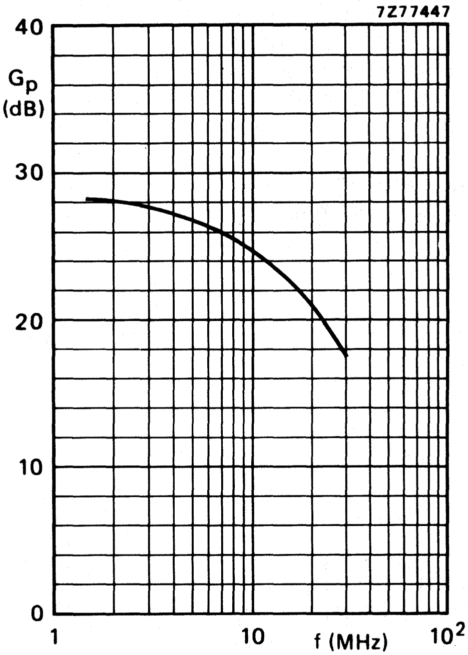


Fig. 11 Power gain as a function of frequency.

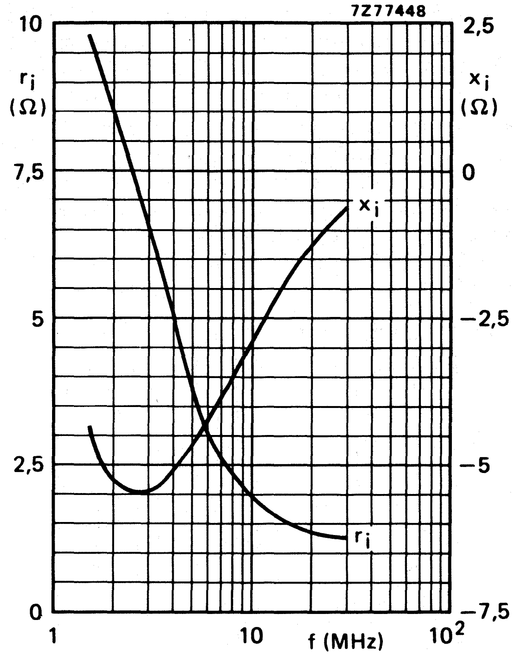


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 80 W; T_h = 25 °C; Z_L = 3,9 Ω.

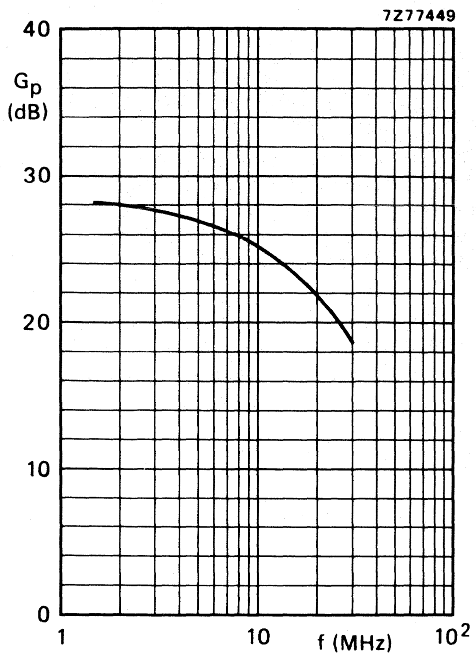


Fig. 13 Power gain as a function of frequency.

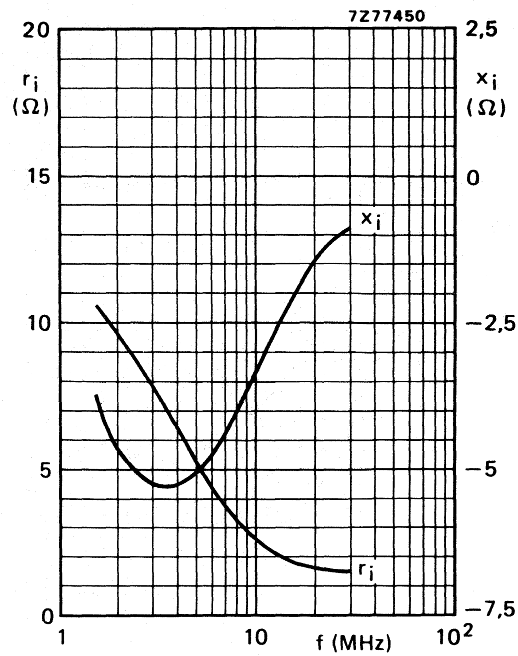


Fig. 14 Input impedance (series components) as a function of frequency.

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 V; $I_{C(ZS)}$ = 50 mA; P_L = 80 W; T_h = 25 °C; Z_L = 3,9 Ω; neutralizing capacitor: 68 pF.

APPLICATION INFORMATION (continued)

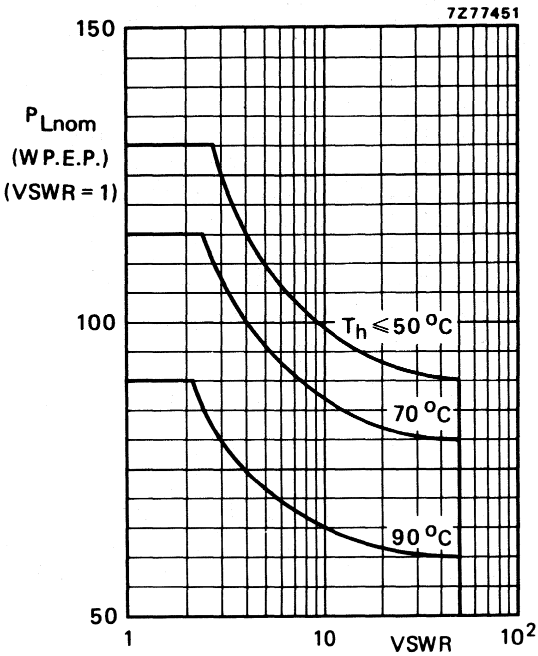


Fig. 15 R.F. SOAR; s.s.b. class-AB operation; f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W.
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)
T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\bar{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
108	**28**	**80**	typ. **13**	typ. **7,9**	typ. **4,1**	typ. **70**	**0,85 + j1,0**	**174 − j40**

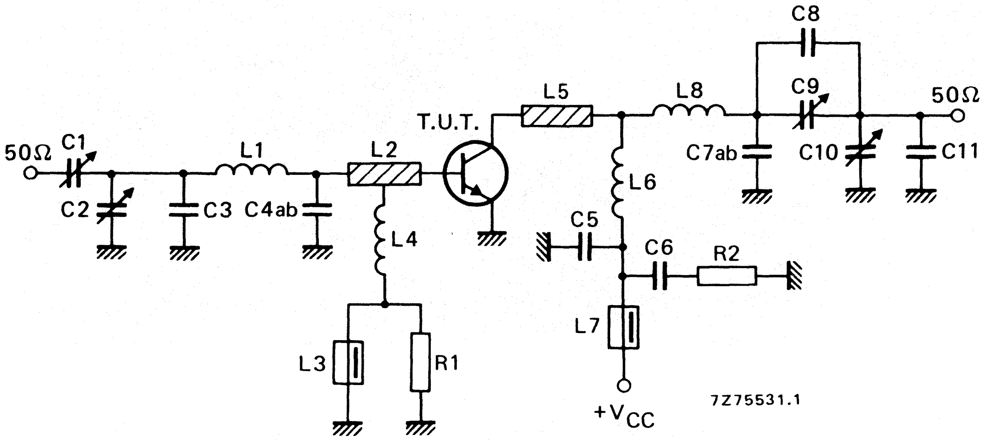


Fig. 16 Test circuit; c.w. class-B.

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)
C 8 = 5,6 pF ceramic capacitor (500 V)
C11 = 10 pF ceramic capacitor (500 V)

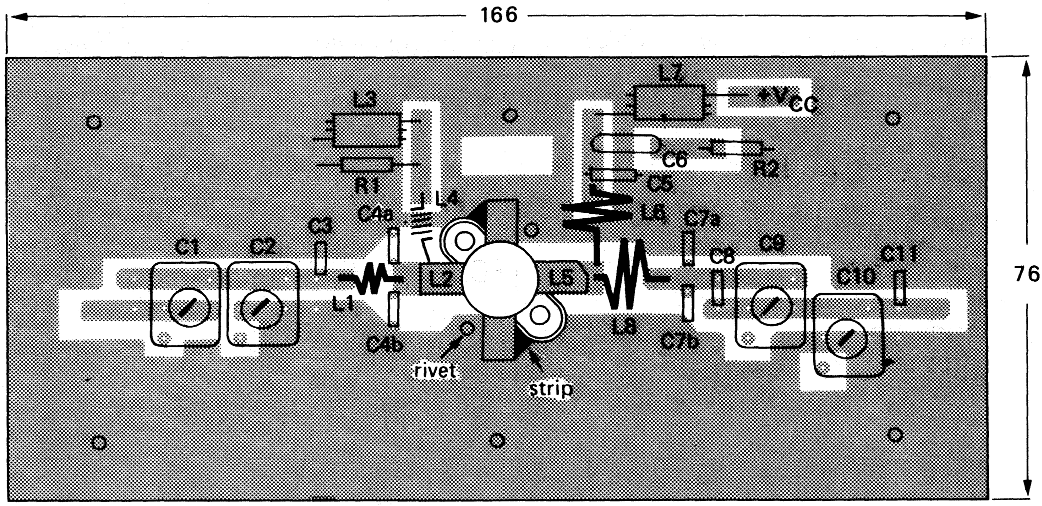
L1 = 21 nH; 2 turns Cu wire (1,0 mm); int. dia. 4,0 mm; length 3,5 mm; leads 2 x 5 mm
L2 = L5 = 2,4 nH; strip (12 mm x 6 mm); tap for L4 at 6 mm from transistor
L3 = L 7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); 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.

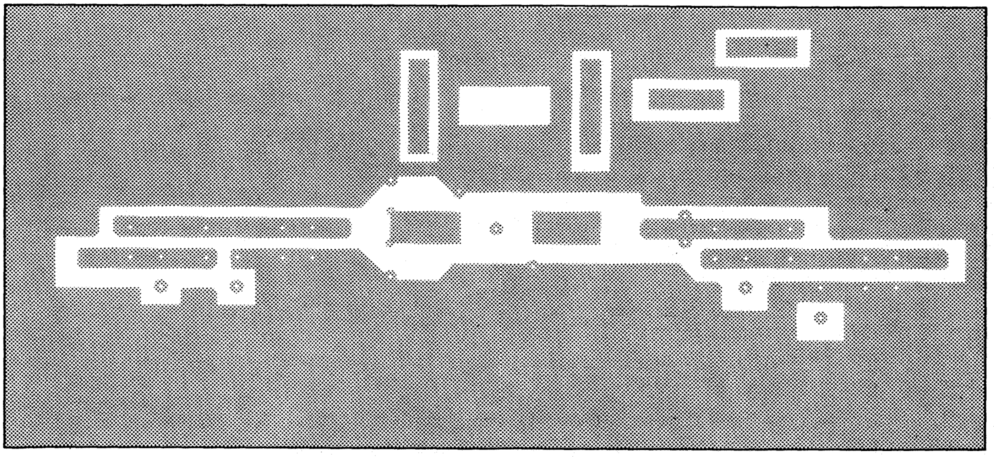
R1 = R2 = 10 Ω (± 10%) carbon resistor

Component layout and printed-circuit board for 108 MHz test circuit are shown in Fig. 17.

APPLICATION INFORMATION (continued)



7Z78091.1



7Z78092

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.

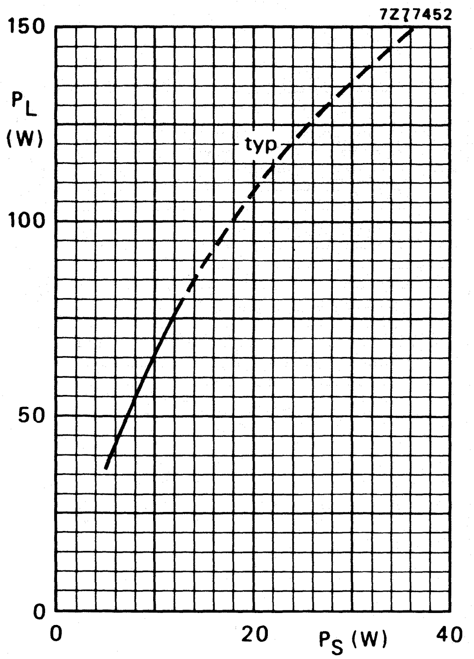


Fig. 18 V_{CE} = 28 V; f = 108 MHz; T_h = 25 °C.

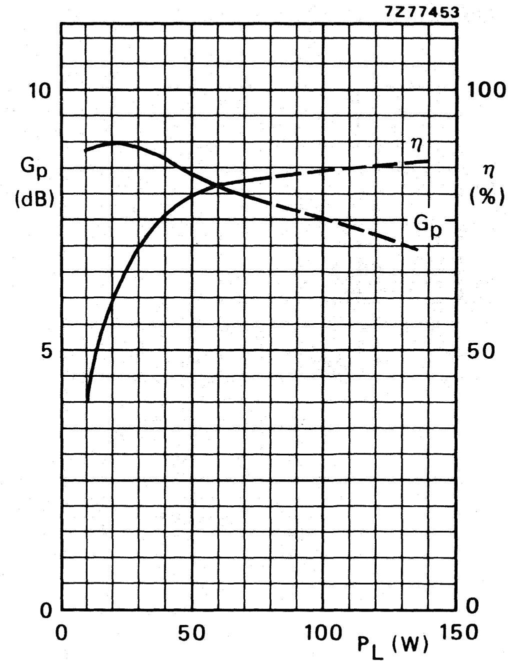


Fig. 19 V_{CE} = 28 V; f = 108 MHz; T_h = 25 °C; typical values.

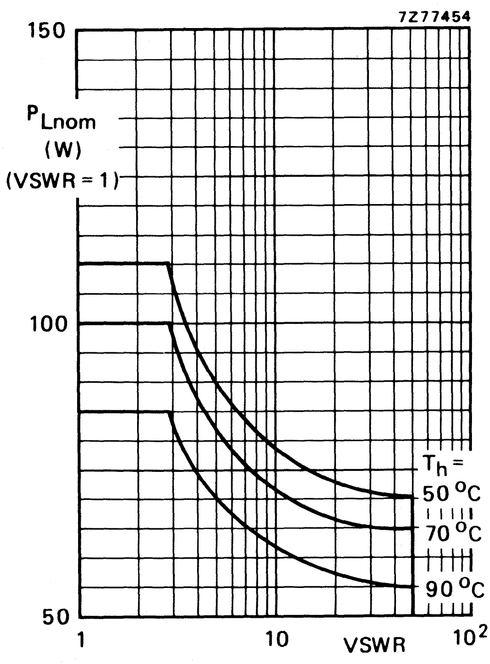


Fig. 20 R.F. SOAR; c.w. class-B operation; f = 108 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

APPLICATION INFORMATION (continued)

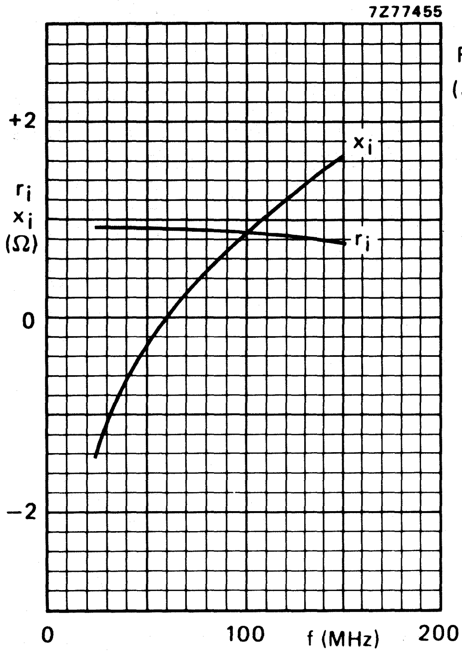


Fig. 21 V_{CE} = 28 V; P_L = 80 W; T_h = 25 °C; typical values.

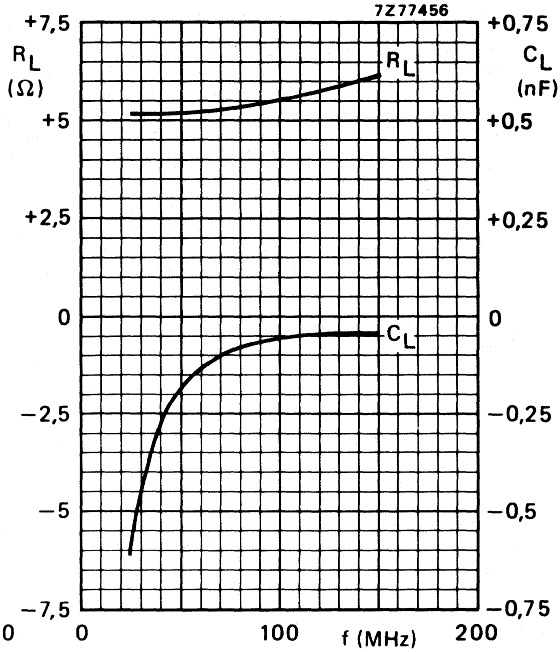


Fig. 22 V_{CE} = 28 V; P_L = 80 W; T_h = 25 °C; typical values.

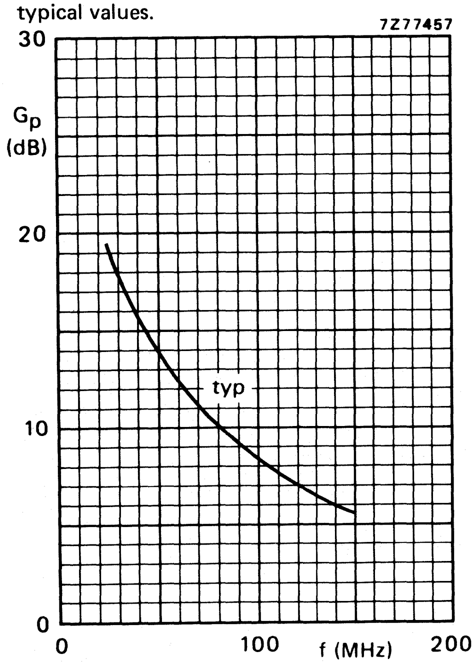


Fig. 23 V_{CE} = 28 V; P_L = 80 W; T_h = 25 °C.

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 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 °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.

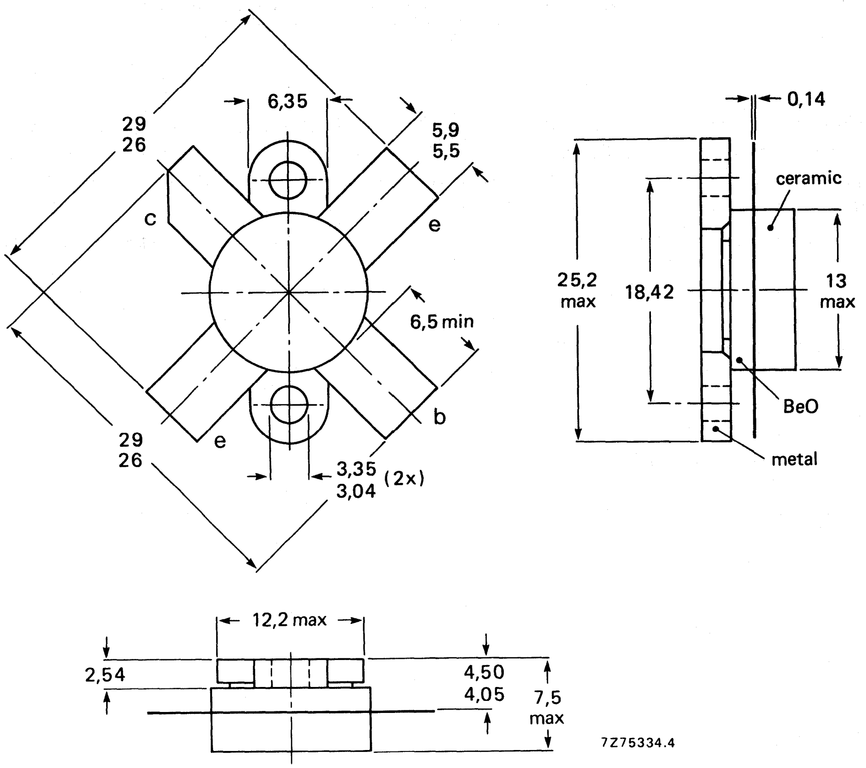
MECHANICAL DATA

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 Dimensions in mm

Fig. 1 SOT-121.



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

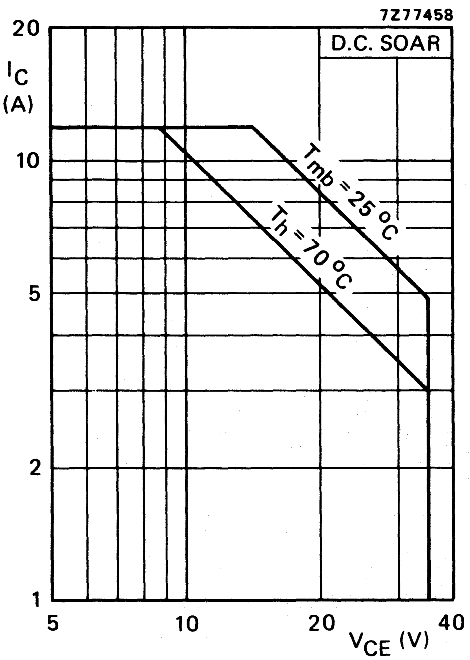


Fig. 2 D.C. SOAR.

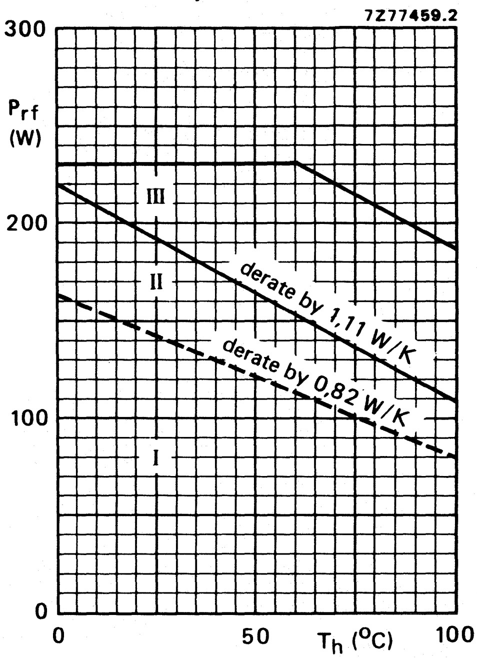


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f ≥ 1 MHz.

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)	$R_{th\ j\text{-}mb(dc)}$	=	1,03	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,71	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	70 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	35 V
Emitter-base breakdown voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 35 V	I_{CES}	<	20 mA
D.C. current gain* I_C = 7 A; V_{CE} = 5 V	h_{FE}		15 to 80
D.C. current gain ratio of matched devices* I_C = 7 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage* I_C = 20 A; I_B = 4 A	V_{CEsat}	typ.	2 V
Transition frequency at f = 100 MHz** $-I_E$ = 7 A; V_{CB} = 28 V $-I_E$ = 20 A; V_{CB} = 28 V	f_T f_T	typ. typ.	320 MHz 300 MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	255 pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	175 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

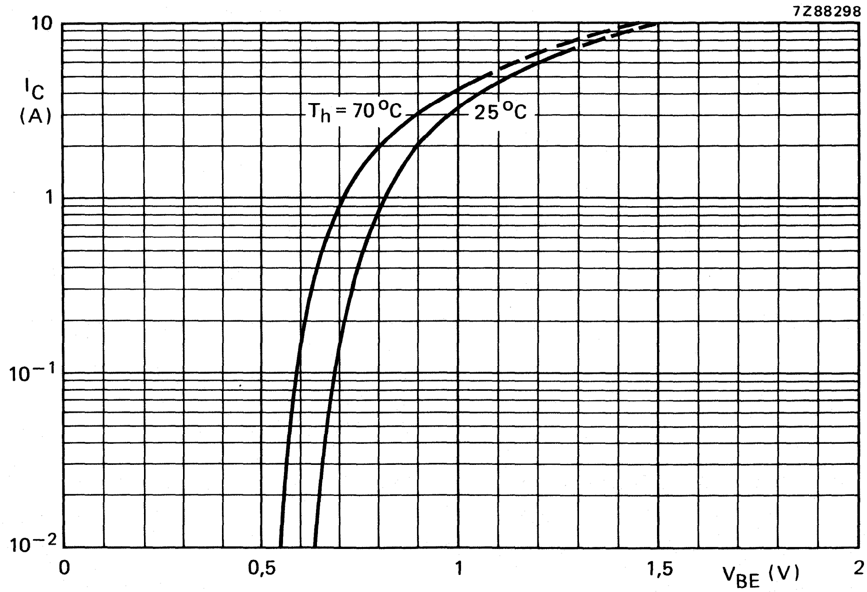


Fig. 4 Typical values; V_{CE} = 20 V.

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

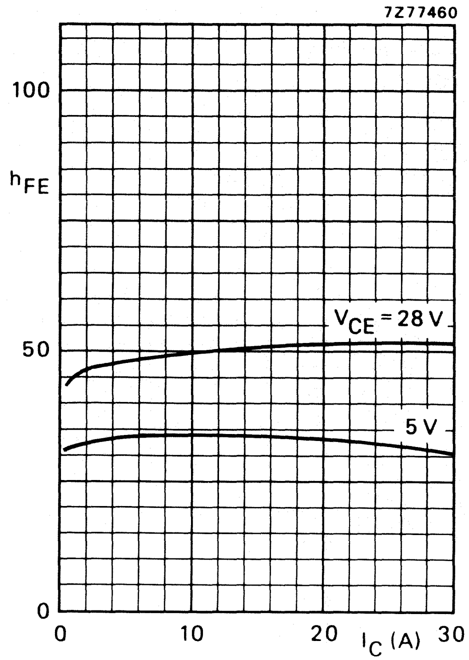


Fig. 5 Typical values; T_j = 25 °C.

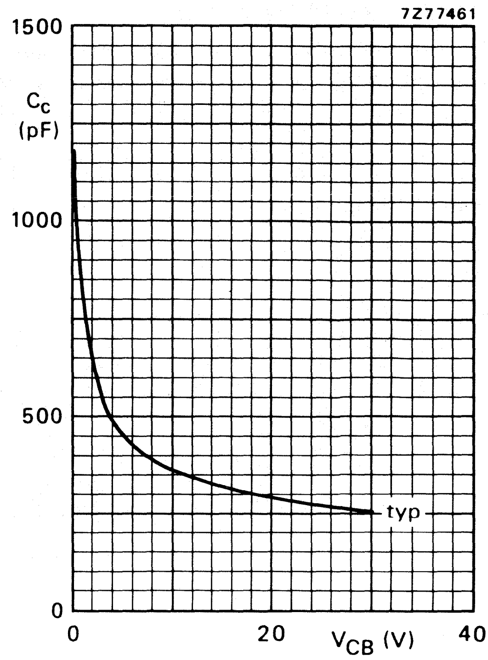


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

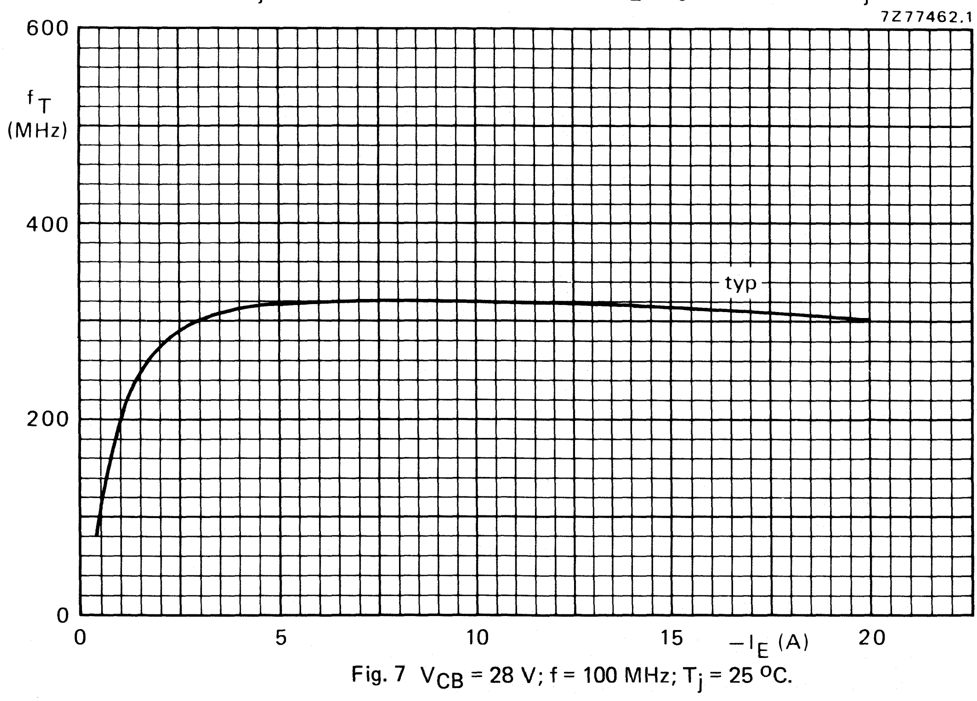


Fig. 7 V_{CB} = 28 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 130 W P.E.P.	I_C (A) at 130 W P.E.P.	d_3 dB	d_5 dB	$I_{C(ZS)}$ A
15 to 130 (P.E.P.)	**> 12**	**> 37,5**	**< 6,2**	**< −30**	**< −30**	**0,1**

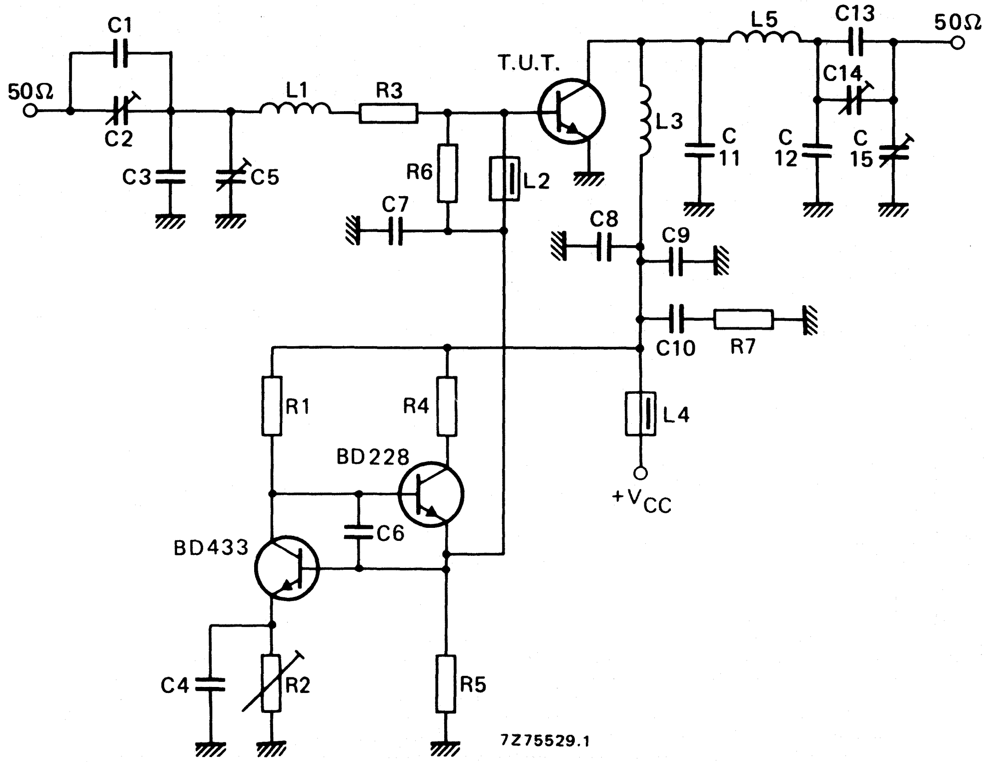


Fig. 8 Test circuit; s.s.b. class-AB.

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 μF 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)

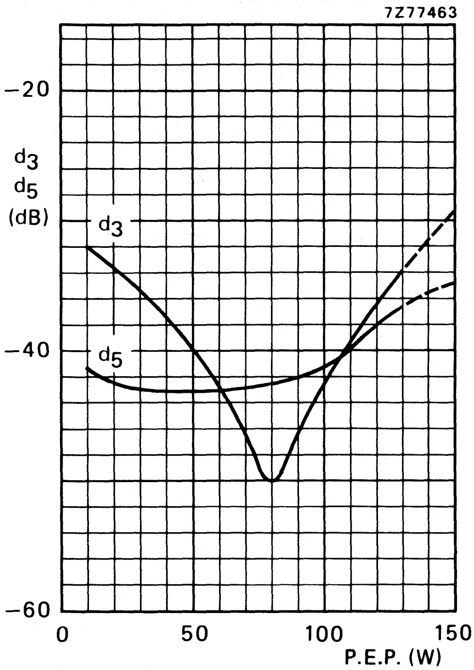


Fig. 9 Intermodulation distortion as a function of output power.*

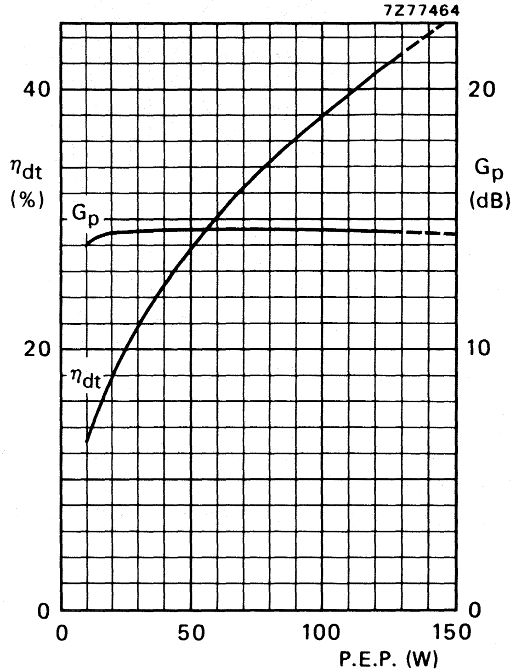


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 28 V; $I_{C(ZS)}$ = 100 mA; f_1 = 28,000 MHz; f_2 = 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)

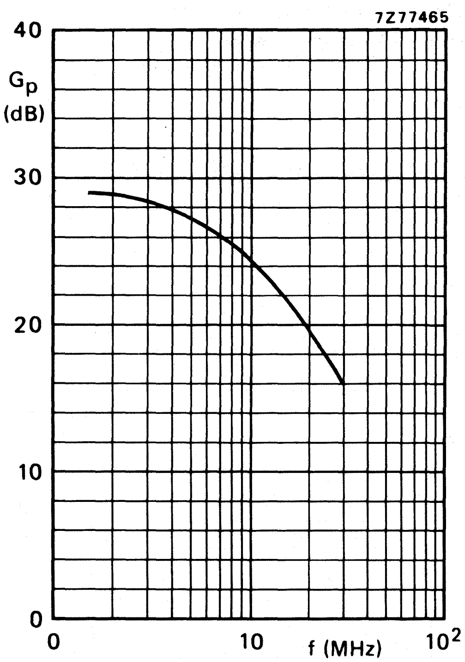


Fig. 11 Power gain as a function of frequency.

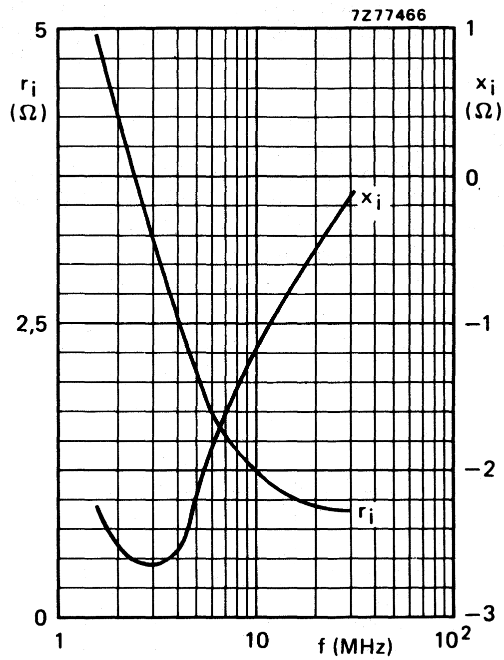
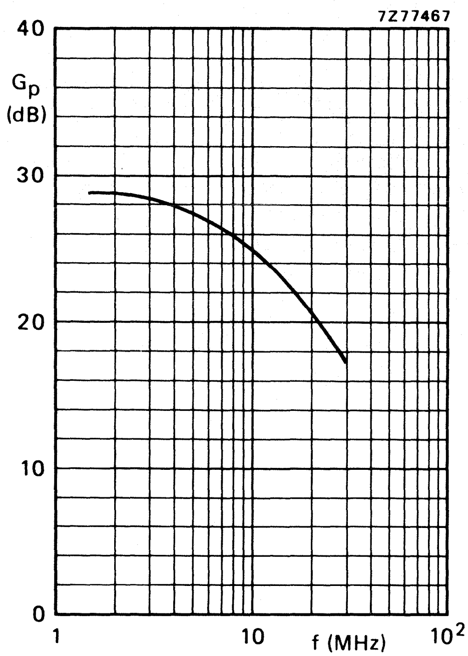


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 100 mA; P_L = 130 W; T_h = 25 °C; Z_L = 2,5 Ω.



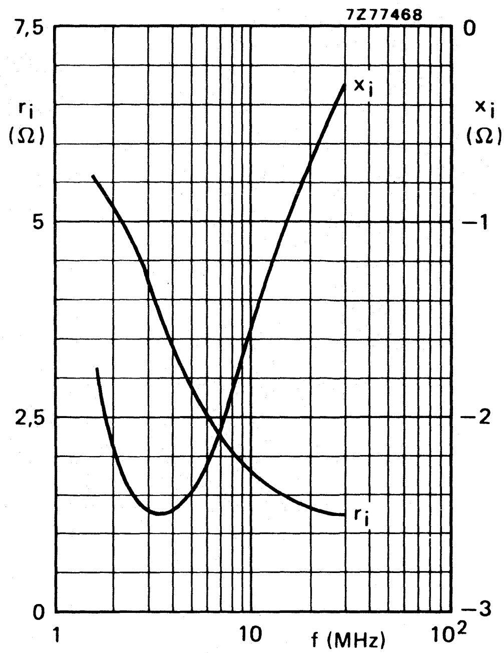


Fig. 13 Power gain as a function of frequency.

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 V; $I_{C(ZS)}$ = 100 mA; P_L = 130 W; T_h = 25 °C; Z_L = 2,5 Ω; neutralizing capacitor: 150 pF.

APPLICATION INFORMATION (continued)

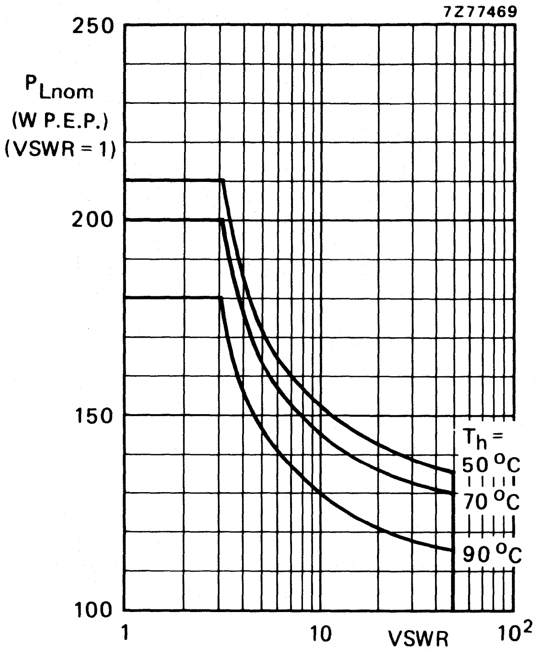


Fig. 15 R.F. SOAR; s.s.b. class-AB operation; f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; $R_{th\ mb-h}$ = 0,2 K/W.
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)
$T_h = 25\ ^oC$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\bar{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
87,5	**28**	**130**	typ. **23,2**	typ. **7,5**	typ. **6,2**	typ. **75**	**0,62 + j0,73**	**273 – j42**

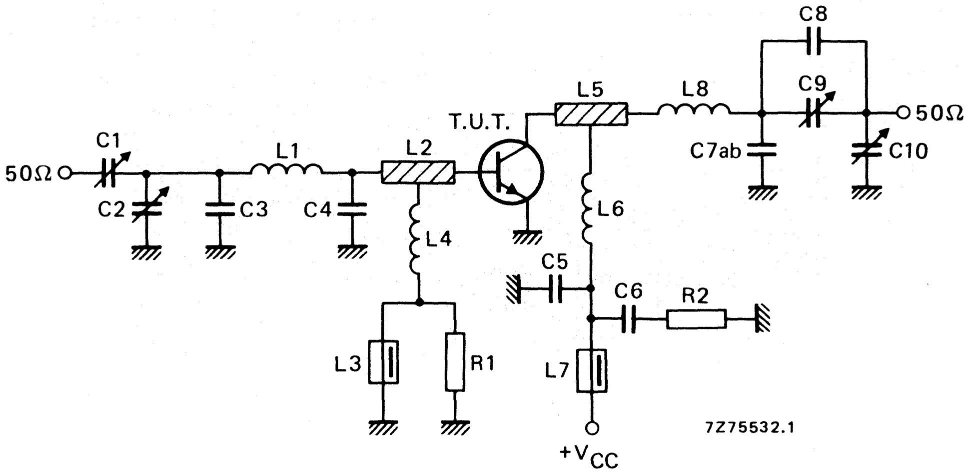


Fig. 16 Test circuit; c.w. class-B.

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)

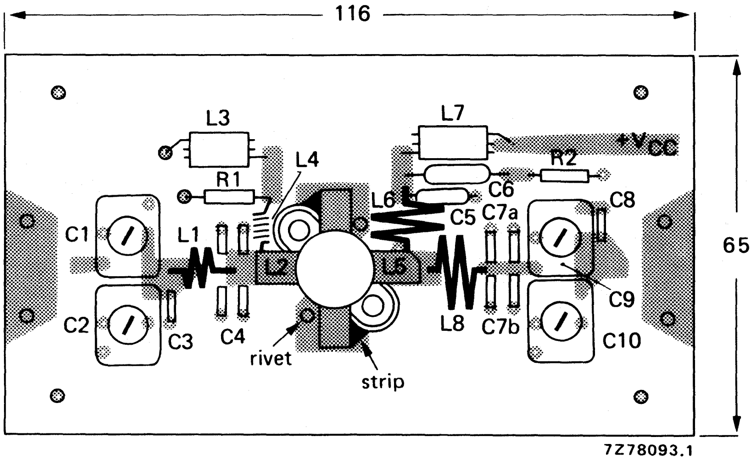
L1 = 25 nH; 2 turns Cu wire (1,6 mm); int. dia. 5,0 mm; length 4,6 mm; leads 2 x 5 mm
L2 = L5 = 2,4 nH; strip (12 mm x 6 mm); tap for L4 and L6 at 5 mm from transistor
L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 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 (± 10%) carbon resistor
R2 = 4,7 Ω (± 10%) carbon resistor

Component layout and printed-circuit board for 87,5 MHz test circuit are shown in Fig. 17.

APPLICATION INFORMATION (continued)



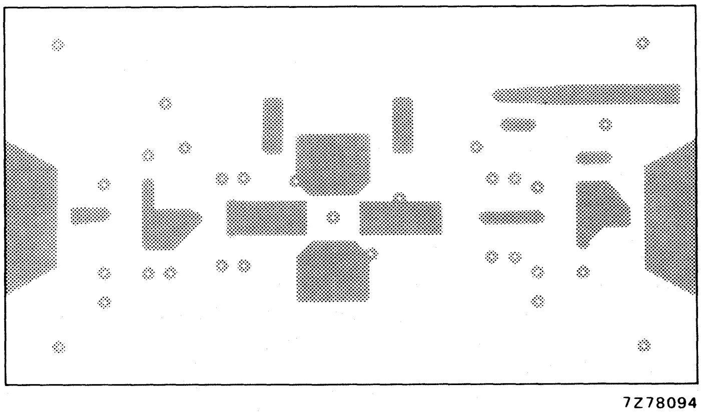


Fig. 17 Component layout and printed-circuit board for 87,5 MHz test circuit.

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 straps are used for a direct contact between upper and lower sheets.

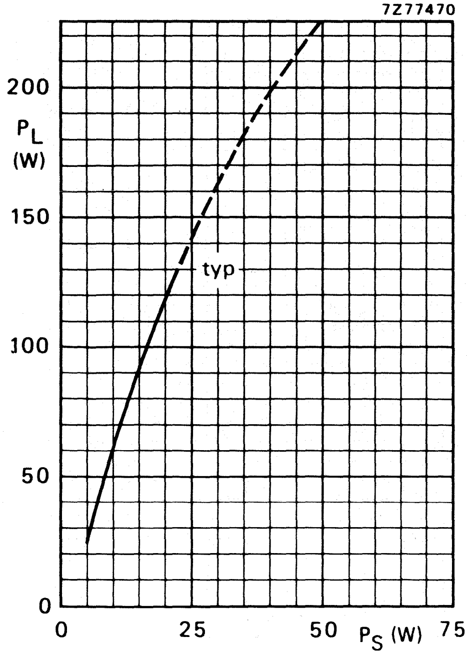


Fig. 18 V_{CE} = 28 V; f = 87,5 MHz; T_h = 25 °C.

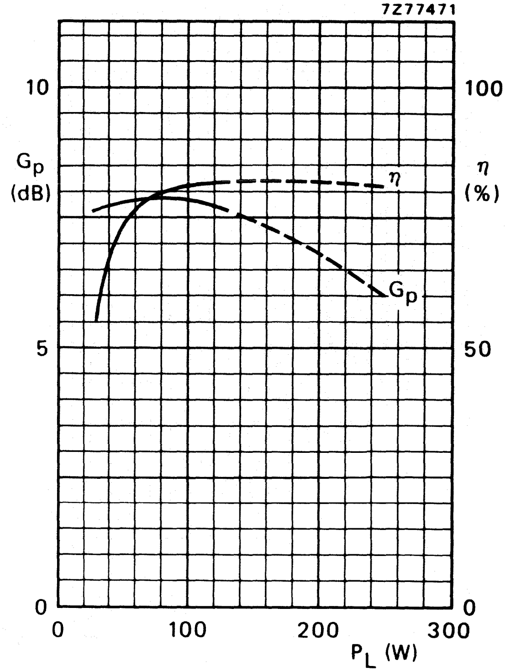


Fig. 19 V_{CE} = 28 V; f = 87,5 MHz; T_h = 25 °C; typical values.

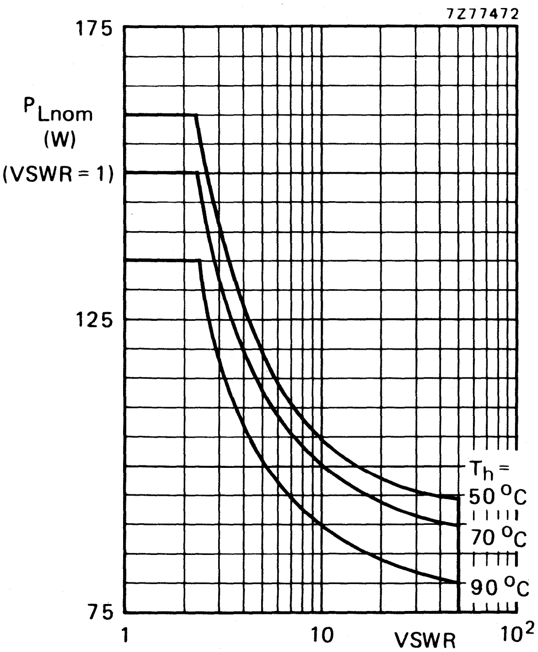


Fig. 20 R.F. SOAR; c.w. class-B operation; f = 87,5 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

APPLICATION INFORMATION (continued)

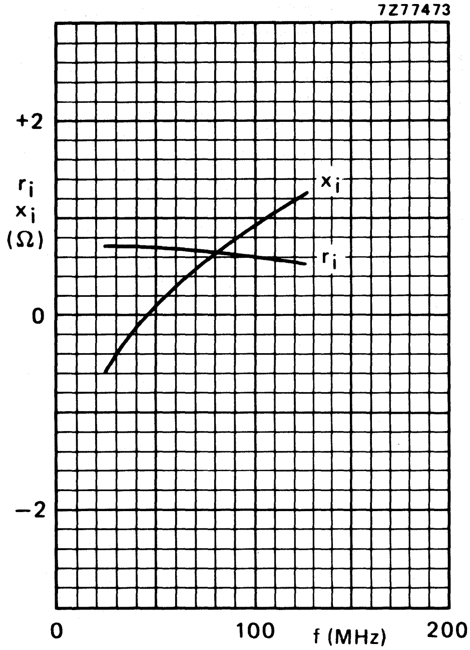


Fig. 21 V_{CE} = 28 V; P_L = 130 W; T_h = 25 °C; typical values.

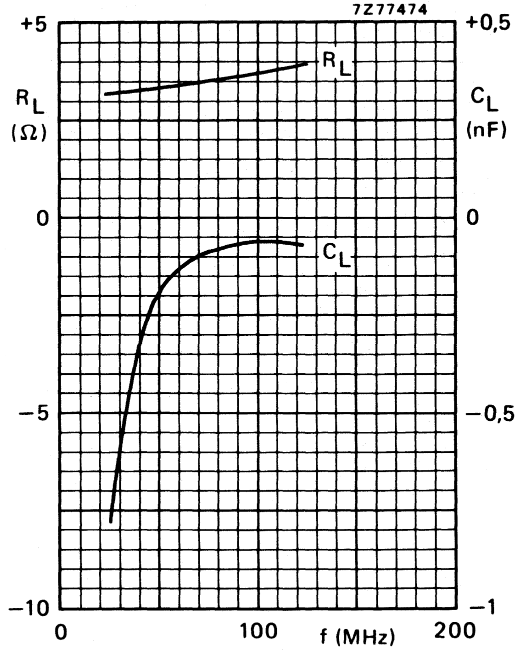


Fig. 22 V_{CE} = 28 V; P_L = 130 W; T_h = 25 °C; typical values.

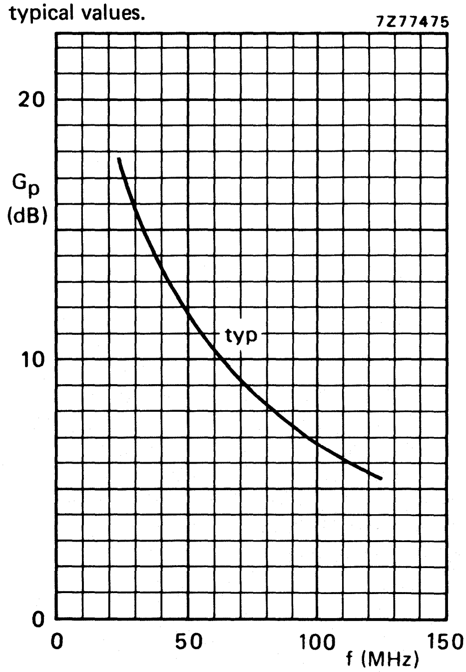


Fig. 23 V_{CE} = 28 V; P_L = 130 W; T_h = 25 °C.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, AB or B operated mobile, industrial and military transmitters in the h.f. and v.h.f. bands. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 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 °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.

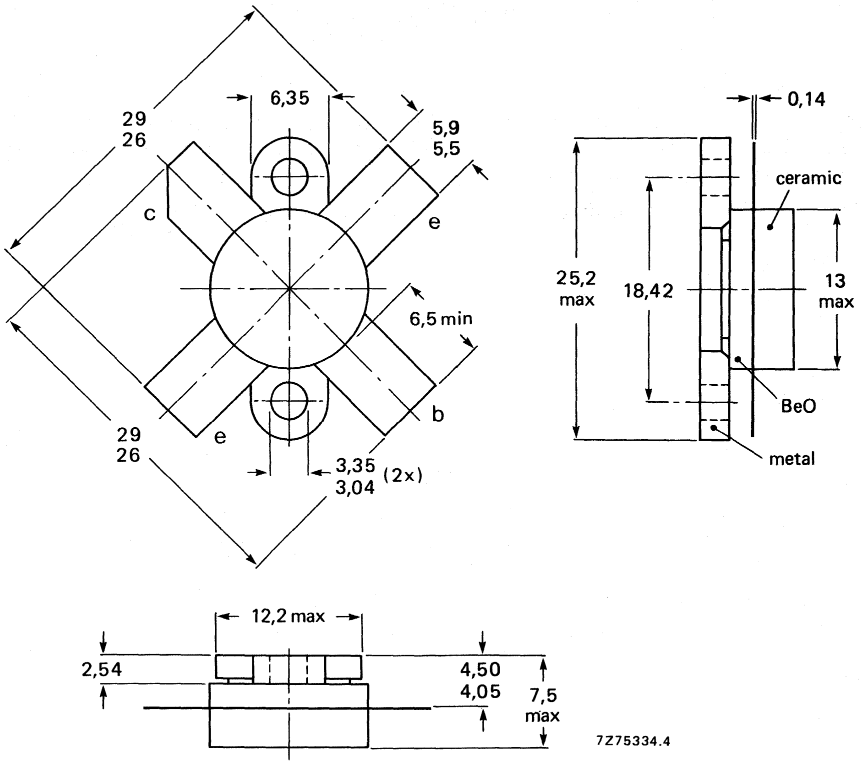
MECHANICAL DATA

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 Dimensions in mm

Fig. 1 SOT-121.



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

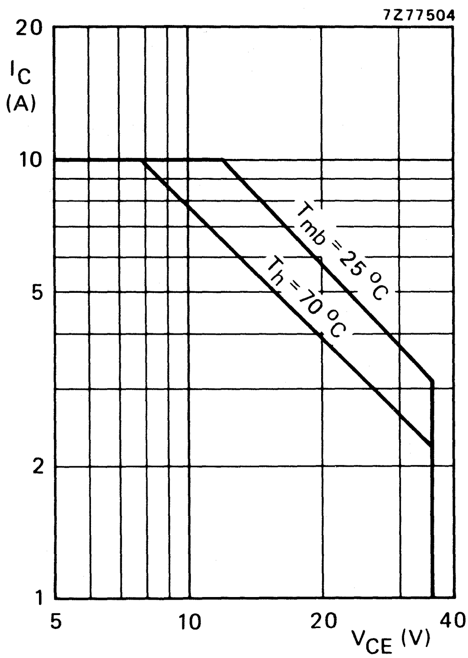


Fig. 2 D.C. SOAR.

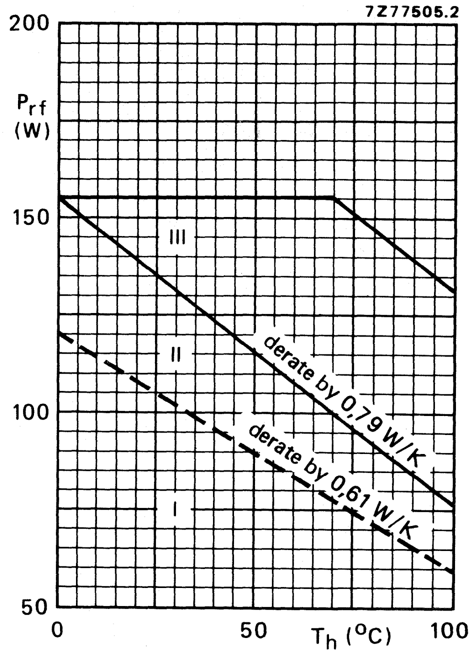


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 28 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 80 W; T_{mb} = 86 °C; i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,45 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,06 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	70 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	35 V
Emitter-base breakdown voltage open collector; I_E = 5 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 35 V	I_{CES}	<	5 mA
D.C. current gain* I_C = 5 A; V_{CE} = 5 V	h_{FE}	20 to 85	
Collector-emitter saturation voltage I_C = 15 A; I_B = 3 A	V_{CEsat}	typ.	2 V
Transition frequency at f = 100 MHz** $-I_E$ = 5 A; V_{CB} = 28 V	f_T	typ.	370 MHz
$-I_E$ = 15 A; V_{CB} = 28 V	f_T	typ.	350 MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	155 pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	102 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

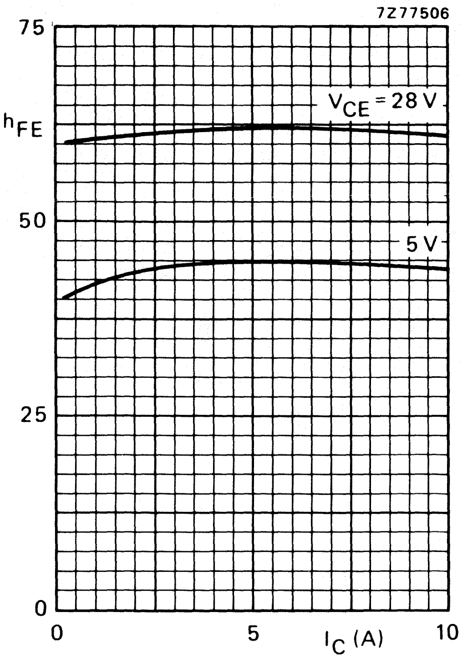


Fig. 4 Typical values; T_j = 25 °C.

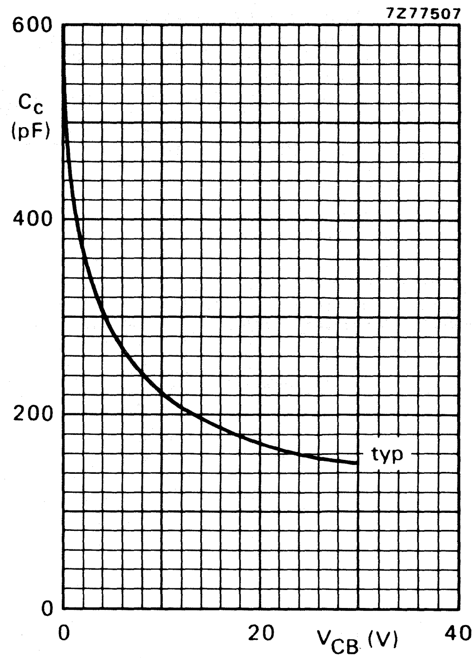


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

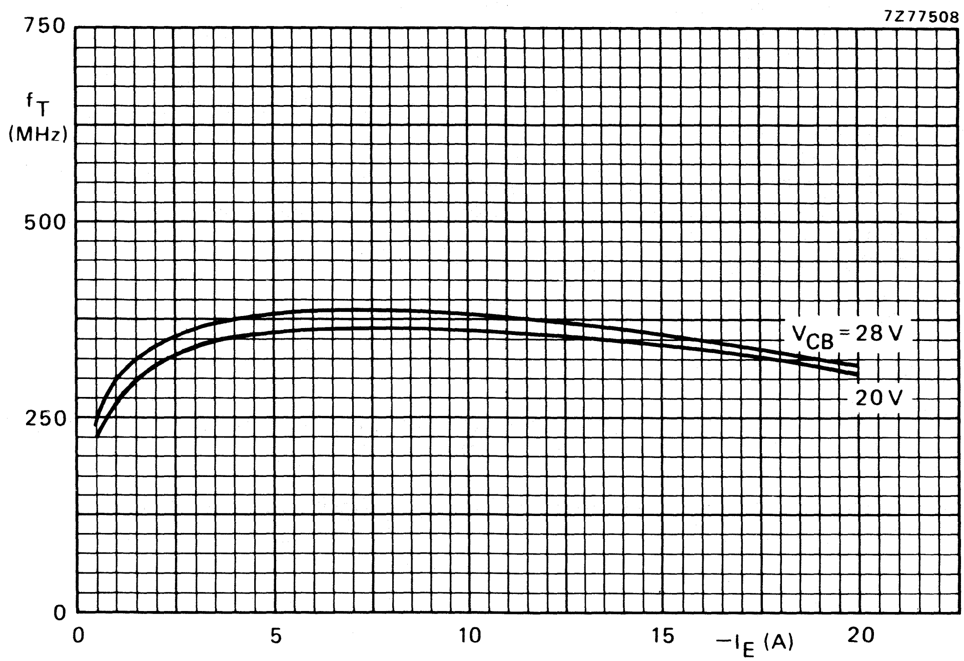


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit); $T_h = 25\ ^oC$

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

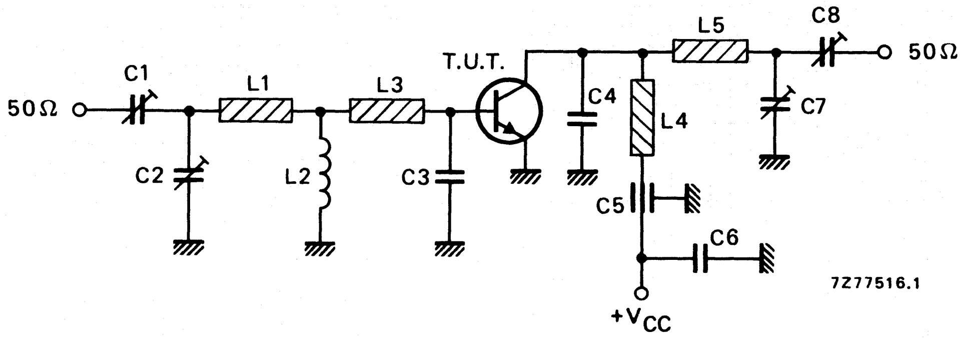


Fig. 7 Test circuit; c.w. class-B; f = 150 MHz.

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 parallel
C4 = 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 W and V_{CE} = 28 V, the output power at heatsink temperatures between 25 ^oC and 90 ^oC relative to that at 25 ^oC 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.

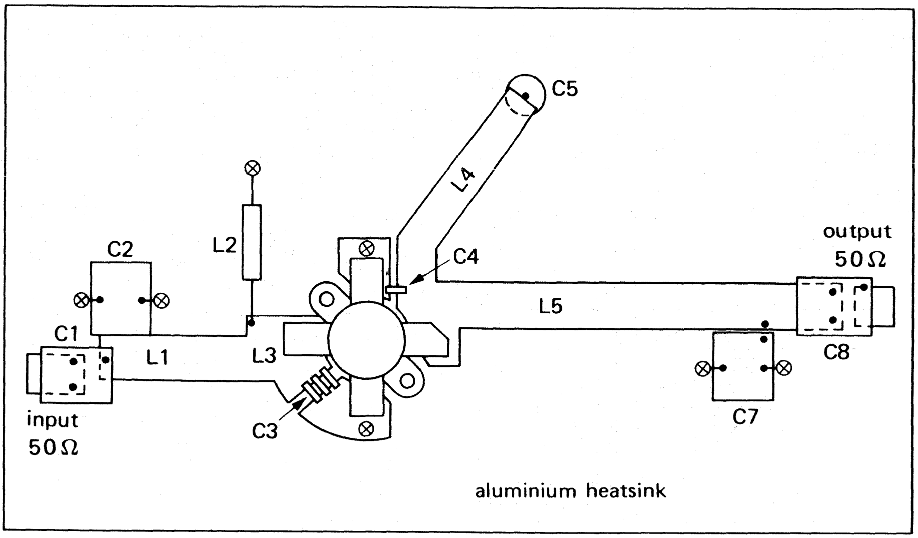


Fig. 8 Component layout on an aluminium heatsink for 150 MHz test circuit. ⊗ Earthing bolts.

APPLICATION INFORMATION (continued)

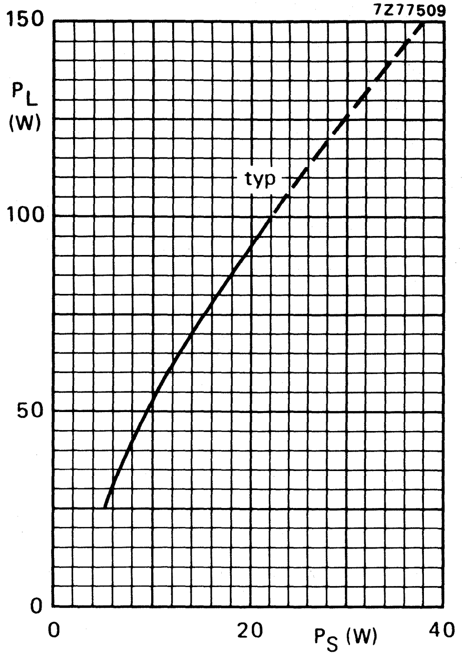


Fig. 9 V_{CE} = 28 V; f = 150 MHz; T_h = 25 °C.

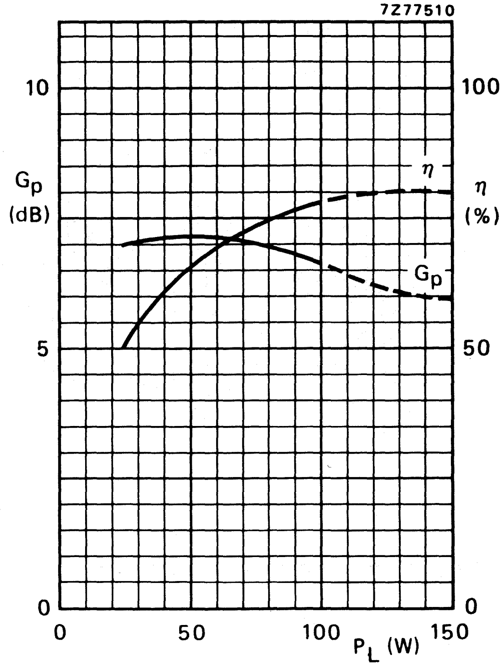


Fig. 10 V_{CE} = 28 V; f = 150 MHz; T_h = 25 °C; typical values.

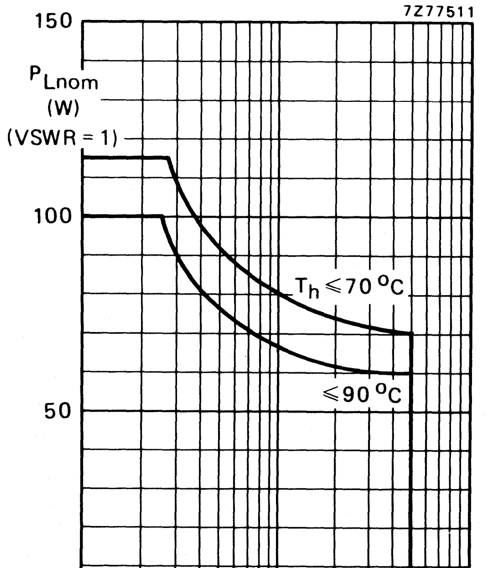


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 150 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

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.

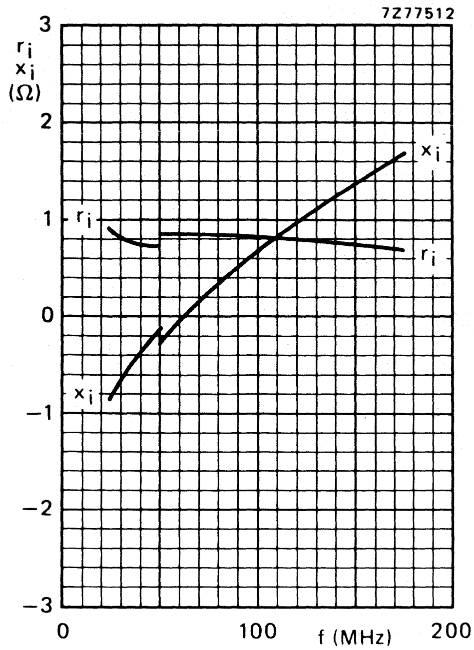


Fig. 12 Input impedance (series components).

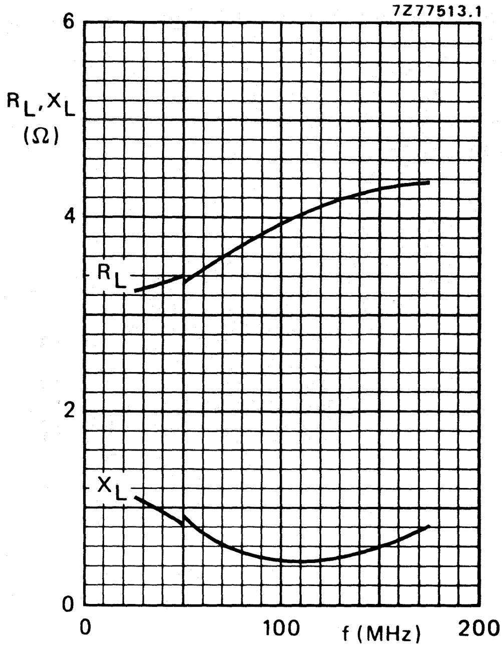


Fig. 13 Load impedance (series components).

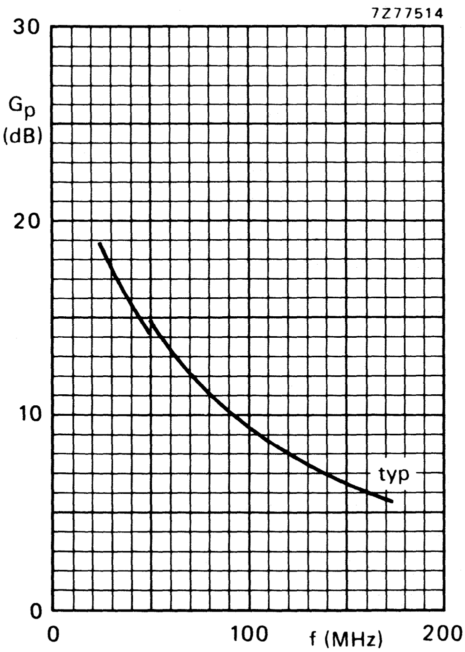


Fig. 14.

Conditions for Figs 12, 13 and 14:
V_{CE} = 28 V; P_L = 100 W; T_h = 25 °C;
typical values; class-B operation.

APPLICATION INFORMATION (continued)

R.F. performance in s.s.b. class-A operation

V_{CE} = 26 V; T_h = 40 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3 dB
35 (P.E.P.)	typ. 19,5	3	typ. −40

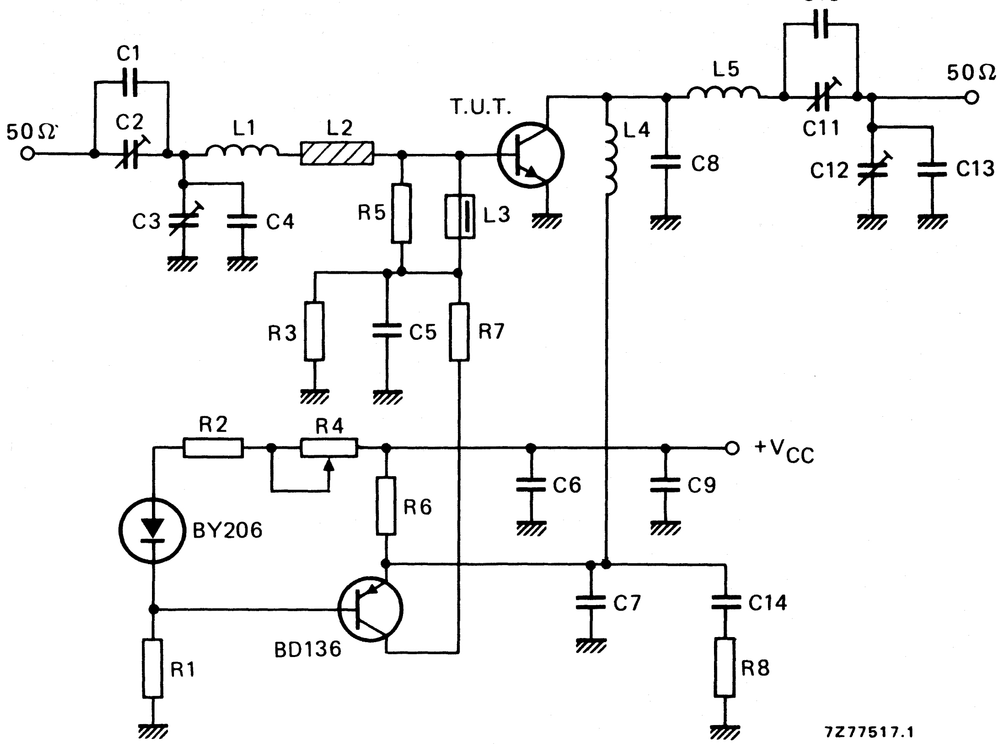


Fig. 15 Test circuit; s.s.b. class-A; f = 28 MHz.

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 kΩ (± 5%) carbon resistor (0,5 W)
R2 = 100 Ω (± 5%) carbon resistor (0,5 W)
R3 = 68 Ω (± 5%) carbon resistor (0,5 W)
R4 = 100 Ω wirewound potentiometer
R5 = 33 Ω (± 5%) carbon resistor (0,5 W)
R6 = 0,68 Ω (± 10%) wirewound resistor (7 W)
R7 = 120 Ω wirewound resistor (8 W)
R8 = 10 Ω (± 10%) carbon resistor (0,5 W)

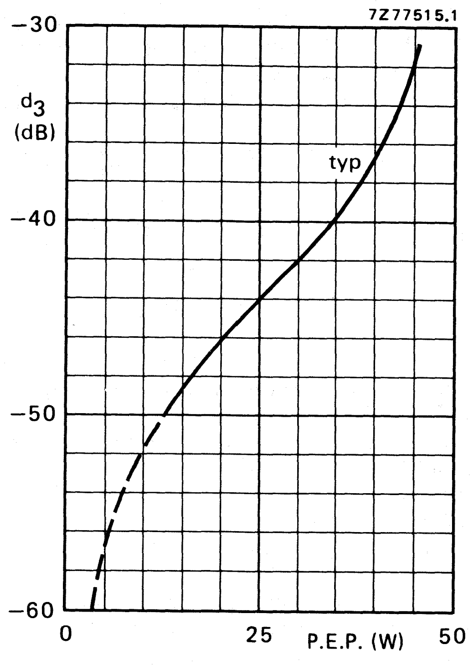


Fig. 16 Intermodulation distortion as a function of output power; V_{CE} = 26 V; I_C = 3 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 40 °C.

APPLICATION INFORMATION (continued)

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 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	$I_{C(ZS)}$ mA
100 (P.E.P.)	typ. 19	typ. 42	typ. 4,3	typ. −30	typ. −37	50

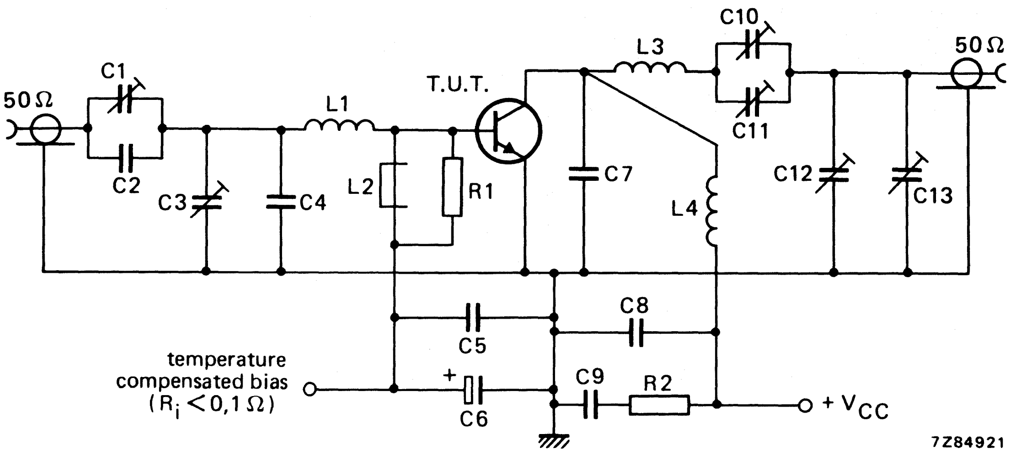


Fig. 17 Test circuit; s.s.b. class-AB; f = 28 MHz.

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 μF/6 V solid tantalum capacitor
C7 = 150 pF ceramic capacitor (500 V)
C9 = 100 nF polyester capacitor
C10 = 750 pF mica dielectric trimmer (single insultated 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 (± 10%) carbon resistor (0,5 W)
R2 = 4,7 Ω (± 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.

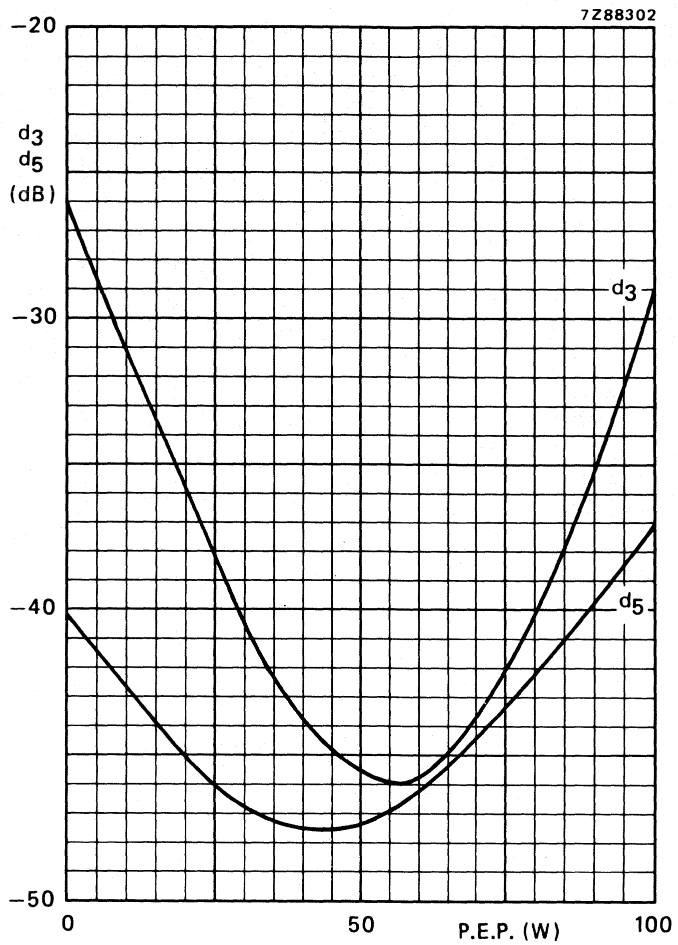


Fig. 18 Intermodulation distortion* as a function of output power.
Typical values; V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C.

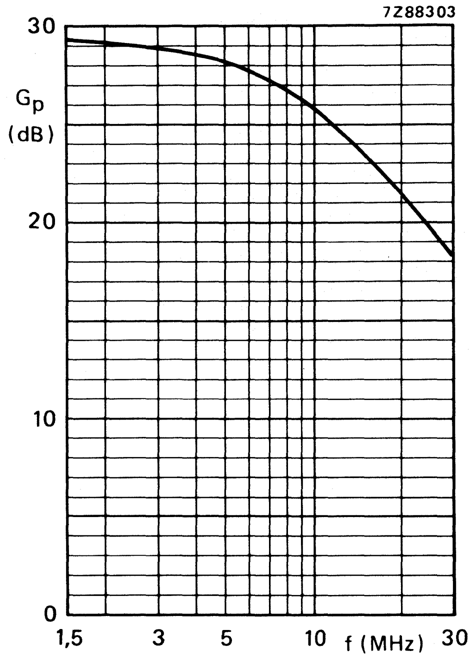


Fig. 19 Power gain as a function of frequency.

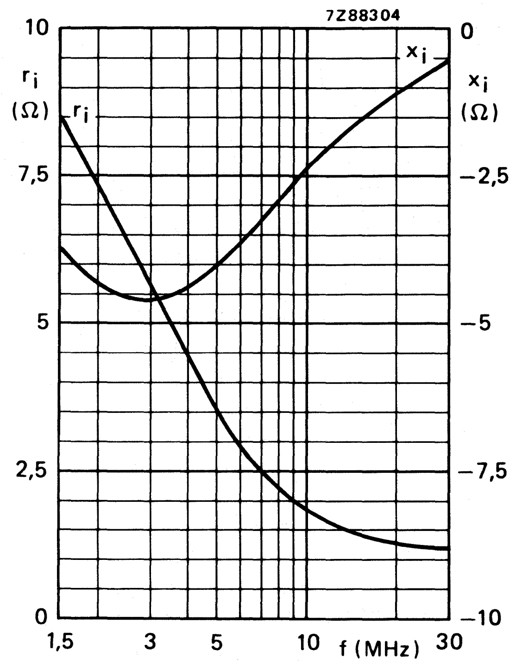


Fig. 20 Input impedance (series components).

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.
Conditions:
V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 100 W (P.E.P.); T_h = 25 °C; Z_L = 2,7 Ω.

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

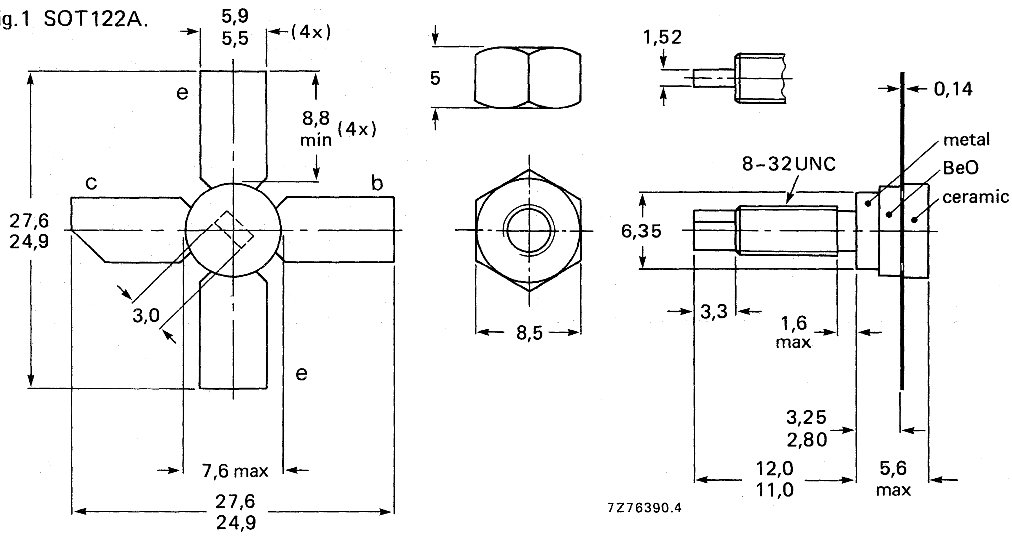
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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 SOT122A.



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

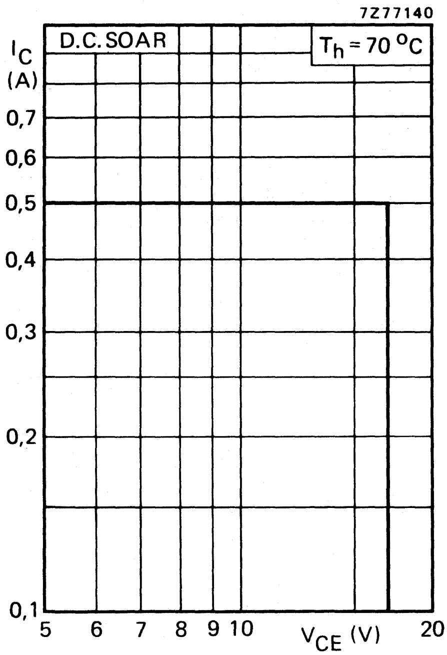


Fig.2.

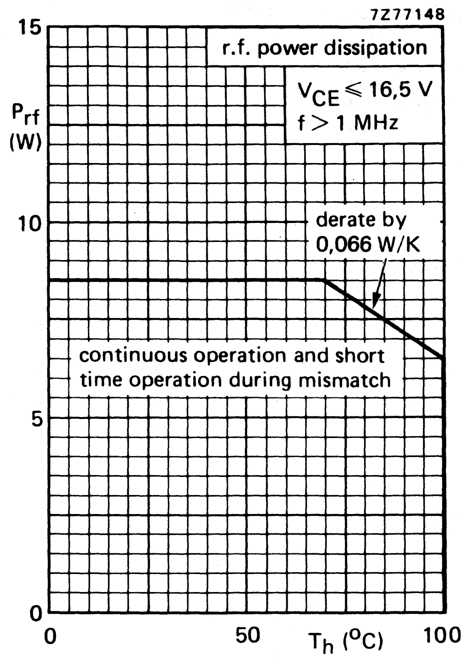


Fig.3.

Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	14,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_j = 25 °C

Breakdown voltages			
Collector-emitter voltage V_{BE} = 0; I_C = 5 mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base; I_C = 25 mA	$V_{(BR)CEO}$	>	17 V
Emitter-base voltage open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 17 V	I_{CES}	<	2 mA
D.C. current gain *			
I_C = 250 mA; V_{CE} = 5 V	h_{FE}	> typ	10 35
Collector-emitter saturation voltage *			
I_C = 750 mA; I_B = 150 mA	V_{CEsat}	typ	0,6 V
Transition frequency at f = 500 MHz *			
I_C = 250 mA; V_{CE} = 12,5 V	f_T	typ	1,5 GHz
I_C = 750 mA; V_{CE} = 12,5 V	f_T	typ	1,0 GHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 12,5 V	C_c	typ	8 pF
Feedback capacitance at f = 1 MHz			
I_C = 20 mA; V_{CE} = 12,5 V	C_{re}	typ	3,6 pF
Collector-stud capacitance	C_{cs}	typ	1,2 pF

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

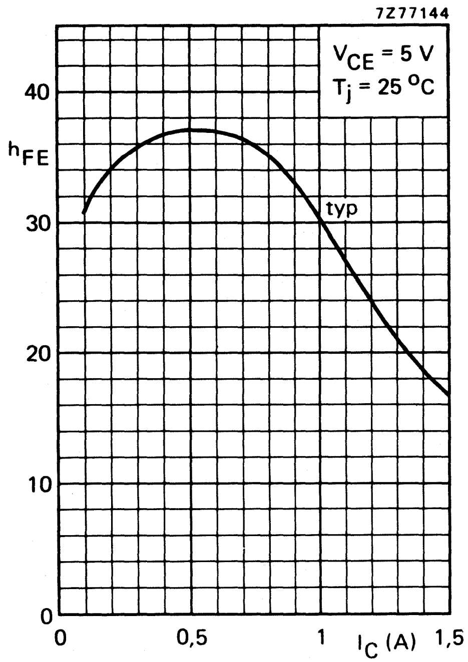


Fig.4.

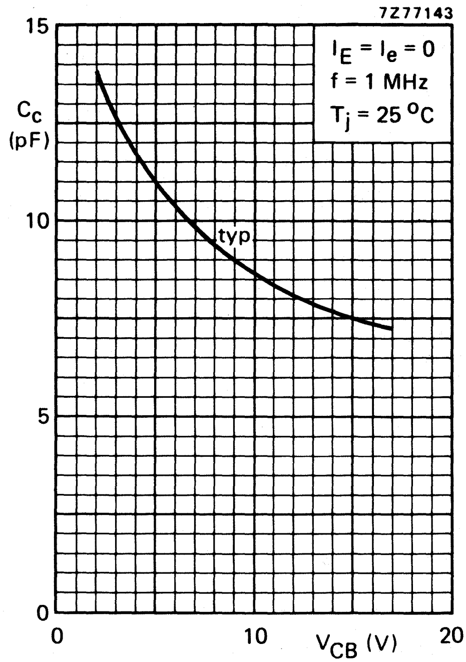


Fig.5.

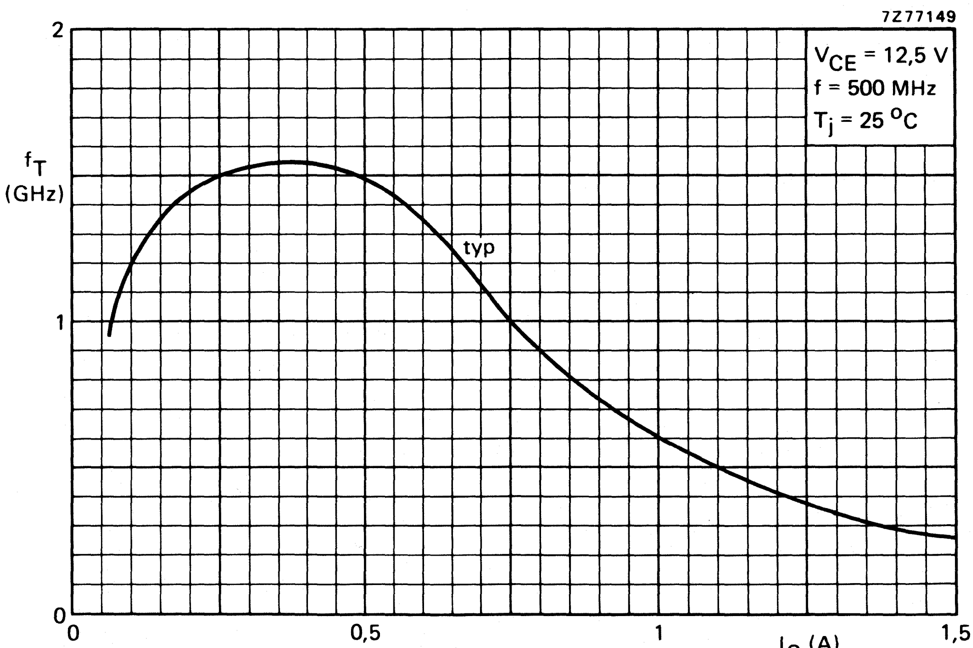


Fig.6.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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

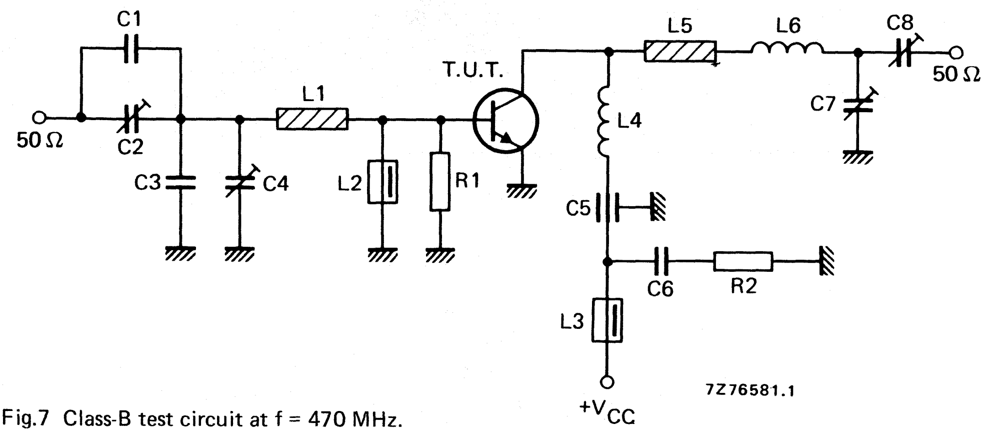


Fig.7 Class-B test circuit at f = 470 MHz.

List of components:

C1 = 2,2 pF (± 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 (± 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)

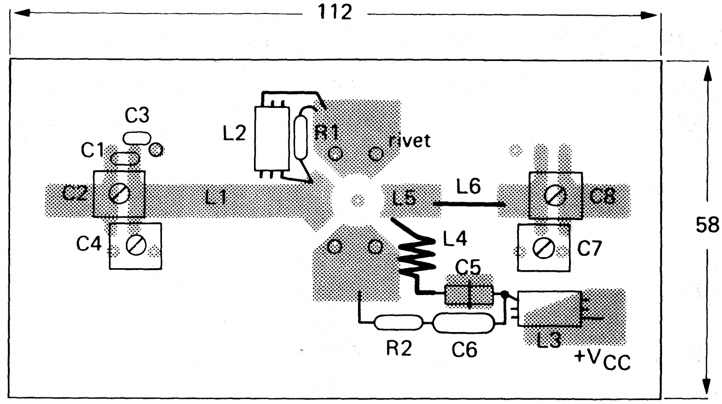
L1 = stripline (35,6 mm x 6,0 mm)
L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 178 nH; 4 turns Cu wire (1 mm); int. dia. 6 mm; length 7 mm; leads 2 x 5 mm
L5 = stripline (10,0 mm x 6,0 mm)
L6 = 28 nH; ½ turn Cu wire (1 mm); int. dia. 10 mm

L1 and L5 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16".

R1 = 100 Ω (± 5%) carbon resistor
R2 = 10 Ω (± 5%) carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit (Fig.8).

APPLICATION INFORMATION (continued)



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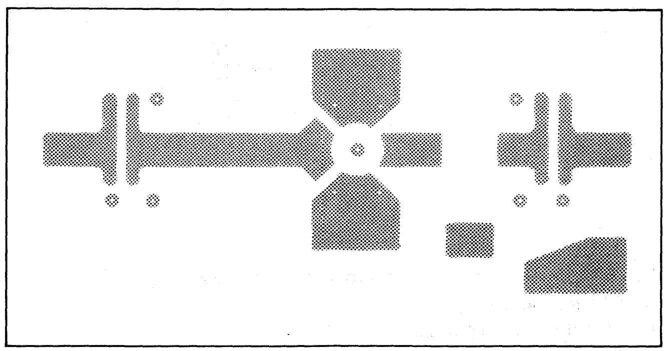

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The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

Fig.8 Component layout and printed-circuit board for 470 MHz circuit test.

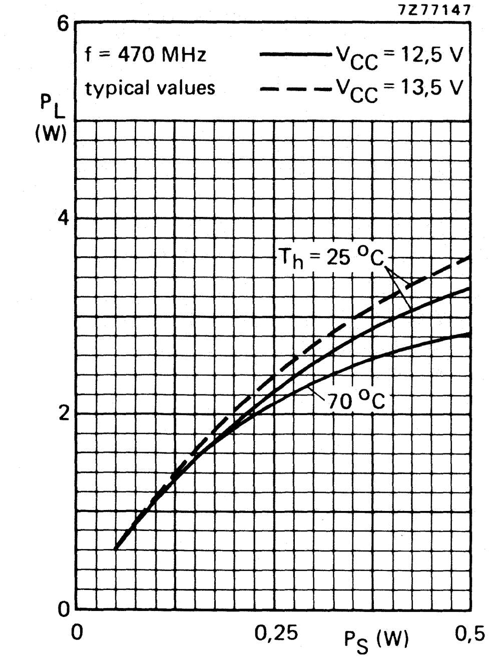


Fig.9.

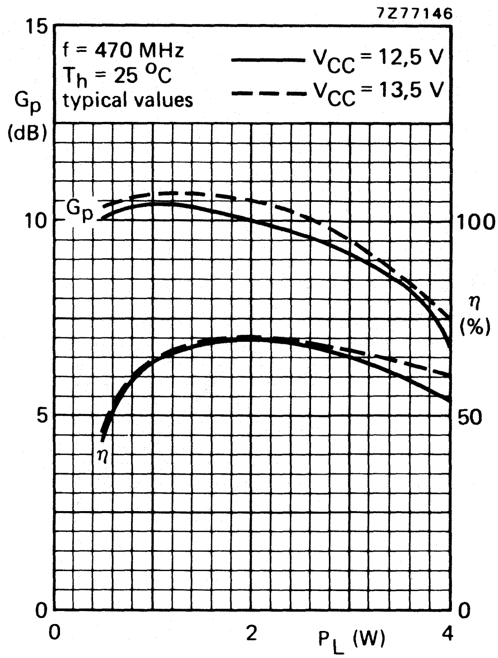


Fig.10.

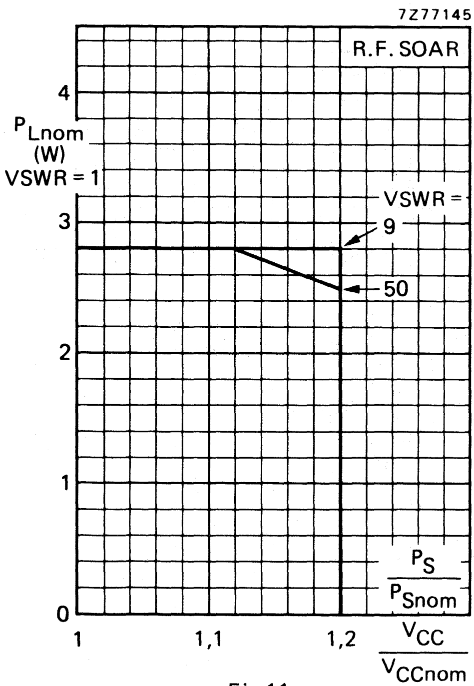


Fig.11.

Conditions for R.F. SOAR

f = 470 MHz
T_h = 70 °C
$R_{th\ mb\text{-}h}$ = 0,6 K/W
V_{CCnom} = 12,5 V or 13,5 V
$P_S = P_{Snom}$ at V_{CCnom} and VSWR = 1
measured in the circuit of Fig.7.

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

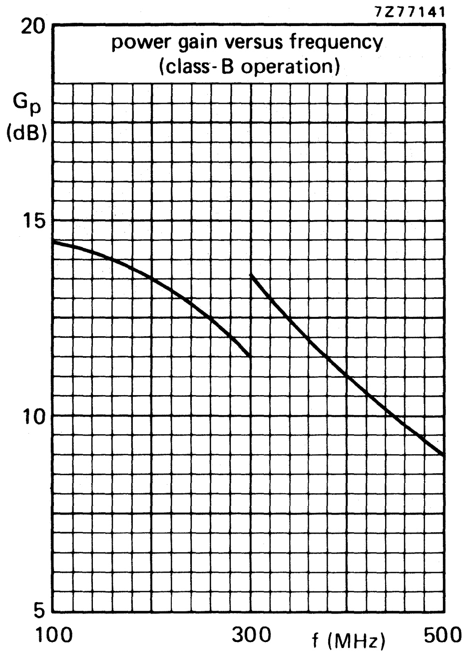


Fig.12.

Measuring conditions for the graphs on this page

V_{CC} = 12,5 V
P_L = 2 W
T_h = 25 °C
typical values

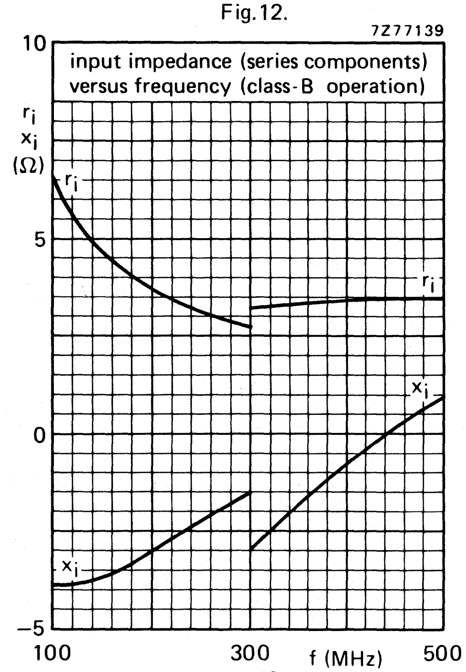


Fig.13.

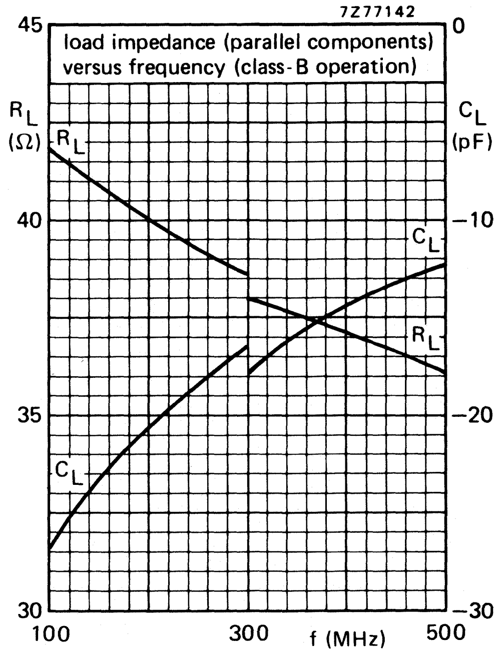


Fig.14.

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

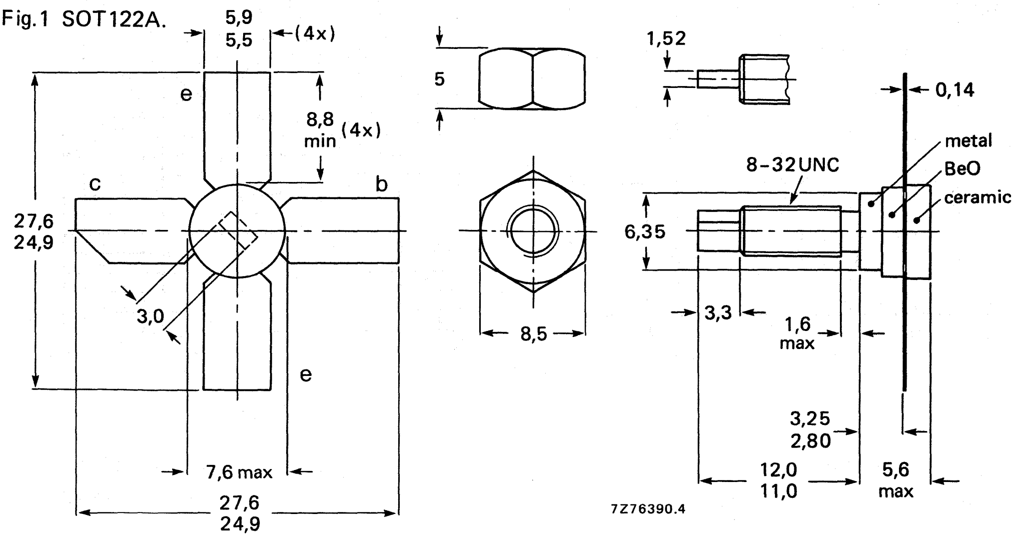
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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 SOT122A.



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

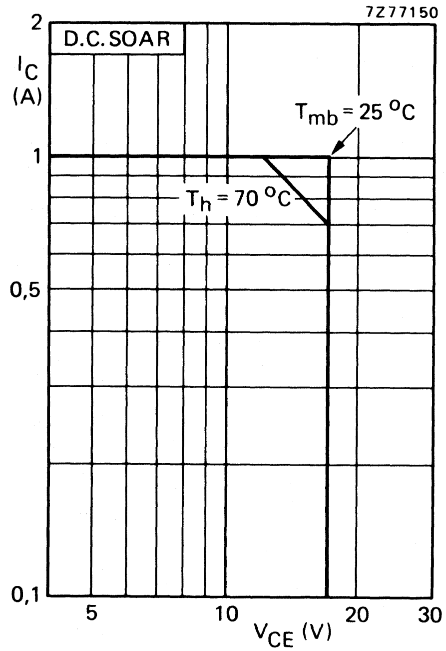


Fig.2.

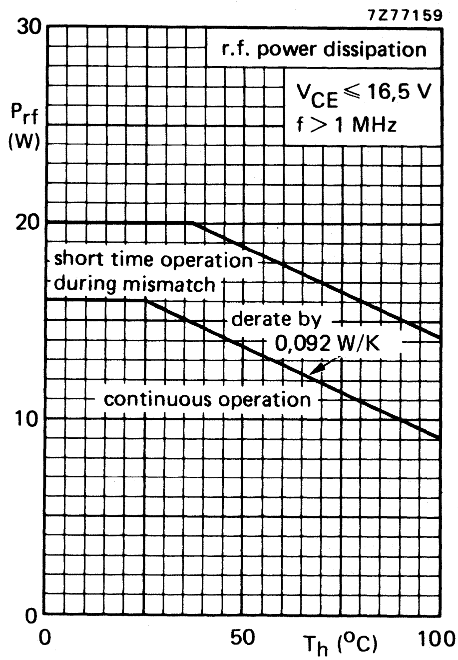


Fig.3.

Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	10,3	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_j = 25 °C

Breakdown voltages				
Collector-emitter voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	36	V
Collector-emitter voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	17	V
Emitter-base voltage open collector; I_E = 4 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 17 V	I_{CES}	<	4	mA
D.C. current gain *				
I_C = 0,5 A; V_{CE} = 5 V	h_{FE}	> typ	10 35	
Collector-emitter saturation voltage *				
I_C = 1,5 A; I_B = 0,3 A	V_{CEsat}	typ	0,75	V
Transition frequency at f = 500 MHz *				
I_C = 0,5 A; V_{CE} = 12,5 V	f_T	typ	1,75	GHz
I_C = 1,5 A; V_{CE} = 12,5 V	f_T	typ	1,25	GHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 12,5 V	C_c	typ	14	pF
Feedback capacitance at f = 1 MHz				
I_C = 40 mA; V_{CE} = 12,5 V	C_{re}	typ	7,1	pF
Collector-stud capacitance	C_{cs}	typ	1,2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

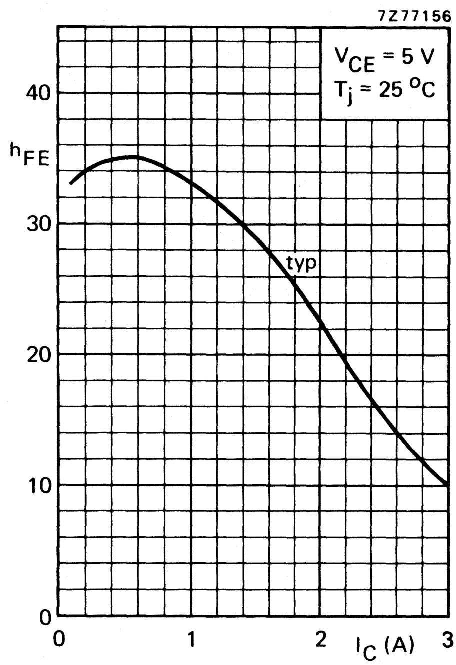

7Z77156
V_{CE} = 5 V
T_j = 25 °C
h_{FE}
40
30
20
10
0
typ
0
1
2
3
I_C (A)

Fig.4.

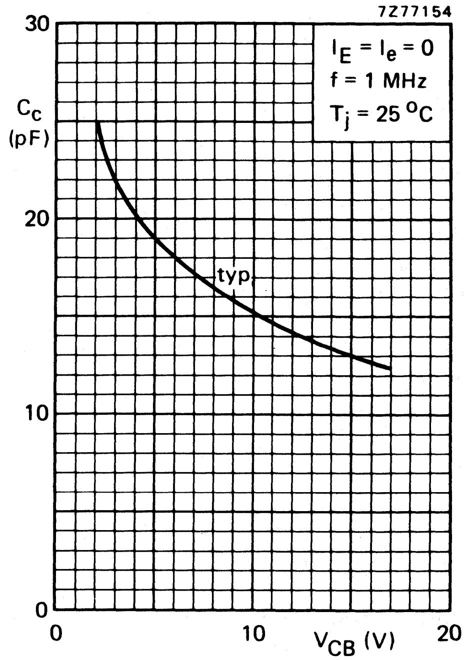
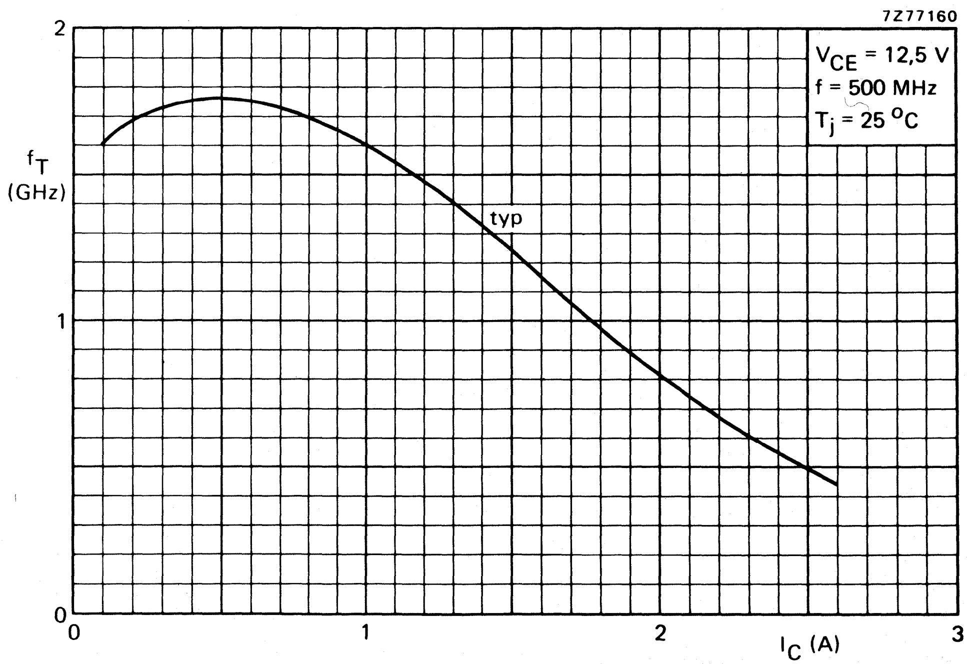

7Z77154
I_E = I_e = 0
f = 1 MHz
T_j = 25 °C
C_c
(pF)
30
20
10
0
typ
0
10
20
V_{CB} (V)

Fig.5.


7Z77160
V_{CE} = 12,5 V
f = 500 MHz
T_j = 25 °C
f_T
(GHz)
2
1
0
typ
0
1
2
3
I_C (A)

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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

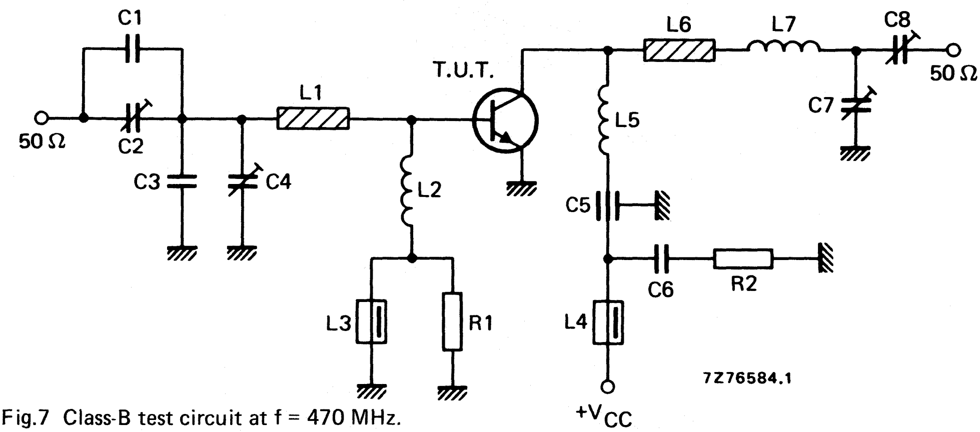


Fig.7 Class-B test circuit at f = 470 MHz.

List of components:

C1 = 2,2 pF (± 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 (± 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

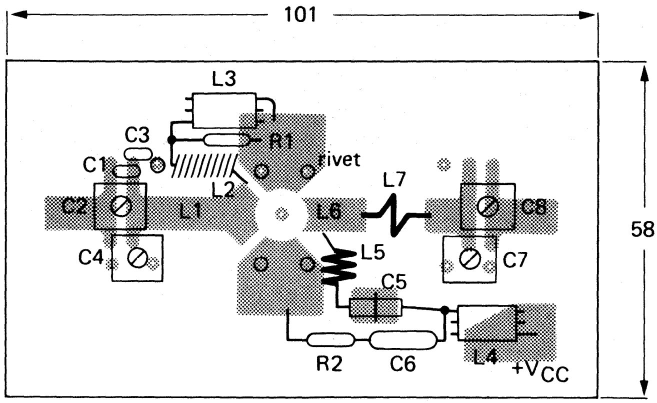
L1 = stripline (22,5 mm x 6,0 mm)
L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; leads 2 x 5 mm
L3 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L5 = 51 nH; 3,5 turns Cu wire (1 mm); int. dia. 6 mm; coil length 7 mm; leads 2 x 5 mm
L6 = stripline (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 (ϵ_r = 2,74); thickness 1/16".

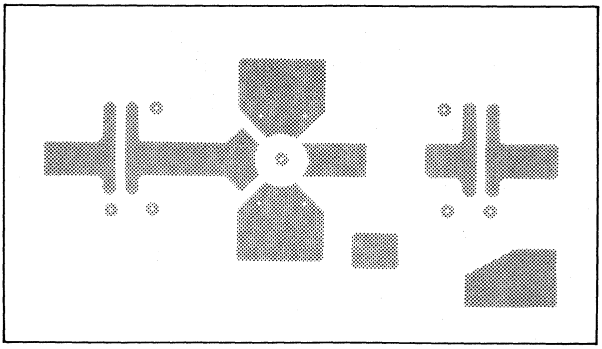
R1 = R2 = 10 Ω (± 5%) carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit (Fig.8).

APPLICATION INFORMATION (continued)



7Z76582



7Z76583

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.

Fig.8 Component layout and printed-circuit board for 470 MHz test circuit.

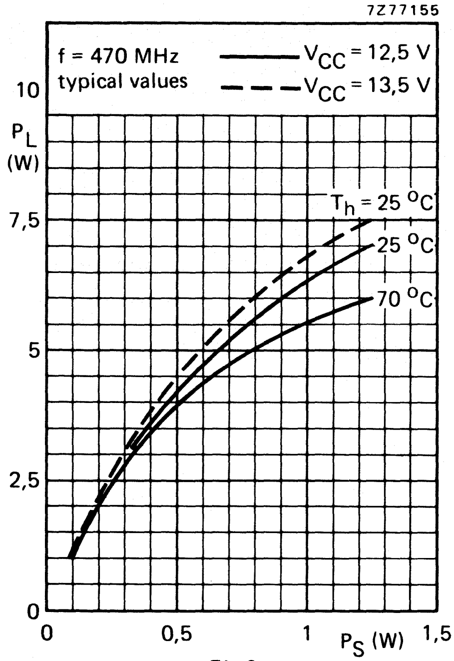


Fig.9.

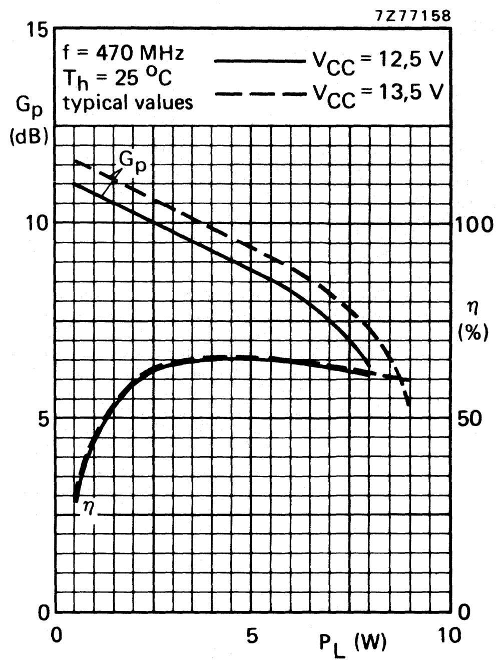


Fig.10.

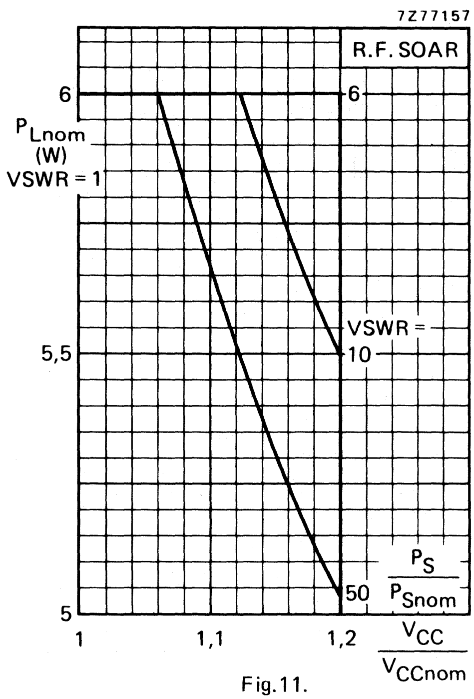


Fig.11.

Conditions for R.F. SOAR

f = 470 MHz
T_h = 70 °C
$R_{th\ mb-h}$ = 0,6 K/W
V_{CCnom} = 12,5 V or 13,5 V
$P_S = P_{Snom}$ at V_{CCnom} and VSWR = 1
measured in the circuit of Fig.7.

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

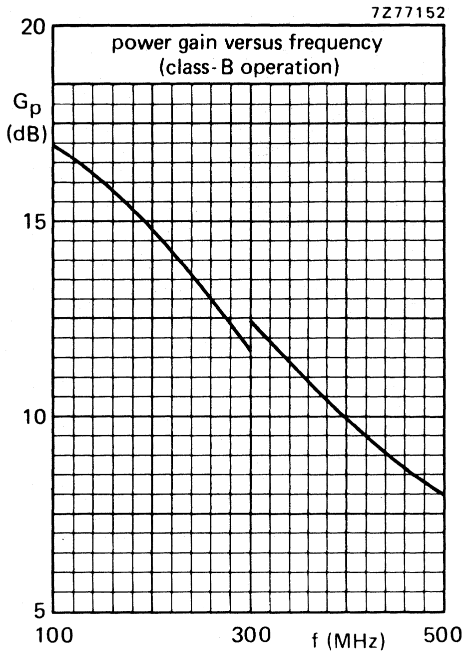


Fig.12.

Measuring conditions for the graphs on this page

V_{CC} = 12,5 V
P_L = 4 W
T_h = 25 °C
typical values

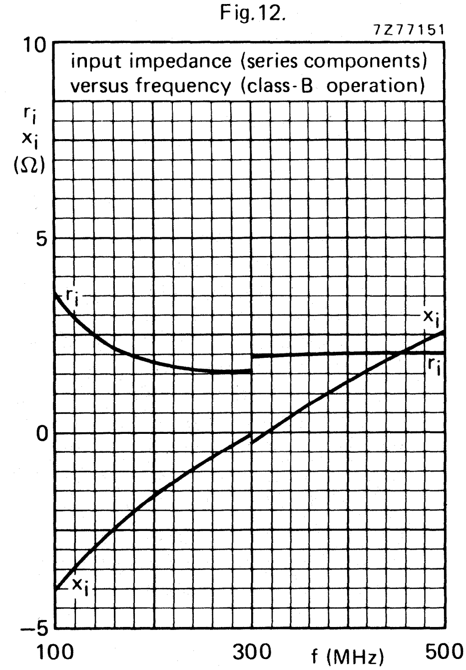


Fig.13.

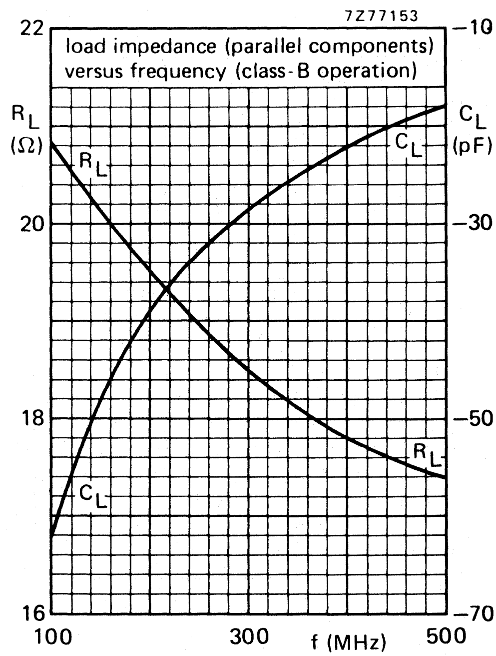


Fig.14.

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

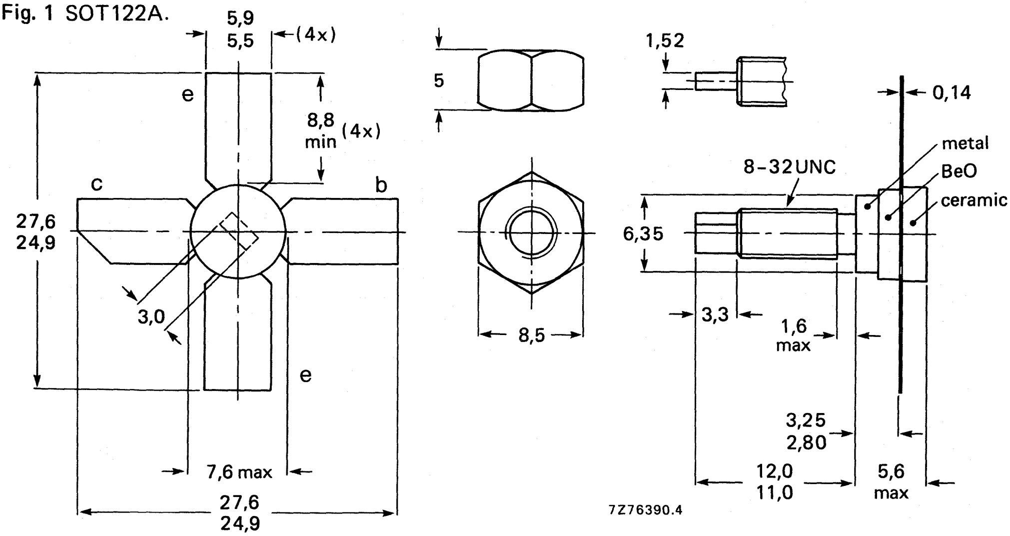
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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 SOT122A.



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

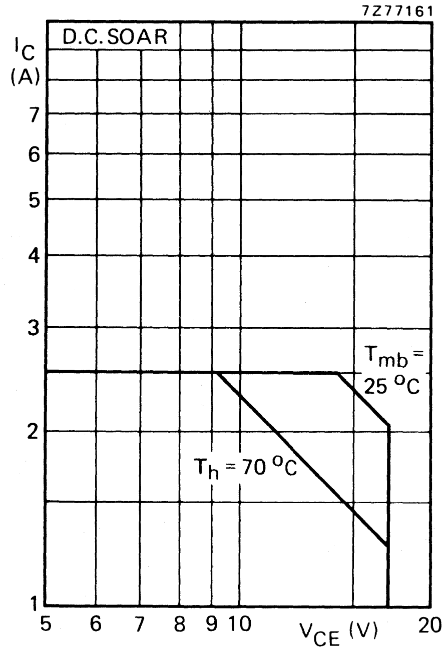


Fig.2.

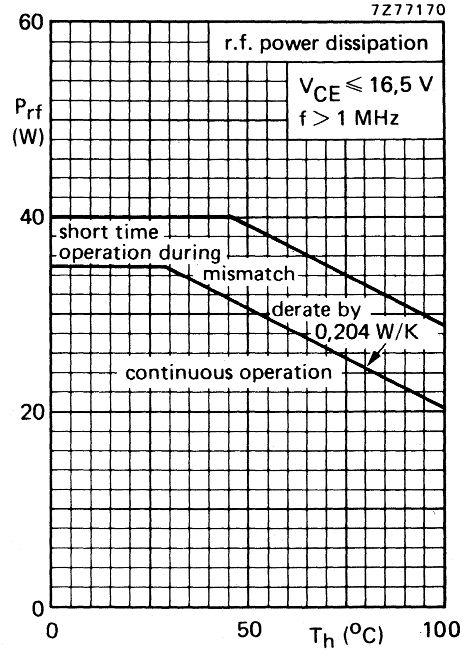


Fig.3.

Storage temperature	T_{stg}	−65 to +150		°C
Operating junction temperature	T_j	max	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4,3	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_j = 25 °C

Breakdown voltages			
Collector-emitter voltage V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	17 V
Emitter-base voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 17 V	I_{CES}	<	10 mA
D.C. current gain *			
I_C = 1,25 A; V_{CE} = 5 V	h_{FE}	> typ	10 35
Collector-emitter saturation voltage *			
I_C = 3,75 A; I_B = 0,75 A	V_{CEsat}	typ	0,75 V
Transition frequency at f = 500 MHz *			
I_C = 1,25 A; V_{CE} = 12,5 V	f_T	typ	1,3 GHz
I_C = 3,75 A; V_{CE} = 12,5 V	f_T	typ	0,9 GHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 12,5 V	C_c	typ	34 pF
Feedback capacitance at f = 1 MHz			
I_C = 100 mA; V_{CE} = 12,5 V	C_{re}	typ	18 pF
Collector-stud capacitance	C_{cs}	typ	1,2 pF

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

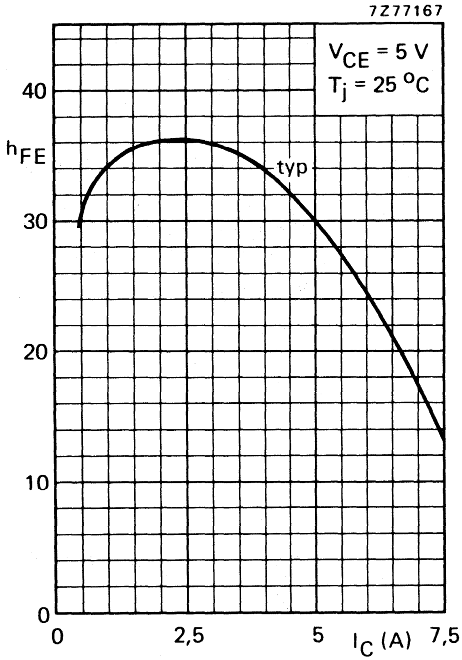


Fig.4.

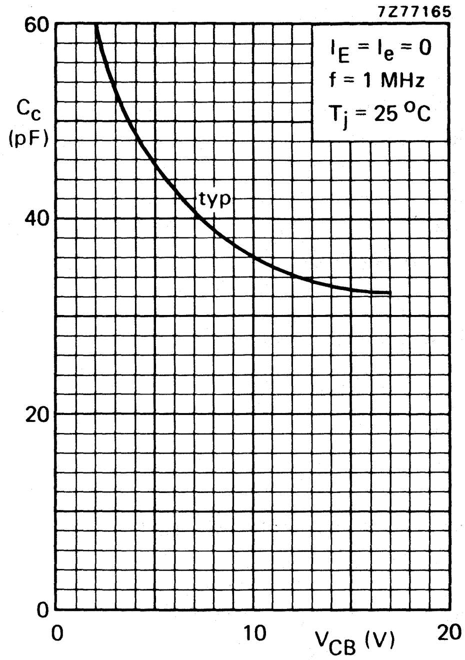


Fig.5.

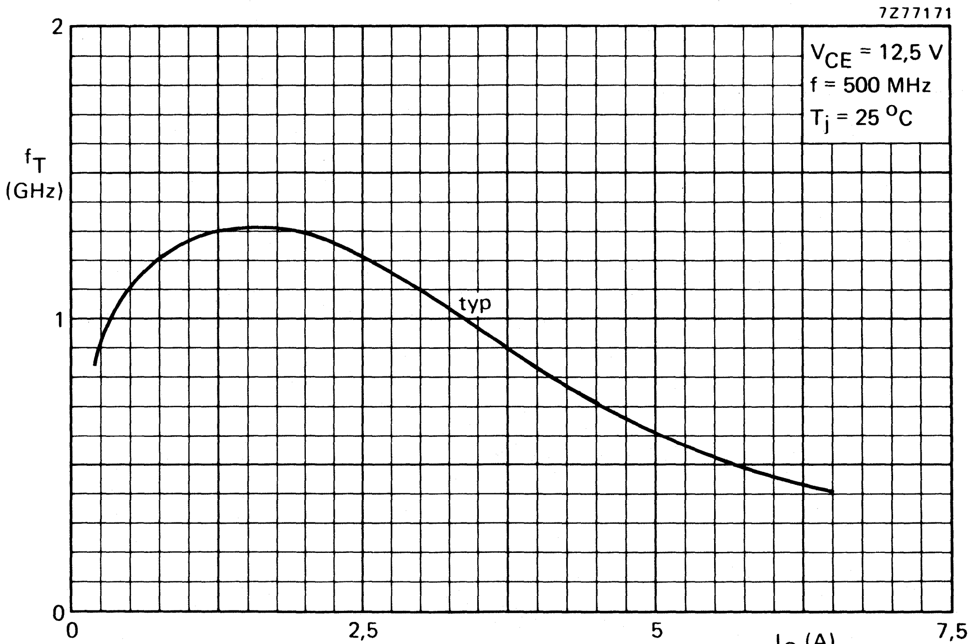


Fig.6.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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

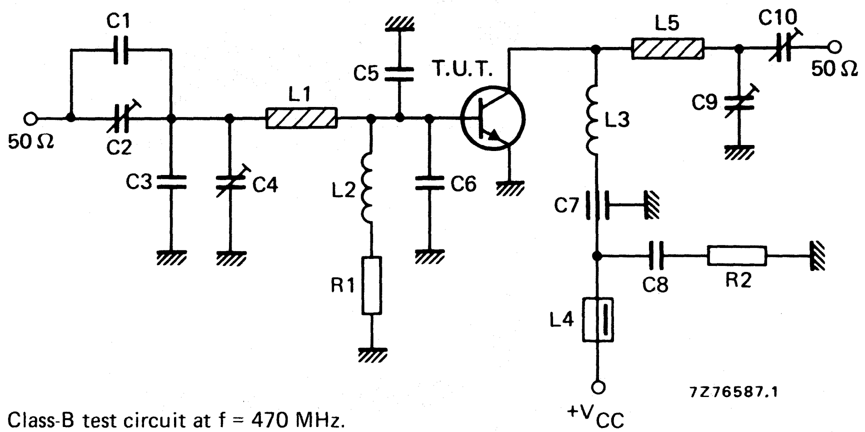


Fig.7 Class-B test circuit at f = 470 MHz.

List of components:

C1 = 2,2 pF (± 0,25 pF) ceramic capacitor
C2 = C9 = C10 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C3 = 3,9 pF (± 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

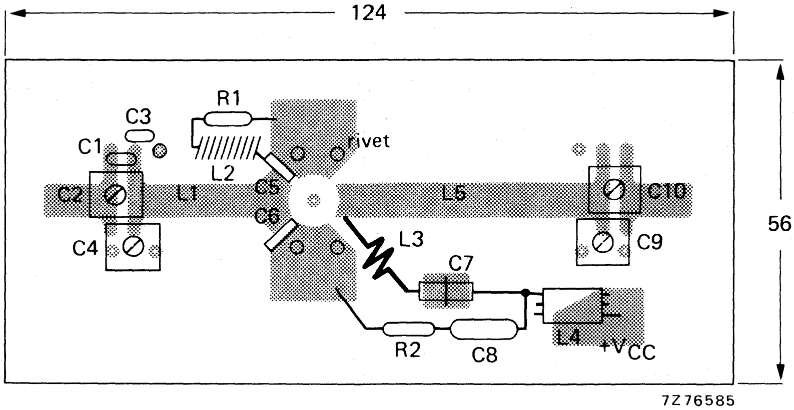
L1 = stripline (27,9 mm x 6,0 mm)
L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. = 4 mm; leads 2 x 5 mm
L3 = 17 nH; 1½ turns enamelled Cu wire (1 mm); spacing 1 mm; int. dia. = 6 mm; leads 2 x 5 mm
L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L5 = stripline (45,8 mm x 6,0 mm)

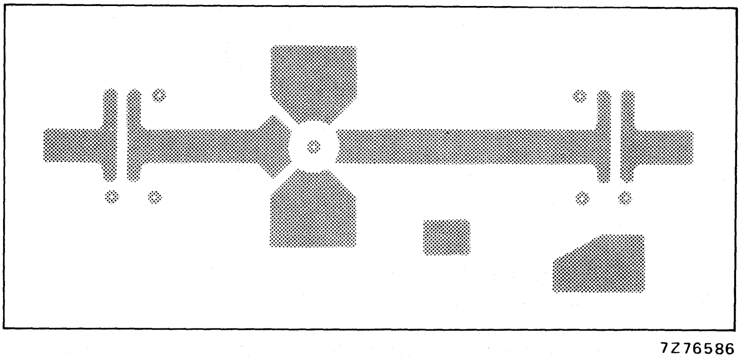
L1 and L5 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16".

R1 = 1 Ω (± 5%) carbon resistor
R2 = 10 Ω (± 5%) carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit (Fig.8).

APPLICATION INFORMATION (continued)





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.

Fig.8 Component layout and printed-circuit board for 470 MHz test circuit.

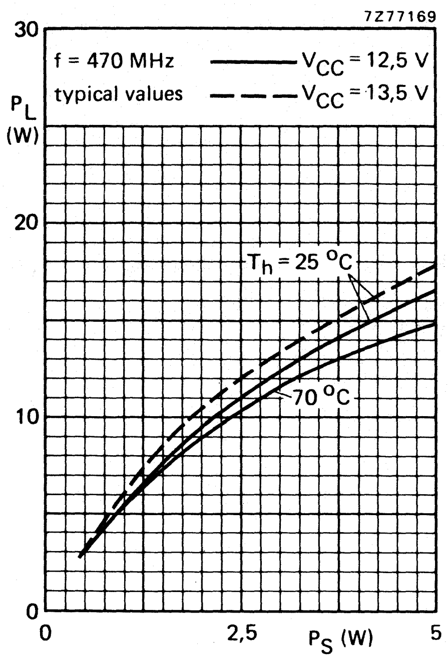


Fig.9.

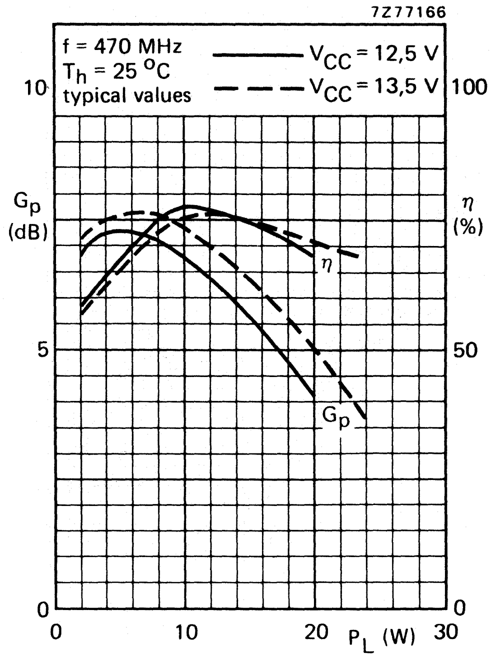


Fig.10.

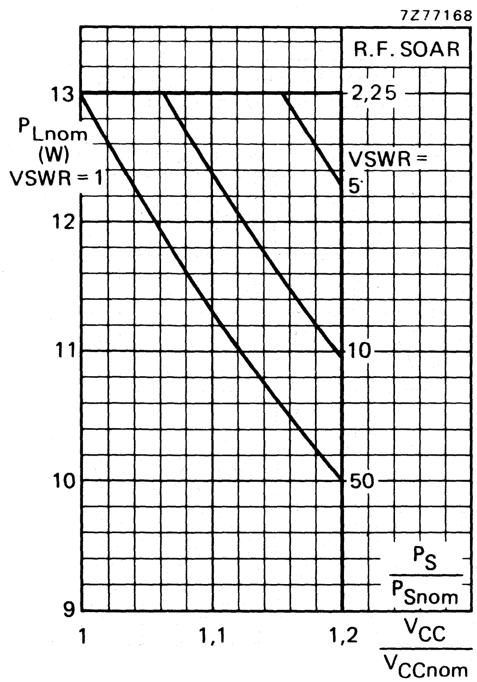


Fig.11.

Measuring conditions for R.F. SOAR

$f = 470$ MHz
$T_h = 70$ °C
$R_{th\ mb\text{-}h} = 0,6$ K/W
$V_{CCnom} = 12,5$ V or 13,5 V
$P_S = P_{Snom}$ at V_{CCnom} and VSWR = 1
measured in the circuit of Fig.7.

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

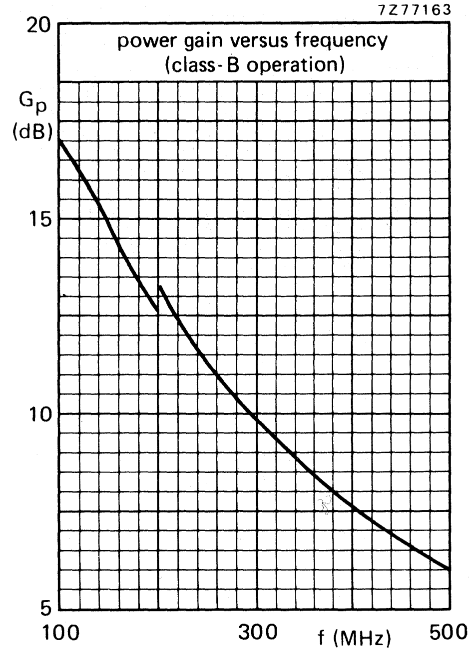


Fig.12.

Measuring conditions for the graphs on this page

V_{CC} = 12,5 V
P_L = 10 W
T_h = 25 °C
typical values

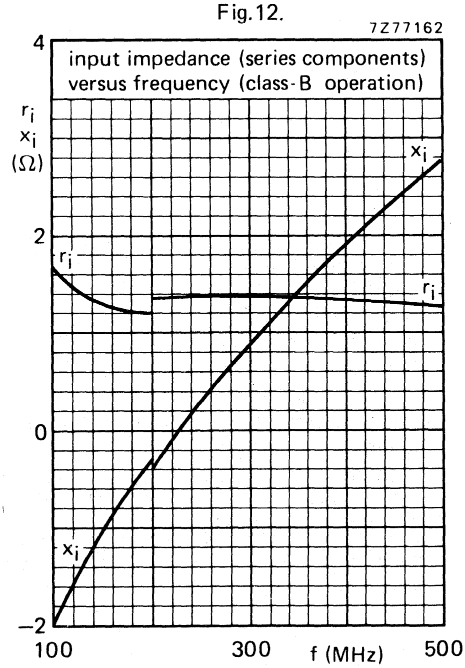


Fig.13.

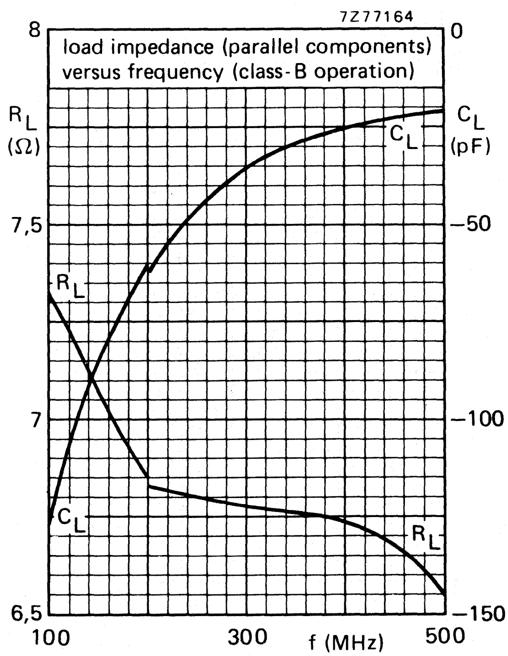


Fig.14.

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

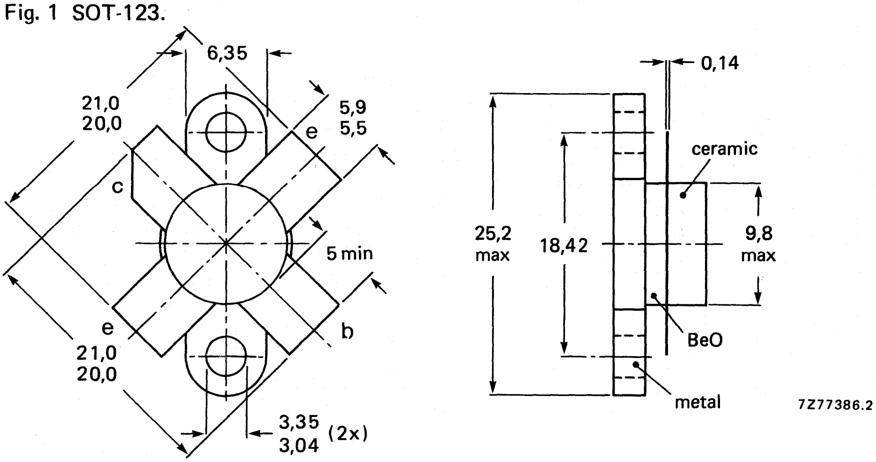
R.F. performance

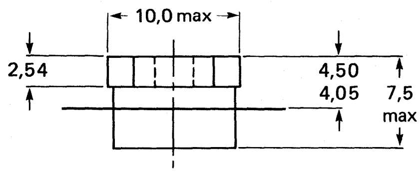
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_{dt} %	I_C A	d_3 dB	T_h °C
s.s.b. (class-A)	**26**	**1,6 – 28**	**0 – 10** (P.E.P.)	> **20**	–	**1,35**	< **–40**	**70**
s.s.b. (class-AB)	28	1,6 – 28	3 – 30 (P.E.P.)	typ. 21	typ. 40	typ. 1,34	typ. –30	25

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





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

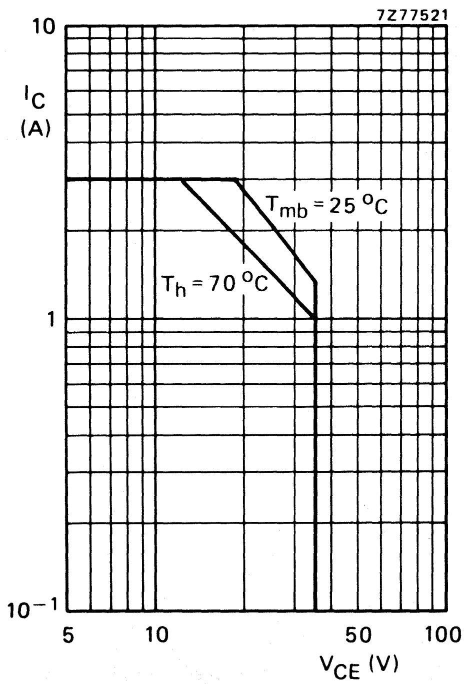


Fig. 2 D.C. SOAR.

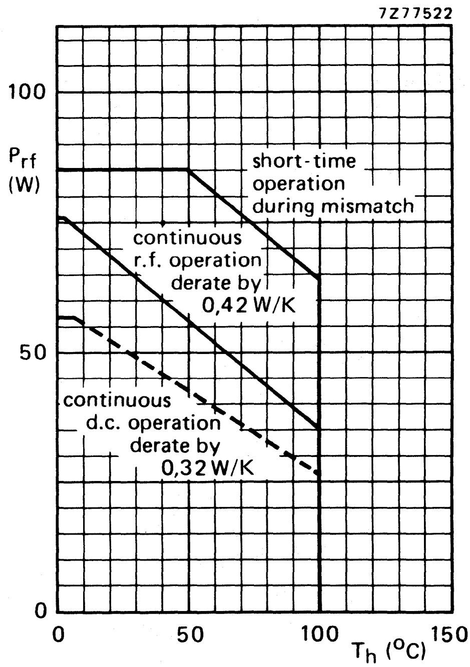


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f ≥ 1 MHz.

THERMAL RESISTANCE (dissipation = 35 W; T_{mb} = 80 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	3,15 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,35 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	65 V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	36 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	4 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	8 mJ
R_{BE} = 10 Ω	E_{SBR}	>	8 mJ
D.C. current gain * I_C = 1,25 A; V_{CE} = 5 V	h_{FE}	typ.	50 10 to 100
D.C. current gain ratio of matched devices* I_C = 1,25 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage* I_C = 3,75 A; I_B = 0,75 A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz* $-I_E$ = 1,25 A; V_{CB} = 28 V	f_T	typ.	530 MHz
$-I_E$ = 3,75 A; V_{CB} = 28 V	f_T	typ.	530 MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	50 pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	31 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

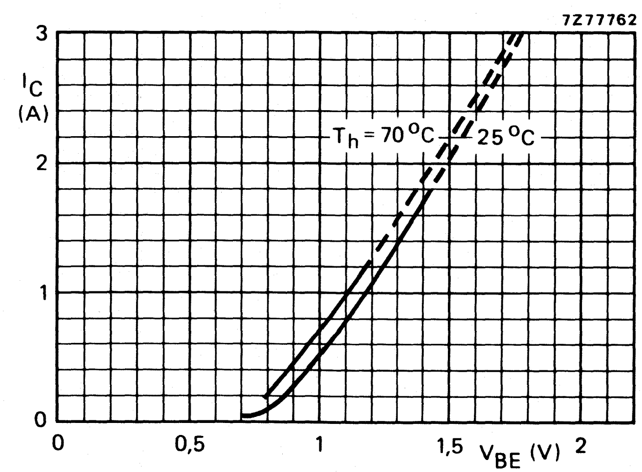


Fig. 4 Typical values; V_{CE} = 28 V.

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

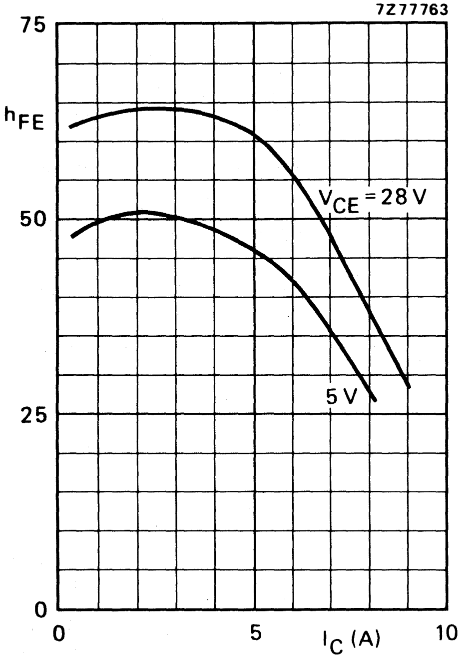


Fig. 5 Typical values; T_j = 25 °C.

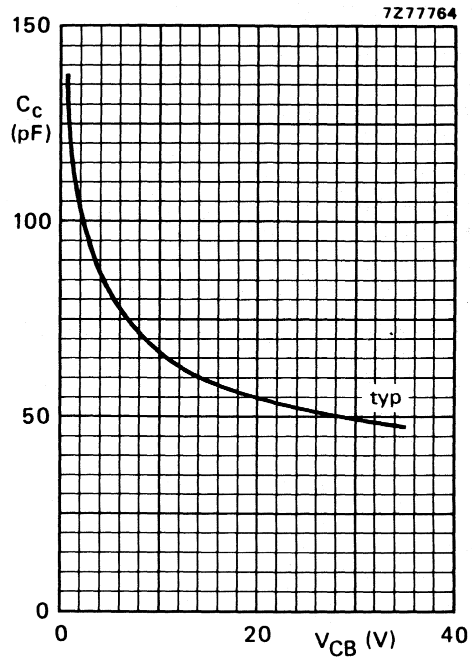


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

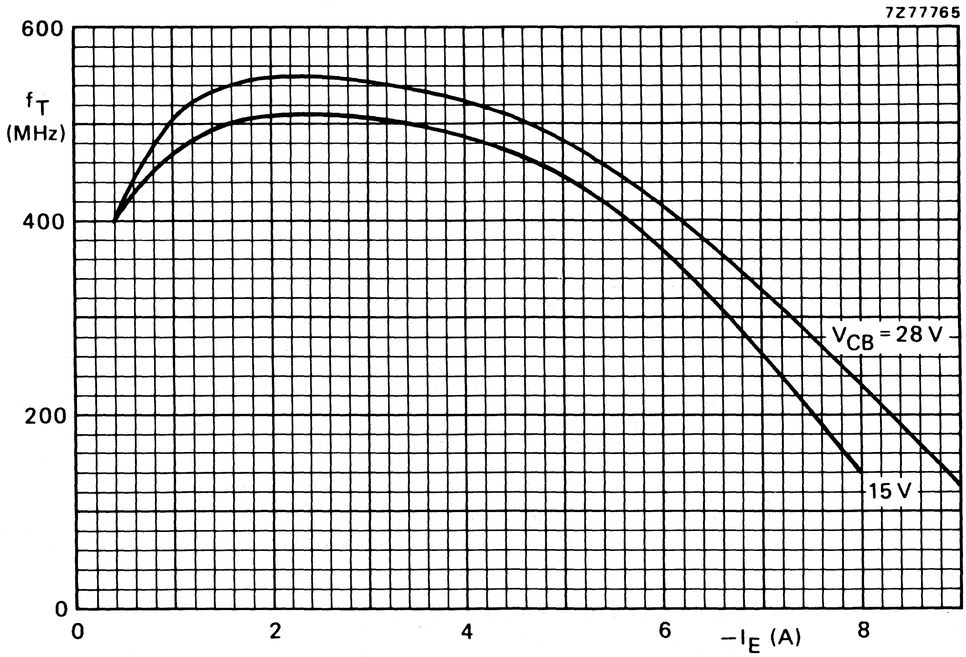


Fig. 7 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 26 V; f_1 = 28,000 MHz; f_2 = 28,001 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

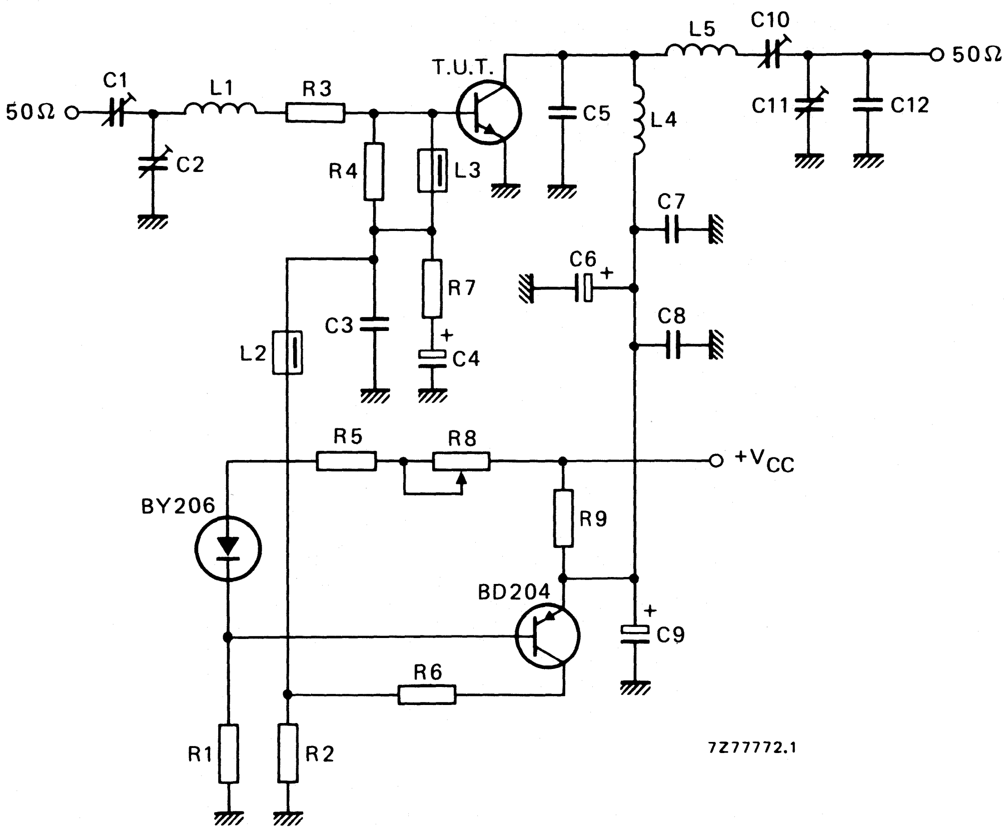


Fig. 8 Test circuit; s.s.b. class-A.

* 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 μF/10 V electrolytic capacitor
C5 = 56 pF ceramic capacitor (500 V)
C6 = 47 μF/35 V electrolytic capacitor
C7 = C8 = 220 nF polyester capacitor
C9 = 10 μF/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 kΩ carbon resistors (±5%; 0,5 W each)
R2 = 15 Ω carbon resistor (±5%; 0,25 W)
R3 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors (±5%; 0,125 W each)
R4 = 33 Ω carbon resistor (±5%; 0,25 W)
R5 = 18 Ω carbon resistor (±5%; 0,25 W)
R6 = 120 Ω wirewound resistor (±5%; 5,5 W)
R7 = 1 Ω carbon resistor (±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 (±5%; 5,5 W each)

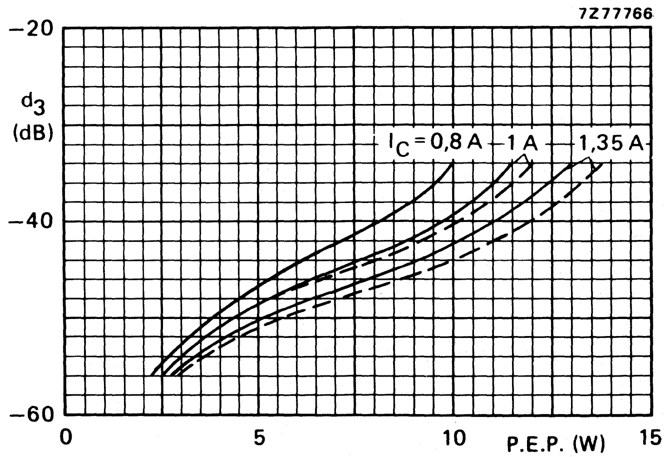


Fig. 9 Intermodulation distortion as a function of output power.
Typical values; V_{CE} = 26 V; —— T_h = 70 °C; ---- T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 30 W P.E.P.	I_C (A) at 30 W P.E.P.	d_3 dB*	d_5 dB*	$I_{C(ZS)}$ mA	T_h °C
3 to 30 (P.E.P.)	typ. 21	typ. 40	typ. 1,34	typ. −30	< −30	25	25
3 to 25 (P.E.P.)	typ. 21	—	—	typ. −30	< −30	25	70

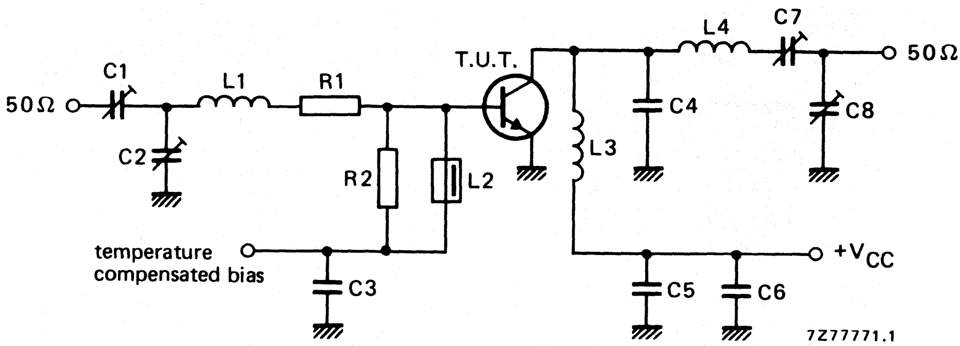


Fig. 10 Test circuit; s.s.b. class-AB.

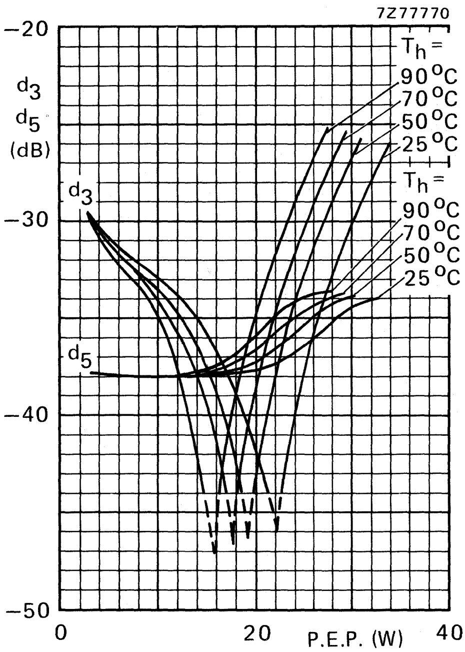
List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = C5 = C6 = 220 nF polyester capacitor
C4 = 56 pF ceramic capacitor (500 V)
C7 = C8 = 15 to 575 pF film dielectric trimmer

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm
L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors
R2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.



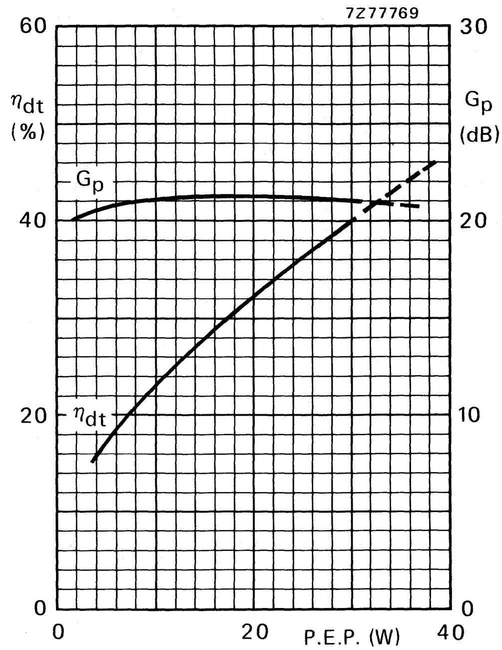


Fig. 11 Intermodulation distortion as a function of output power.*

Fig. 12 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 11:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 12:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

* See note on previous page.

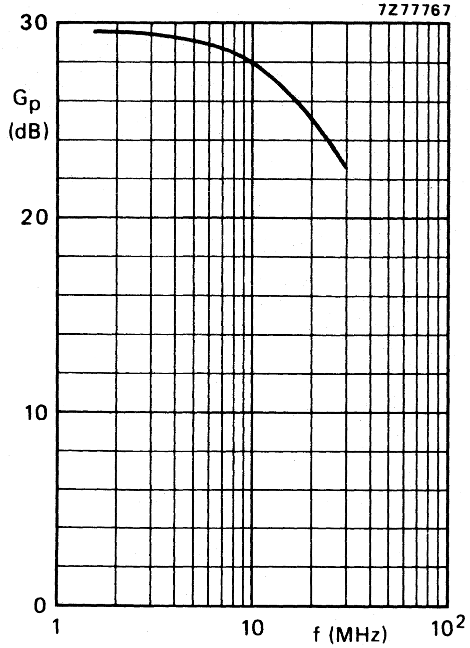


Fig. 13 Power gain as a function of frequency.

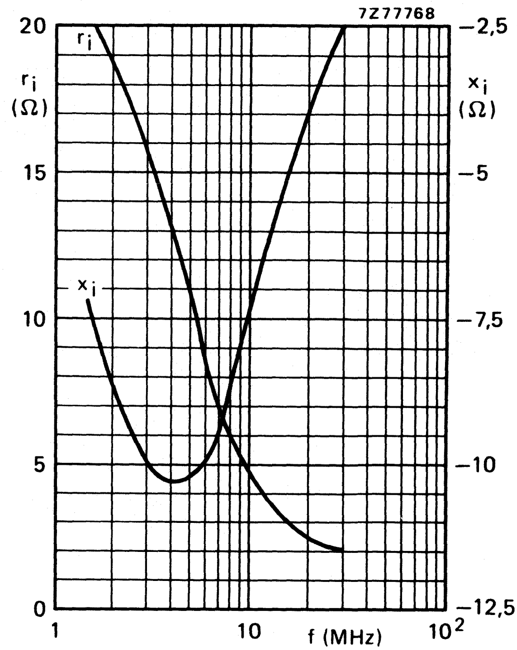


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; P_L = 30 W; T_h = 25 °C; Z_L = 9,5 Ω.

Ruggedness in s.s.b. operation

The BLW83 is capable of withstanding a load mismatch (VSWR = 50) under the following conditions: f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; T_h = 70 °C and P_{Lnom} = 35 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

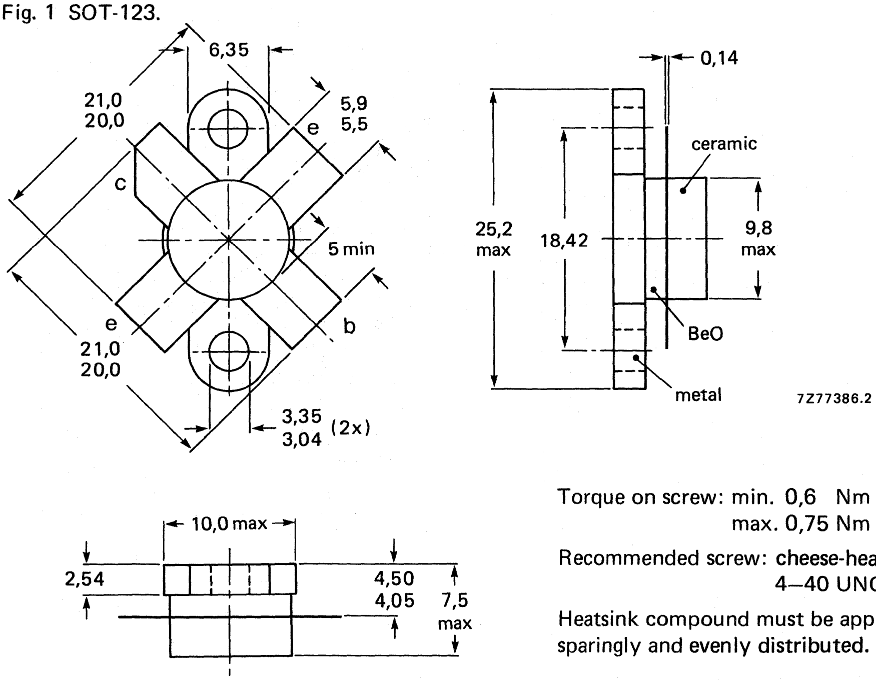
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**28**	**175**	**25**	**> 9**	**> 60**	**1,0 + j1,2**	**59 − j54**

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



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

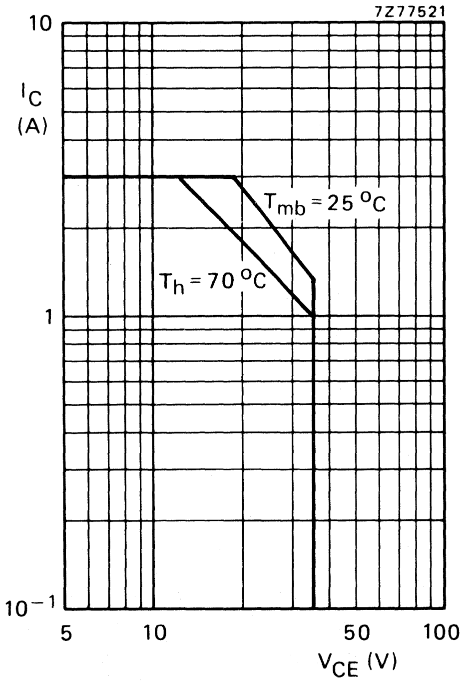


Fig. 2 D.C. SOAR.

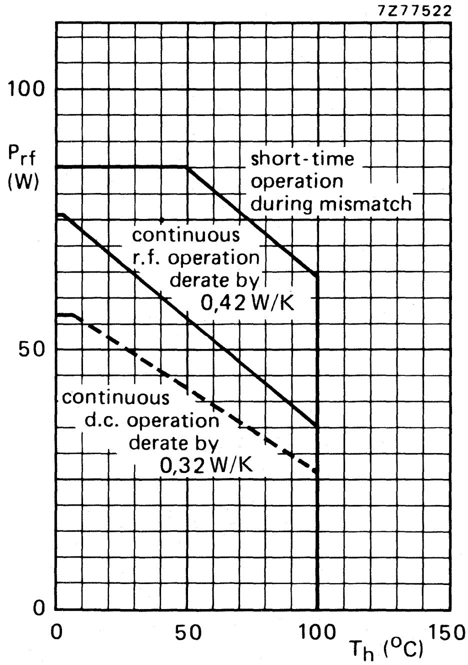


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f ⩾ 1 MHz.

THERMAL RESISTANCE (dissipation = 20 W; T_{mb} = 76 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb\ (dc)}$	=	3,0	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb\ (rf)}$	=	2,25	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage				
open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 36$ V	I_{CES}	<	4	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	8	mJ
D.C. current gain *				
$I_C = 1,25$ A; $V_{CE} = 5$ V	h_{FE}	typ.	45	
			10 to 100	
Collector-emitter saturation voltage *				
$I_C = 3,75$ A; $I_B = 0,75$ A	V_{CEsat}	typ.	1,5	V
Transition frequency at f = 100 MHz *				
$-I_E = 1,25$ A; $V_{CB} = 28$ V	f_T	typ.	650	MHz
$-I_E = 3,75$ A; $V_{CB} = 28$ V	f_T	typ.	650	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	45	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 28$ V	C_{re}	typ.	28	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

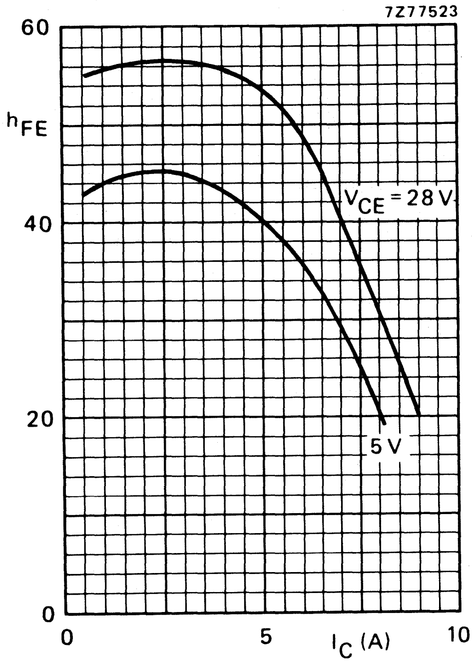


Fig. 4 Typical values; T_j = 25 °C.

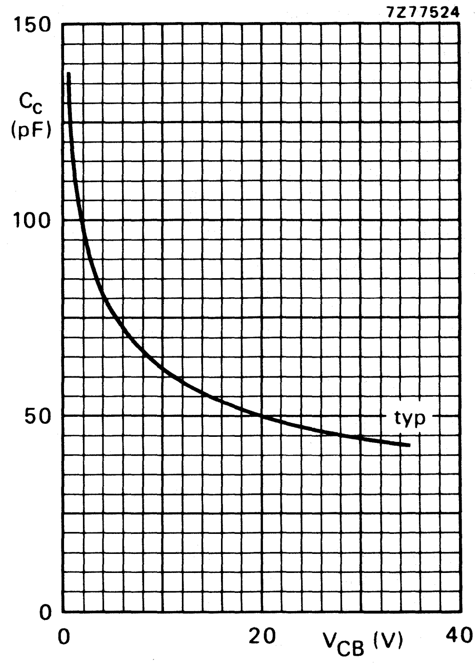


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

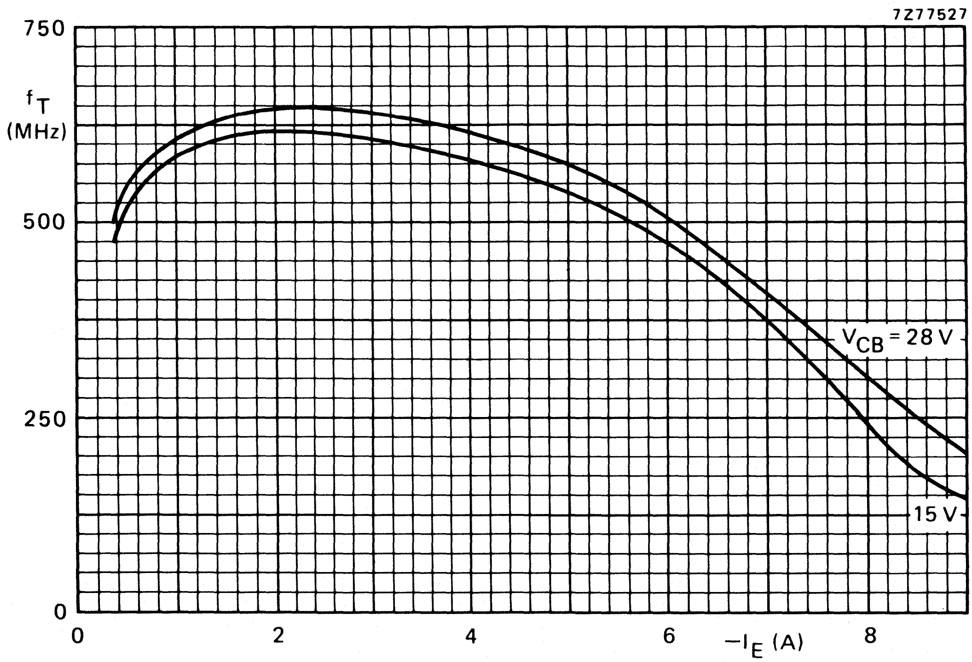


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

$T_h = 25\ ^oC$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**28**	**25**	**< 3,15**	**> 9**	**< 1,49**	**> 60**	**1,0 + j1,2**	**59−j54**

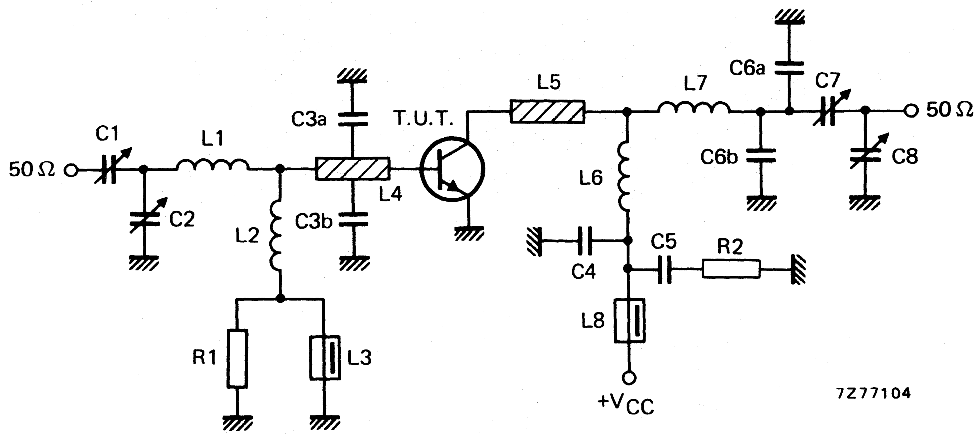


Fig. 7 Test circuit; c.w. class-B.

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 (± 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)

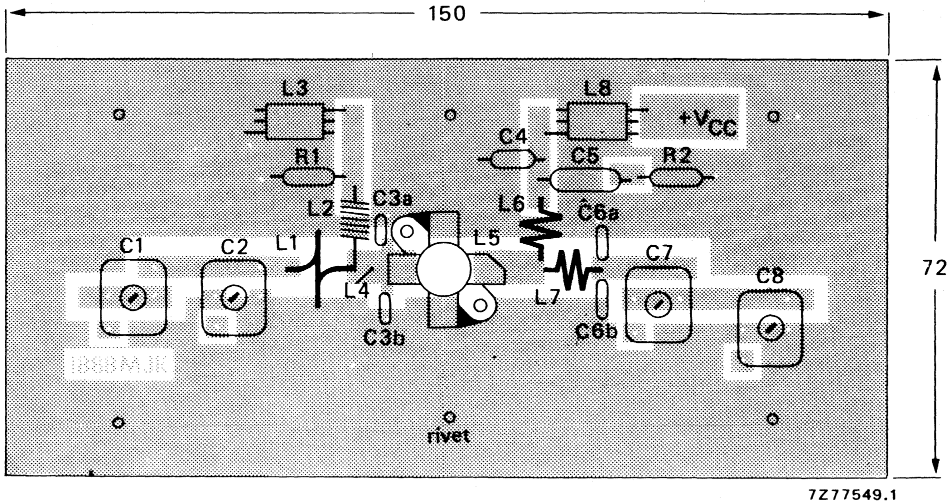
L1 = 14 nH; 1 turn enamelled Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and 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 (± 10%) carbon resistor (0,25 W)

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

APPLICATION INFORMATION (continued)



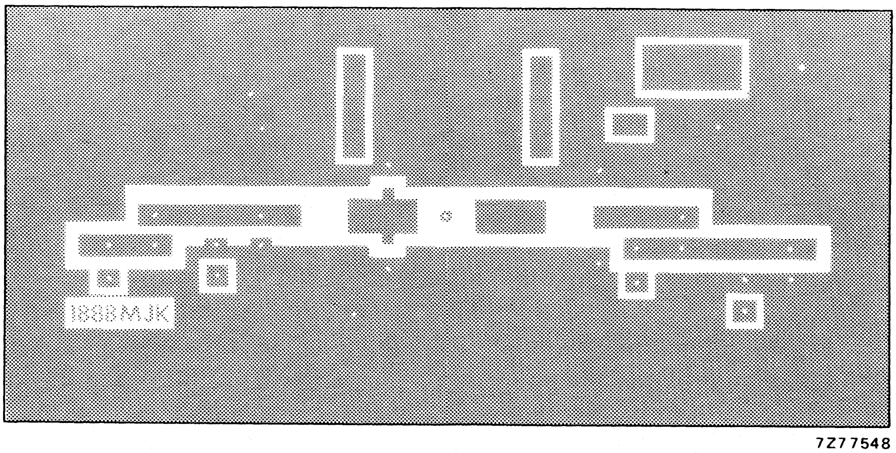


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

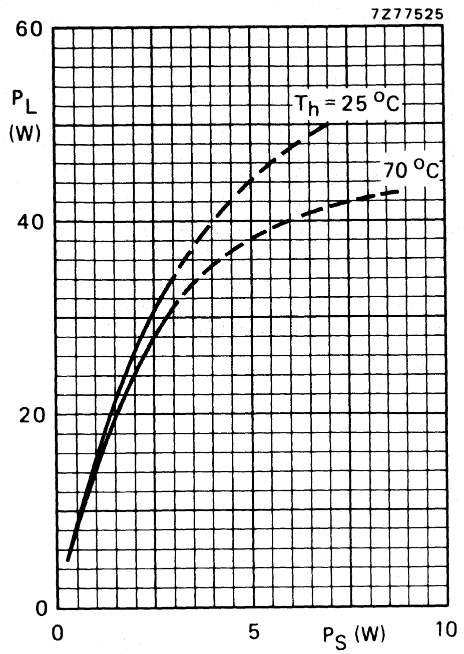


Fig. 9 V_{CE} = 28 V; f = 175 MHz; typical values.

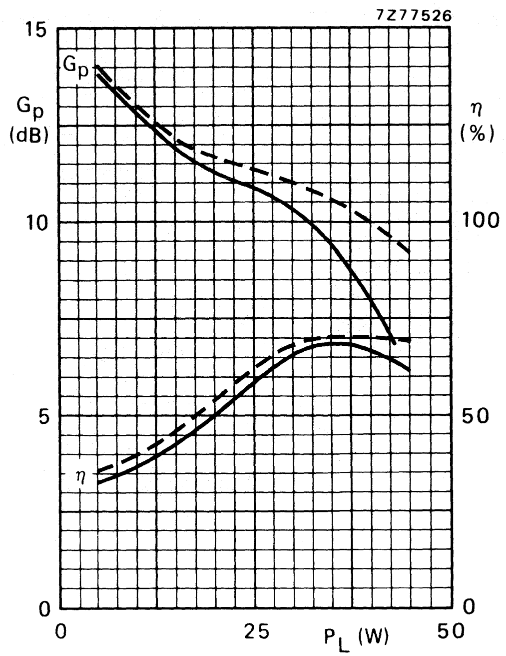


Fig. 10 V_{CE} = 28 V; f = 175 MHz; typical values;
– – – T_h = 25 °C; ——— T_h = 70 °C.

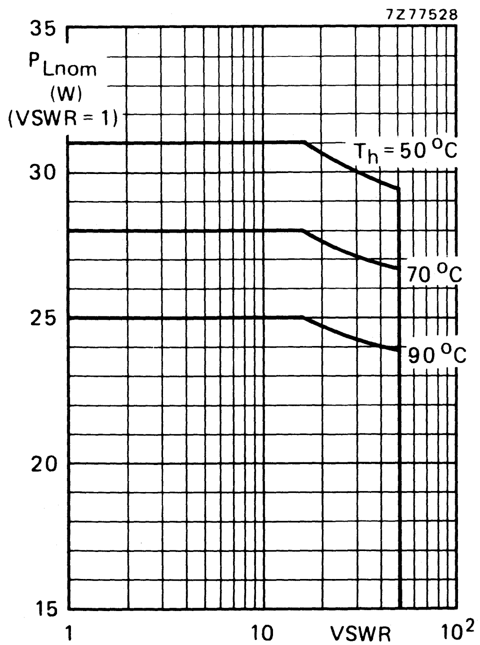


Fig. 11 R.F. SOAR; c.w. class-B operation;
f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,3 K/W

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

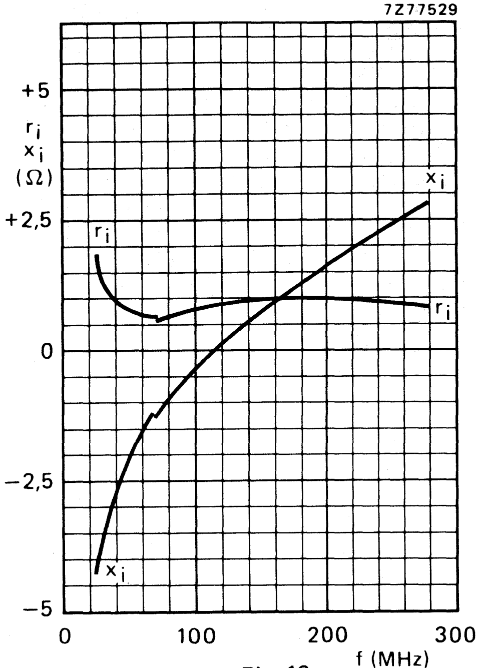


Fig. 12.

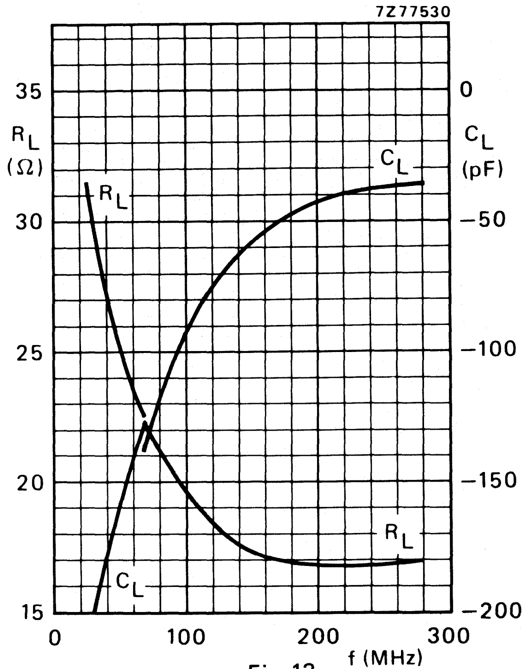
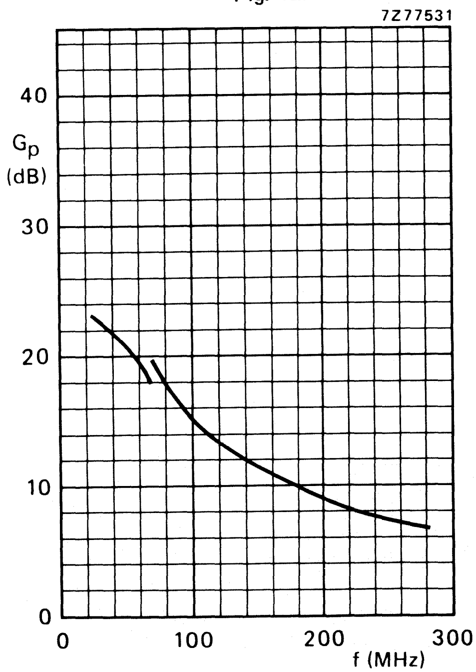


Fig. 13.



Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 28 V; P_L = 25 W;
T_h = 25 °C.

Fig. 14.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile h.f. and v.h.f. transmitters with a nominal supply voltage of 12,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. Matched h_{FE} groups are available on request.

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

QUICK REFERENCE DATA

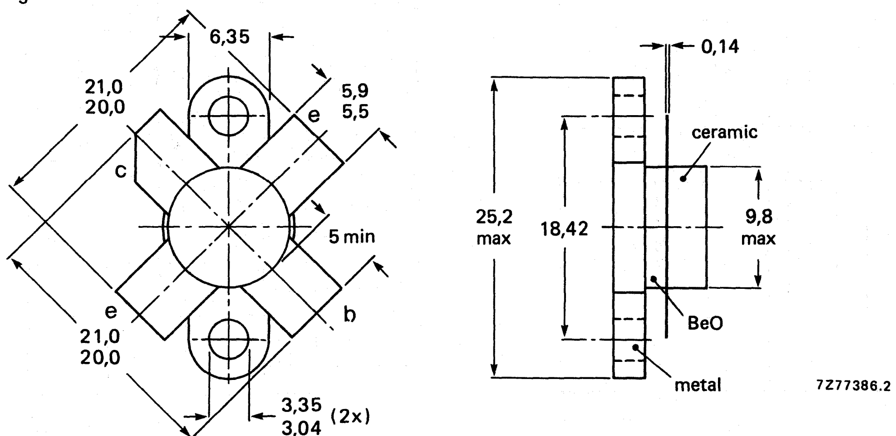
R.F. performance up to T_h = 25 °C

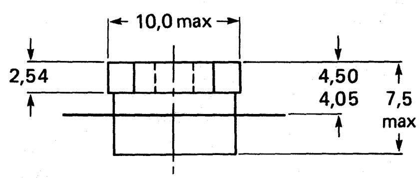
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω	d_3 dB
c.w. (class-B)	**12,5**	**175**	**45**	> **4,5**	> **75**	**1,4 + j1,5**	**2,7 − j1,3**	−
s.s.b. (class-AB)	12,5	1,6–28	3–30 (P.E.P.)	typ. 19,5	typ. 35	−	−	typ. −33

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





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.	16	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

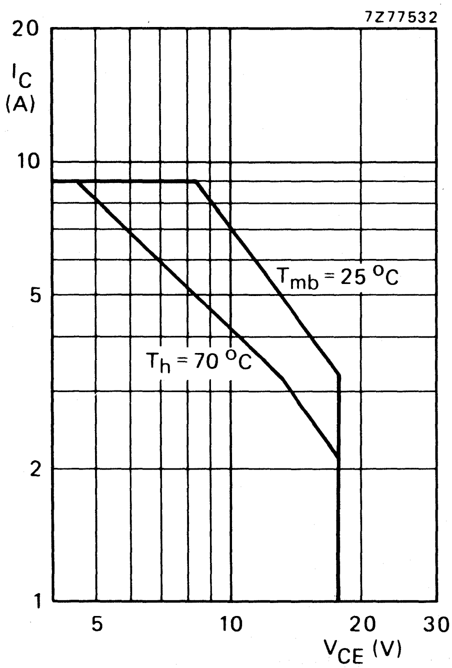


Fig. 2 D.C. SOAR.

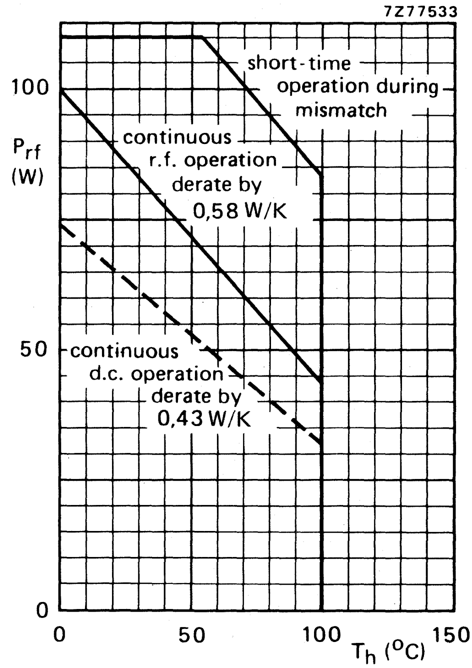


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 16,5$ V; $f \geqslant 1$ MHz.

THERMAL RESISTANCE (dissipation = 30 W; $T_{mb} = 79$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,5	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,8	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; I_E = 25 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 18 V	I_{CES}	<	25 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	8 mJ
R_{BE} = 10 Ω	E_{SBR}	>	8 mJ
D.C. current gain* I_C = 4 A; V_{CE} = 5 V	h_{FE}	typ.	50
			10 to 80
D.C. current gain ratio of matched devices* I_C = 4 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage* I_C = 12,5 A; I_B = 2,5 A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz* $-I_E$ = 4 A; V_{CB} = 12,5 V	f_T	typ.	650 MHz
$-I_E$ = 12,5 A; V_{CB} = 12,5 V	f_T	typ.	600 MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 15 V	C_c	typ.	120 pF
Feedback capacitance at f = 1 MHz I_C = 200 mA; V_{CE} = 15 V	C_{re}	typ.	82 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

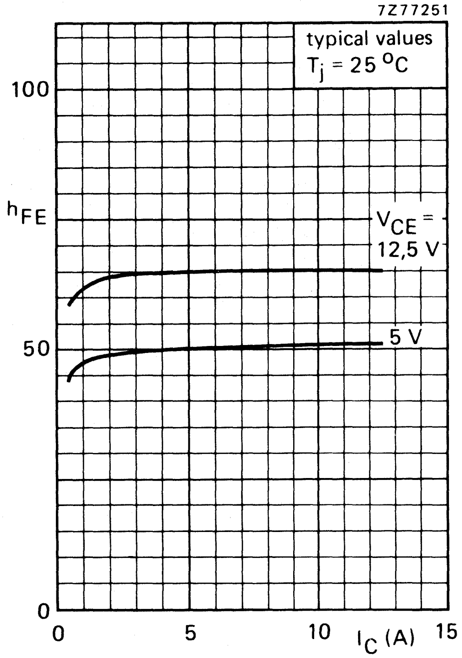


Fig. 4.

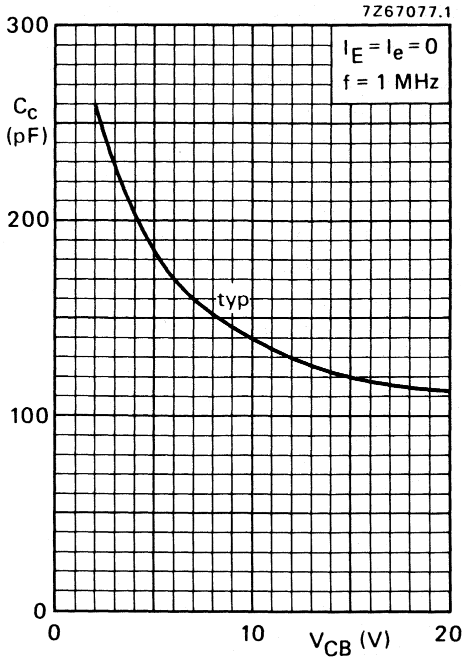


Fig. 5 T_j = 25 °C.

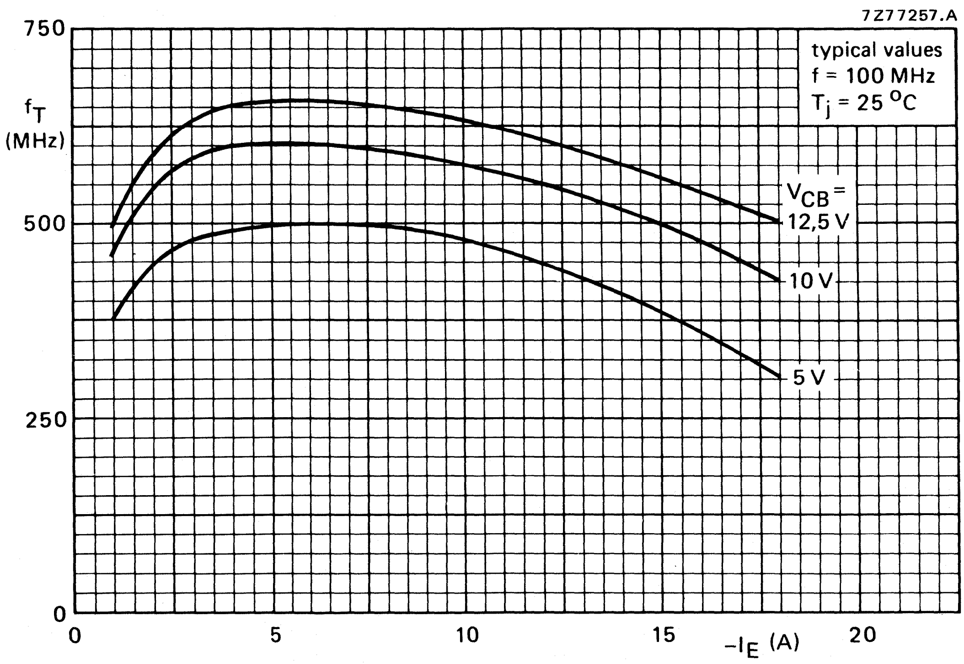


Fig. 6.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\bar{z_i}$ (Ω)	$\overline{Z_L}$ (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	–	–

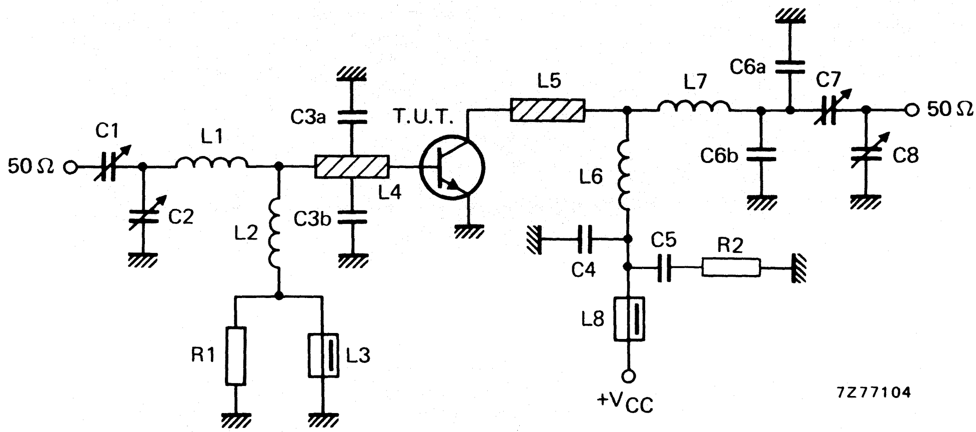


Fig. 7 Test circuit; c.w. class-B.

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)

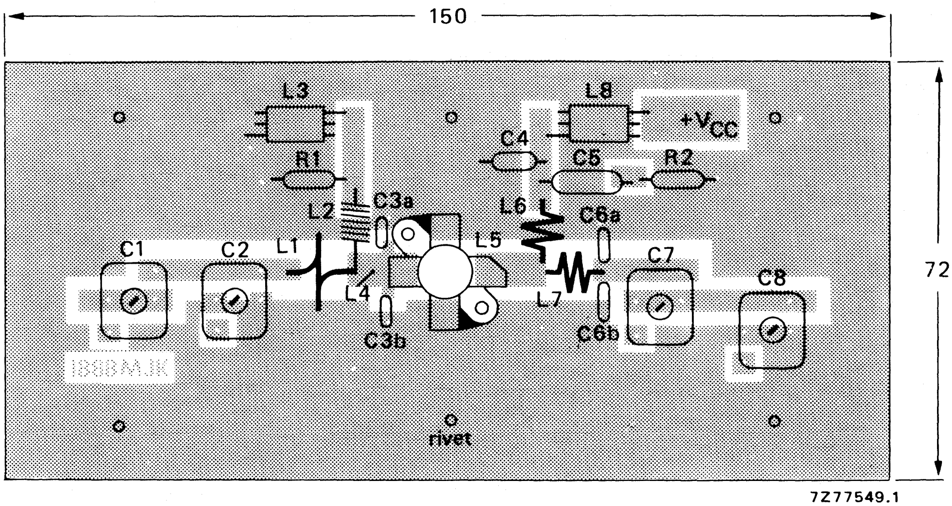
L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from 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 (±10%) carbon resistor (0,25 W)
R2 = 4,7 Ω (±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)



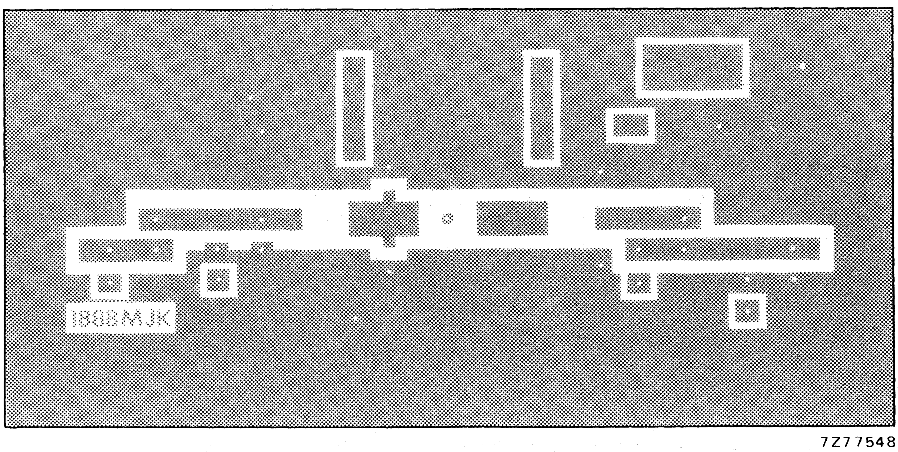


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

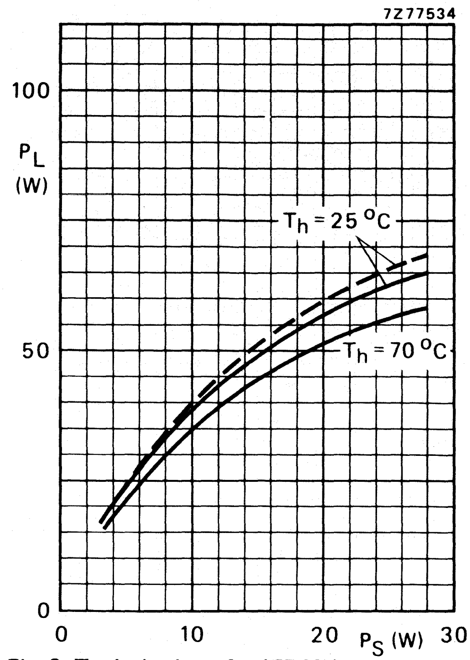


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 12,5 V; --- V_{CE} = 13,5 V.

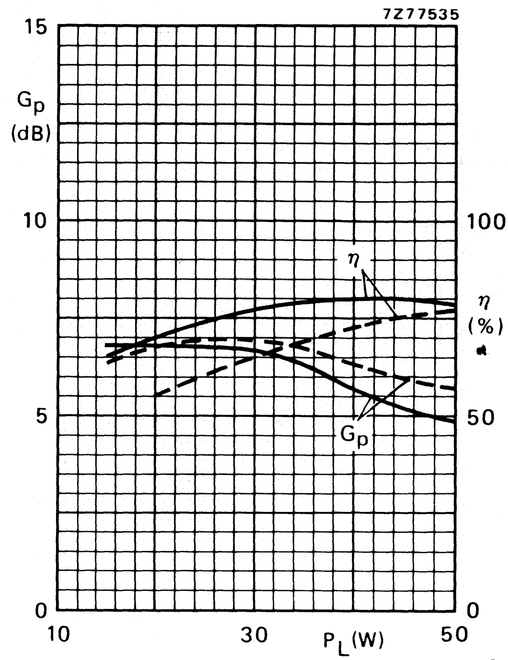


Fig. 10 Typical values; f = 175 MHz; T_h = 25 °C;
—— V_{CE} = 12,5 V; --- V_{CE} = 13,5 V.

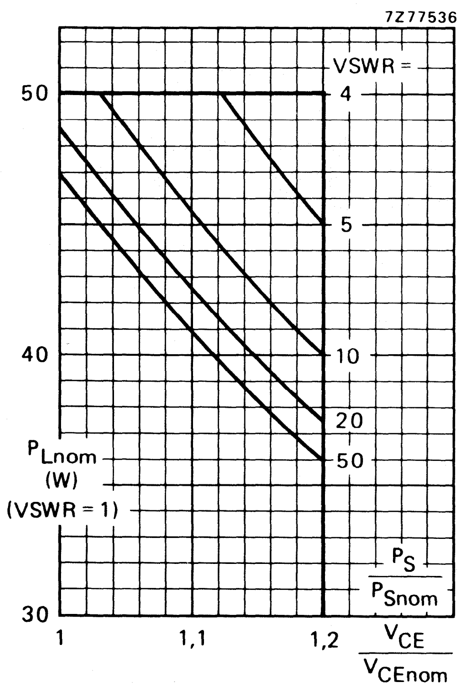


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,3 K/W ; V_{CEnom} = 12,5 V or 13,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1 measured in the circuit of Fig.7.

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.

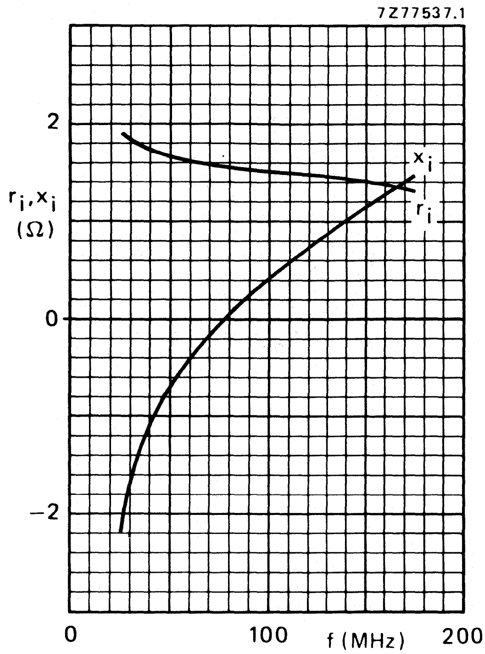


Fig. 12 Input impedance (series components).

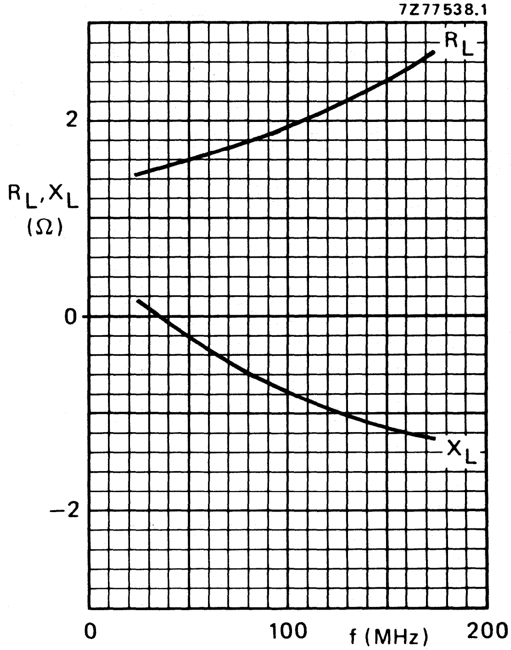


Fig. 13 Load impedance (series components).

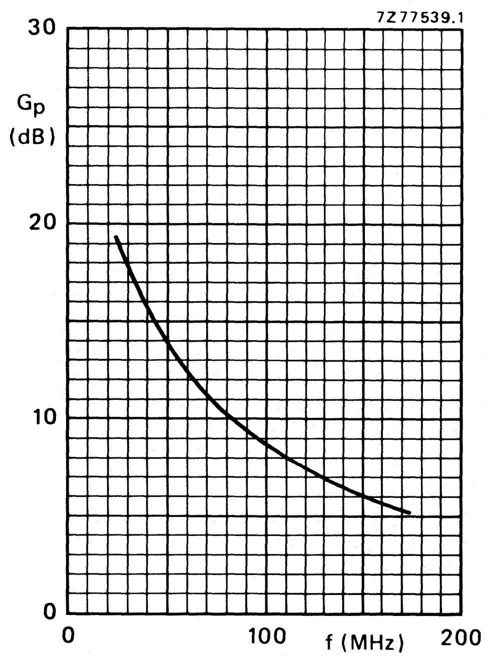


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 12,5 V; P_L = 45 W; class-B operation; T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation

V_{CE} = 12,5 V; T_h up to 25 °C; $R_{th\ mb\text{-}h} \leq$ 0,3 K/W
f_1 = 28,000 MHz; f_2 = 28,001 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

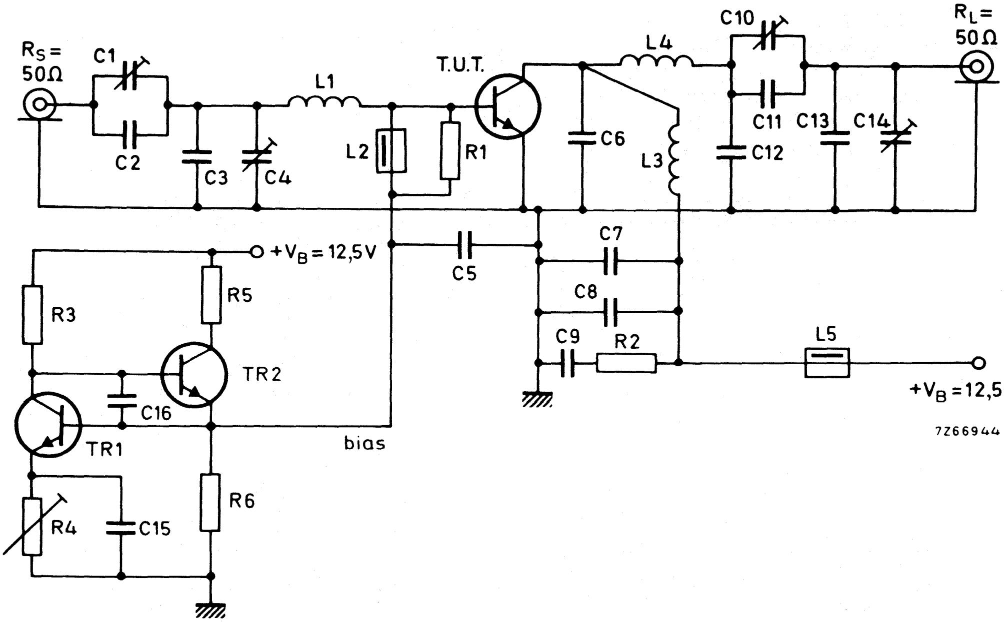


Fig. 15 Test circuit; s.s.b. class-AB.

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)

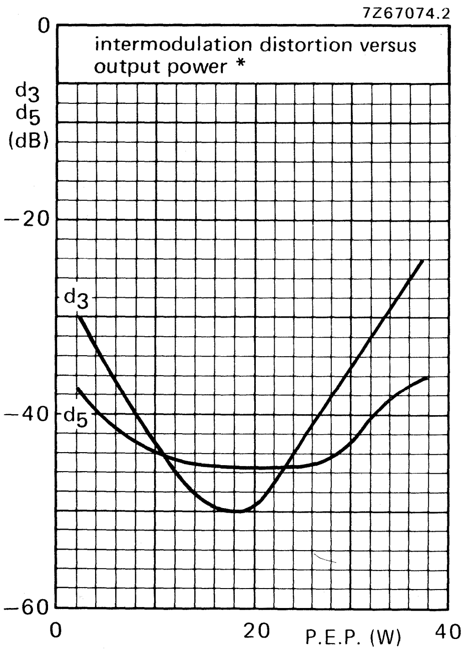


Fig. 16.

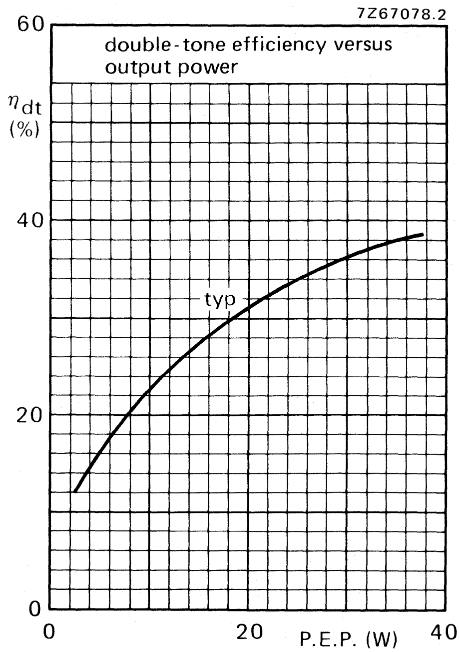


Fig. 17.

Conditions for Figs 16 and 17:

V_{CE} = 12,5 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h} \leq 0,3$ °K/W; $I_{C(ZS)}$ = 25 mA; typical values.

* See next page.

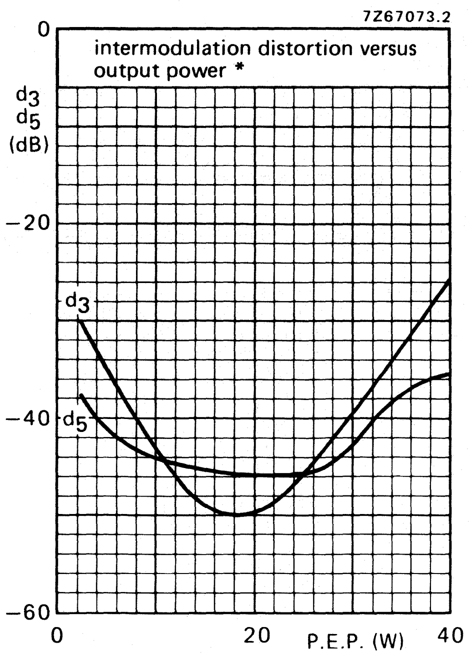


Fig. 18.

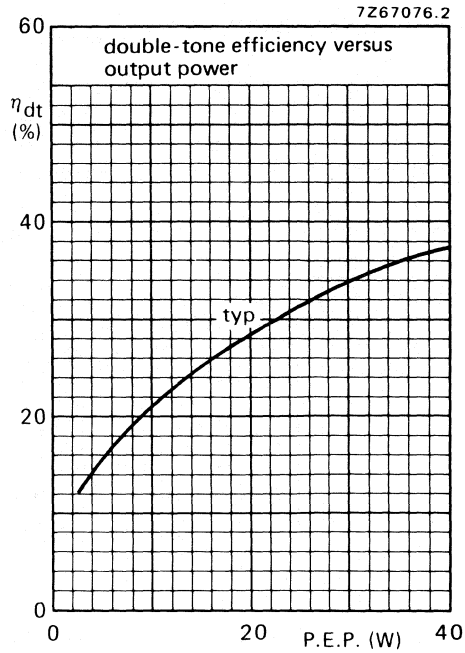


Fig. 19.

Conditions for Figs 18 and 19:

V_{CE} = 13,5 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h} \leqslant 0{,}3$ K/W ; $I_{C(ZS)}$ = 25 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)

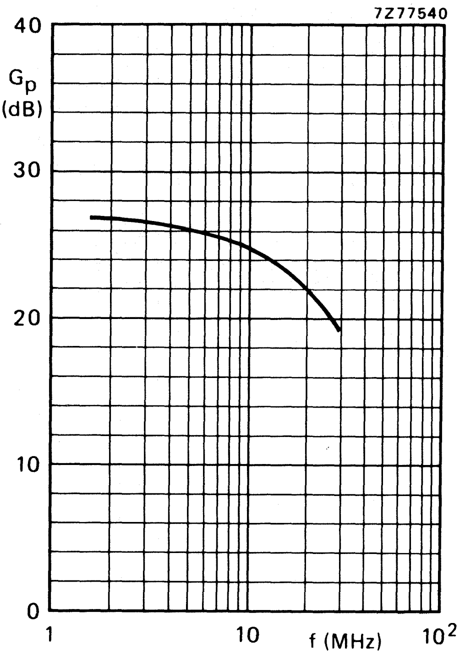


Fig. 20 Power gain as a function of frequency.

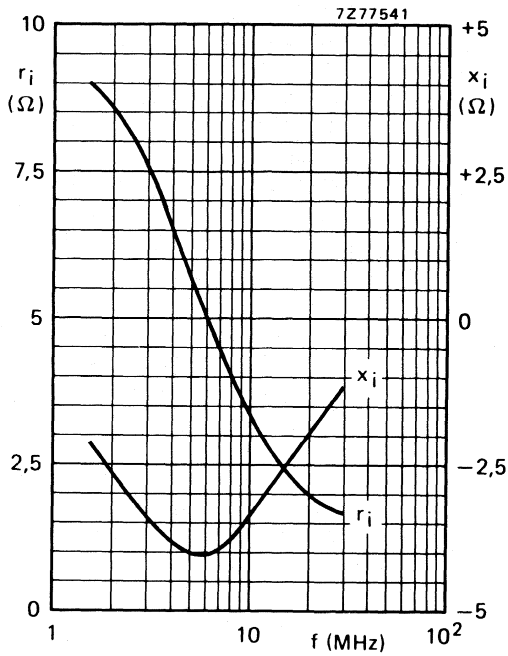


Fig. 21 Input impedance (series components) as a function of frequency.

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 V	V_{CE} = 13,5 V
P_L = 30 W (P.E.P.)	P_L = 35 W (P.E.P.)
T_h = 25 °C	T_h = 25 °C
$R_{th\ mb\text{-}h} \leqslant$ 0,3 K/W	$R_{th\ mb\text{-}h} \leqslant$ 0,3 K/W
$I_{C(ZS)}$ = 25 mA	$I_{C(ZS)}$ = 25 mA
Z_L = 1,8 Ω	Z_L = 1,8 Ω

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

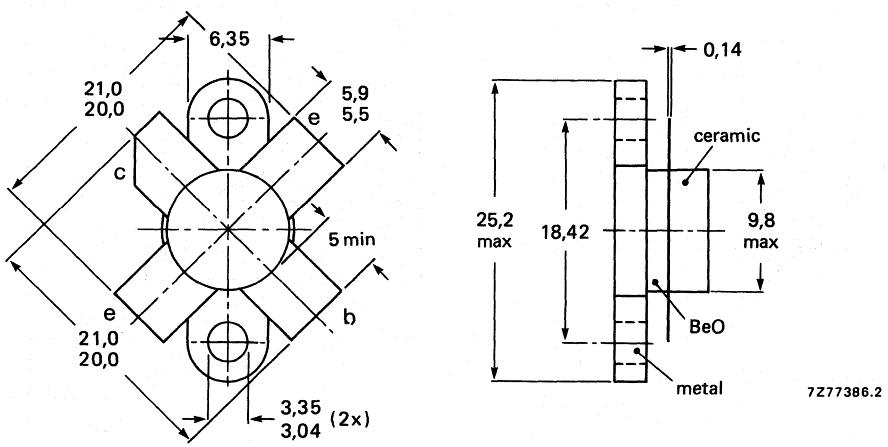
R.F. performance up to T_h = 25 °C

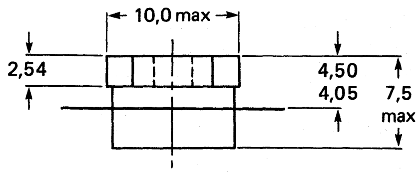
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS	d_3 dB
c.w. (class-B)	**28**	**175**	**45**	**> 7,5**	**> 70**	**0,7 + j1,3**	**110 − j62**	**–**
s.s.b. (class-AB)	28	1,6 – 28	5–47,5(P.E.P.)	typ. 19	typ. 45	–	–	typ. −30
s.s.b. (class-A)	26	1,6 – 28	17(P.E.P.)	typ. 22	–	–	–	typ. −42

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





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_{rf}	max.	105	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

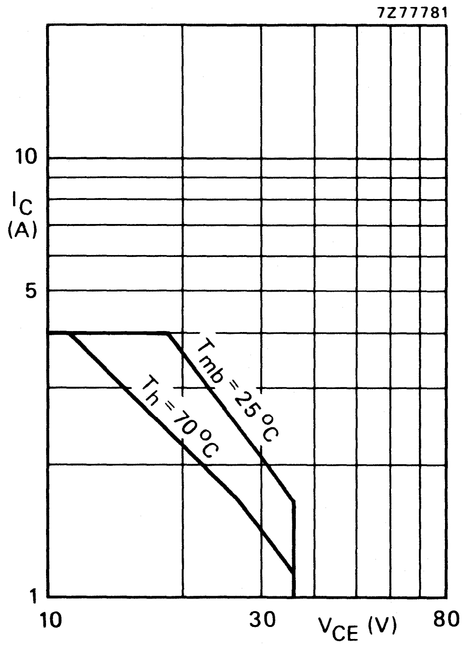


Fig. 2 D.C. SOAR.

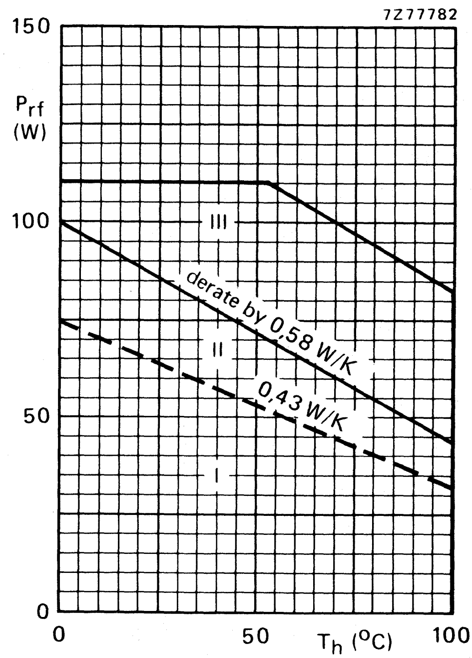


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 28 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 45 W; T_{mb} = 83,5 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,65	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,95	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65 V
Collector-emitter breakdown voltage			
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	36 V
Emitter-base breakdown voltage			
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	8 mJ
R_{BE} = 10 Ω	E_{SBR}	>	8 mJ
D.C. current gain*			
I_C = 2,5 A; V_{CE} = 5 V	h_{FE}	typ.	45
			10 to 80
D.C. current gain ratio of matched devices*			
I_C = 2,5 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage*			
I_C = 7,5 A; I_B = 1,5 A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz*			
$-I_E$ = 2,5 A; V_{CB} = 28 V	f_T	typ.	570 MHz
$-I_E$ = 7,5 A; V_{CB} = 28 V	f_T	typ.	570 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	82 pF
Feedback capacitance at f = 1 MHz			
I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	54 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

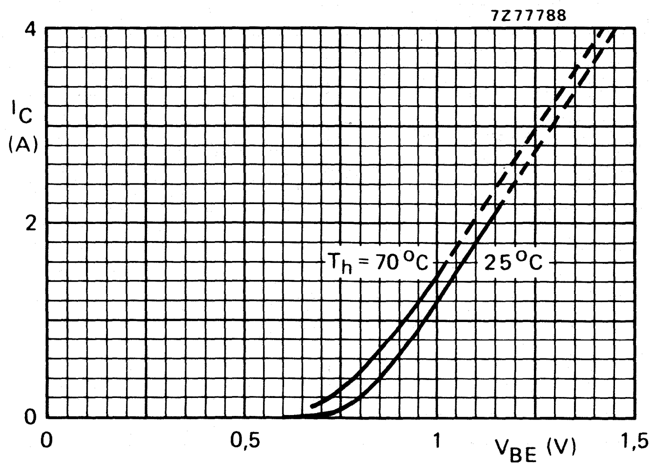


Fig. 4 Typical values; V_{CE} = 28 V.

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

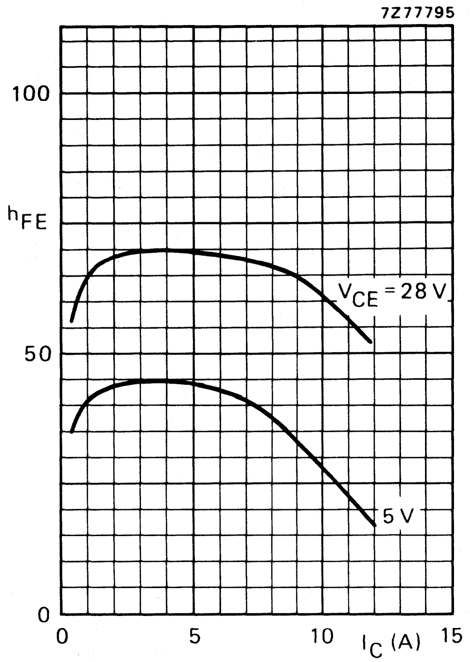


Fig. 5 Typical values; T_j = 25 °C.

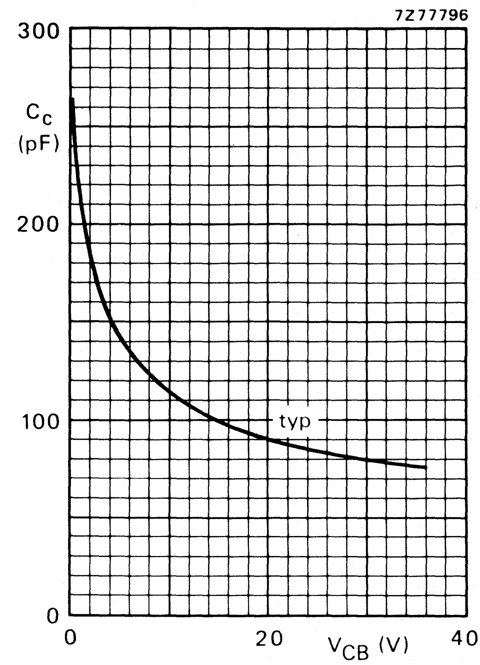


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

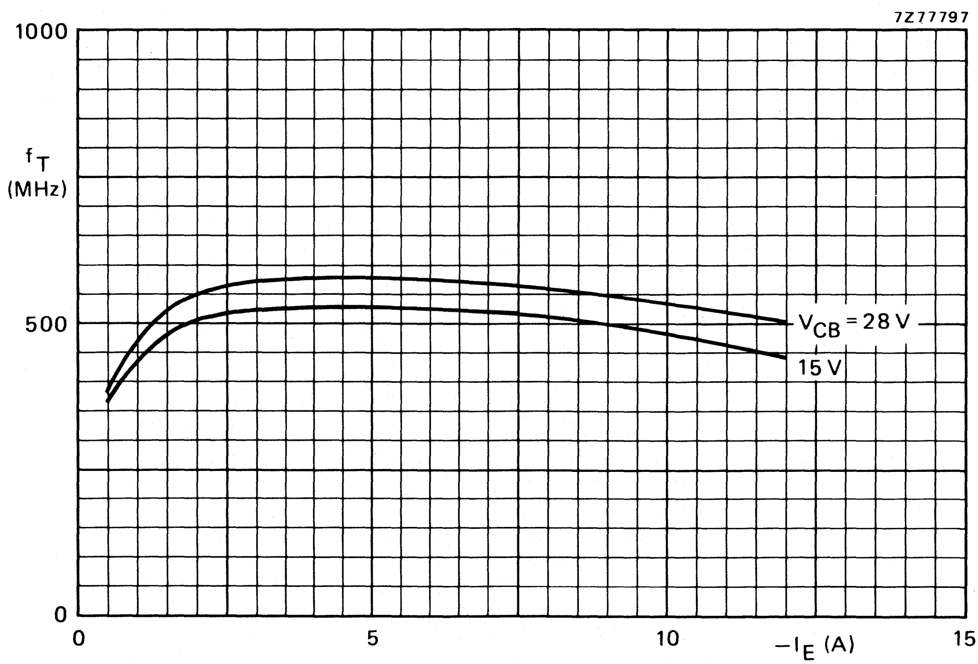


Fig. 7 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	45	< 8	> 7,5	< 2,47	> 70	0,7 + j1,3	110 – j62

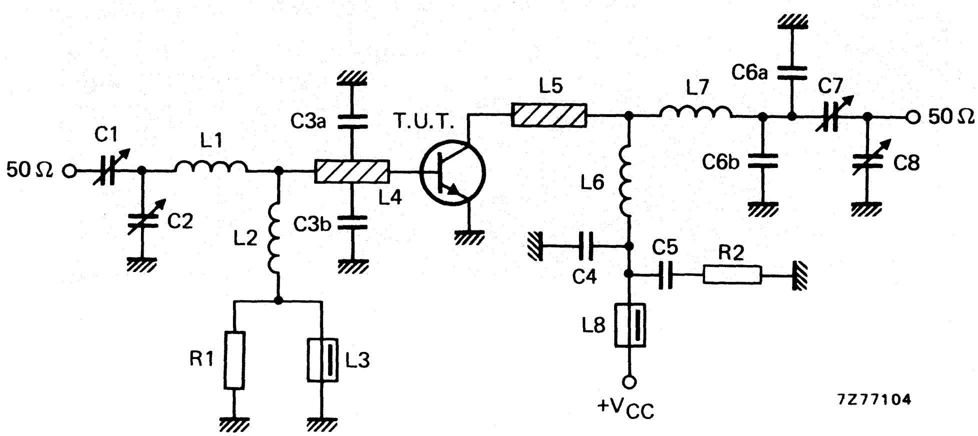


Fig. 8 Test circuit; c.w. class-B.

List of components:

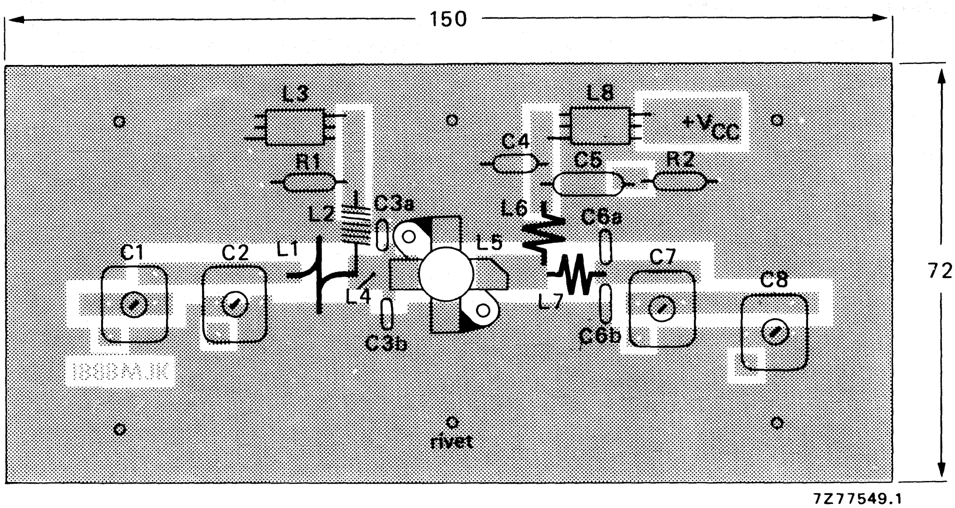
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor
C5 = 100 nF polyester capacitor
C6a = 2,2 pF ceramic capacitor (500 V)
C6b = 1,8 pF ceramic 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.



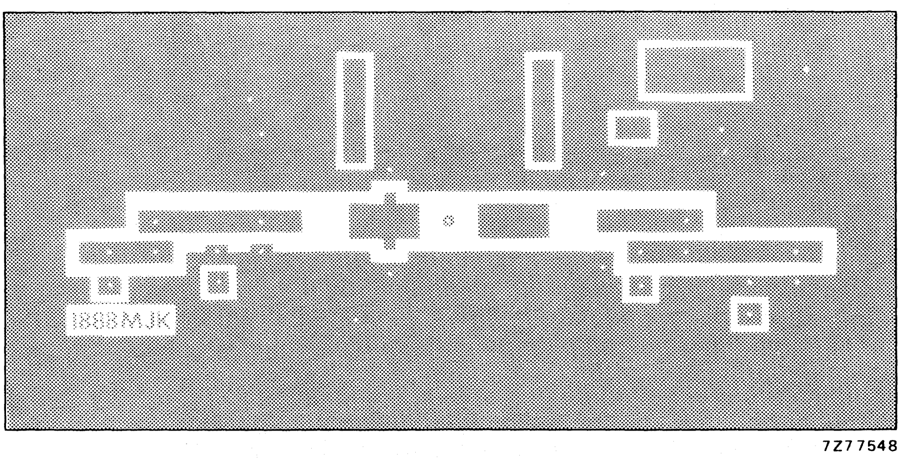


Fig. 9 Component layout and printed-circuit board for 175 MHz test circuit.

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.

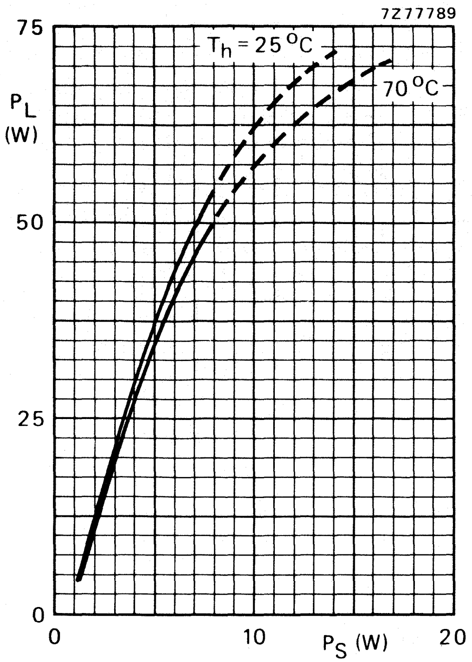


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

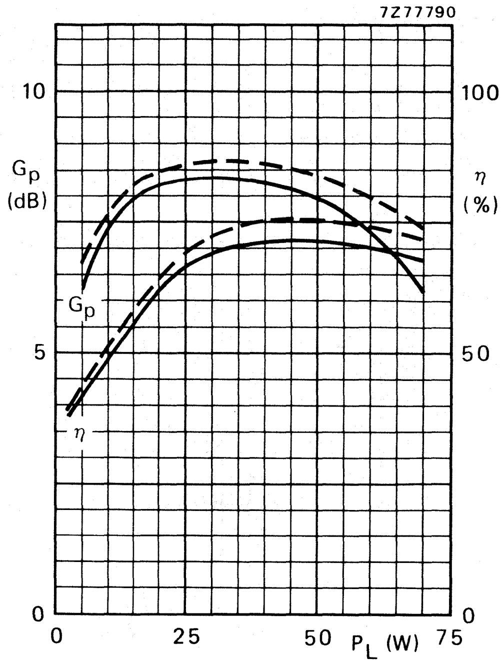


Fig. 11 Typical values; V_{CE} = 28 V; f = 175 MHz;
--- T_h = 25 °C; —— T_h = 70 °C.

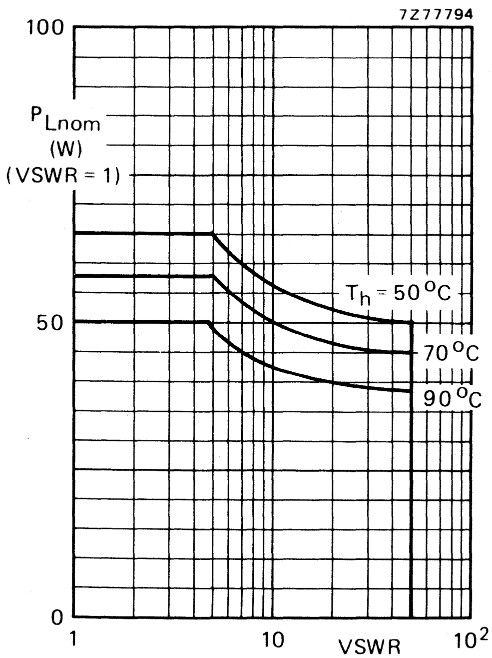


Fig. 12 R.F. SOAR; c.w. class-B operation;
f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb-h}$ = 0,3 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

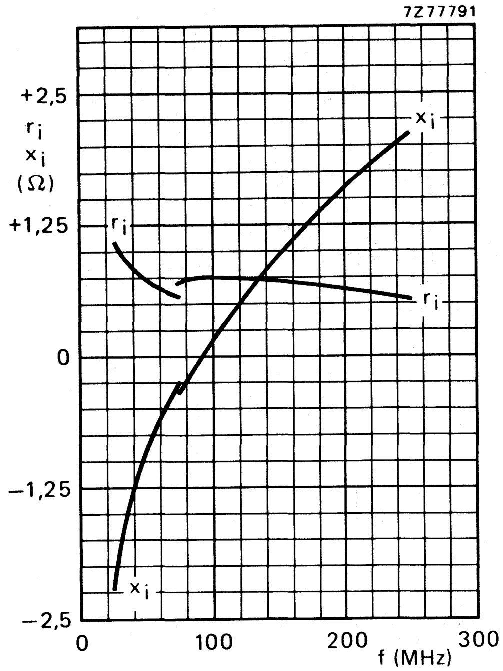


Fig. 13 Input impedance (series components).

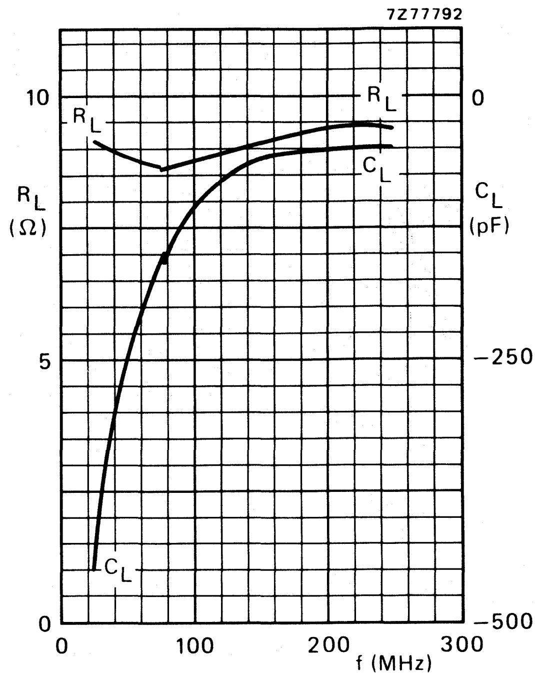


Fig. 14 Load impedance (parallel components).

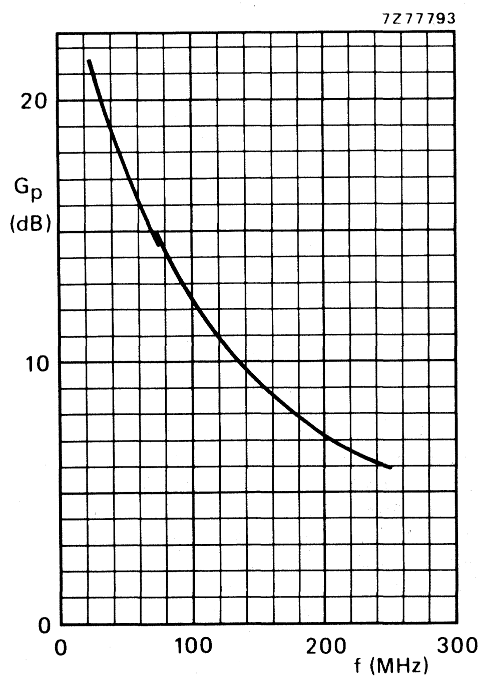


Fig. 15 Power gain versus frequency.

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 V; P_L = 45 W; T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 47,5 W (P.E.P.)	I_C (A) at 47,5 W (P.E.P.)	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

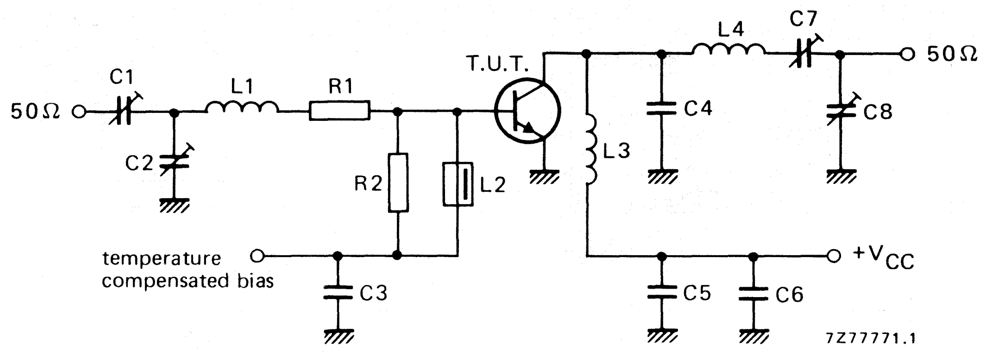


Fig. 16 Test circuit; s.s.b. class-AB.

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.

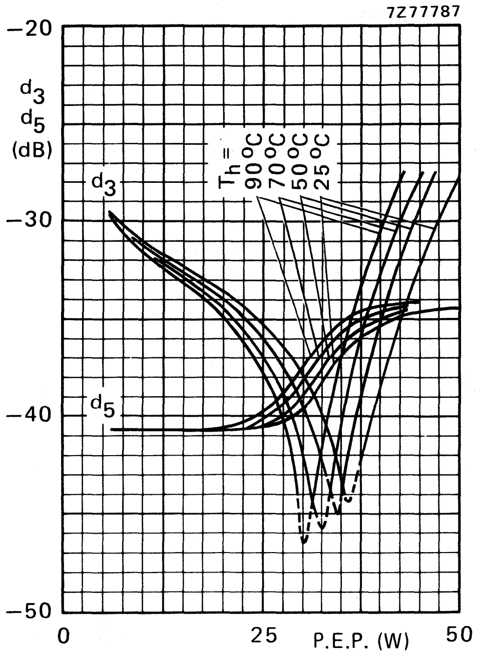


Fig. 17 Intermodulation distortion as a function of output power.*

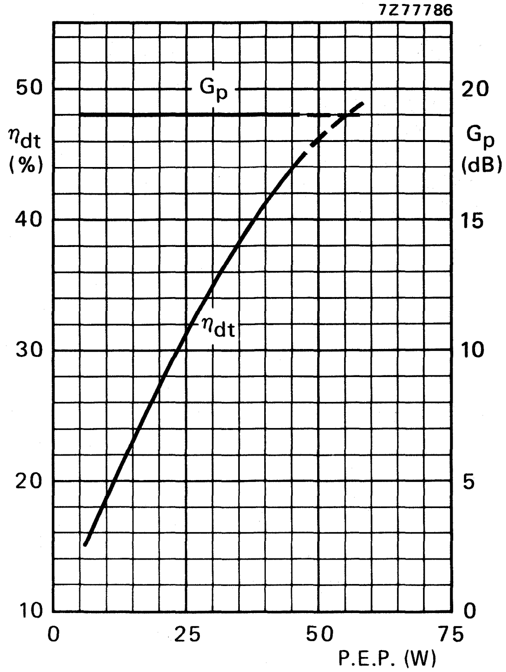


Fig. 18 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 17:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 18:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

* See note on previous page.

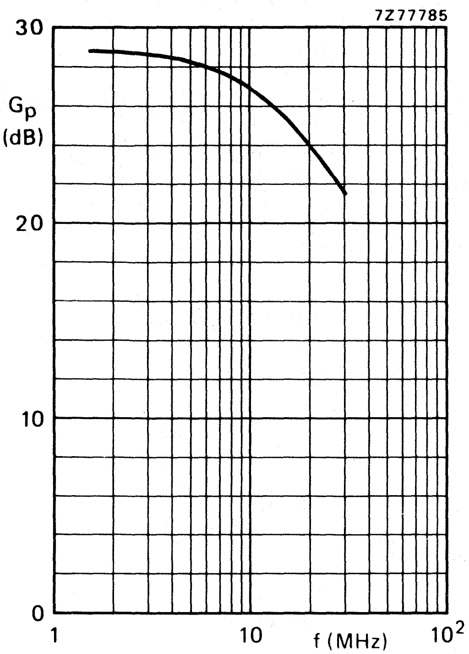


Fig. 19 Power gain as a function of frequency.

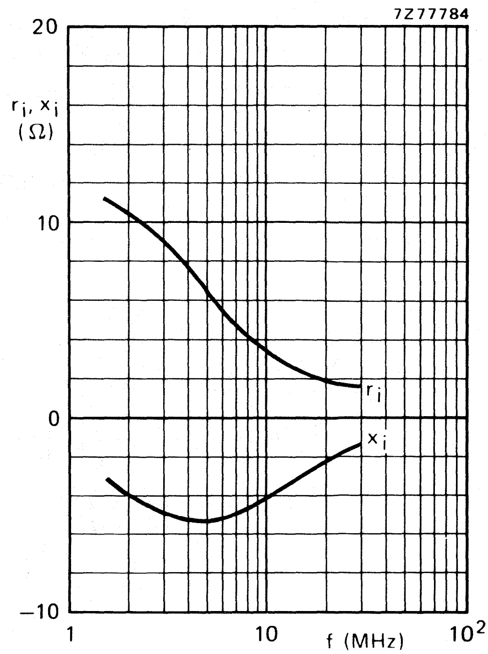


Fig. 20 Input impedance (series components) as a function of frequency.

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 47,5 W; T_h = 25 °C; Z_L = 6,4 Ω.

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 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; T_h = 70 °C and P_{Lnom} = 50 W P.E.P.

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 26 V; f_1 = 28,000 MHz; f_2 = 28,001 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

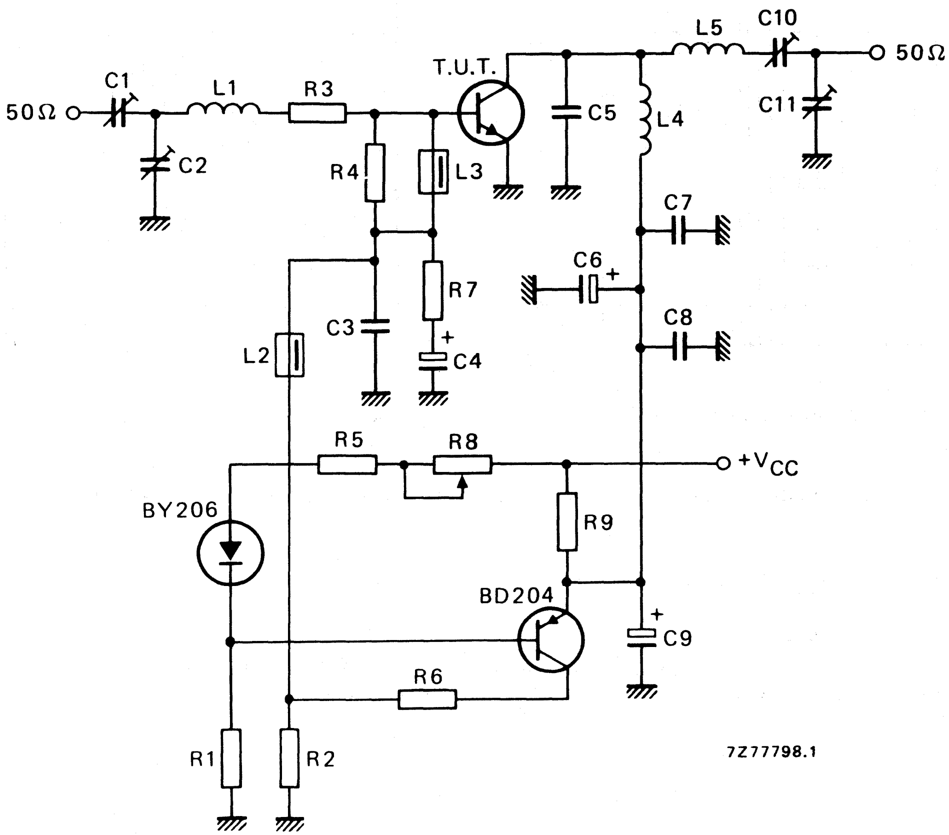


Fig. 21 Test circuit; s.s.b. class-A.

* 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 μF/10 V electrolytic capacitor
C5 = 56 pF ceramic capacitor (500 V)
C6 = 47 μF/35 V electrolytic capacitor
C7 = C8 = 220 nF polyester capacitor
C9 = 10 μF/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 kΩ carbon resistors (±5%; 0,5 W each)
R2 = 15 Ω carbon resistor (±5%; 0,25 W)
R3 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors (±5%; 0,125 W each)
R4 = 33 Ω carbon resistor (±5%; 0,25 W)
R5 = 18 Ω carbon resistor (±5%; 0,25 W)
R6 = 120 Ω wirewound resistor (±5%; 5,5 W)
R7 = 1 Ω carbon resistor (±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 (±5%; 5,5 W each)

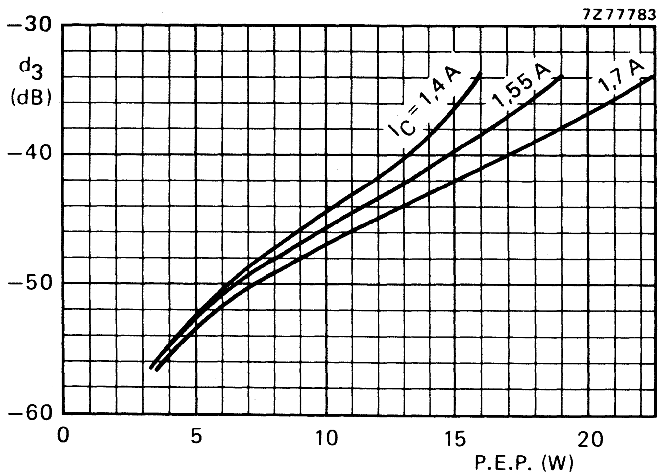


Fig. 22 Intermodulation distortion as a function of output power.
Typical values; V_{CE} = 26 V; T_h = 70 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

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

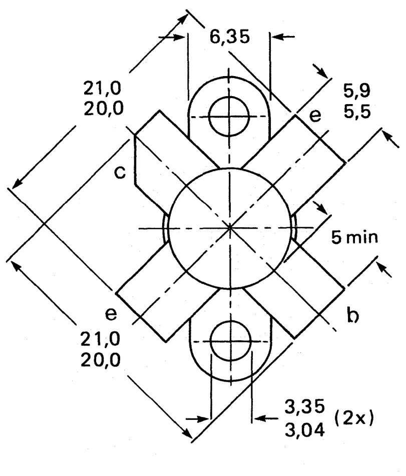
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

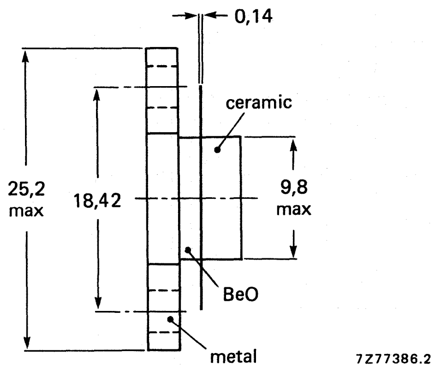
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,5	175	25	> 6	> 70	1,6 + j1,4	210 + j5,5

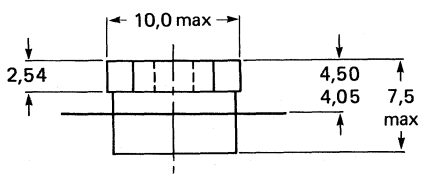
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.







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

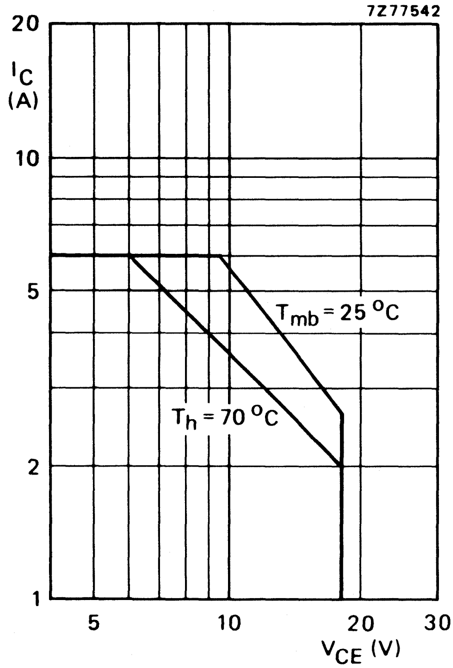


Fig. 2 D.C. SOAR.

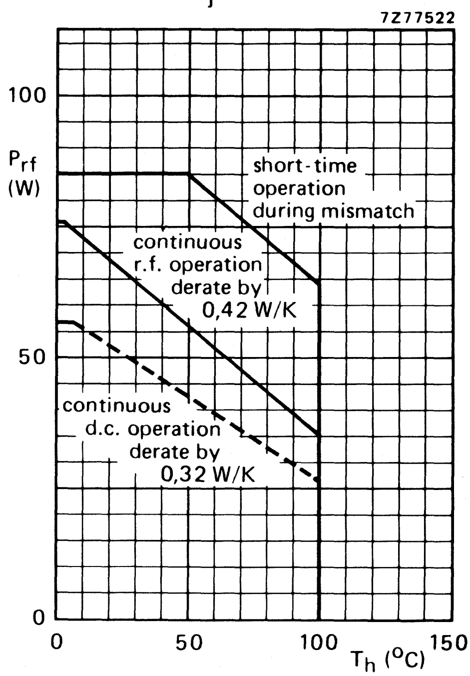


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 16,5 V; f $\geqslant$ 1 MHz.

THERMAL RESISTANCE (dissipation = 20 W; T_{mb} = 76 °C; i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	3,0	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,25	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage				
open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage				
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	8	mJ
D.C. current gain*				
$I_C = 2{,}5$ A; $V_{CE} = 5$ V	h_{FE}	typ.	50	
			10 to 80	
Collector-emitter saturation voltage*				
$I_C = 7{,}5$ A; $I_B = 1{,}5$ A	V_{CEsat}	typ.	1,7	V
Transition frequency at f = 100 MHz*				
$-I_E = 2{,}5$ A; $V_{CB} = 13{,}5$ V	f_T	typ.	800	MHz
$-I_E = 7{,}5$ A; $V_{CB} = 13{,}5$ V	f_T	typ.	750	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ.	65	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 15$ V	C_{re}	typ.	41	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

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

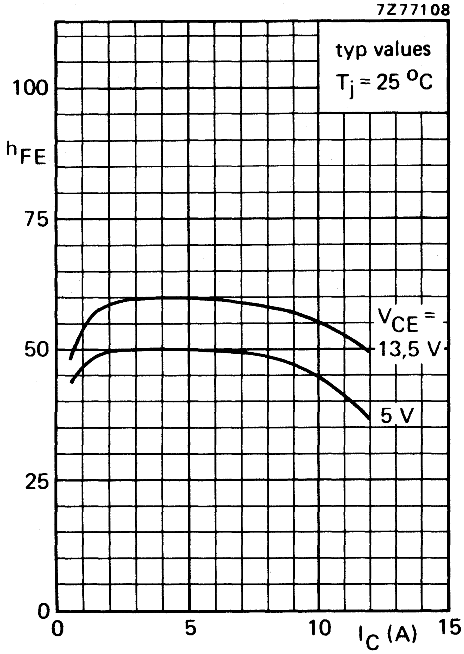


Fig. 4.

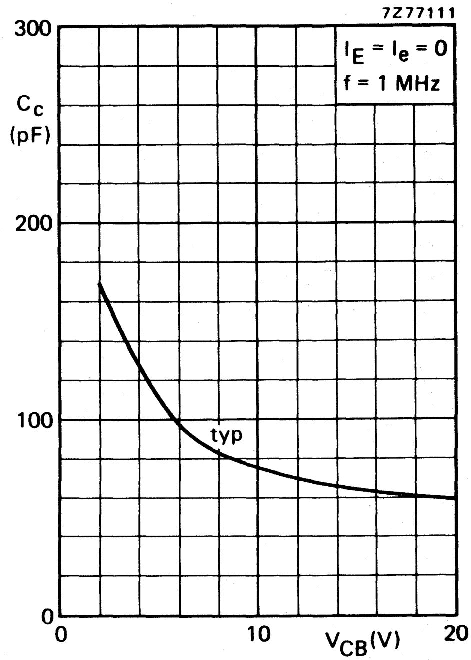


Fig. 5 T_j = 25 °C.

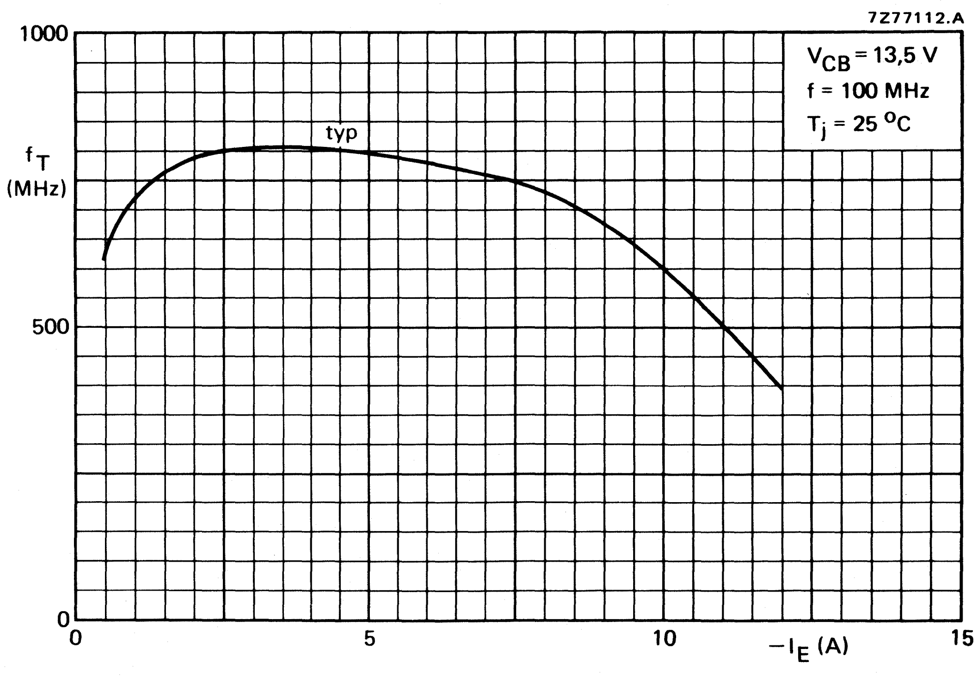


Fig. 6.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	–	–

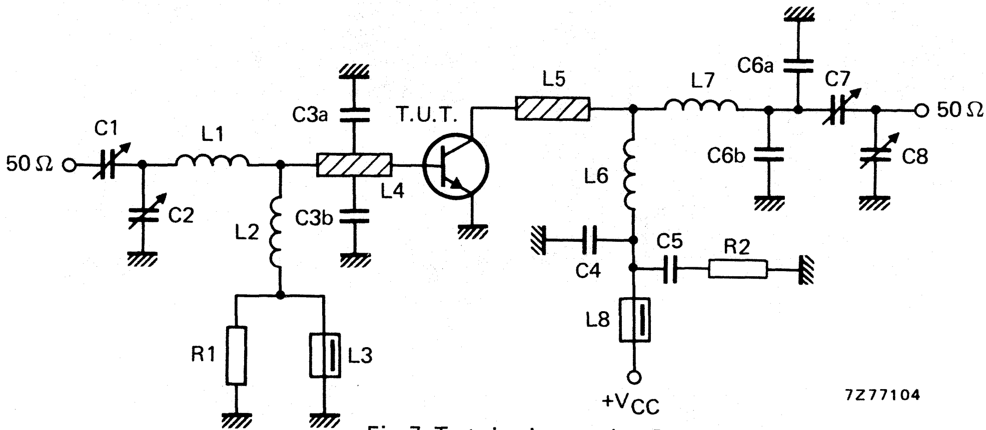


Fig. 7 Test circuit; c.w. class-B.

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)

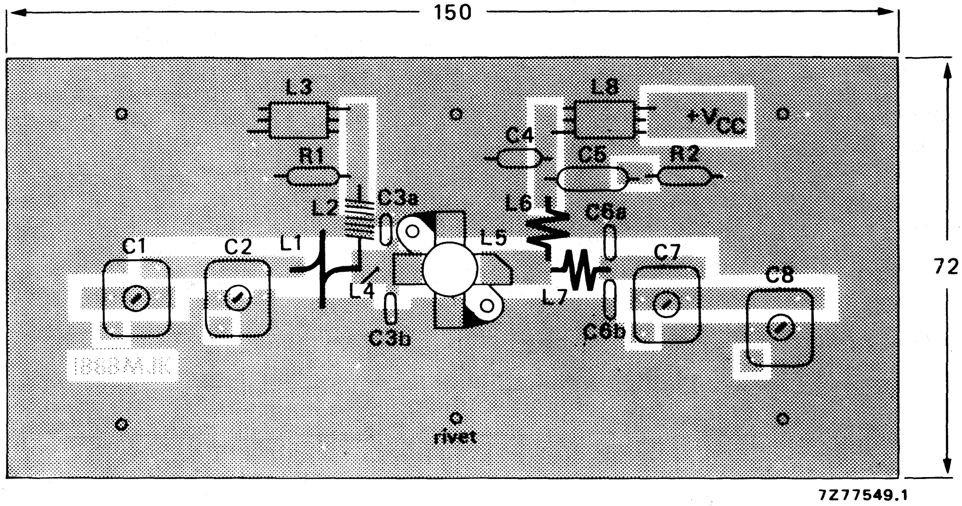
L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from 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 (± 10%) carbon resistor (0,25 W)
R2 = 4,7 Ω (± 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)



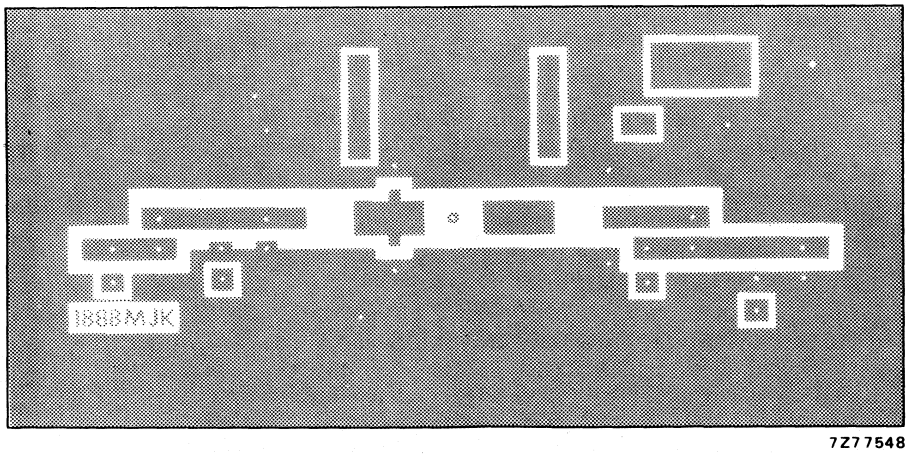


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

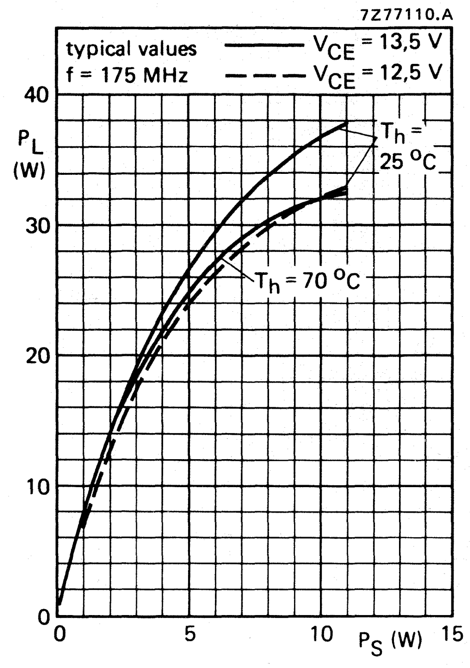


Fig. 9.

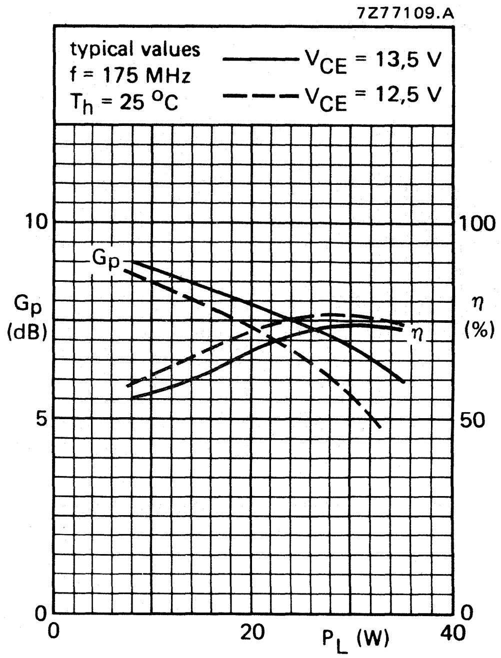


Fig. 10.

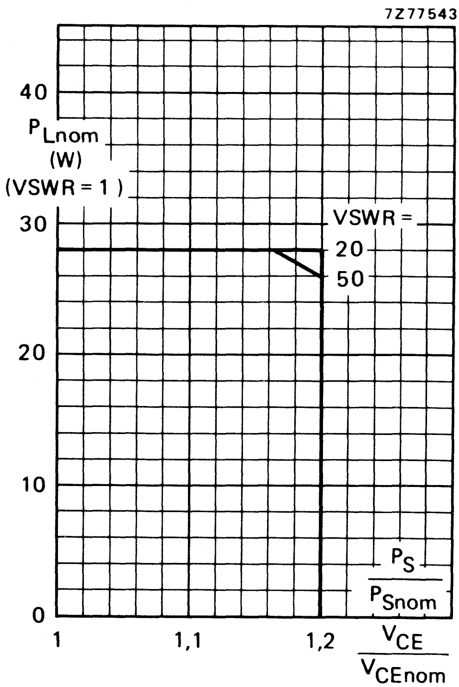


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb-h}$ = 0,3 K/W ; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1; measured in the circuit of Fig.7.

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

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

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

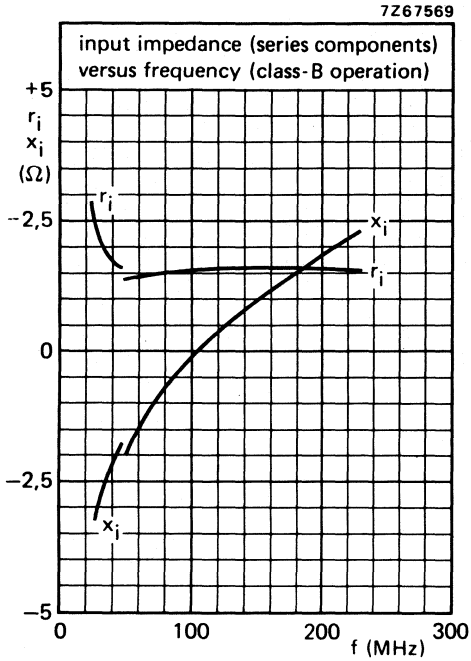


Fig. 12.

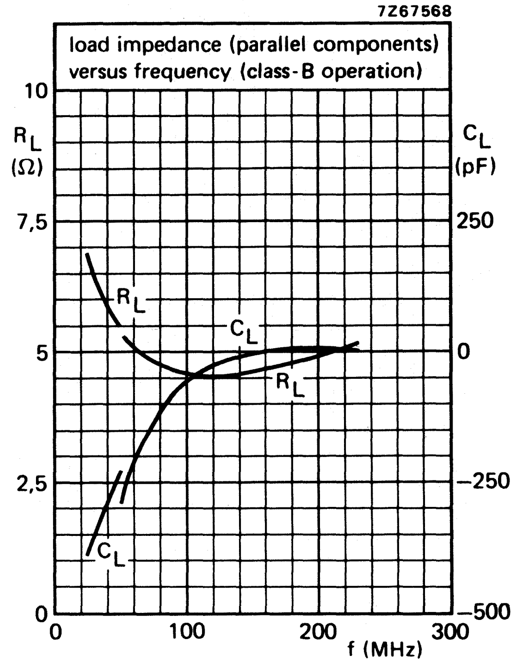
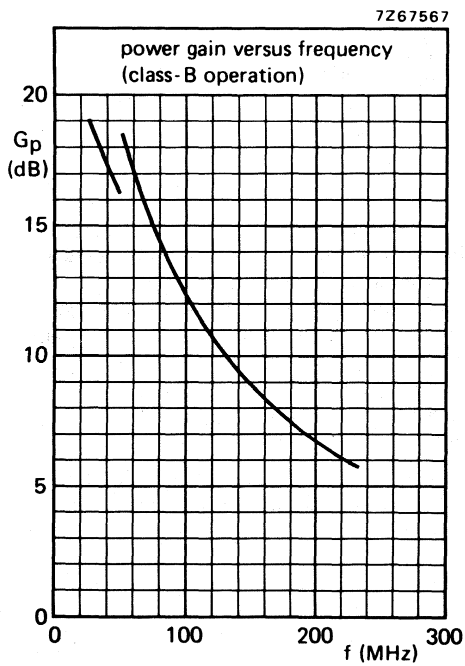


Fig. 13.



Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 25 W; T_h = 25 °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

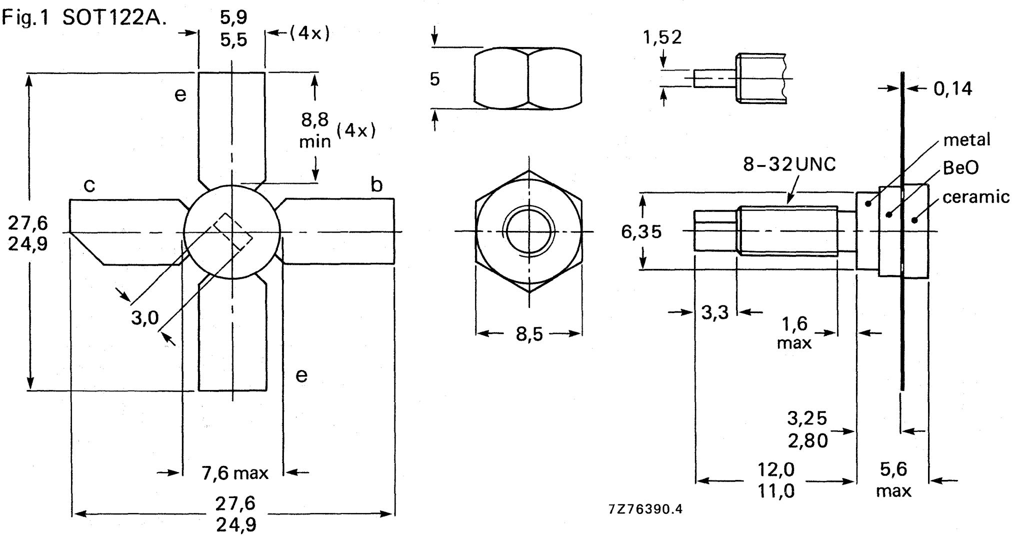
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

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 SOT122A.



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.	0,62	A
(peak value); f > 1 MHz	I_{CM}	max.	2,0	A
Total power dissipation (d.c. and r.f.) up to T_{mb} = 25 °C	P_{tot}	max.	18,6	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

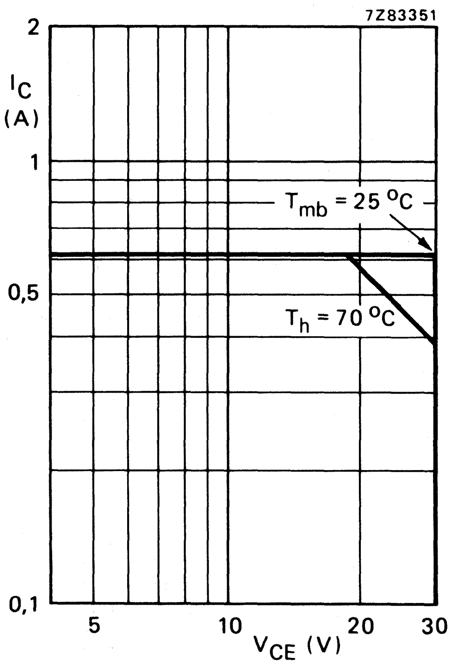


Fig. 2 D.C. SOAR.

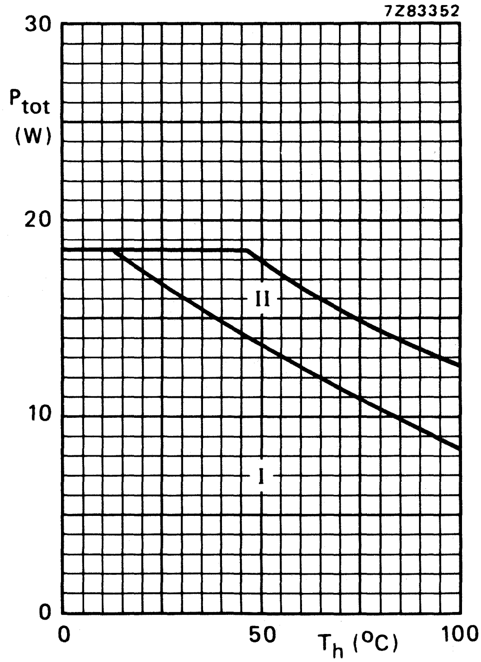


Fig. 3 Power derating curves vs. temperature.
I Continuous d.c. and r.f. operation
II Short-time operation during mismatch

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)	$R_{th\ j\text{-}mb}$	=	9,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 4 mA	$V_{(BR)CES}$	>	60 V
Collector-emitter breakdown voltage open base; I_C = 20 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	2 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	1 mJ
R_{BE} = 10 Ω	E_{SBR}	>	1 mJ
D.C. current gain * I_C = 0,3 A; V_{CE} = 5 V	h_{FE}	typ.	40
			10 to 100
Collector-emitter saturation voltage * I_C = 1,0 A; I_B = 0,2 A	V_{CEsat}	typ.	0,9 V
Transition frequency at f = 500 MHz * $-I_E$ = 0,3 A; V_{CB} = 28 V	f_T	typ.	1,2 GHz
$-I_E$ = 1,0 A; V_{CB} = 28 V	f_T	typ.	0,9 GHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 28 V	C_c	typ.	8,4 pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 28 V	C_{re}	typ.	3,6 pF
Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

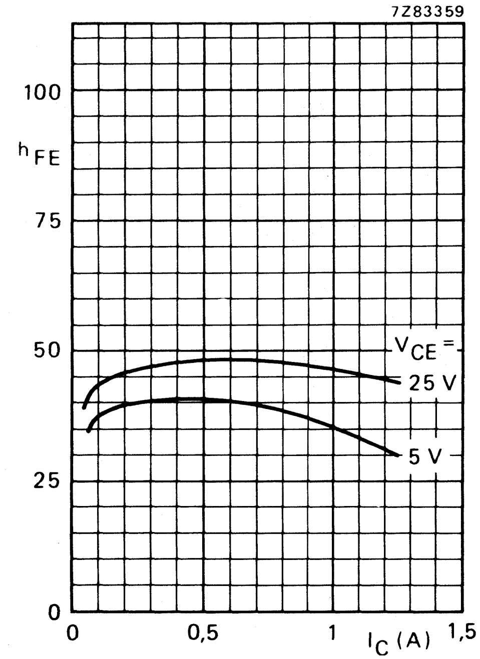


Fig. 4 Typical values; T_j = 25 ^oC.

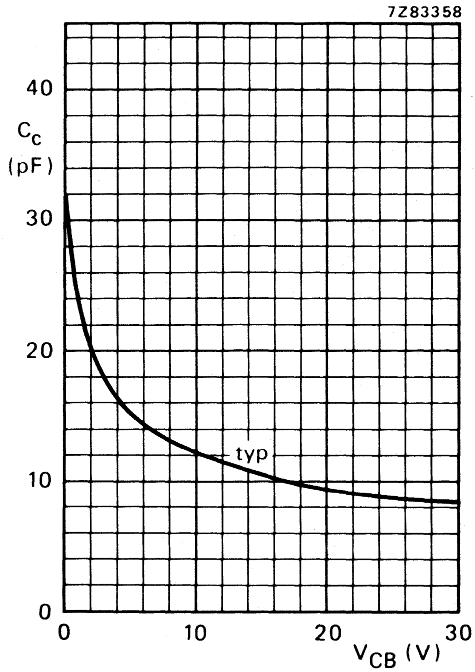


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 ^oC.

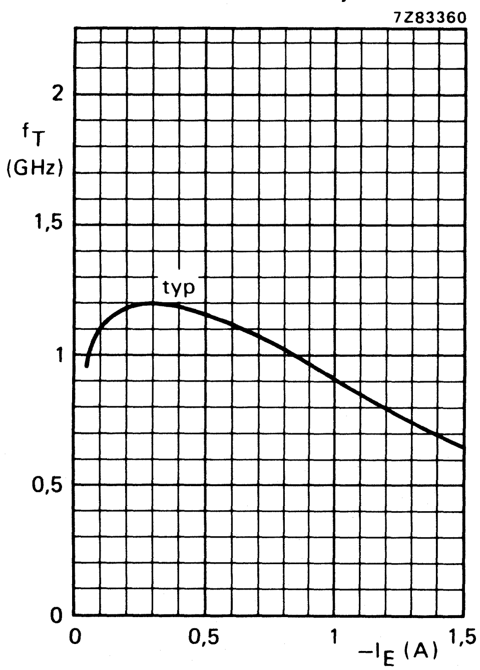


Fig. 6 V_{CB} = 28 V; f = 500 MHz; T_j = 25 ^oC.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Z_L}$ (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	–	–

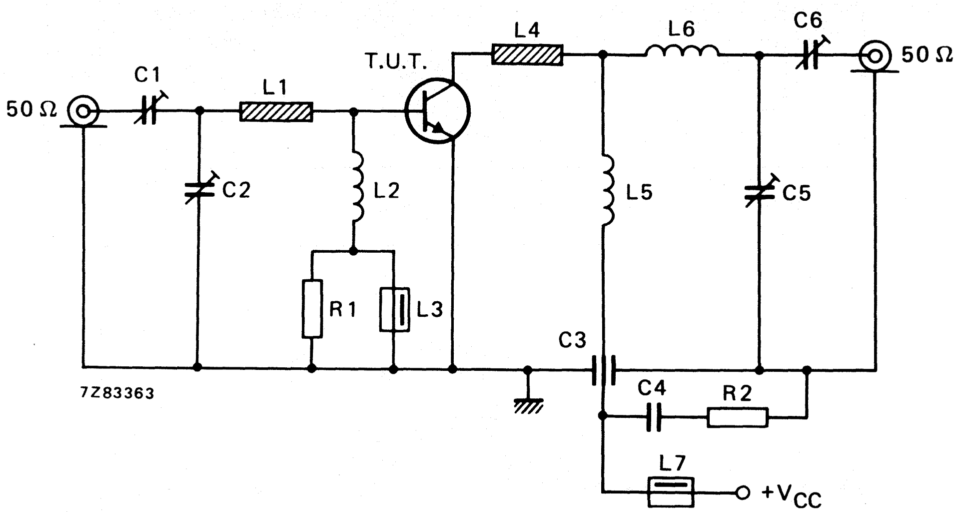


Fig. 7 Test circuit; c.w. class-B.

List of components:

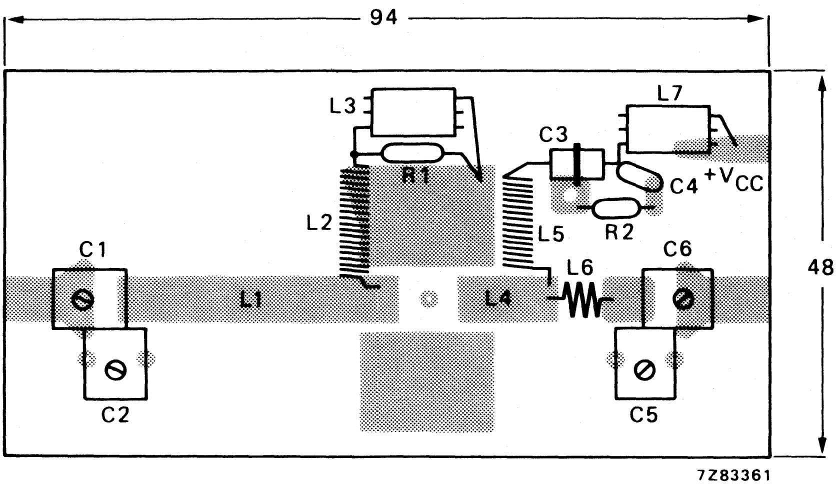
C1 = C5 = C6 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = 100 pF feed-through capacitor
C4 = 100 nF polyester capacitor

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 (ϵ_r = 2,74); thickness 1/16".

R1 = 100 Ω carbon resistor
R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit are shown in Fig. 8.



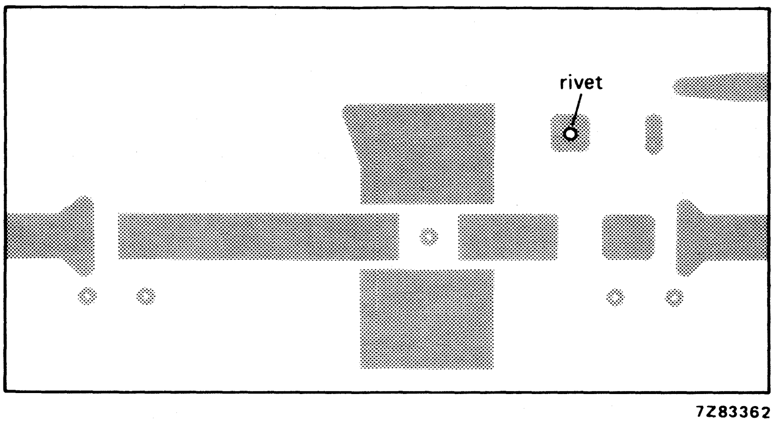


Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

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.

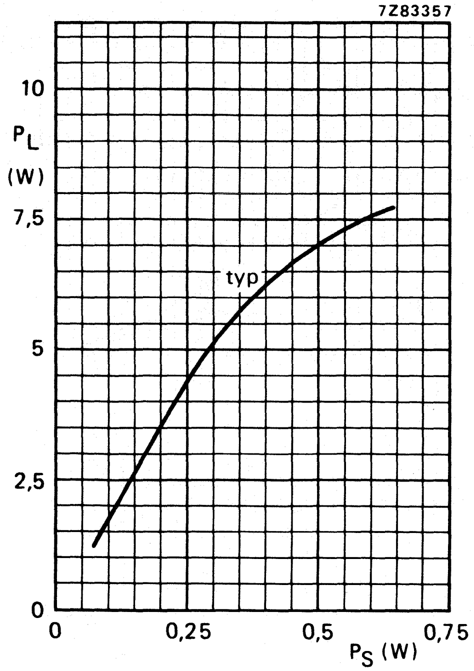


Fig. 9 V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

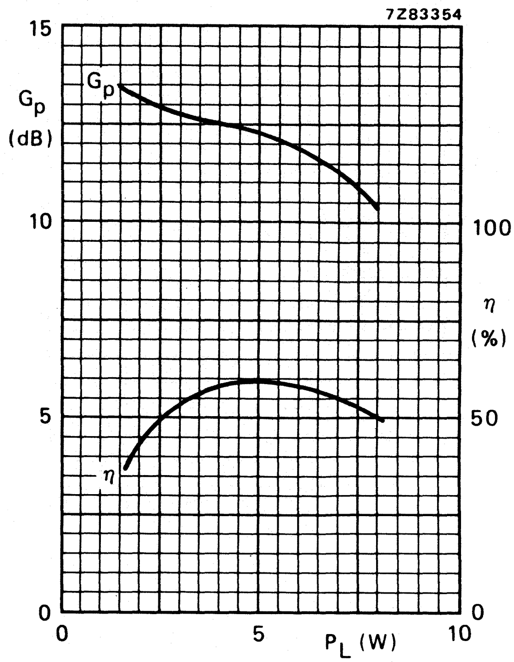


Fig. 10 Typical values; V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

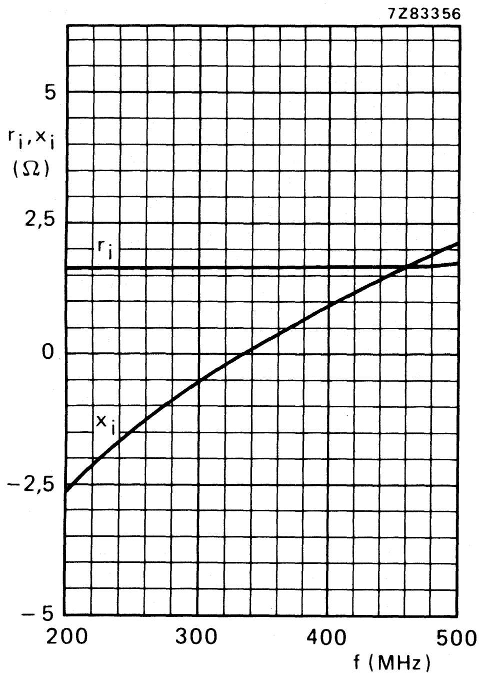


Fig. 11 Input impedance (series components).

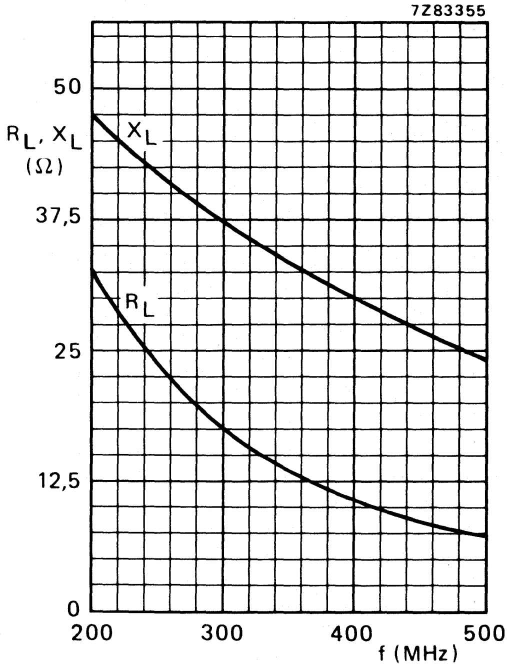


Fig. 12 Load impedance (series components).

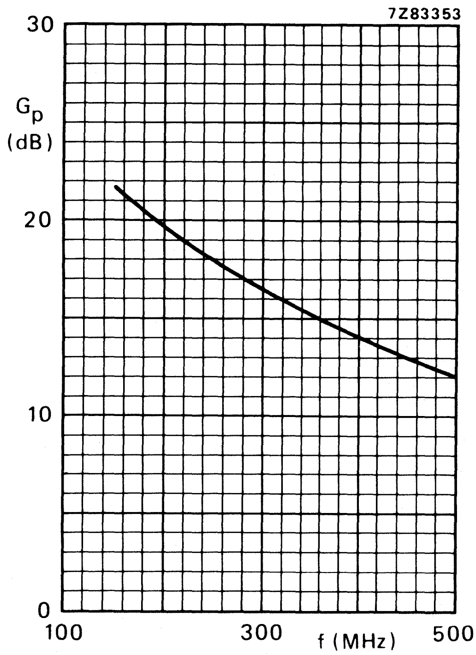


Fig. 13.

Conditions for Figs 11, 12 and 13:

Typical values; V_{CE} = 28 V; P_L = 4 W;
T_h = 25 °C.

Ruggedness

The BLW90 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 4 W under the following conditions:

V_{CE} = 28 V; f = 470 MHz; T_h = 70 °C;
$R_{th\ mb\text{-}h}$ = 0,6 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 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 °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

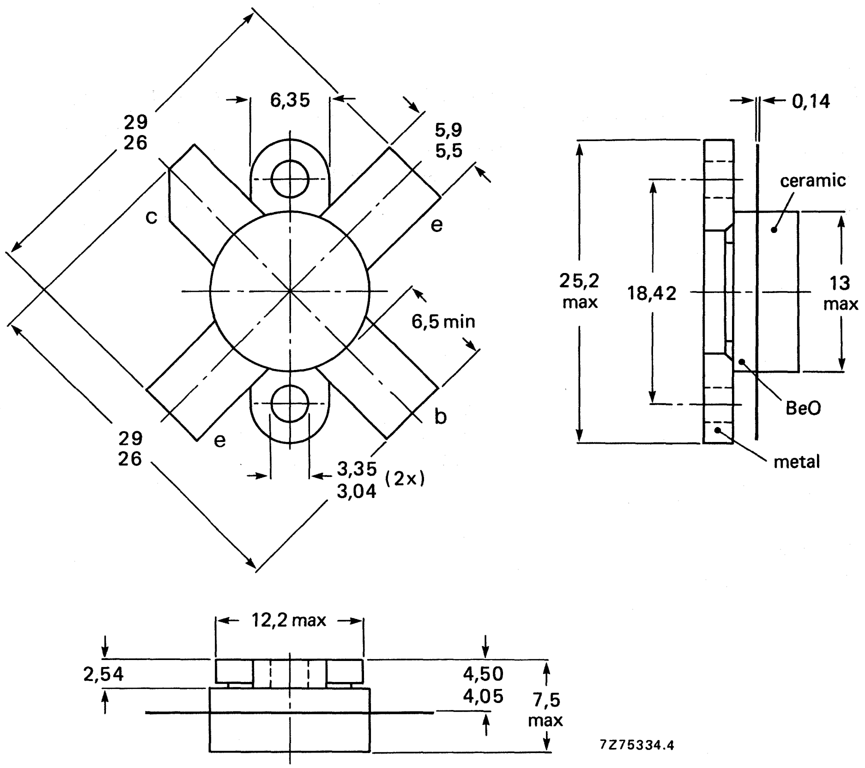
SOT-121A (see Fig. 1).

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

Dimensions in mm

Fig. 1 SOT-121.



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.	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

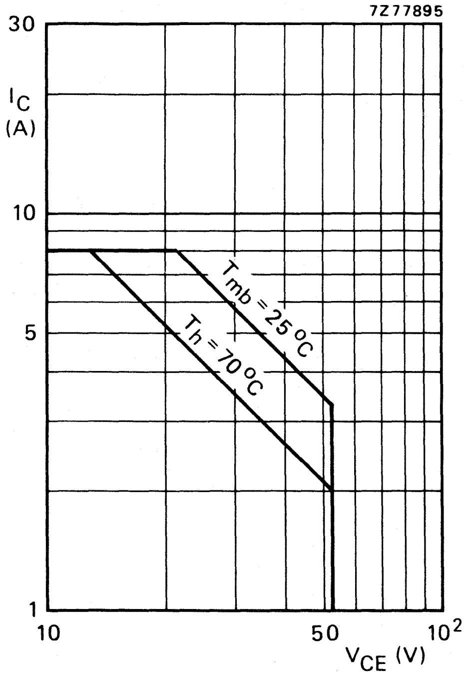


Fig. 2 D.C. SOAR.

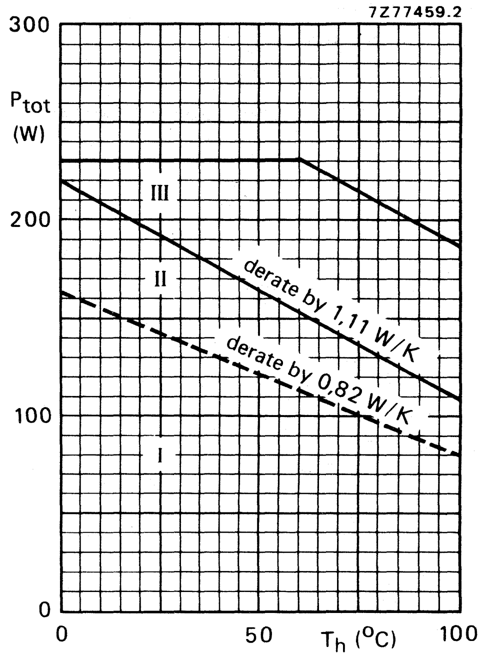


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 50$ V; f ⩾ 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 100 W; T_{mb} = 90 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,0 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,7 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	110 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	53 V
Emitter-base breakdown voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 53 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	12,5 mJ
R_{BE} = 10 Ω	E_{SBR}	>	12,5 mJ
D.C. current gain * I_C = 4 A; V_{CE} = 5 V	h_{FE}	typ.	30 15 to 50
D.C. current gain ratio of matched devices * I_C = 4 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	≤	1,2
Collector-emitter saturation voltage * I_C = 12,5 A; I_B = 2,5 A	V_{CEsat}	typ.	2,2 V
Transition frequency at f = 100 MHz * $-I_E$ = 4 A; V_{CB} = 40 V	f_T	typ.	270 MHz
$-I_E$ = 12,5 A; V_{CB} = 40 V	f_T	typ.	285 MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 50 V	C_c	typ.	185 pF
Feedback capacitance at f = 1 MHz I_C = 150 mA; V_{CE} = 50 V	C_{re}	typ.	115 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

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

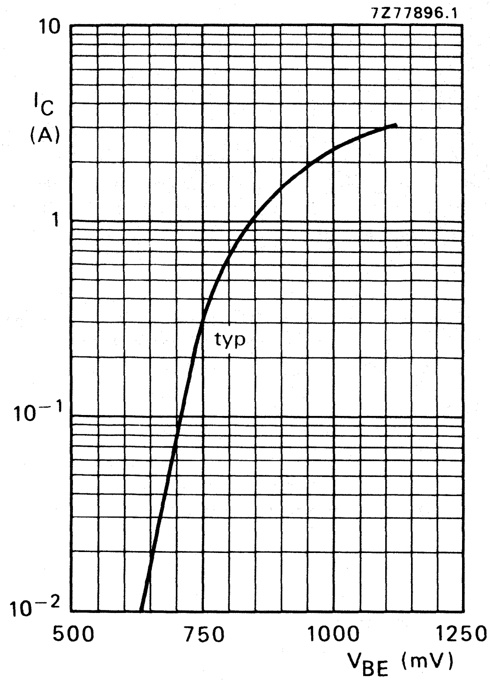


Fig. 4 V_{CE} = 40 V; T_h = 25 °C.

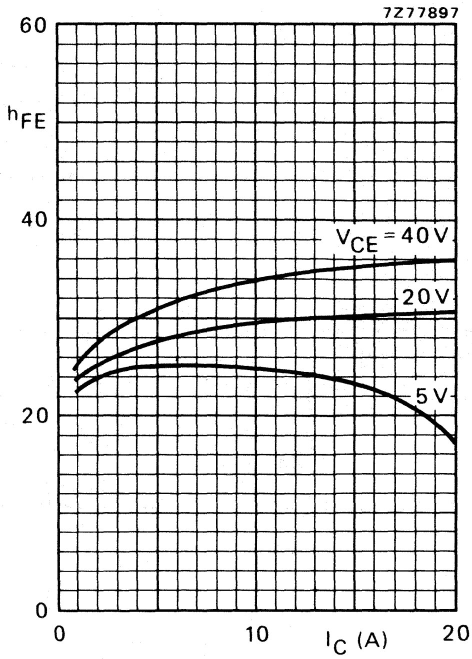


Fig. 5 Typical values; T_j = 25 °C.

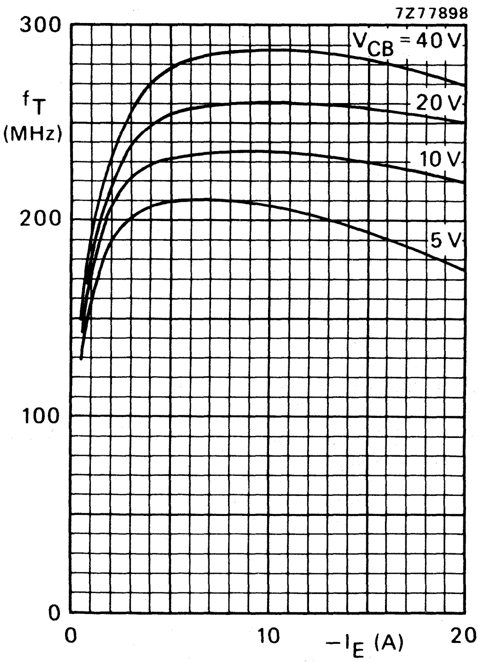


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

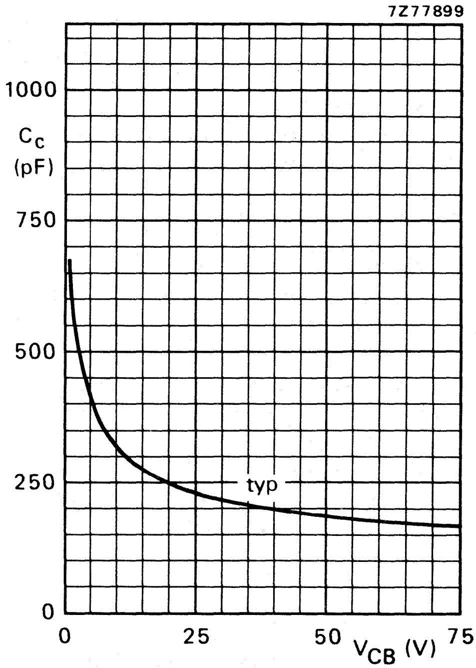


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 50 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 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

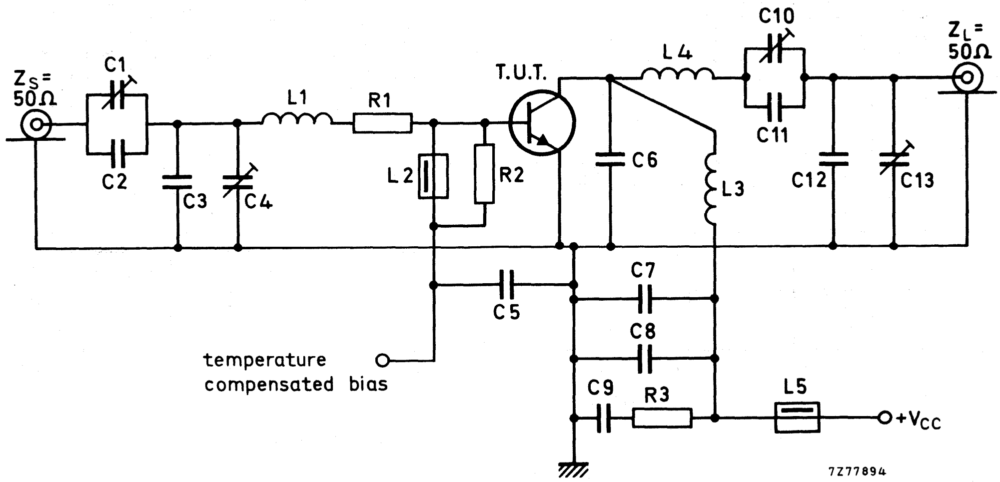


Fig. 8 Test circuit; s.s.b. class-AB.

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.

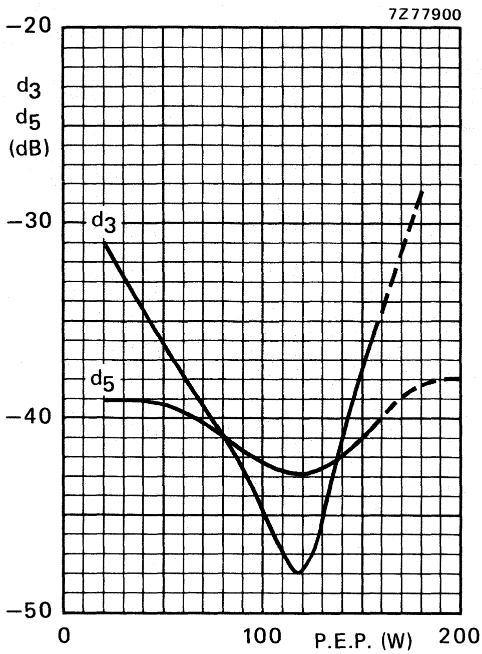


Fig. 9 Intermodulation distortion as a function of output power.*

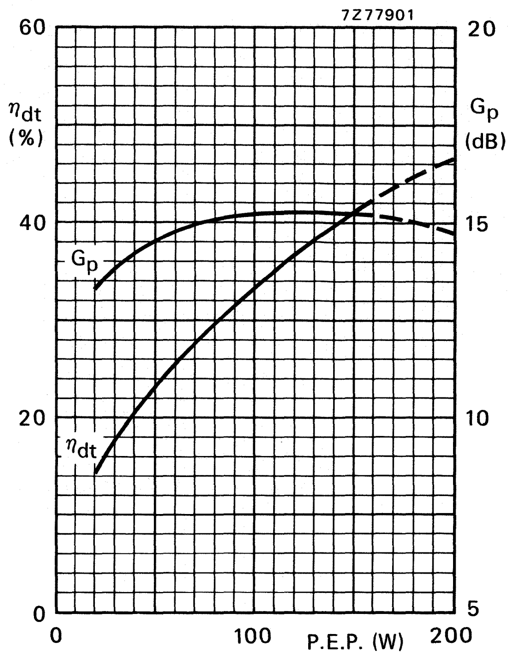


Fig.10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 50 V; $I_{C(ZS)}$ = 0,1 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °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} = 45V; f = 28 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

* See note on previous page.

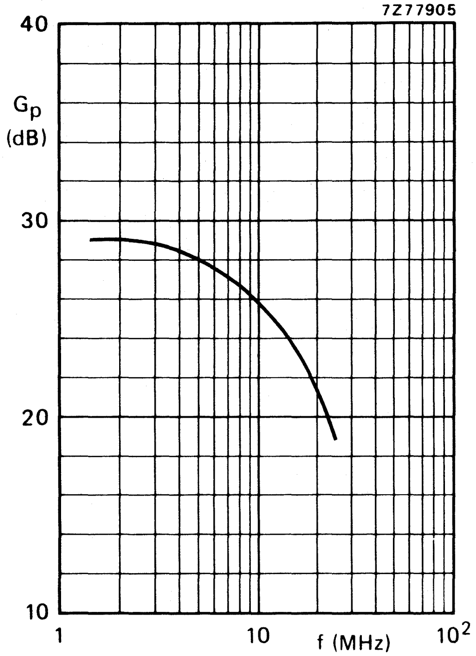


Fig. 11 Power gain as a function of frequency.

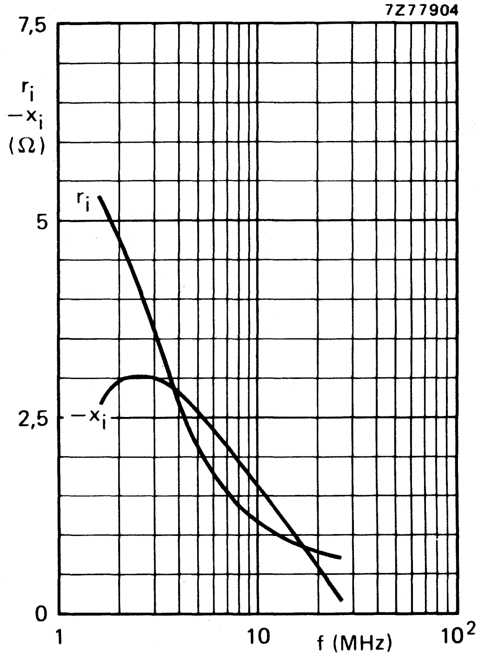


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 50 V; $I_{C(ZS)}$ = 0,1 A; P_L = 160 W (P.E.P.); T_h = 25 °C; Z_L = 6,25 Ω in series with 7,3 nH (in parallel with −188 pF).

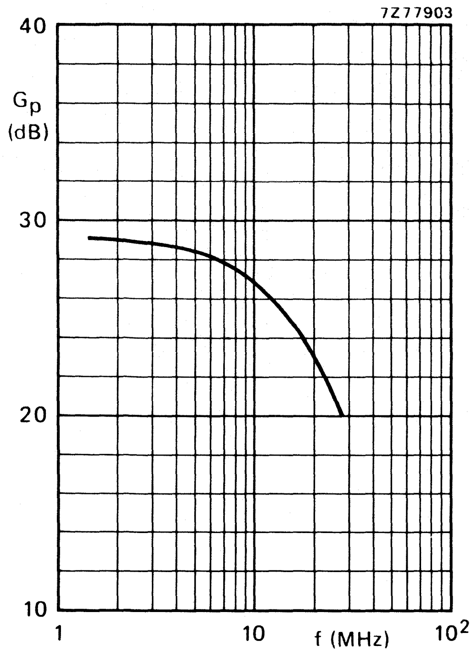


Fig. 13 Power gain as a function of frequency.

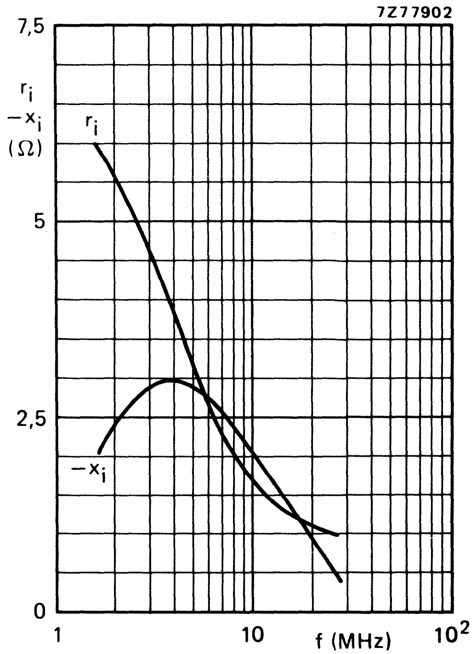


Fig. 14 Input impedance (series components) as a function of frequency.

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 V; $I_{C(ZS)}$ = 0,1 A; P_L = 160 W (P.E.P.); T_h = 25 °C; Z_L = 6,25 Ω in series with 10,4 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 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 °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

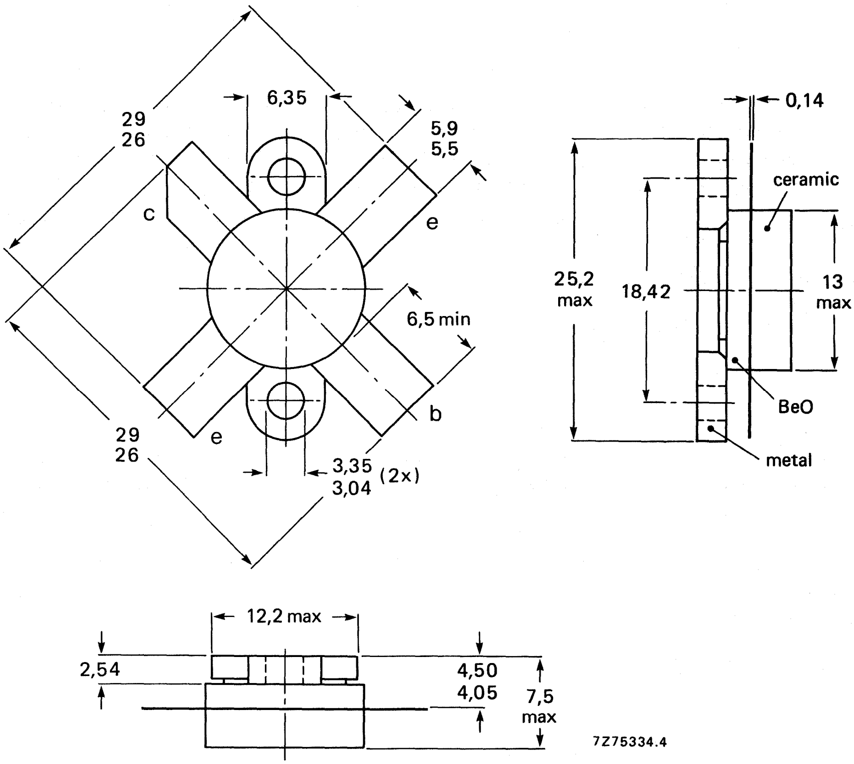
SOT-121 (see Fig. 1).

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

Dimensions in mm

Fig. 1 SOT-121.



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

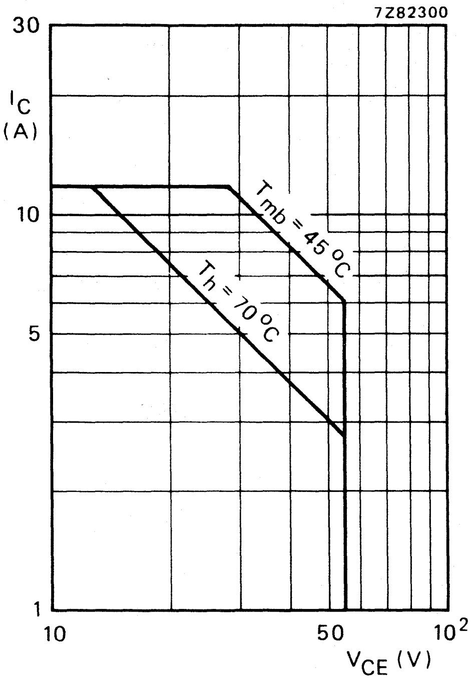


Fig. 2 D.C. SOAR.

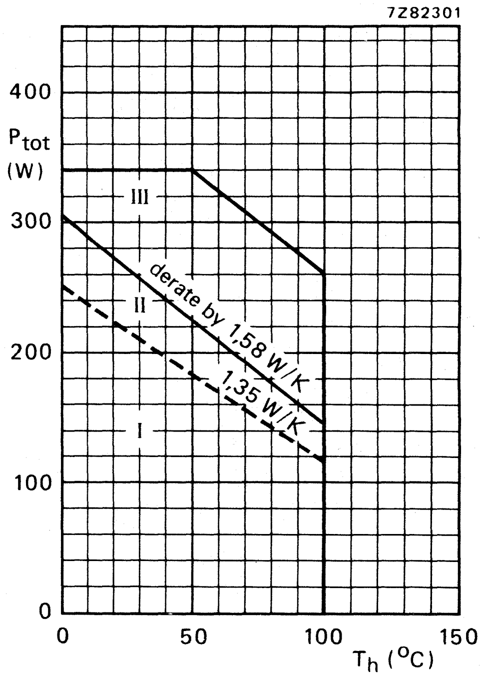


Fig. 3 Power/temperature derating curves.
I Continuous d.c. operation
II Continuous r.f. operation; f > 1 MHz
III Short-time operation during mismatch; f > 1 MHz

THERMAL RESISTANCE (dissipation = 150 W; T_{mb} = 100 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	0,63	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,45	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	110 V
Collector-emitter breakdown voltage open base; I_C = 200 mA	$V_{(BR)CEO}$	>	55 V
Emitter-base breakdown voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 55 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	20 mJ
R_{BE} = 10 Ω	E_{SBR}	>	20 mJ
D.C. current gain* I_C = 7 A; V_{CE} = 5 V	h_{FE}	typ.	30
			15 to 50
D.C. current gain ratio of matched devices* I_C = 7 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	⩽	1,2
Collector-emitter saturation voltage* I_C = 20 A; I_B = 4 A	V_{CEsat}	typ.	1,9 V
Transition frequency at f = 100 MHz** $-I_E$ = 7 A; V_{CB} = 45 V	f_T	typ.	235 MHz
$-I_E$ = 20 A; V_{CB} = 45 V	f_T	typ.	245 MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 50 V	C_c	typ.	280 pF
Feedback capacitance at f = 1 MHz I_C = 150 mA; V_{CE} = 50 V	C_{re}	typ.	170 pF
Collector-flange capacitance	C_{cf}	typ.	4,4 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

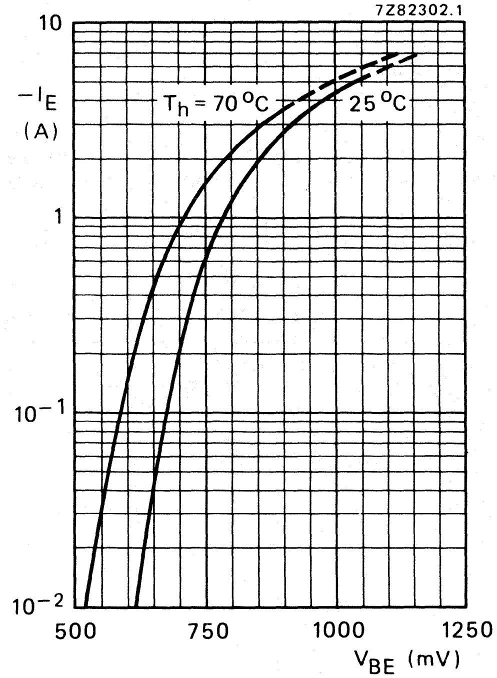


Fig. 4 Typical values; $V_{CE} = 40$ V.

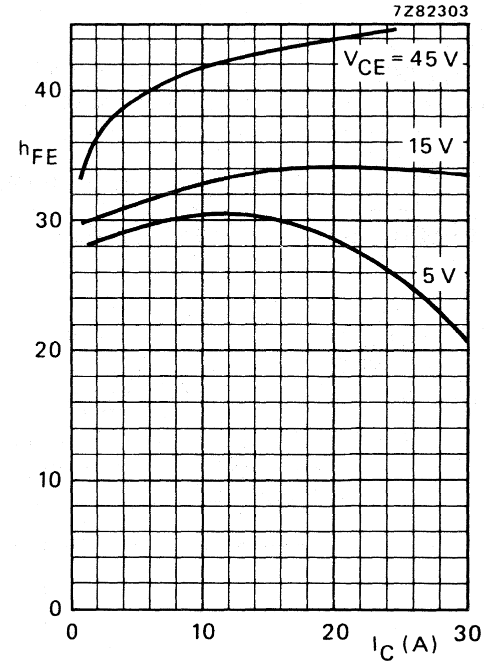


Fig. 5 Typical values; $T_j = 25\ ^oC$.

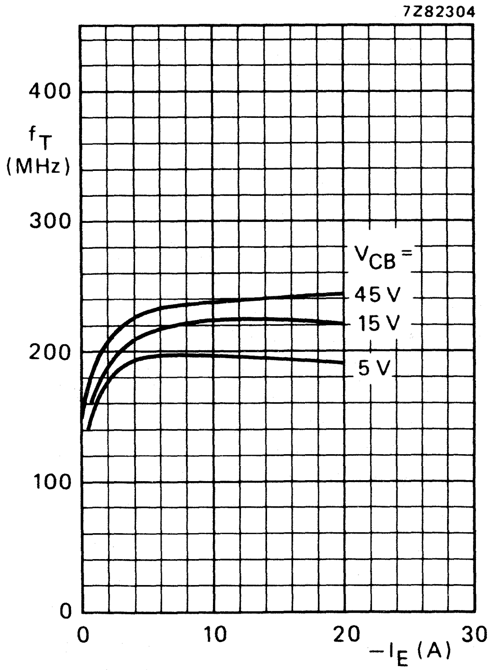


Fig. 6 Typical values; f = 100 MHz; $T_j = 25\ ^oC$.

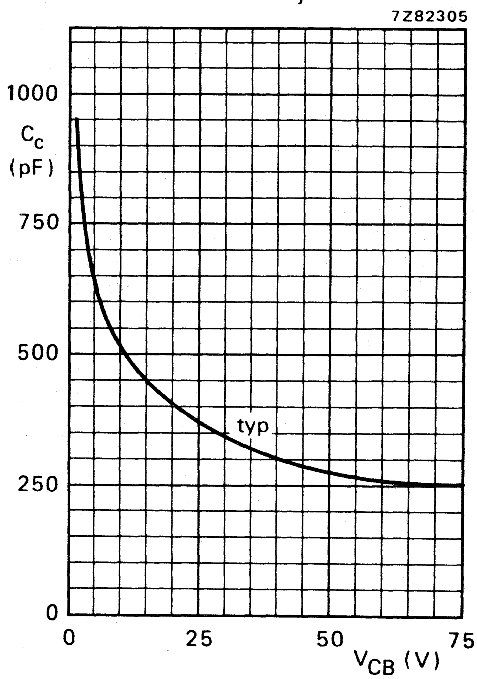


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; $T_j = 25\ ^oC$.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 50 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{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

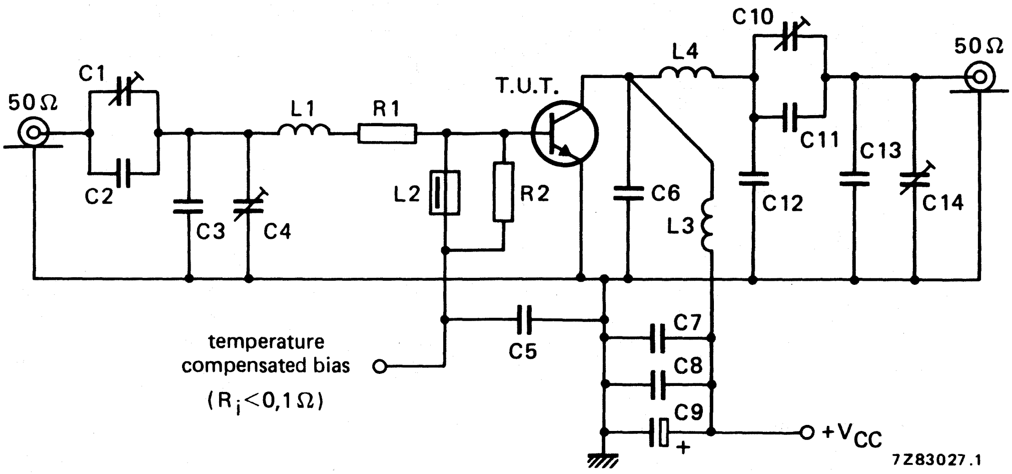


Fig. 8 Test circuit; s.s.b. class-AB.

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; ± 5%; 1,6 W each)
R2 = 27 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.

▲ ATC means American Technical Ceramics.

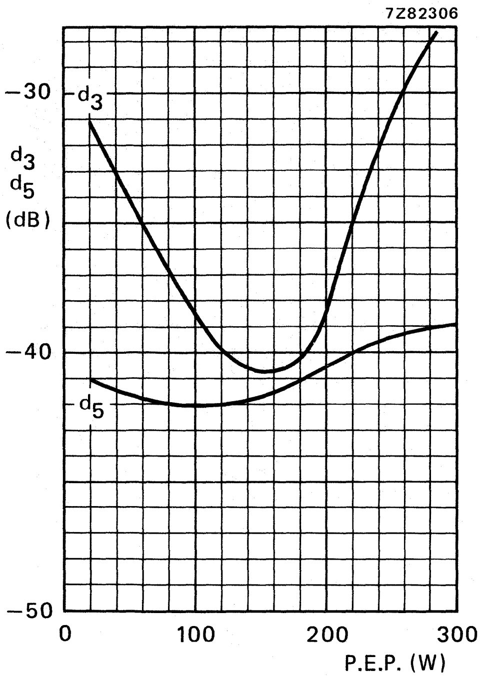


Fig. 9 Intermodulation distortion as a function of output power.*

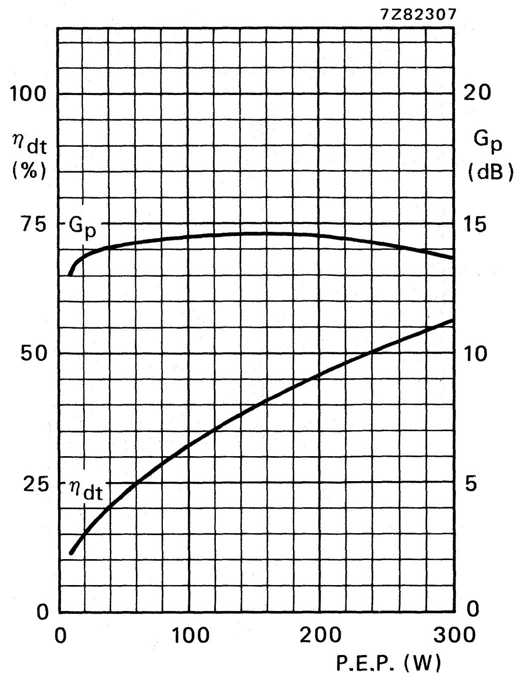


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 50 V; $I_{C(ZS)}$ = 0,1 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °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 V; f = 28 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

* See note on previous page.

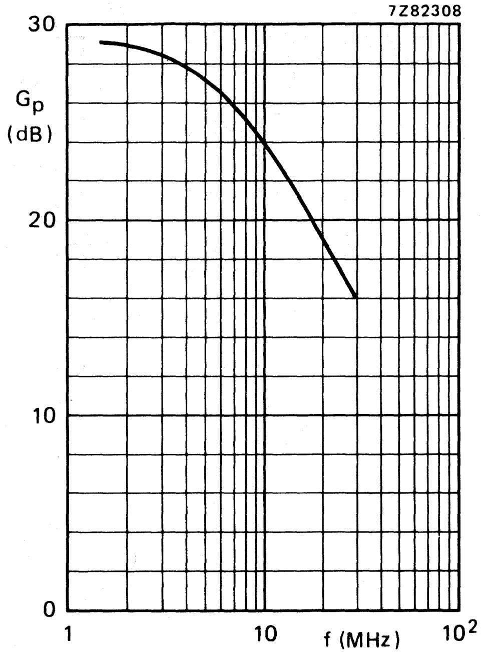


Fig. 11 Power gain as a function of frequency.

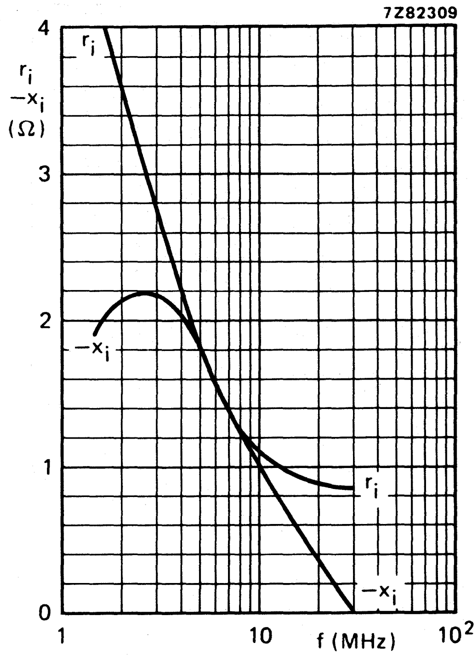


Fig. 12 Input impedance (series components) as a function of frequency.

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 °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

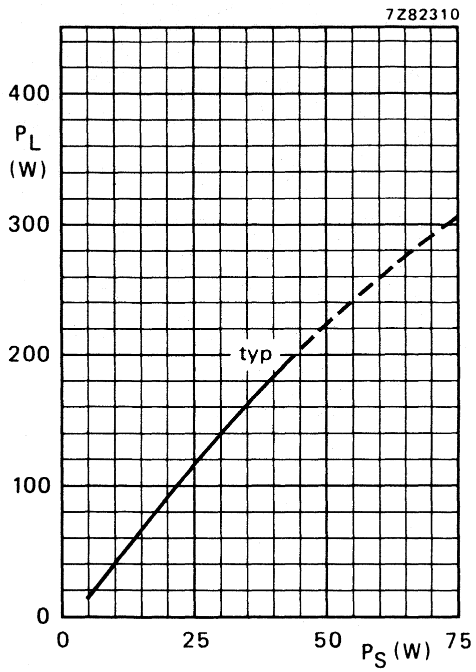


Fig. 13 V_{CE} = 50 V; f = 108 MHz; T_h = 25 °C.

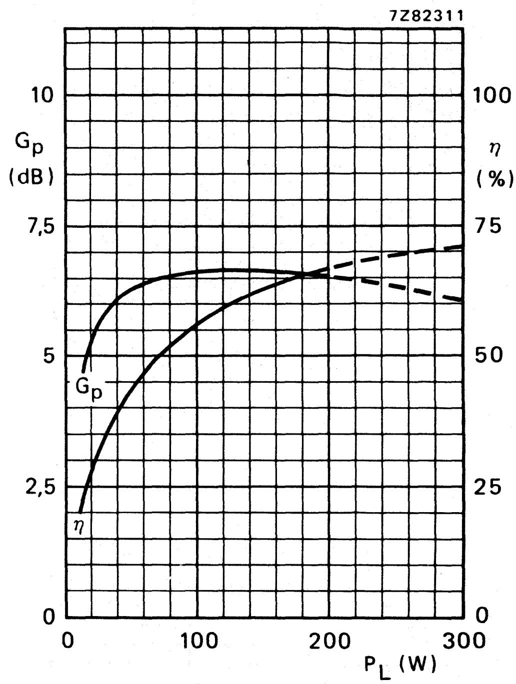


Fig. 14 V_{CE} = 50 V; f = 108 MHz; T_h = 25 °C; typical values.

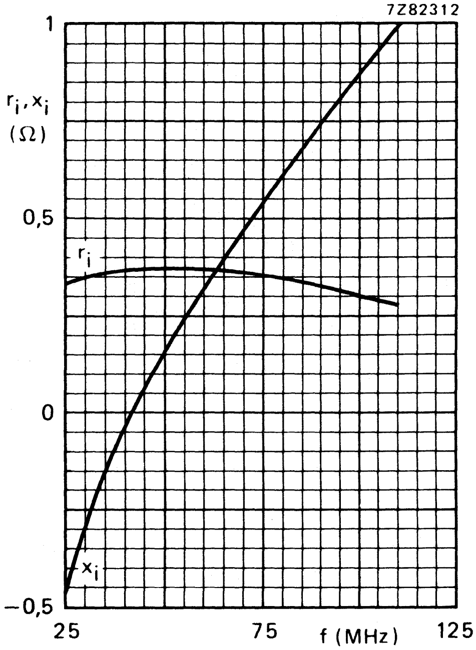


Fig. 15 Input impedance (series components).

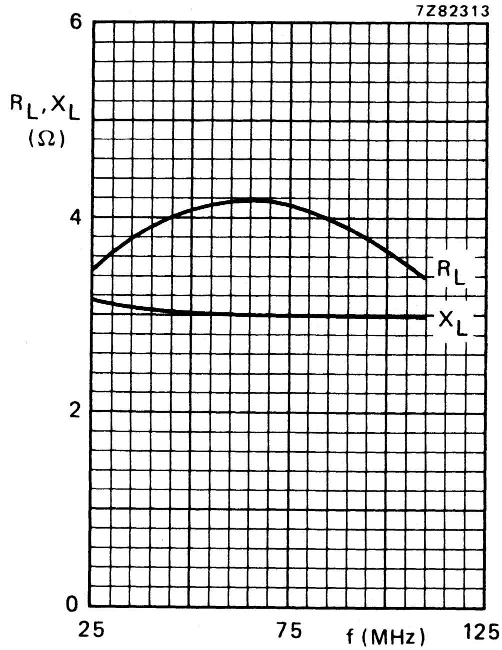


Fig. 16 Load impedance (series components).

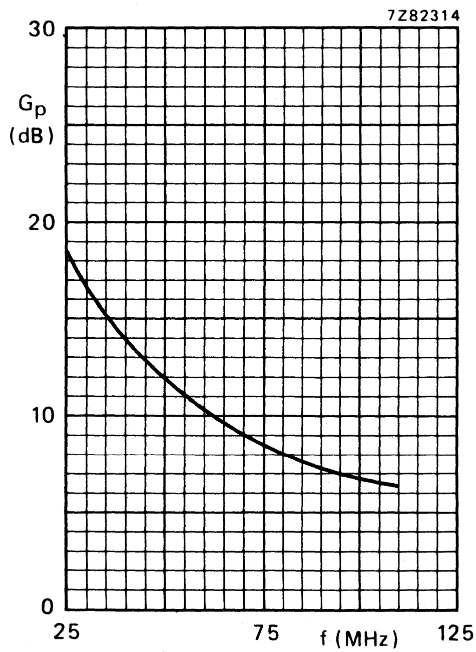


Fig. 17.

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 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 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

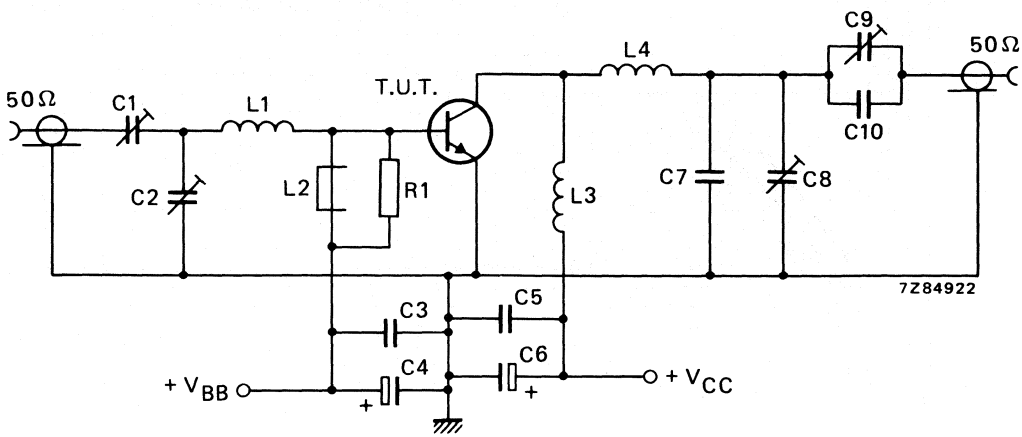


Fig. 18 Test circuit; s.s.b. class-A.

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 (± 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.

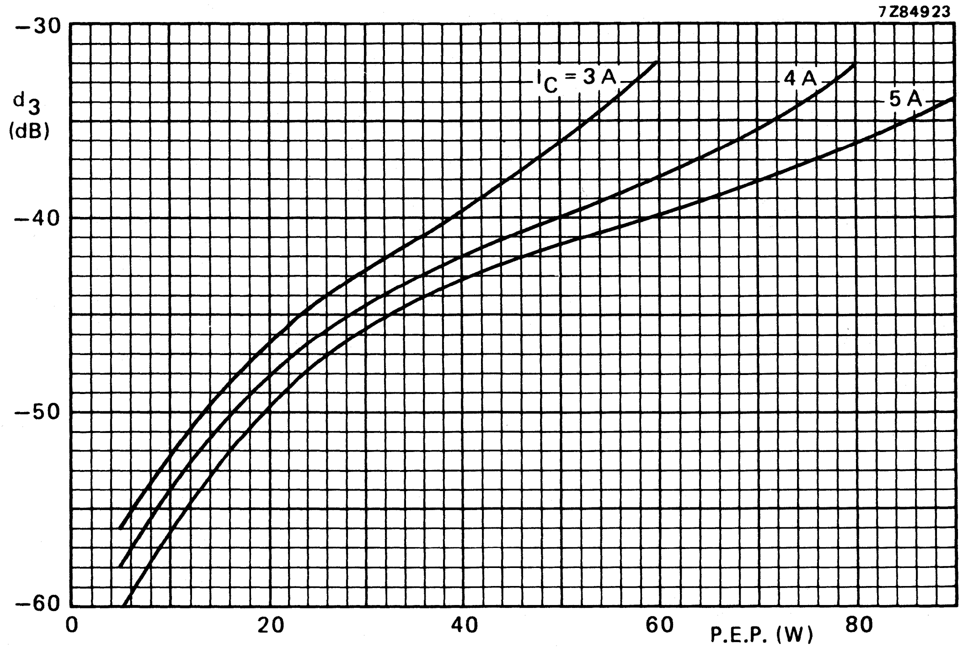


Fig. 19 Third order intermodulation distortion as a function of output power.*
Typical values; V_{CE} = 40 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

* 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 °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

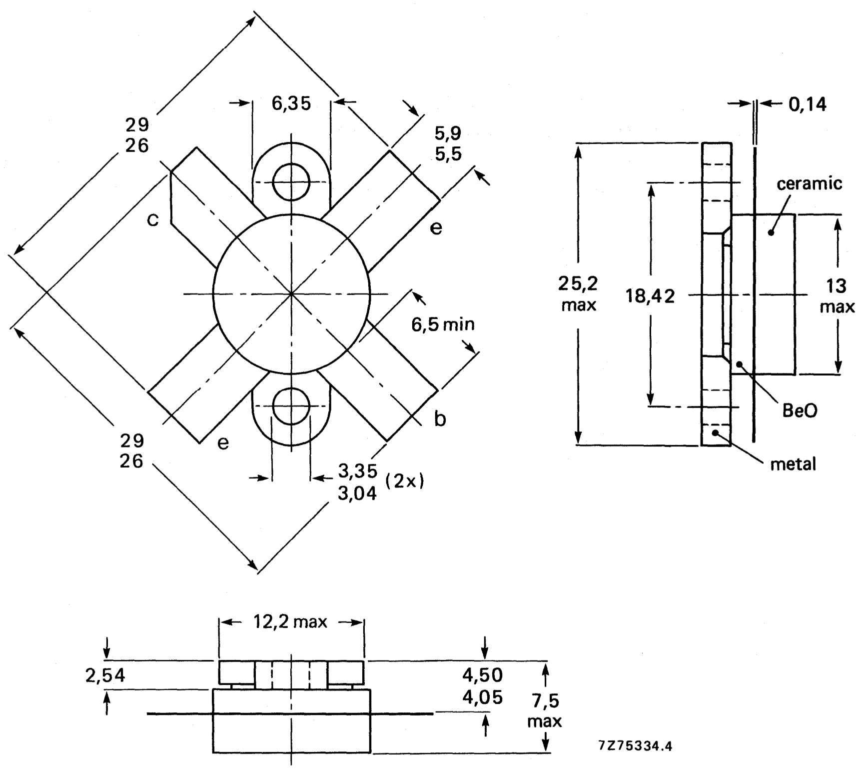
SOT-121 (see Fig. 1).

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

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)				
$V_{BE} = 0$	V_{CESM}	max.	65	V
open base	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
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 $T_h = 25°C$	$P_{tot(d.c.)}$	max.	190	W
R.F. power dissipation				
f > 1 MHz; $T_h = 25°C$	$P_{tot(rf)}$	max.	230	W
Storage temperature	T_{stg}	−65 to +150		°C
Operating junction temperature	T_j	max.	200	°C

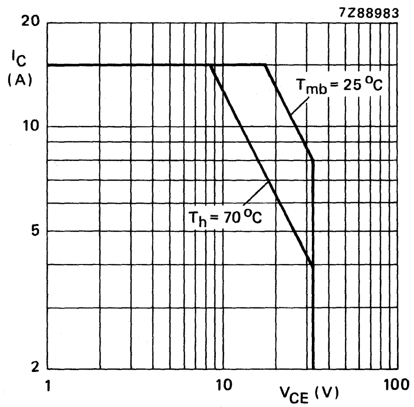


Fig. 2 D.C. SOAR.

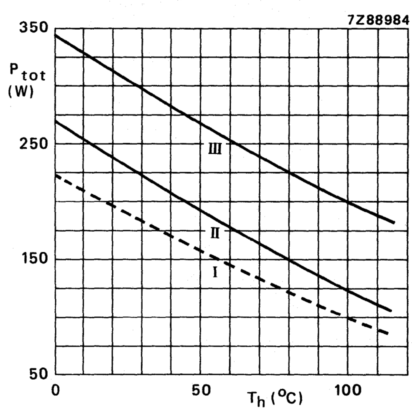


Fig. 3 Power/temperature derating curves.

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 °C i.e. T_{mb} = 49 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	0,63	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	0,48	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,20	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	65 V
I_C = 100 mA; open base	$V_{(BR)CEO}$	>	33 V
Emitter-base breakdown voltage			
I_E = 20 mA; open collector	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{CE} = 33 V; V_{BE} = 0	I_{CES}	<	20 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	20 mJ
R_{BE} = 10 Ω	E_{SBR}	>	20 mJ
D.C. current gain*			
I_C = 10 A; V_{CE} = 5 V	h_{FE}	typ. 15 to	30 50
D.C. current gain ratio of matched devices*			
I_C = 10 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage*			
I_C = 25 A; I_B = 5 A	V_{CEsat}	typ.	2,4 V
Transition frequency at f = 100 MHz**			
$-I_E$ = 10 A; V_{CB} = 28 V	f_T	typ.	230 MHz
$-I_E$ = 20 A; V_{CB} = 28 V	f_T	typ.	235 MHz
Collector capacitance at f = 1 MHz			
I_E = i_e = 0; V_{CB} = 28 V	C_c	typ.	380 pF
Feedback capacitance at f = 1 MHz			
I_C = 0; V_{CE} = 28 V	C_{re}	typ.	235 pF
Collector-flange capacitance	C_{cf}	typ.	4,5 pF

* Measured under pulse conditions: t_p = 500 μs.
** Measured under pulse conditions: t_p = 300 μs; δ = 0,02.

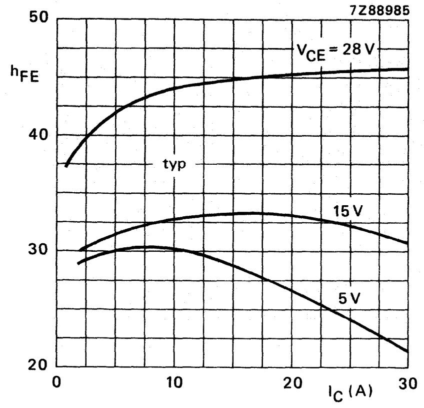


Fig. 4 $T_j = 25\ ^oC$.

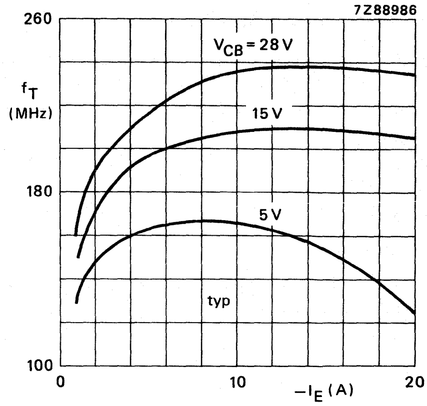


Fig. 5 $T_j = 25\ ^oC$; f = 100 MHz; $t_p = 300\ \mu s$.

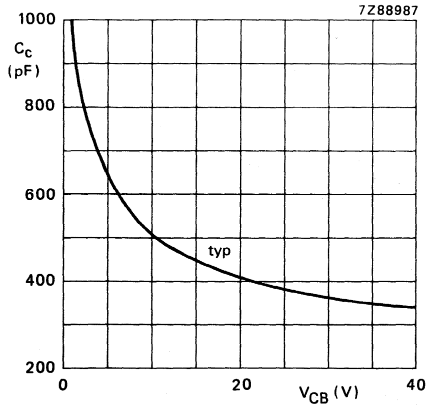


Fig. 6 $I_E = i_e = 0$; f = 1 MHz; $T_j = 25\ ^oC$.

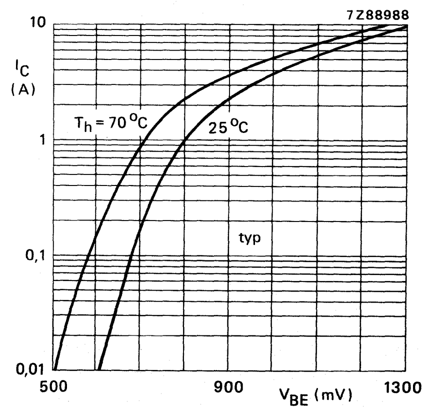


Fig. 7 $V_{CE} = 28$ V.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier).
V_{CE} = 28 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
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.

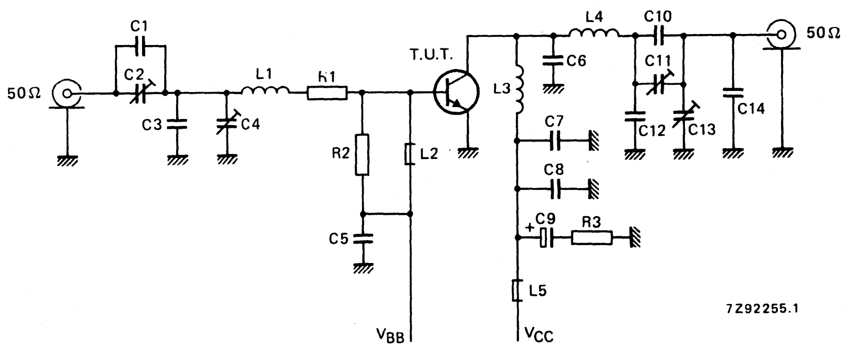


Fig. 8 Class-AB (s.s.b.) test circuit.

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

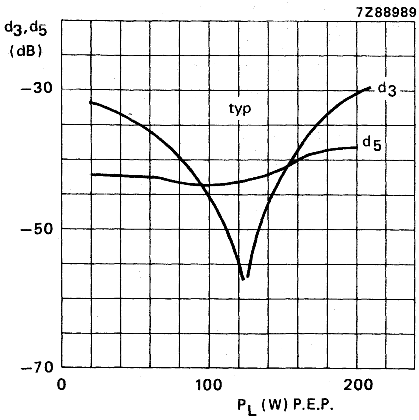


Fig. 9 Intermodulation distortion (see note on preceding page).

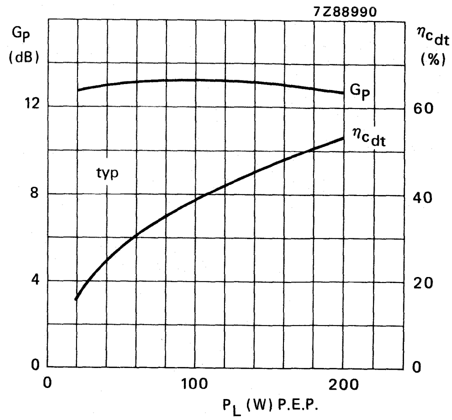


Fig. 10 Power gain and double-tone efficiency.

Conditions for Figs 9 and 10:
V_{CE} = 28 V; $I_{C(ZS)}$ = 0,1 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °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 V; f = 28 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 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.

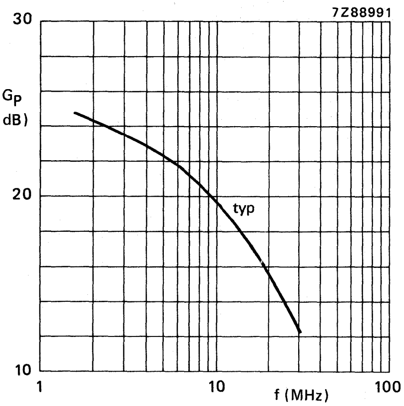


Fig. 11 Power gain.

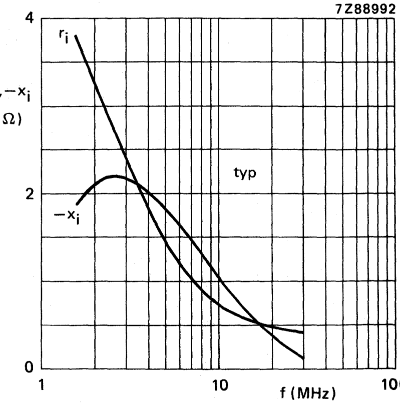


Fig. 12 Input impedance (series components).

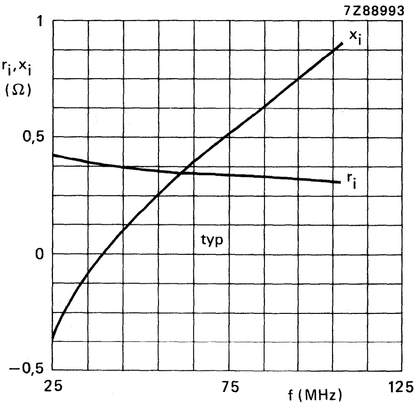


Fig. 13 Input impedance (series components).

Conditions for Figs 11 and 12:
V_{CE} = 28 V; $I_{C(ZS)}$ = 0,1 A;
P_L = 175 W(PEP); T_h = 25 °C;
Z_L = 1,55 Ω

Conditions for Figs 13, 14 and 15:
V_{CE} = 28 V; P_L = 175 W; T_h = 25 °C;
class-B operation.

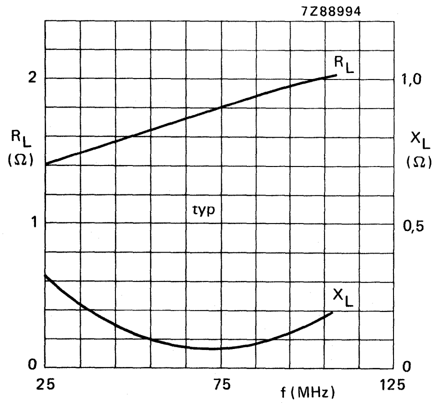


Fig. 14 Load impedance (series components).

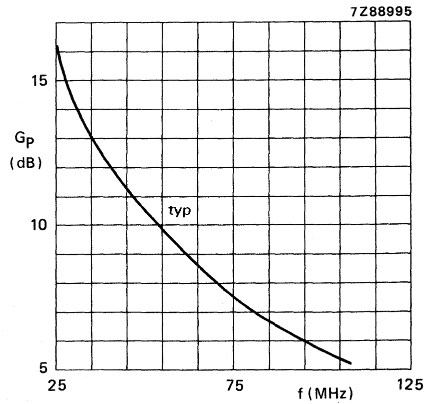


Fig. 15 Power gain.

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 ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

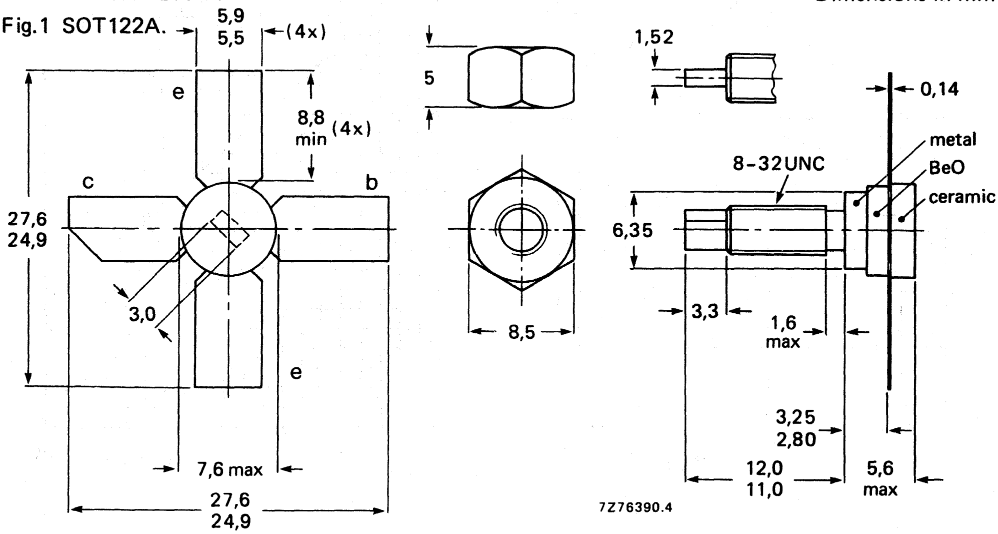
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A	860	25	850	70	−60	> 3,5	> 6,5
class-A	860	25	850	25	−60	typ. 4,4	typ. 7,0

* 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

Dimensions in mm

Fig.1 SOT122A.



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.

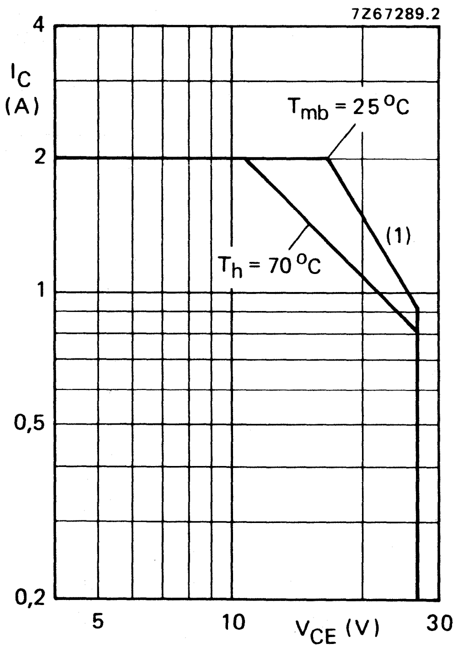
When locking is required an adhesive is preferred instead of a lock washer.

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.	50	V
open base	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current				
d.c.	I_C	max.	2	A
(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.

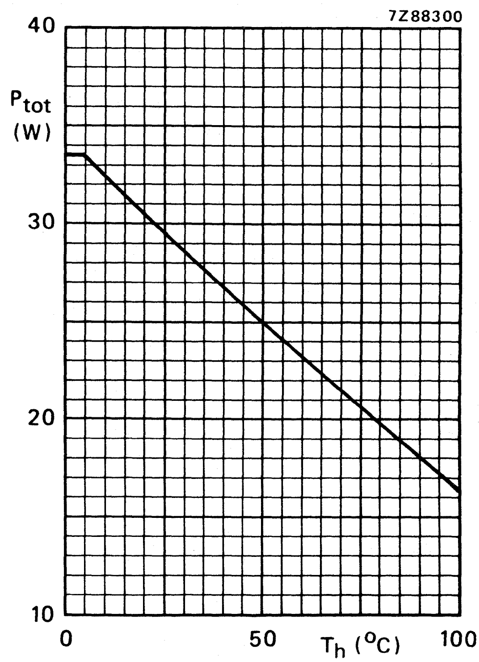


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (dissipation = 21,25 W; T_{mb} = 82,75 °C, T_h = 70 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	5,45	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

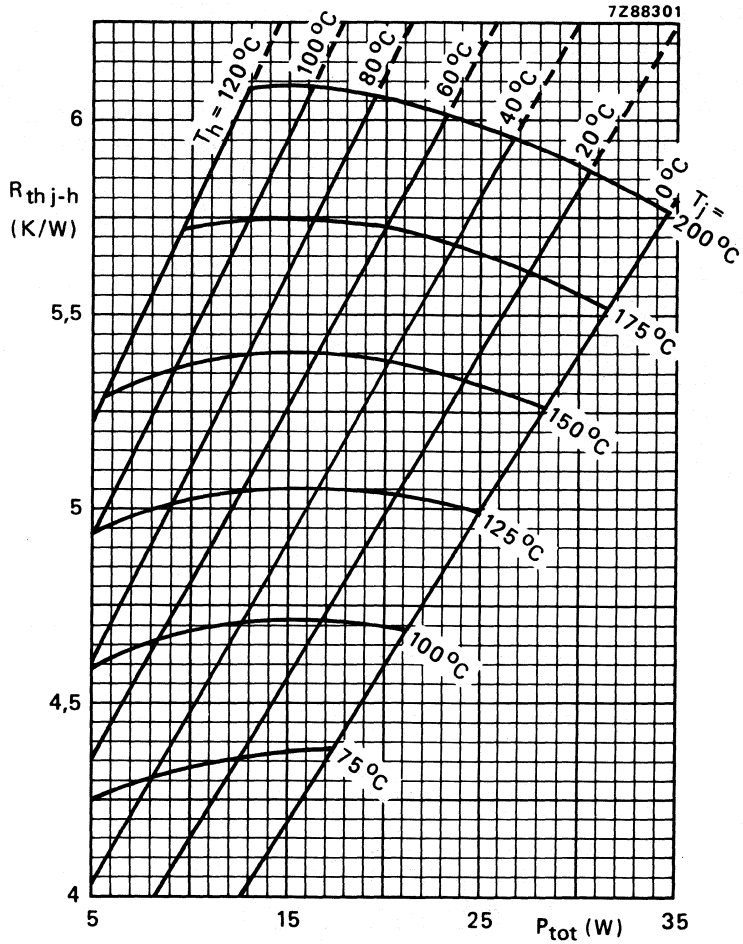


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h}$ = 0,6 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 850 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j-h}$	max.	6,05 K/W
	T_j	max.	200 °C
Typical device:	$R_{th\ j-h}$	typ.	5,35 K/W
	T_j	typ.	183 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	50	V
open base, I_C = 25 mA	$V_{(BR)CEO}$	>	27	V
Emitter-base breakdown voltage				
open collector, I_E = 5 mA	$V_{(BR)EBO}$	>	3,5	V
D.C. current gain*				
I_C = 850 mA; V_{CE} = 25 V	h_{FE}	>	15	
		typ.	40	
Collector-emitter saturation voltage*				
I_C = 500 mA; I_B = 100 mA	V_{CEsat}	typ.	0,25	V
Transition frequency at f = 500 MHz**				
$-I_E$ = 850 mA; V_{CB} = 25 V	f_T	typ.	2,5	GHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	24	pF
		<	30	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	15	pF
Collector-stud capacitance	C_{cs}	typ.	1,2	pF

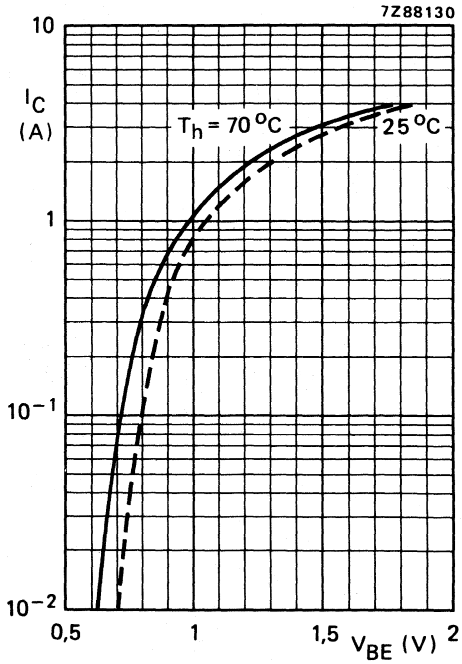


Fig. 5 Typical values; V_{CE} = 25 V.

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

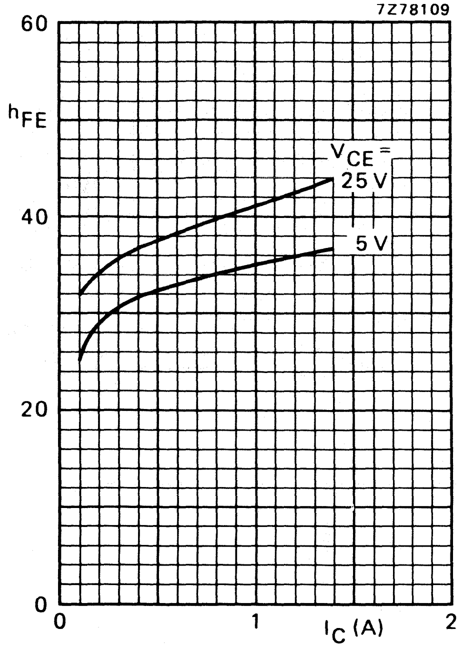


Fig. 6 Typical values; T_j = 25 ^{o}C.

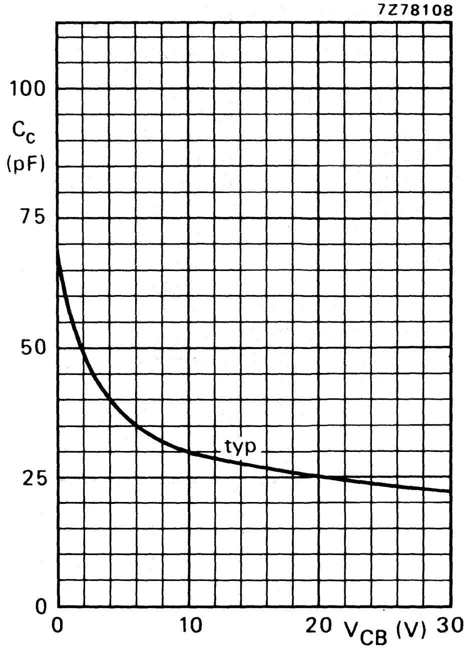


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 ^{o}C.

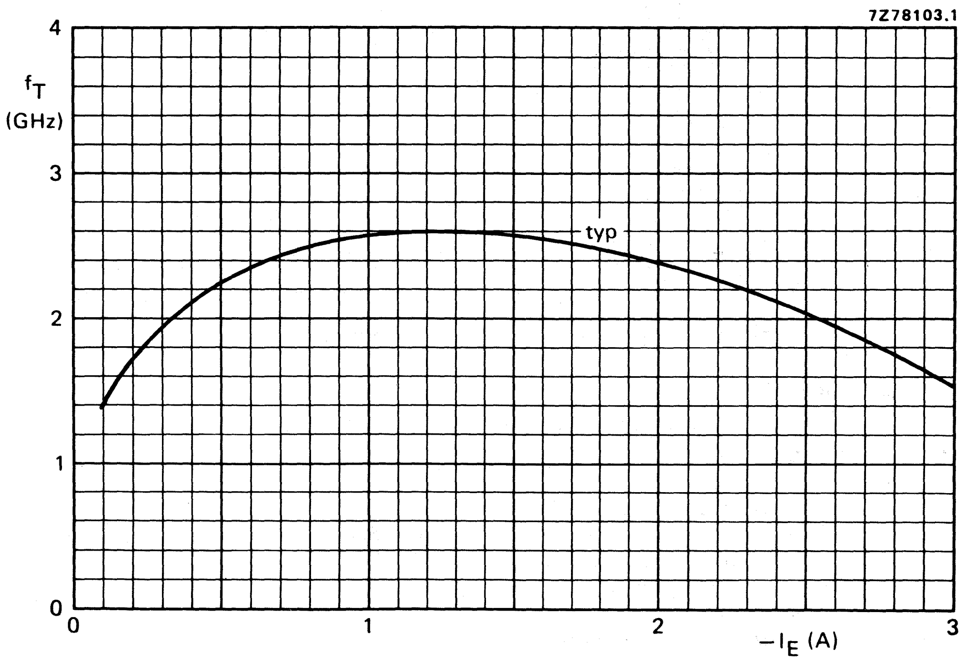


Fig. 8 V_{CB} = 25 V; f = 500 MHz; T_j = 25 ^{o}C.

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)*	$P_{o\ sync}$ (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.

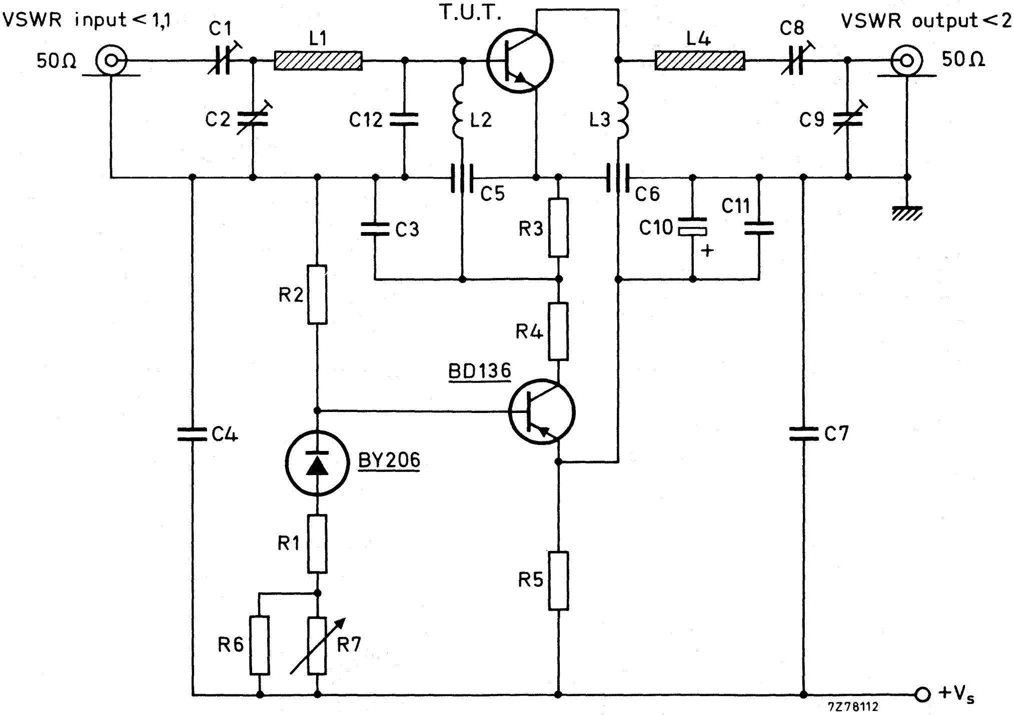


Fig. 9 Class-A test circuit at f_{vision} = 860 MHz.

List of components:

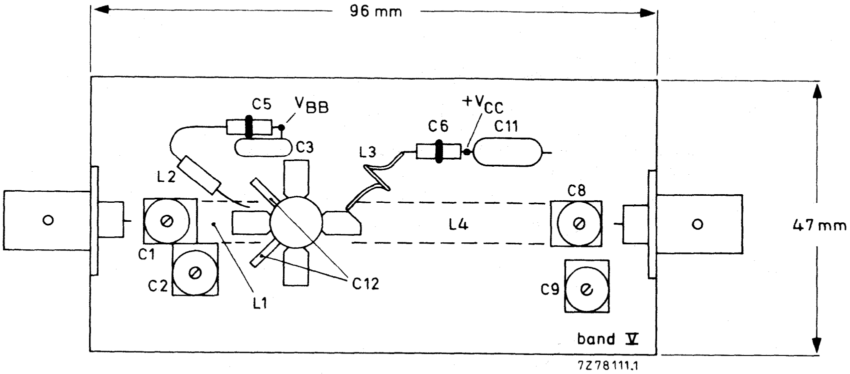
C1 = C2 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = C4 = 100 nF polyester capacitor
C5 = C6 = 1 nF feed-through capacitor
C7 = 5,6 pF ceramic capacitor
C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C9 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C10 = 10 μF/40 V solid aluminium electrolytic capacitor
C11 = 470 nF polyester capacitor
C12 = 2 x 3,3 pF chip capacitors (in parallel)

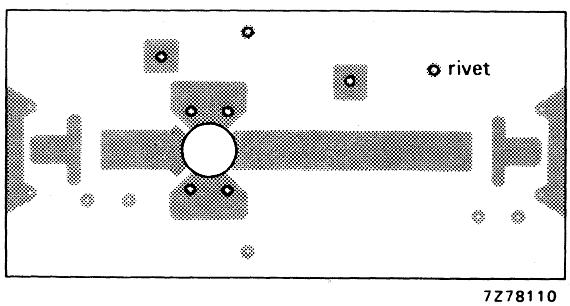
List of components: (continued)

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)
R5 = 4 x 12 Ω carbon resistors in parallel (1 W each)
R6 = 1 kΩ carbon resistor (0,25 W)
R7 = 220 Ω carbon potentiometer (0,25 W)

L1 = stripline (13,6 mm x 6,9 mm)
L2 = microchoke 0,47 μH (cat. no. 4322 057 04770)
L3 = 1 turn Cu wire (1 mm); internal diameter 5,5 mm; leads 2 x 5 mm
L4 = stripline (40,8 mm x 6,9 mm)

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1,5 mm.





Note
Hole in printed-circuit board: ϕ 9,7 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.

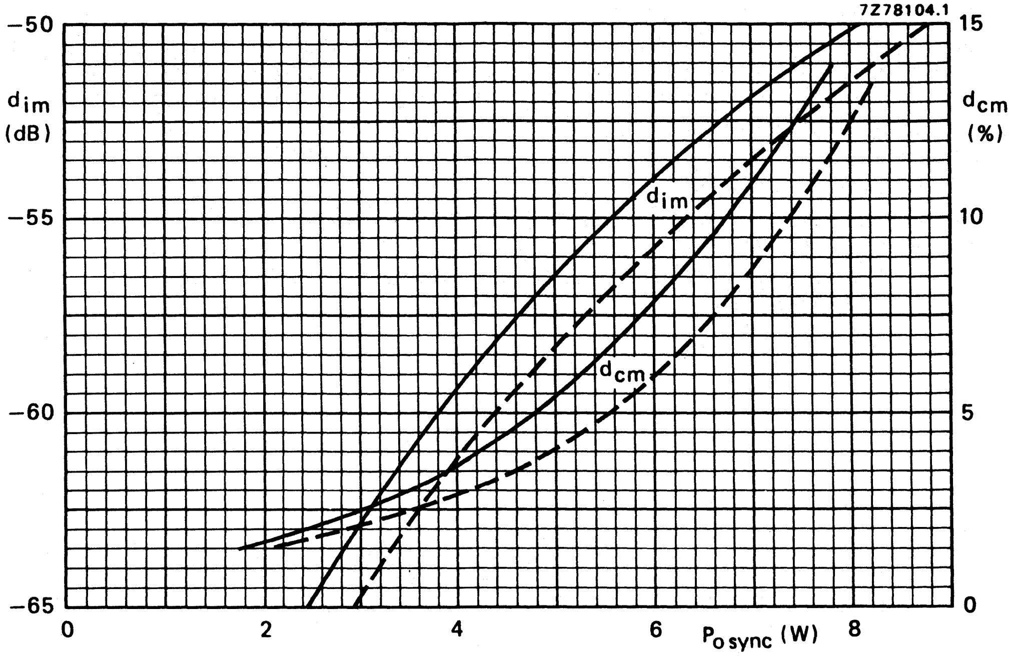


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of $P_{o\ sync}$. Typical values; V_{CE} = 25 V; I_C = 850 mA; – – – T_h = 25 °C; —— T_h = 70 °C; f_{vision} = 860 MHz.

* 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.

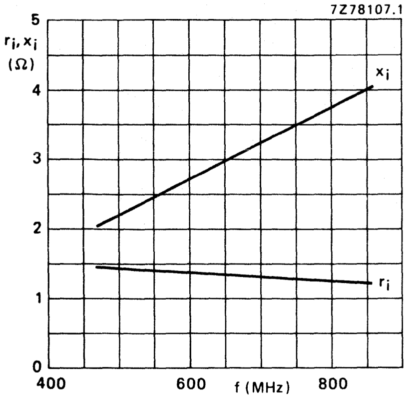


Fig. 12 Input impedance (series components).

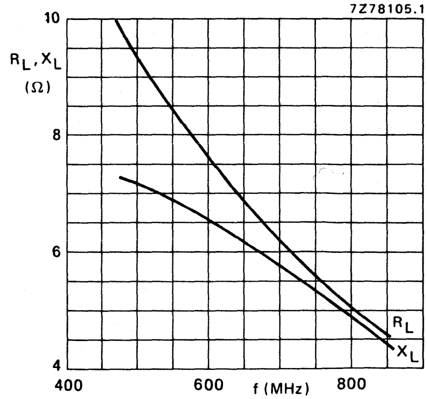


Fig. 13 Load impedance (series components).

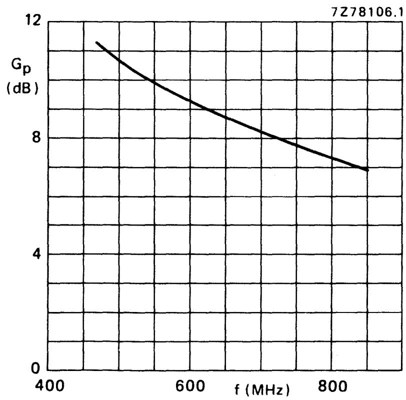


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 V; I_C = 850 mA; class-A operation; T_h = 70 ^oC.

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

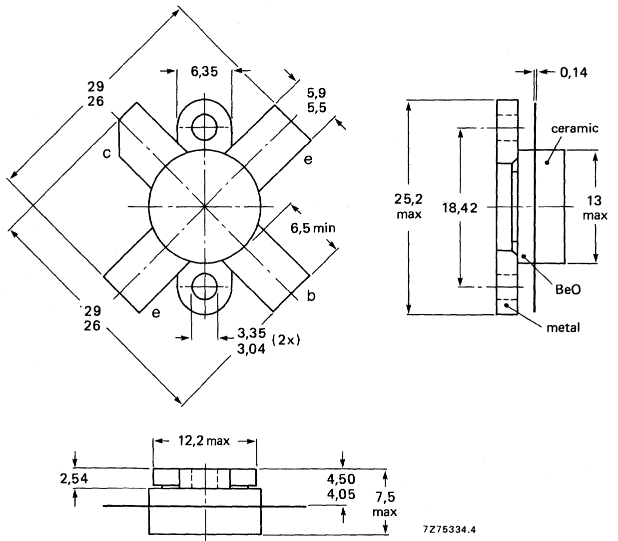
R.F. performance at T_h = 25 °C

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

* See note on page 4.

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 $T_{mb} = 25\ ^oC$	$P_{tot(d.c.)}$	max.	154 W
R.F. power dissipation			
f > 1 MHz; $T_{mb} = 25\ ^oC$	$P_{tot(rf)}$	max.	192 W
Storage temperature	T_{stg}	−65 to +150	^oC
Operating junction temperature	T_j	max.	200 ^oC

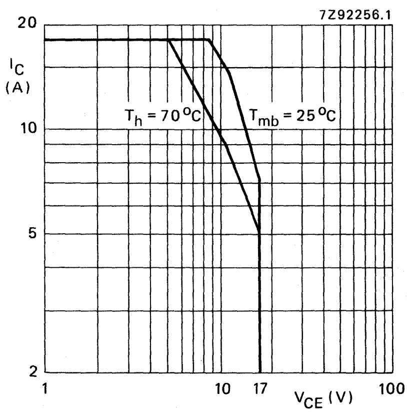


Fig. 2 D.C. SOAR.

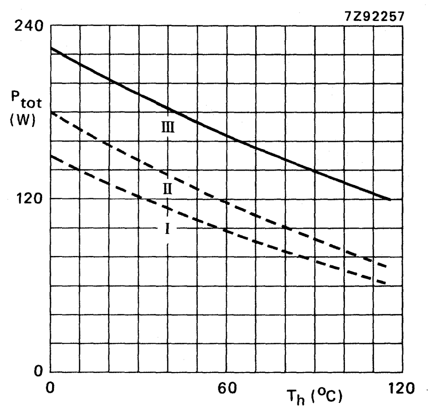


Fig. 3 Power/temperature derating curves.

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; $T_{mb} = 25\ ^oC$

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,00 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,75 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage			
$V_{BE} = 0$; $I_C = 50$ mA	$V_{(BR)CES}$	>	36 V
open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	17 V
Emitter-base breakdown voltage			
open collector; $I_E = 20$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 17$ V	I_{CES}	<	20 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	12,5 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	12,5 mJ
D.C. current gain*			
$I_C = 10$ A; $V_{CE} = 5$ V	h_{FE}	typ. 15 to	35 80
D.C. current gain ratio of matched devices*			
$I_C = 10$ A; $V_{CE} = 5$ V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage*			
$I_C = 25$ A; $I_B = 5$ A	V_{CEsat}	typ.	1,7 V
Transition frequency at f = 100 MHz**			
$-I_E = 10$ A; $V_{CB} = 12,5$ V	f_T	typ.	290 MHz
$-I_E = 20$ A; $V_{CB} = 12,5$ V	f_T	typ.	275 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 12,5$ V	C_c	typ.	400 pF
Feedback capacitance at f = 1 MHz			
$I_C = 0$; $V_{CE} = 12,5$ V	C_{re}	typ.	265 pF
Collector-flange capacitance	C_{cf}	typ.	4,5 pF

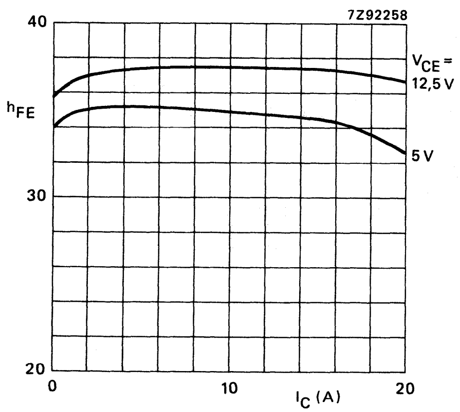


Fig. 4 $T_j = 25\ ^oC$.

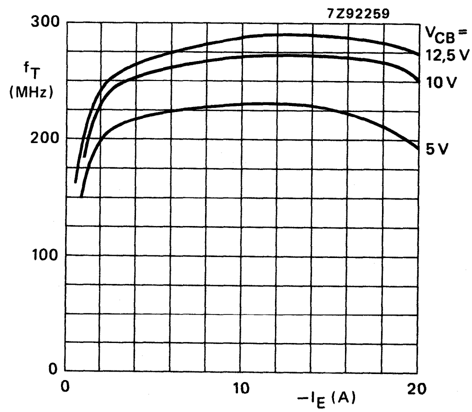


Fig. 5 f = 100 MHz; $T_j = 25\ ^oC$.

* Measured under pulse conditions: $t_p = 500\ \mu s$.
** Measured under pulse conditions: $t_p = 300\ \mu s$; $\delta = 0,02$.

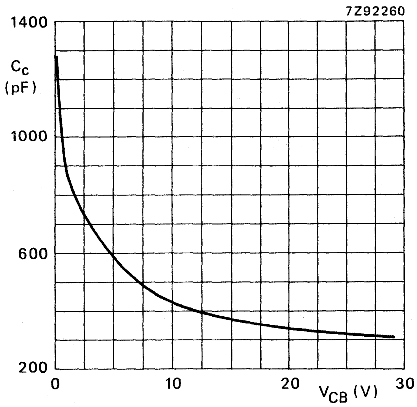


Fig. 6 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C.

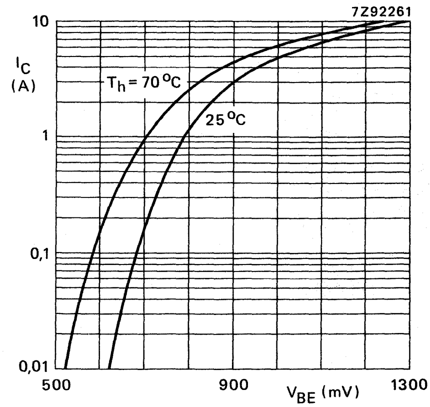


Fig. 7 V_{CE} = 12,5 V; typ. values.

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.

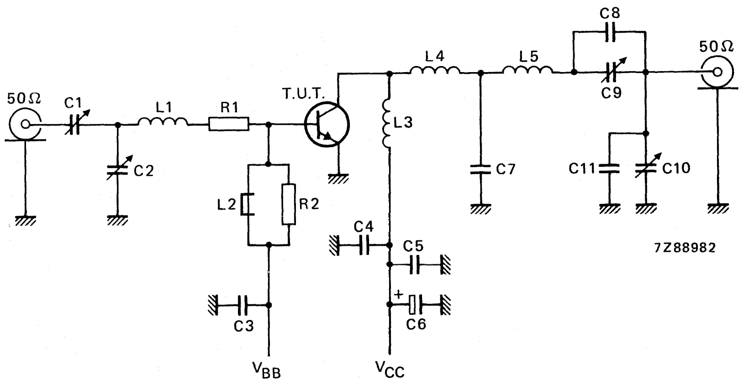


Fig. 8 Class-AB test circuit, s.s.b.

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 μF − 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.

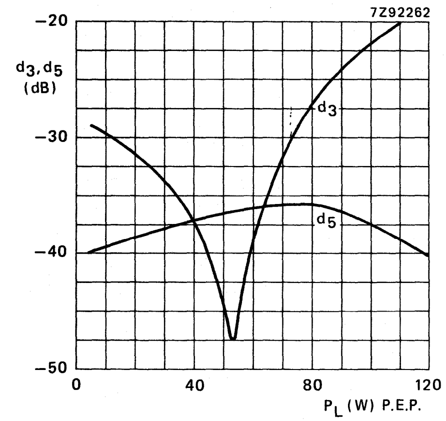


Fig. 9 Intermodulation distortion (see note on preceding page); typ. values.

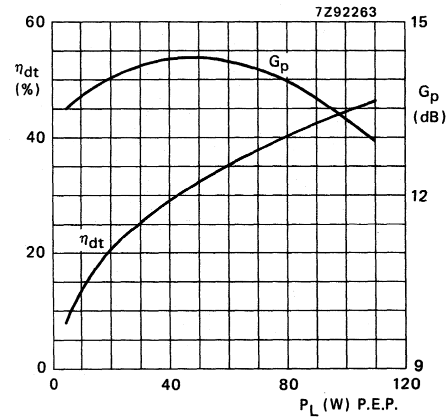


Fig. 10 Double-tone efficiency and power gain; typ. values.

Conditions for Figs 9 and 10:

V_{CE} = 12,5 V; $I_{C(ZS)}$ = 0,15 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C.

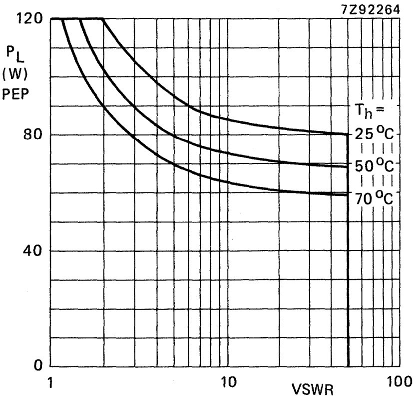


Fig. 11 R.F. SOAR: s.s.b. class-AB operation; V_{CE} = 15 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

This graph shows the permissible output power as a function of VSWR during mismatch conditions with the heatsink temperature as parameter.

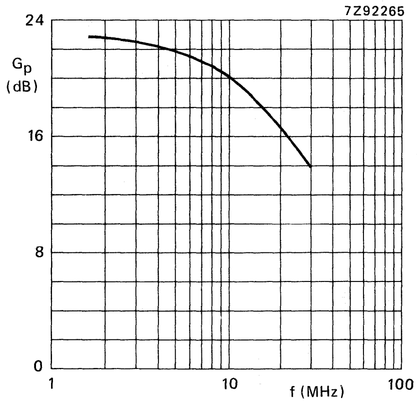


Fig. 12 Power gain.

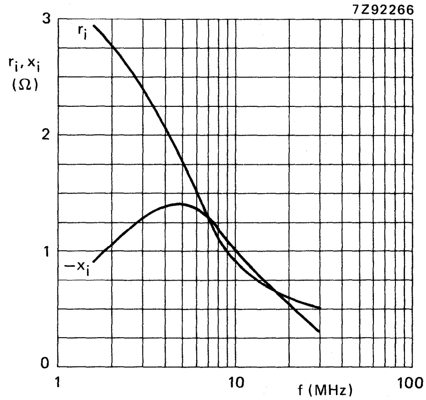


Fig. 13 Input impedance (series components).

Conditions for Figs 12 and 13:

V_{CE} = 12,5 V; $I_{C(ZS)}$ = 0,15 A; Z_L = 0,65 Ω; P_L = 80 W (PEP); T_h = 25 °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.

UHF linear power transistor — BLW898

FEATURES

- Internal input matching for wideband operation and high power gain
- Polysilicon emitter ballasting resistors for an optimum temperature profile
- Gold metallization ensures excellent reliability.

APPLICATION

- Common emitter class-A operation in linear transposers/transmitters (television) in the 470 to 860 MHz frequency band.

DESCRIPTION

NPN silicon planar transistor in a SOT171A 6-lead rectangular flange package, with a ceramic cap. The transistor delivers a $P_{o\ sync}$ = 3 W in class-A operation at 860 MHz and a supply voltage of 25 V.

PINNING SOT171A

PIN	DESCRIPTION
1	emitter
2	emitter
3	base
4	collector
5	emitter
6	emitter

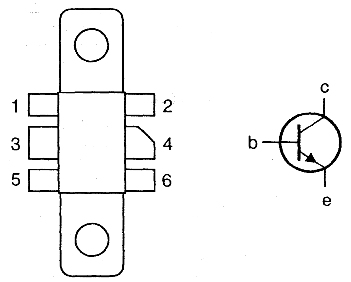


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common emitter push-pull test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)
CW class-A	860	25	1.1	≥3(1)	≥9(1)

Note

1. Three-tone test signal (–8, –16, or –7 dB); d_{im} = –60 dB.

WARNING
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	28	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	3.7	A
$I_{C(AV)}$	average collector current		–	3.7	A
P_{tot}	total power dissipation	up to T_h = 70 °C	–	37	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting-base	P = 37 W; T_h = 70 °C	3.1	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting-base to heatsink		0.4	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 15 mA; I_E = 0	60	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 30 mA; I_B = 0	28	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 0.6 mA; I_C = 0	2.5	–	–	V
I_{CBO}	collector-base leakage current	V_{BE} = 0; V_{CB} = 28 V	–	–	1.5	mA
I_{CEO}	collector-emitter leakage current	V_{CE} = 20 V	–	–	3	mA
h_{FE}	DC current gain	V_{CE} = 25 V; I_C = 1.1 A	30	–	140	
C_c	collector capacitance	V_{CE} = 25 V; I_E = i_e = 0; f = 1 MHz	–	18	–	pF
C_{re}	feedback capacitance	V_{CE} = 25 V; I_C = 0; f = 1 MHz	–	11	–	pF

APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter class-A test circuit.

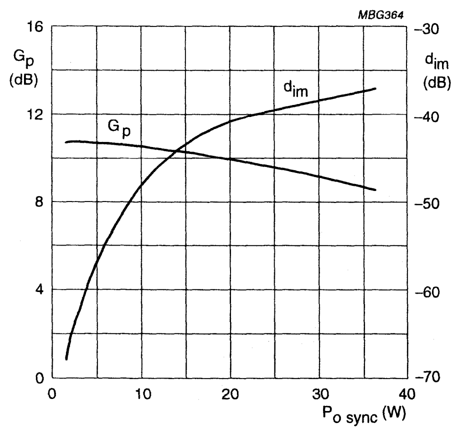
MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)	d_{im} (dB)
CW class-A	860	25	1.1	≥3(1)	≥9(1)	<–60(1)
CW class-A	860	25	1.1	≥3(2)	≥9(2)	<–63(2)

Notes

1. Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), 0 dB corresponds to peak sync level.
2. Three-tone test method (vision carrier –8 dB, sound carrier –10 dB, sideband signal –16 dB), 0 dB corresponds to peak sync level.

Ruggedness in class-A operation

The BLV898 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases, under the conditions: V_{CE} = 25 V; I_{CQ} = 1.1 A; T_h = 25 °C; $P_{o\ sync}$ = 3 W.



V_{CE} = 25 V.
I_{CQ} = 1.1 A.
f = 860 MHz.
Tuned at $P_{o\ sync}$ = 3 W.

Fig.2 Power gain and intermodulation distortion as functions of $P_{o\ sync}$; typical values.

H.F./V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for s.s.b. in class-A and AB and in f.m. transmitting applications in class-C with a supply voltage up to 28 V. The transistor is resistance stabilized and tested under severe load mismatch conditions. It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

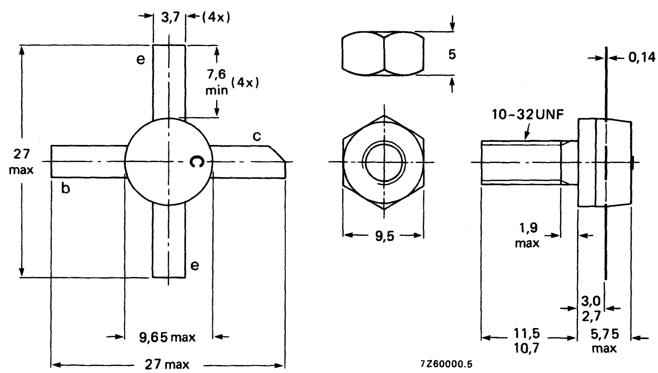
QUICK REFERENCE DATA

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 %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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

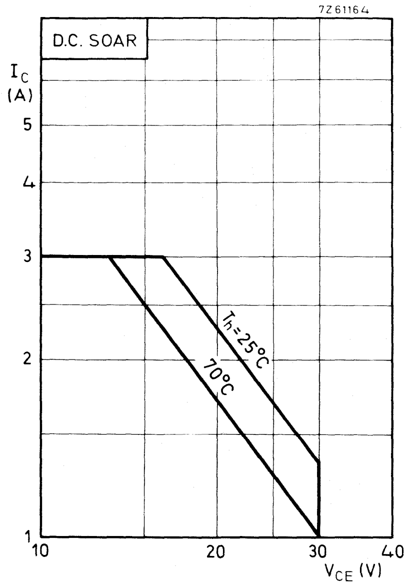
T_j = 25 °C unless otherwise specified

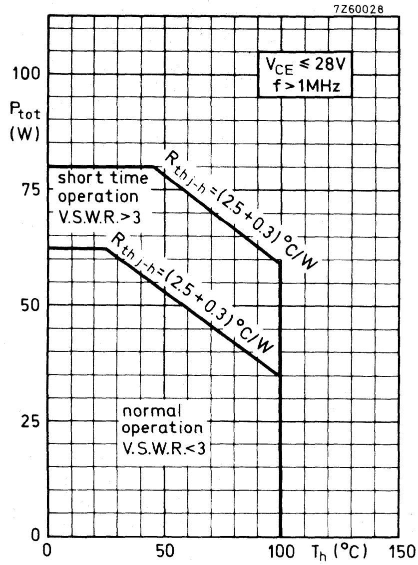
Breakdown voltages

Collector-base voltage open emitter; I_C = 50 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4.0	V
Transient energy L = 25 mH; f = 50 Hz				
open base	E	>	8	ms
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	8	ms
D.C. current gain I_C = 1.0 A; V_{CE} = 5 V	h_{FE}	typ. 10	50 to 100	
Transition frequency I_C = 3.0 A; V_{CE} = 20 V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 30 V	C_c	typ. <	50 65	pF pF
Feedback capacitance I_C = 100 mA; V_{CE} = 30 V	$-C_{re}$	typ.	31	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

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

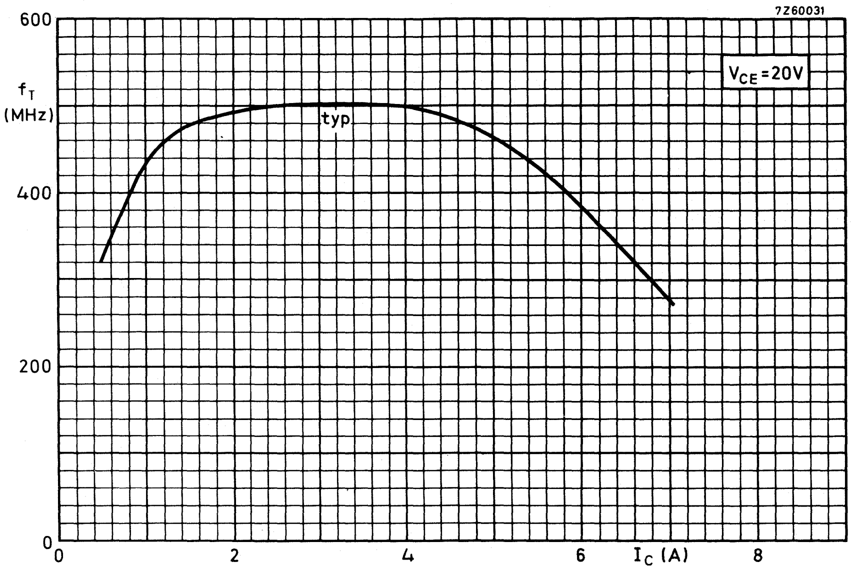


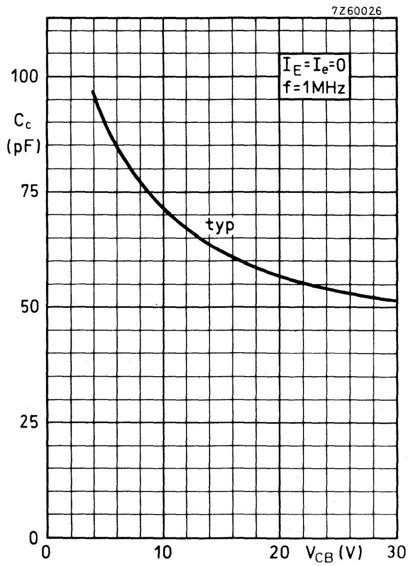


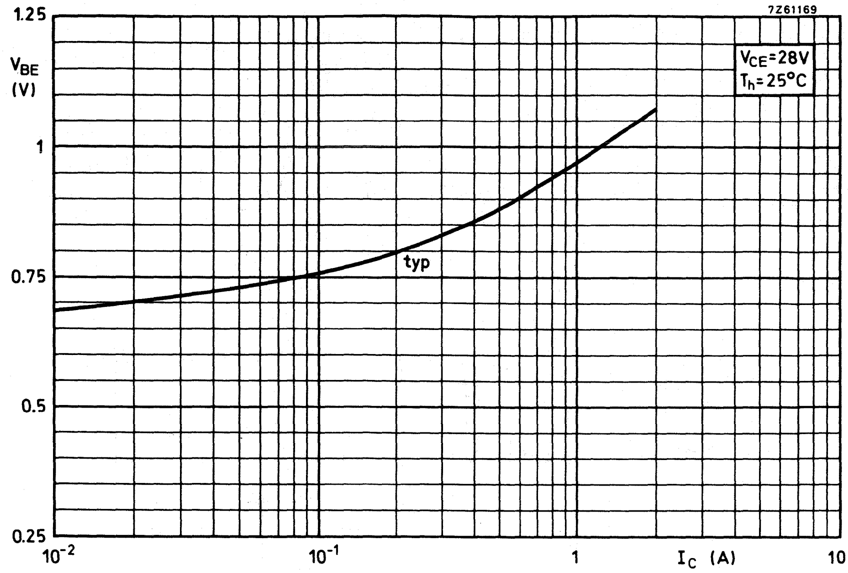
Storage temperature	T_{stg}	−30 to +200		°C
Operating junction temperature	T_j	max.	200	°C

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


7Z60031
600
400
200
0
f_T
(MHz)
V_{CE}=20V
typ
0
2
4
6
8
I_C (A)


7Z60026
100
75
50
25
0
C_c
(pF)
$I_E = I_e = 0$
f=1MHz
typ
0
10
20
30
V_{CB} (V)


7Z61169
1.25
V_{BE}
(V)
1
0.75
0.5
0.25
V_{CE}=28V
T_h=25°C
typ
10^{-2}
10^{-1}
1
I_C (A)
10

APPLICATION INFORMATION

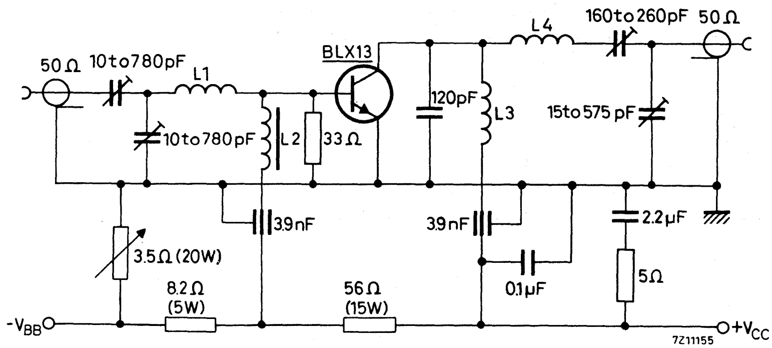
R.F. performance in S.S.B. operation (linear power amplifier)

V_{CE} = 26 V; T_h up to 25 °C
f_1 = 28.000 MHz; f_2 = 28.001 MHz

output power (W)	G_p (dB)	d_3 (dB) [1]	I_C (A)	Class
0-8 (PEP)	> 18	< −40	< 1.2	A

Test circuit:

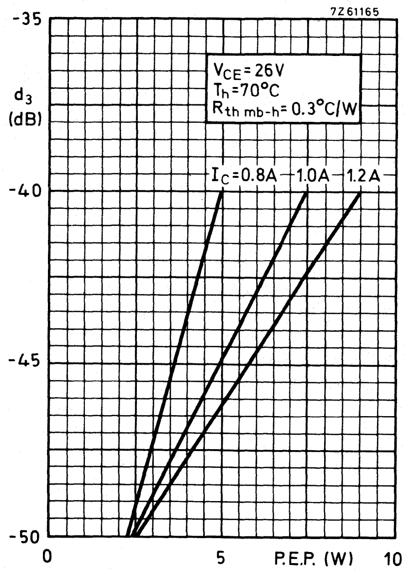
S.S.B.
class A



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.


7Z61165
V_{CE} = 26 V
T_h = 70 °C
$R_{th\ mb-h}$ = 0.3 °C/W
d_3 (dB)
I_C = 0.8 A
1.0 A
1.2 A
-35
-40
-45
-50
0
5
10
P.E.P. (W)

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	Gp dB	η_{dt} %	I_C A	d_3* dB	$I_{C(ZS)}$ mA	T_h °C
25 (P.E.P.)	> 18	typ. 35	typ. 1,28	typ. −35	25	25

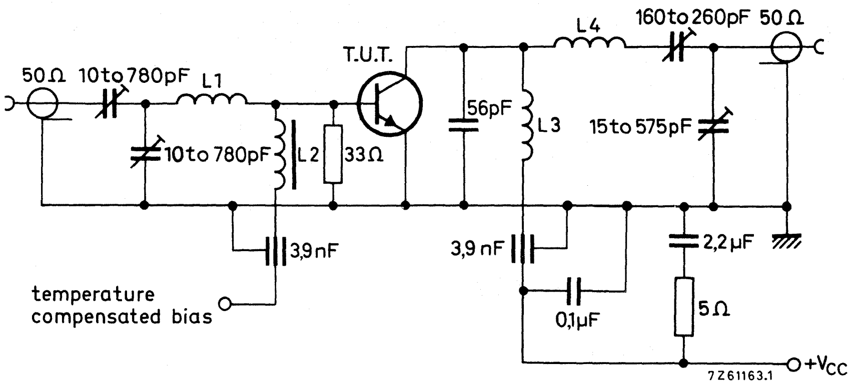
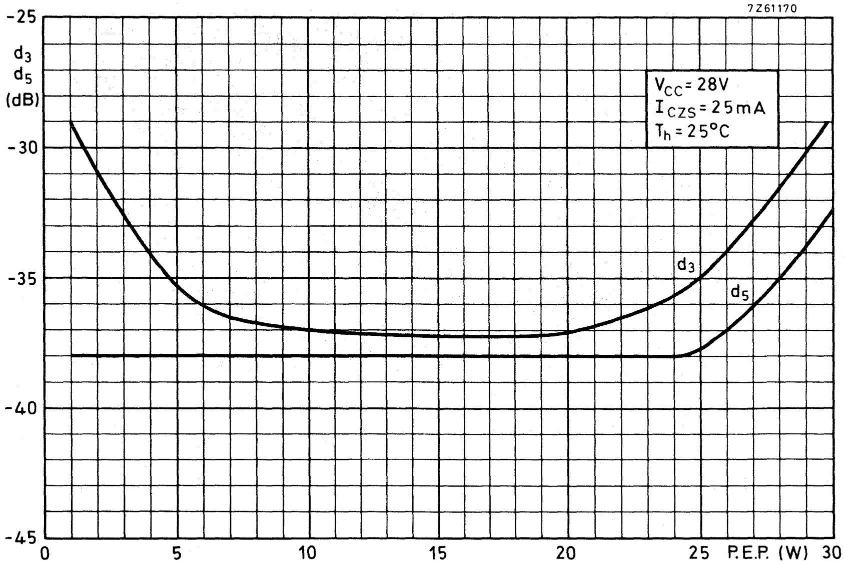


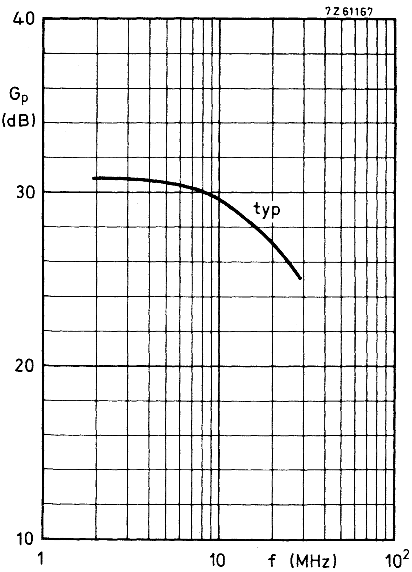
Fig. 9 Test circuit; s.s.b. class-AB.

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:

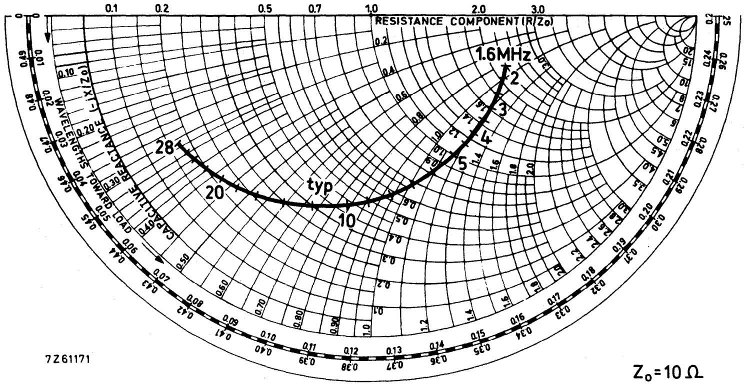
P_L = 25 W PEP

V_{CC} = 28 V

I_{CZS} = 25 mA

Z_L = 12.5 Ω

T_h = 25 °C



Conditions:

P_L = 25 W PEP

V_{CC} = 28 V

I_{CZS} = 25 mA

Z_L = 12.5 Ω

T_h = 25 °C

APPLICATION INFORMATION

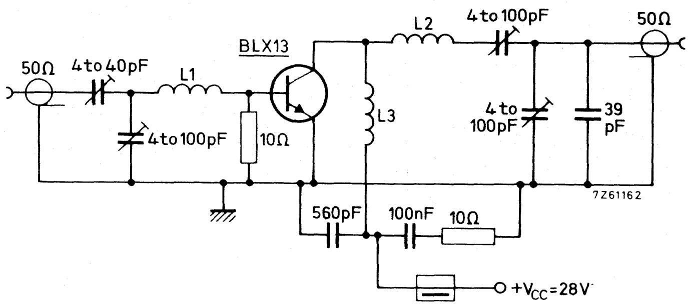
R.F. performance in c.w. operation (class B)

V_{CC} = 28 V; T_h up to 25 °C

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\bar{z}_i$ (Ω)	$\bar{Y}_L$ (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

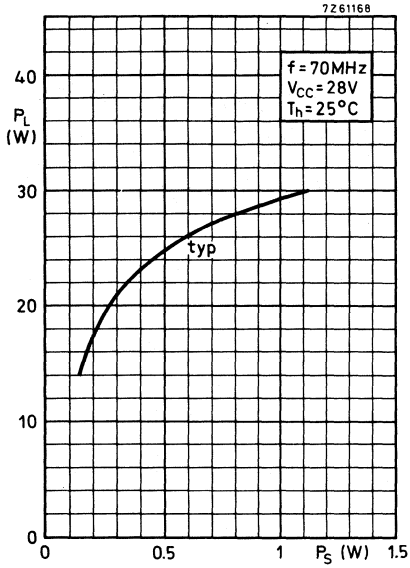


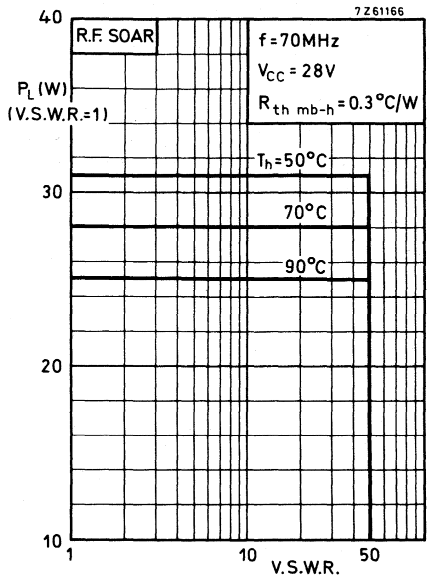
L1 = 93 nH; 3 turns enamelled Cu wire (1.5 mm); int. diam. 10 mm; length 8 mm; leads 2 x 5 mm

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

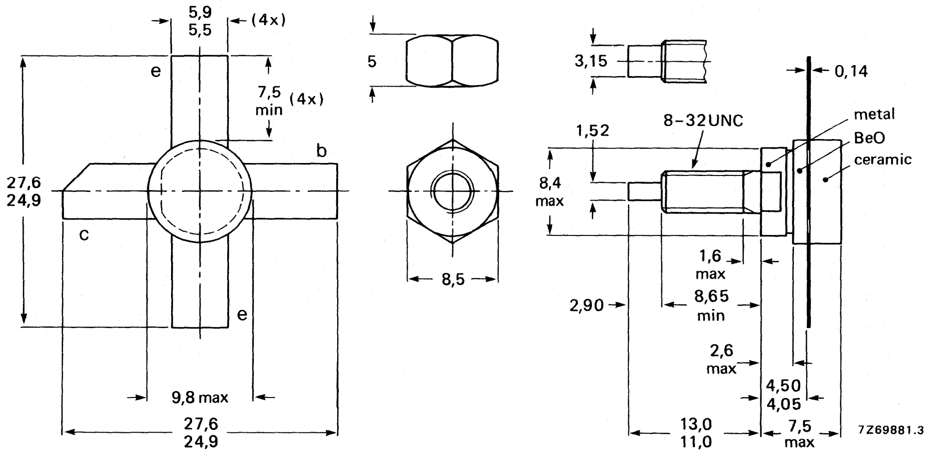
R.F. performance

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

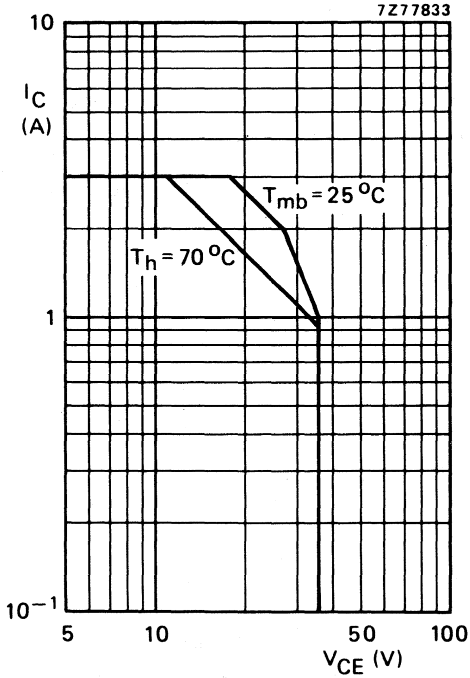


Fig. 2 D.C. SOAR.

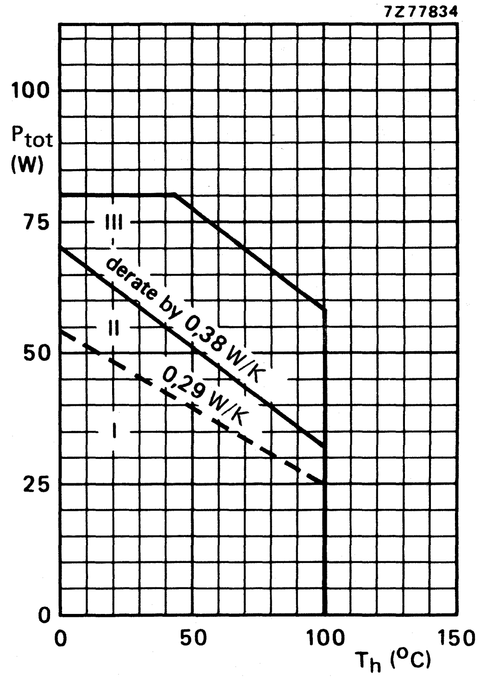


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f ≥ 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operating during mismatch

THERMAL RESISTANCE (dissipation = 32,5 W; T_{mb} = 85 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	3,55 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,65 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage				
open base; I_C = 50 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	4	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
R_{BE} = 10 Ω	E_{SBR}	>	8	mJ
D.C. current gain *				
I_C = 1,25 A; V_{CE} = 5 V	h_{FE}	typ.	50	
			10 to 100	
D.C. current gain ratio of matched devices *				
I_C = 1,25 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage *				
I_C = 3,75 A; I_B = 0,75 A	V_{CEsat}	typ.	1,5	V
Transition frequency at f = 100 MHz *				
$-I_E$ = 1,25 A; V_{CB} = 28 V	f_T	typ.	530	MHz
$-I_E$ = 3,75 A; V_{CB} = 28 V	f_T	typ.	530	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	50	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	31	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

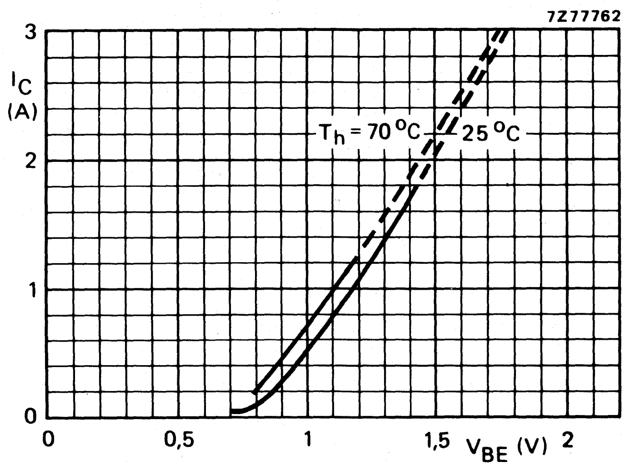


Fig. 4 Typical values; V_{CE} = 28 V.

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

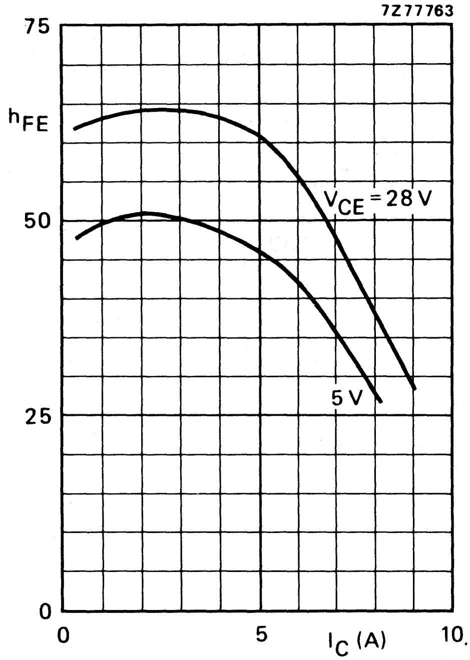


Fig. 5 Typical values; T_j = 25 °C.

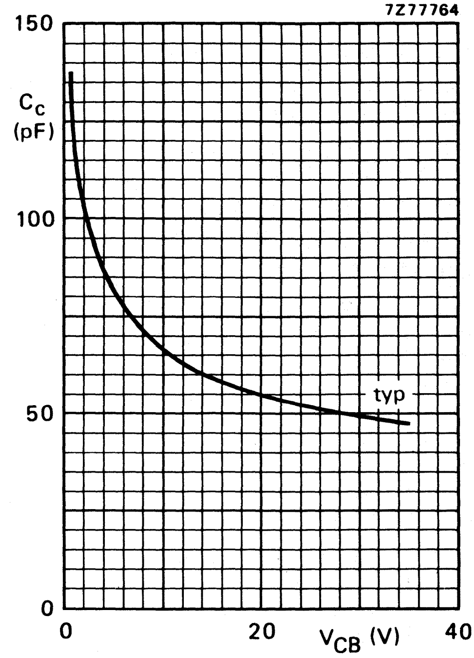


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

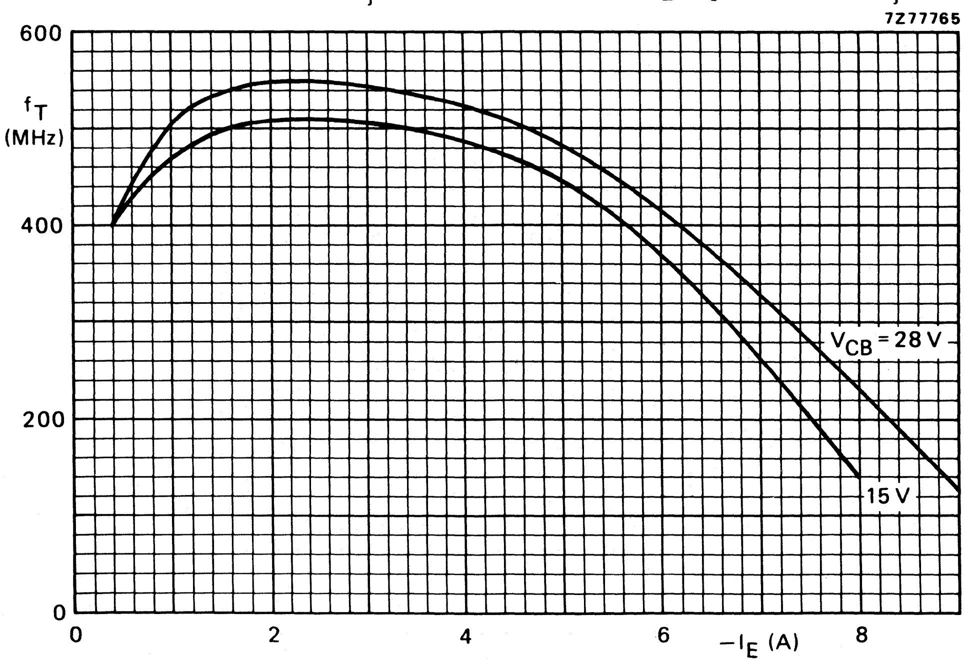


Fig. 7 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 26 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3 dB *	d_5 dB *	T_h °C
> 8 (P.E.P.)	> 20	1,25	−40	< −40	70
typ. 10 (P.E.P.)	typ. 24	1,25	−40	< −40	25

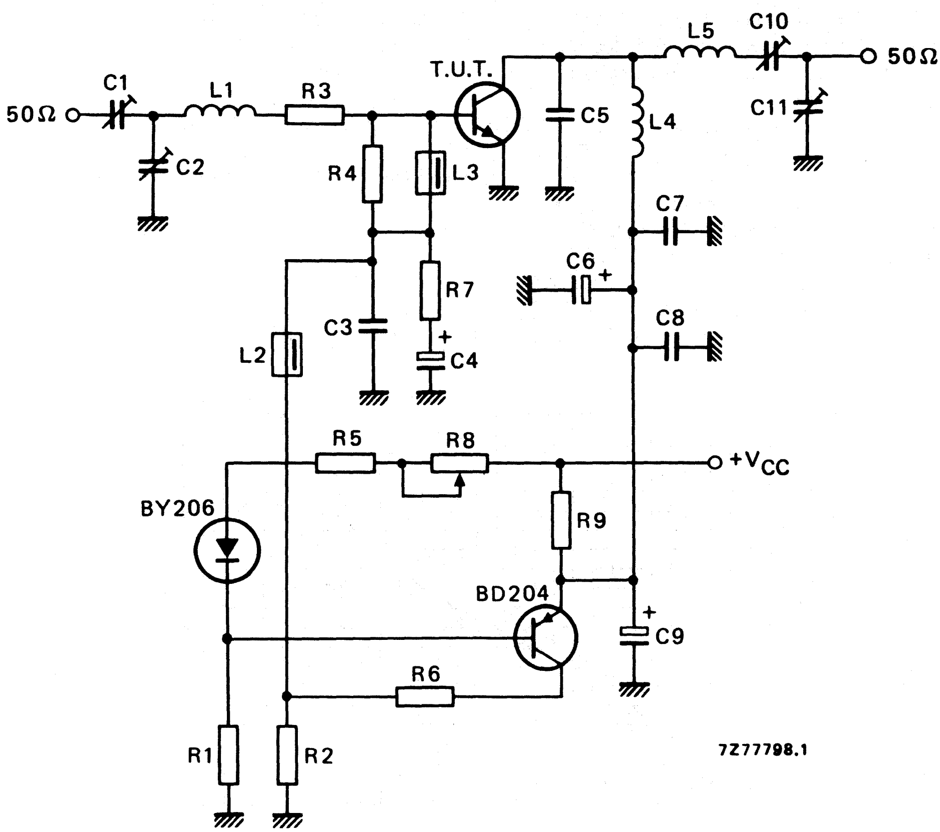


Fig. 8 Test circuit; s.s.b. class-A.

* 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 μF/10 V electrolytic capacitor
C5 = 56 pF ceramic capacitor (500 V)
C6 = 47 μF/35 V electrolytic capacitor
C7 = C8 = 220 nF polyester capacitor
C9 = 10 μF/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 enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

R1 = 600 Ω; parallel connection of 2 x 1,2 kΩ carbon resistors (± 5%; 0,5 W each)
R2 = 15 Ω carbon resistor (± 5%; 0,25 W)
R3 = 1,2 Ω parallel connection of 4 x 4,7 Ω carbon resistors (± 5%; 0,125 W each)
R4 = 33 Ω carbon resistor (± 5%; 0,25 W)
R5 = 18 Ω carbon resistor (± 5%; 0,25 W)
R6 = 120 Ω wirewound resistor (± 5%; 5,5 W)
R7 = 1 Ω carbon resistor (± 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 (± 5%; 5,5 W each)

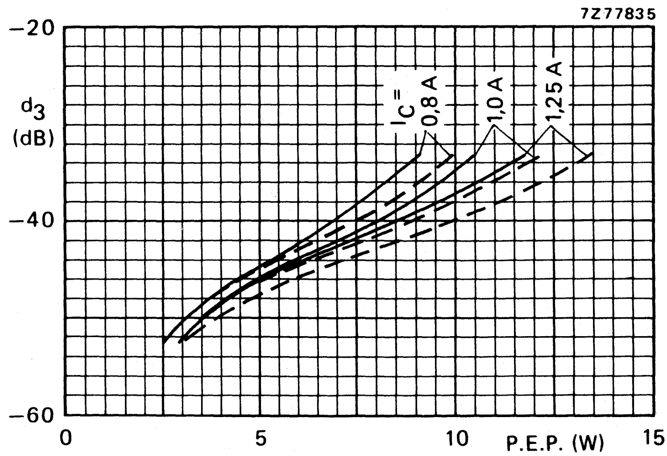


Fig. 9 Intermodulation distortion as a function of output power.
Typical values; V_{CE} = 26 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz;
—— T_h = 70 °C; – – – T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 25 W P.E.P.	I_C (A) at 25 W P.E.P.	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

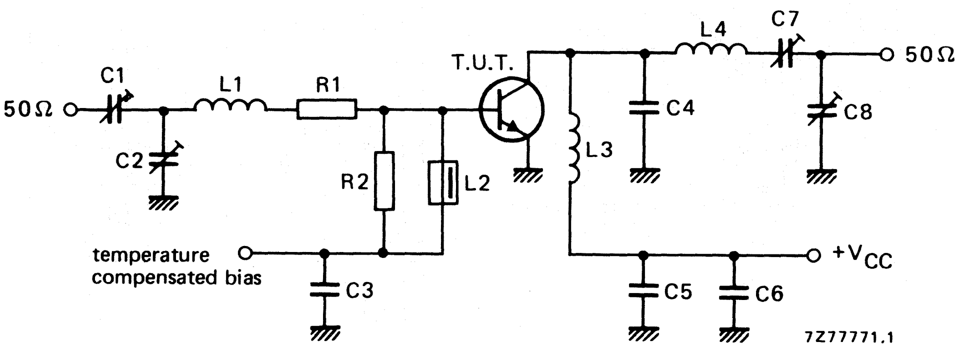


Fig. 10 Test circuit; s.s.b. class-AB.

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.

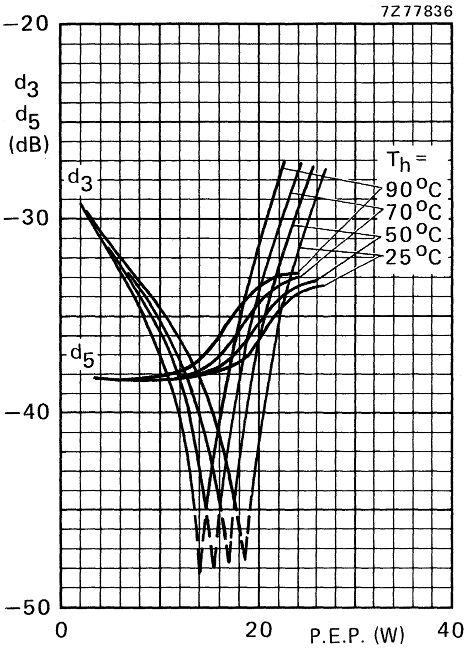


Fig. 11 Intermodulation distortion as a function of output power. *

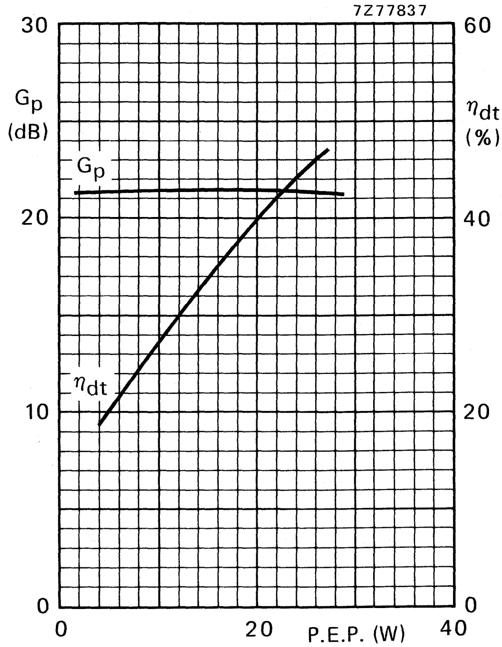


Fig. 12 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 11:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 12:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

* See note on previous page.

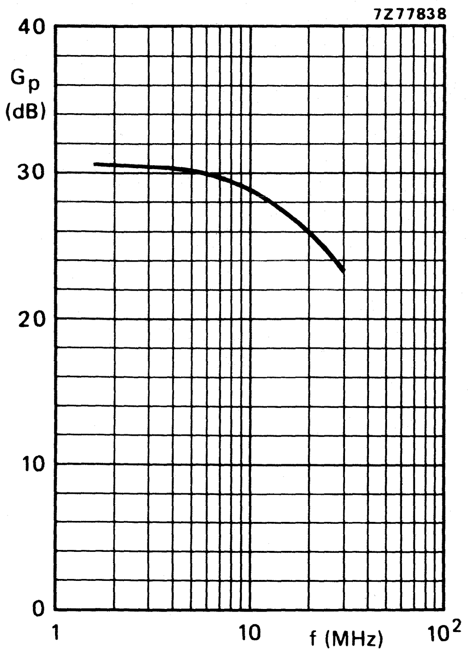


Fig. 13 Power gain as a function of frequency.

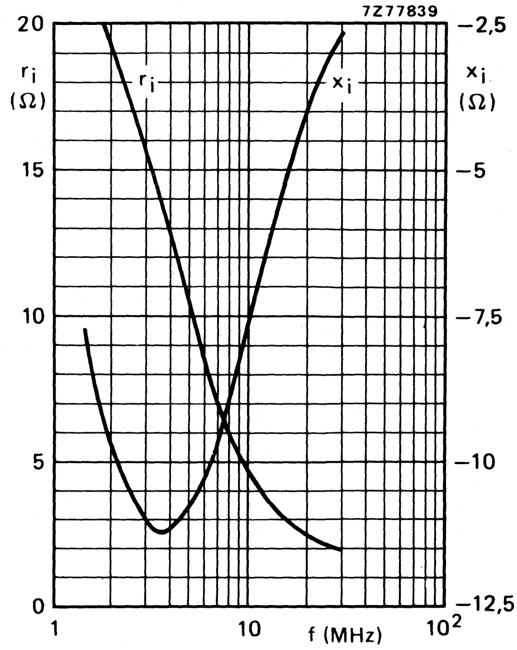


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; P_L = 25 W; T_h = 25 °C; Z_L = 12 Ω.

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 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; T_h = 70 °C and P_L = 30 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

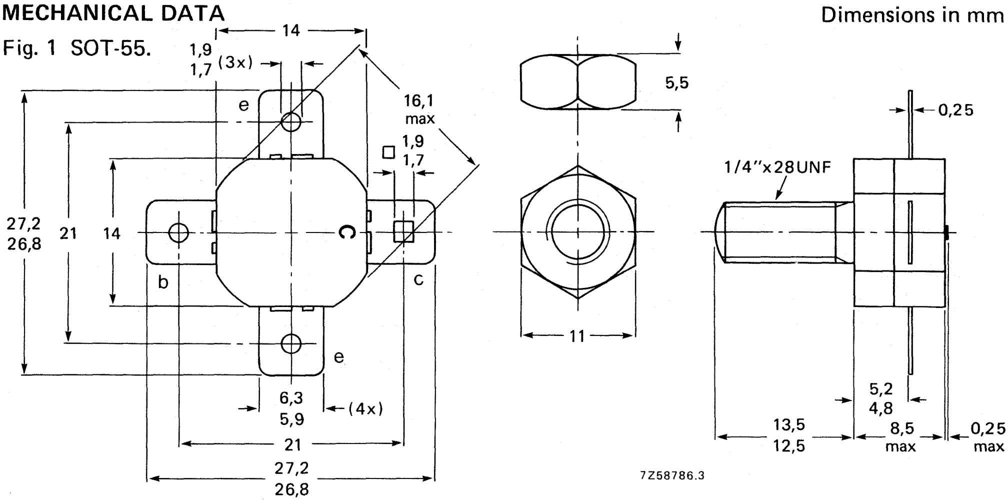
QUICK REFERENCE DATA

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

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.	85	V
Collector-emitter voltage (R_{BE} = 10 Ω) 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 °C f > 1 MHz	P_{tot}	max.	88	W

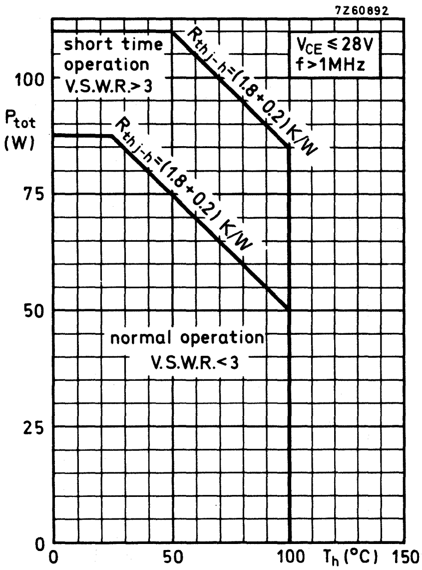


Fig.2.

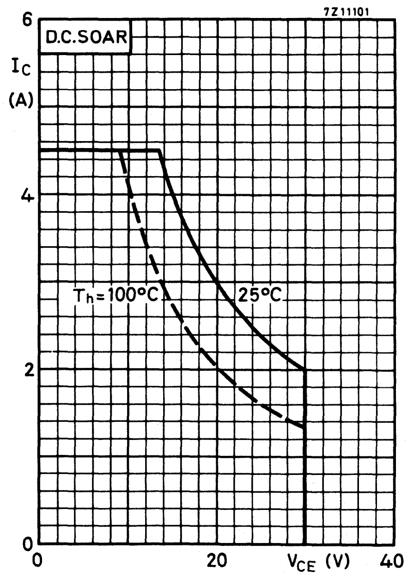


Fig.3.

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

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	1.8	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.2	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-base breakdown voltage				
open emitter; $I_C = 25$ mA	$V_{(BR)CBO}$	>	85	V
Collector-emitter breakdown voltage				
$R_{BE} = 10\ \Omega$; $I_C = 25$ mA	$V_{(BR)CER}$	>	85	V
open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4,0	V
Collector-emitter saturation voltage				
$I_C = 0,7$ A; $I_B = 0,14$ A	V_{CEsat}	<	1,0	V
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
$R_{BE} = 33\ \Omega$	E_{SBR}	>	8	mJ
D.C. current gain				
$I_C = 1,4$ A; $V_{CE} = 6$ V	h_{FE}		15 to 100	
Transition frequency				
$I_C = 3,0$ A; $V_{CE} = 20$ V	f_T	typ.	250	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 30$ V	C_c	typ.	115	pF
		<	125	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 30$ V	C_{re}	typ.	90	pF
Collector-stud capacitance	C_{cs}	typ.	3,5	pF

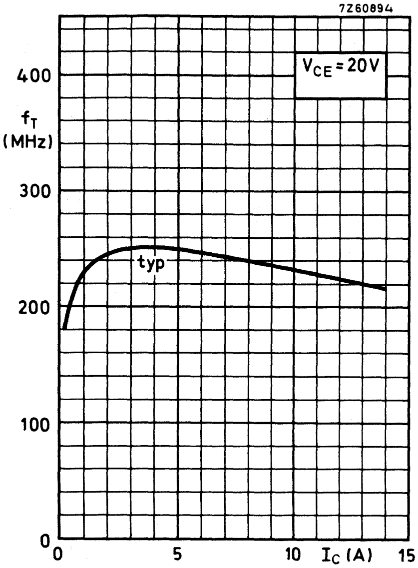


Fig.4.

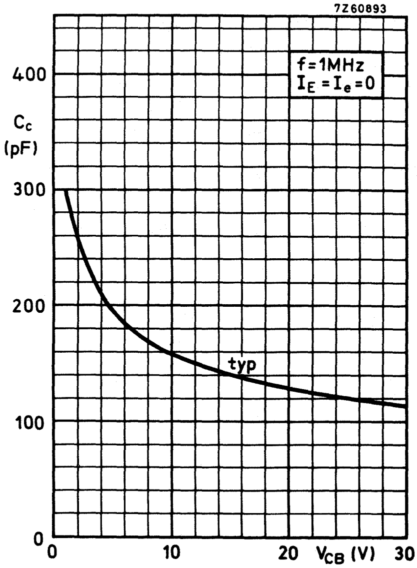


Fig.5.

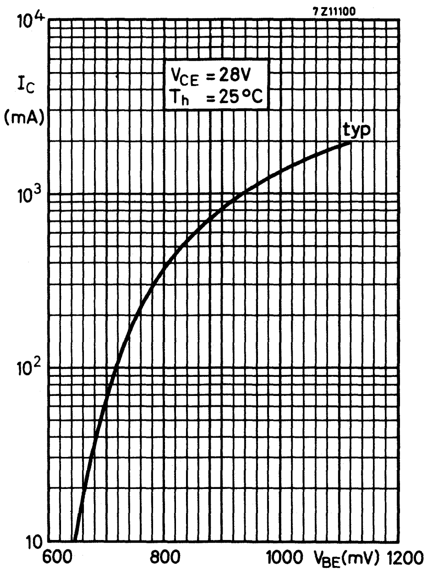


Fig.6.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 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 V and T_h = 70 °C.

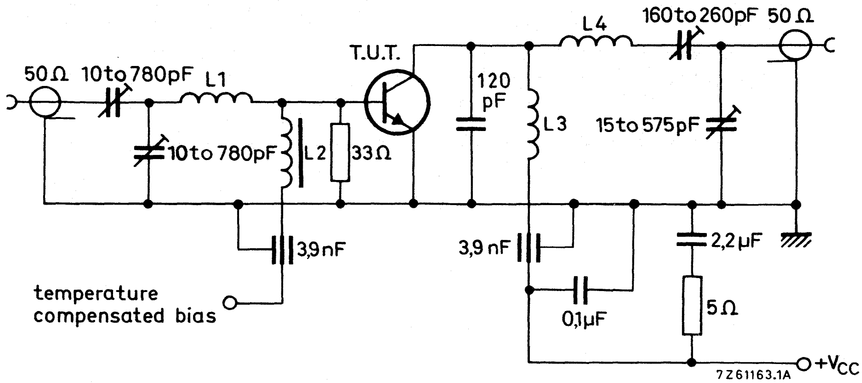


Fig. 7 Test circuit; s.s.b. class-AB.

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.

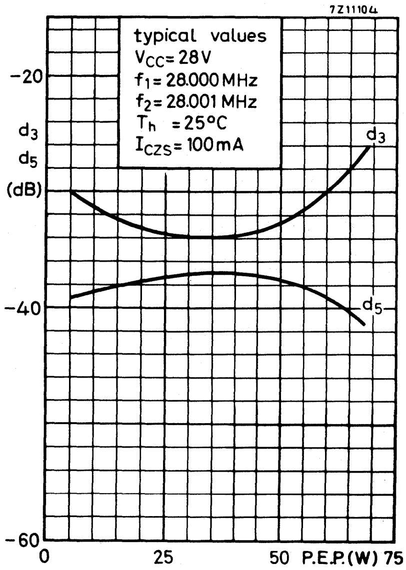


Fig.8.

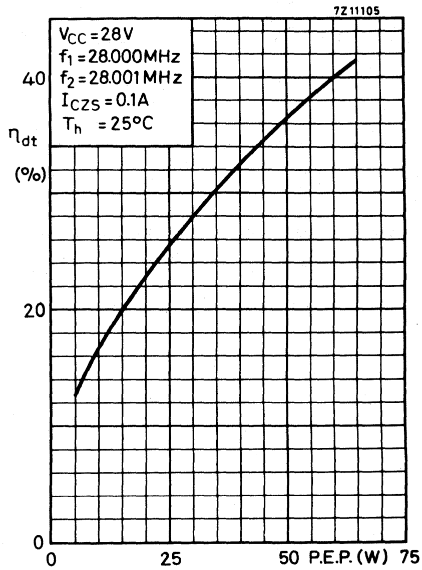


Fig.9.

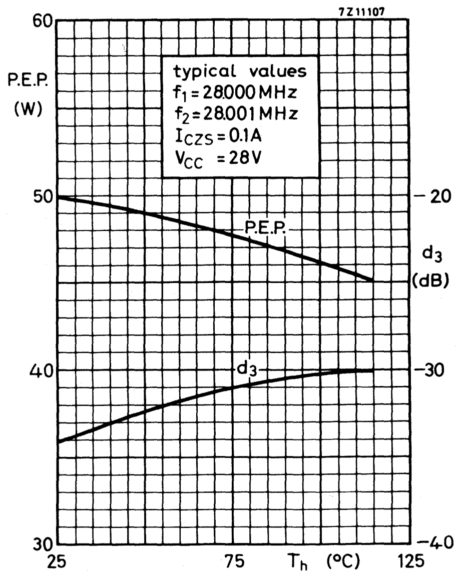


Fig. 10.

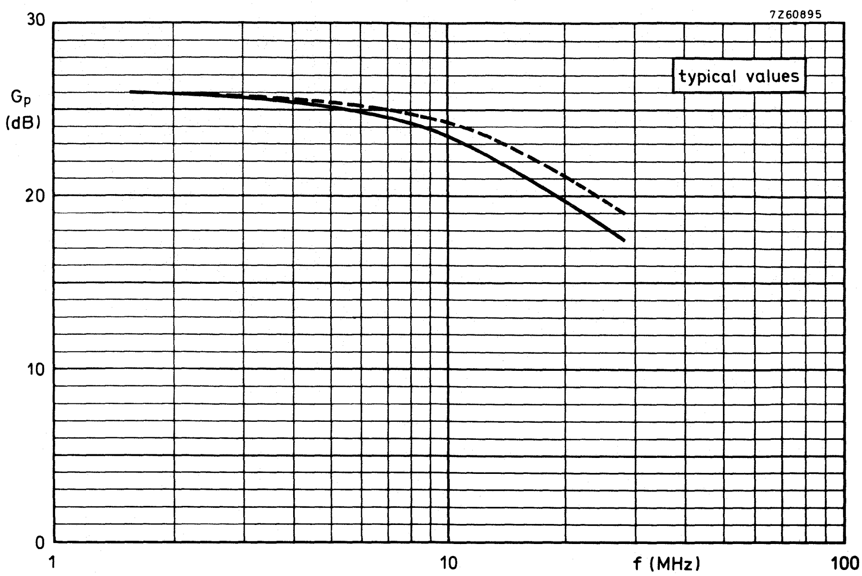


Fig.11.

S.S.B. class AB operation

P_L = 50 W PEP
V_{CC} = 28 V
I_C = 100 mA
Z_L = 6.25 Ω
T_h = 25 °C

The drawn curve holds for an unneutralized amplifier.

The dashed curve holds for a push-pull amplifier with cross neutralization.
Collector-base neutralizing capacitor: 82 pF

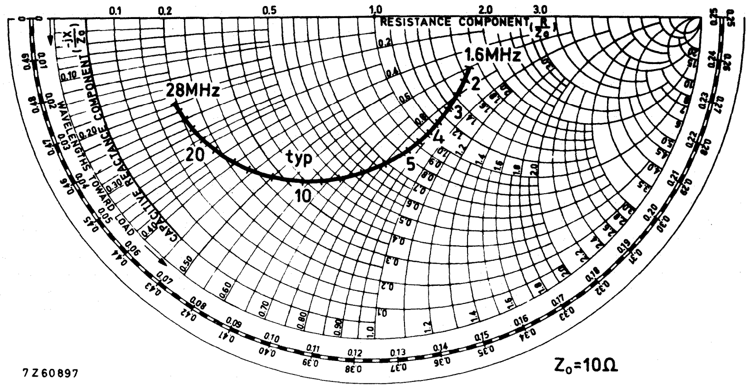


Fig.12.

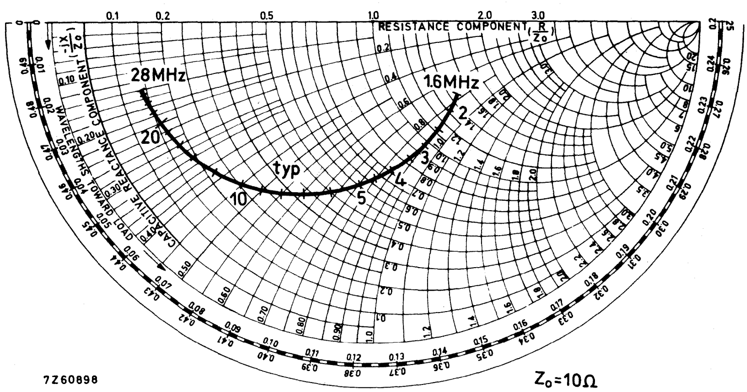


Fig.13.

S.S.B. class AB operation

P_L = 50 W PEP
V_{CC} = 28 V
I_C = 100 mA
Z_L = 6.25 Ω
T_h = 25 °C

The upper graph holds for a push-pull amplifier with cross neutralization.
Collector-base neutralizing capacitor: 82 pF

The lower graph holds for an unneutralized amplifier.

APPLICATION INFORMATION (continued)

R.F. performance in s.s.b. operation (linear power amplifier)

V_{CC} = 28 V; T_h up to 25 °C
f_1 = 28,000 MHz; f_2 = 28,001 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

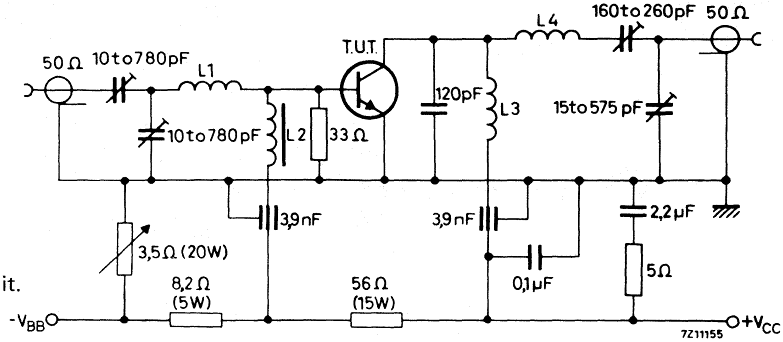


Fig.14 S.S.B. class A test circuit.

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

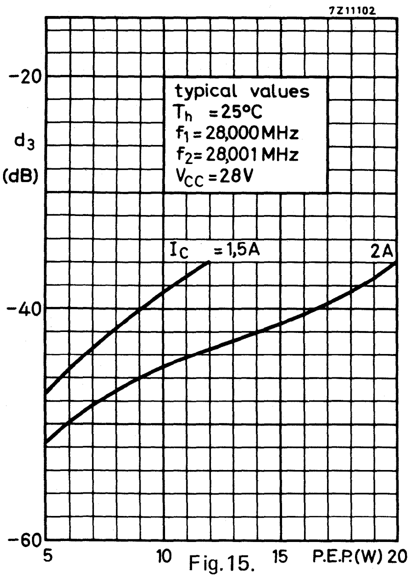


Fig.15.

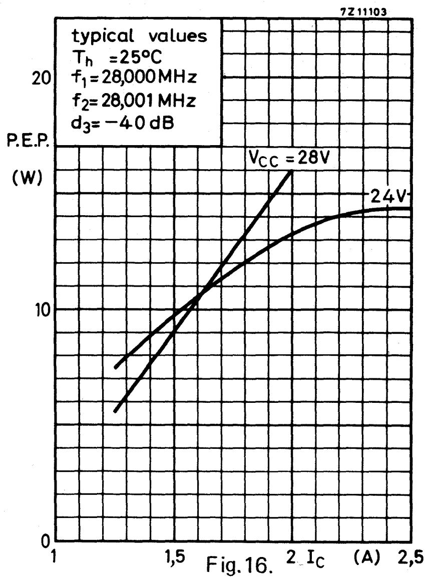


Fig.16.

APPLICATION INFORMATION

R.F. performance in c.w. operation (class B)

V_{CC} = 28 V; T_h up to 25 °C

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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 °C the output power relative to that at 25 °C is diminished by a factor −40 mW/K.

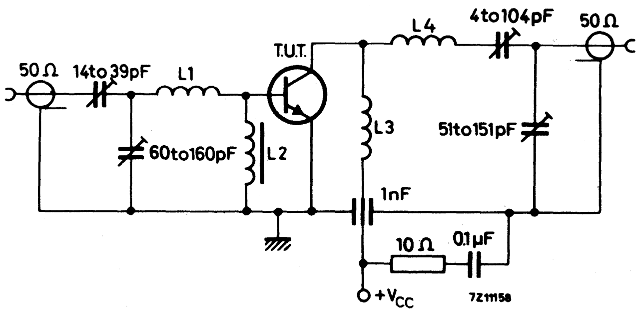


Fig.17 C.W. 70 MHz test circuit.

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

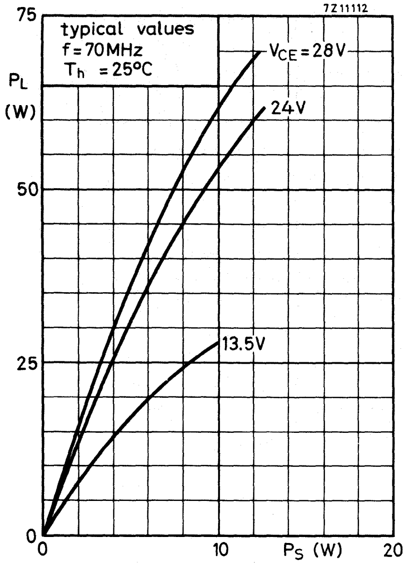


Fig.18.

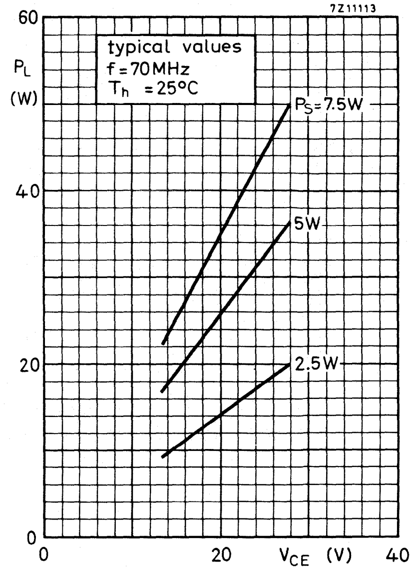


Fig.19.

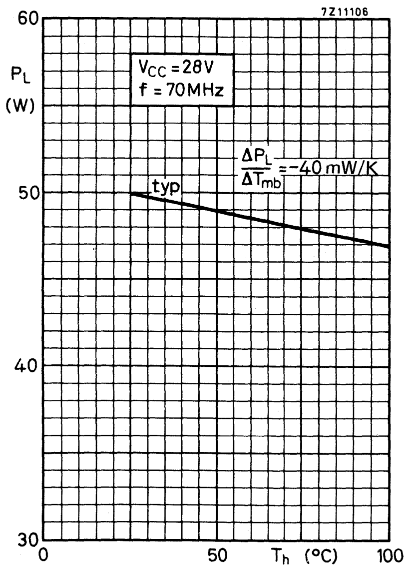


Fig.20.

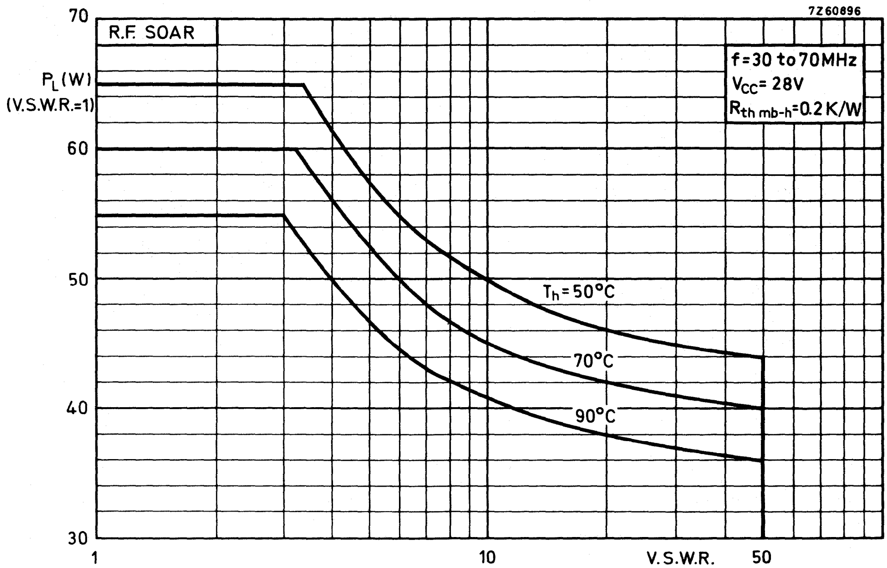


Fig.21.

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 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.

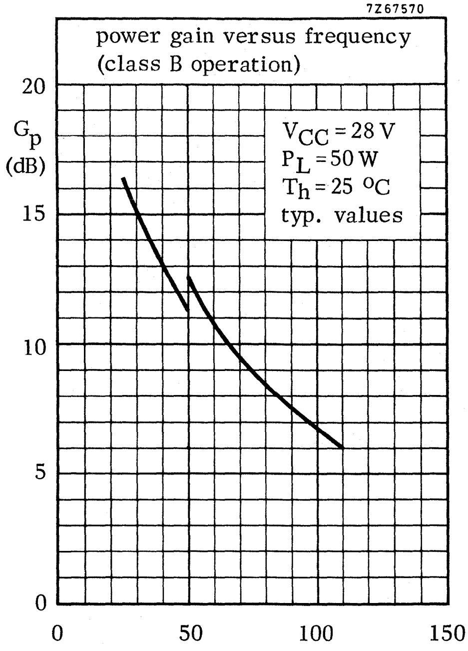


Fig.22.

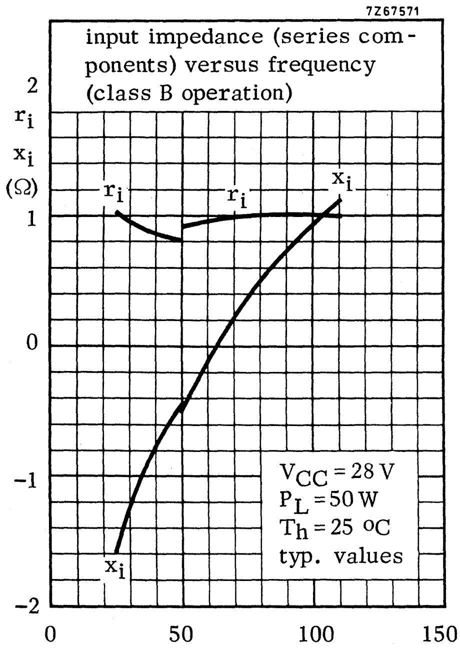


Fig.23.

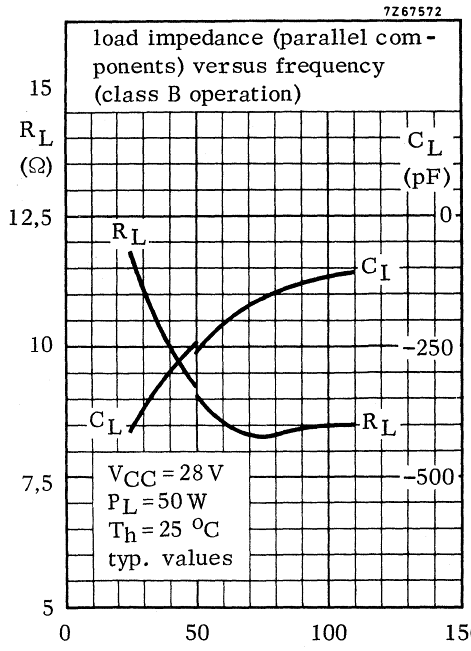


Fig.24.

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

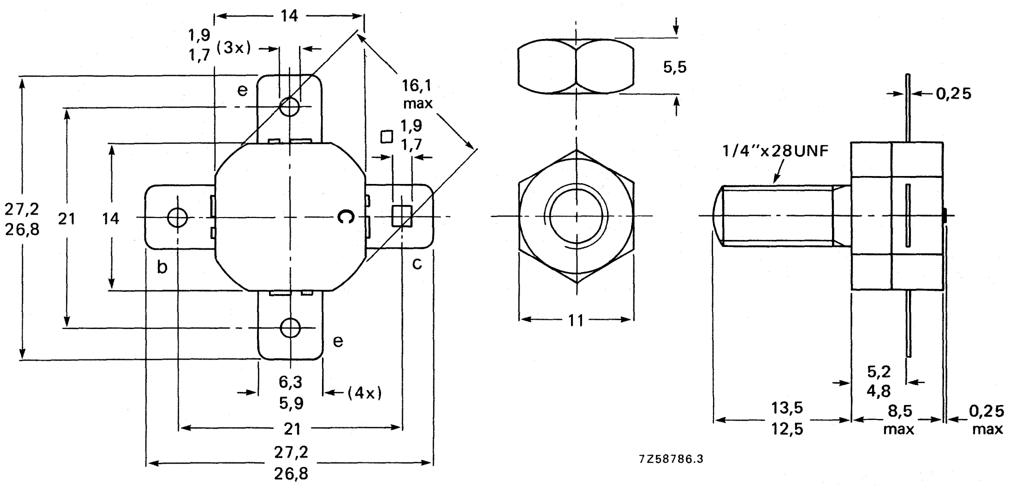
QUICK REFERENCE DATA

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.

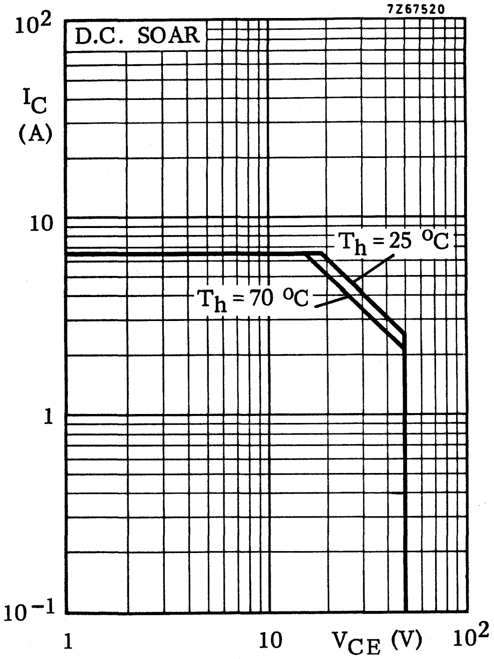
Torque on nut: min. 2,3 Nm (23 kg cm)
max. 2,7 Nm (27 kg cm)

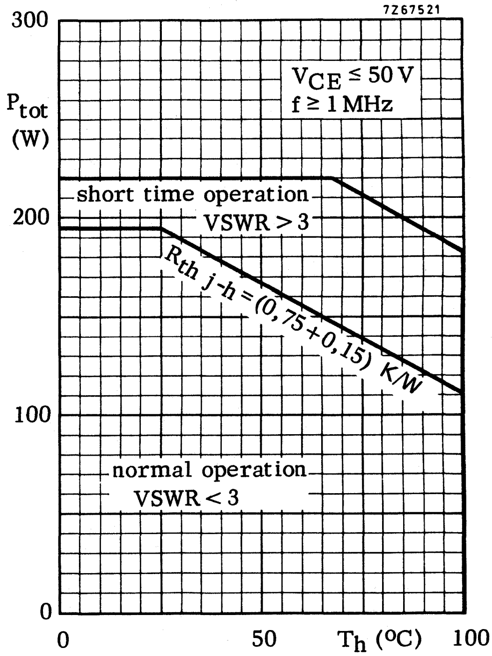
Diameter of clearance hole in heatsink: max. 6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

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	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC

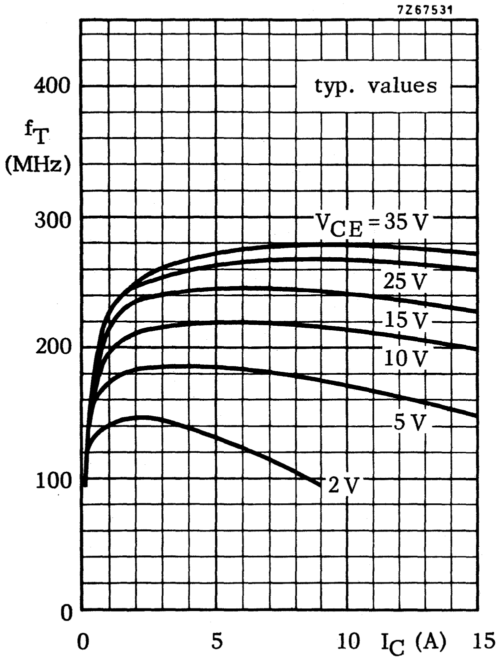
THERMAL RESISTANCE

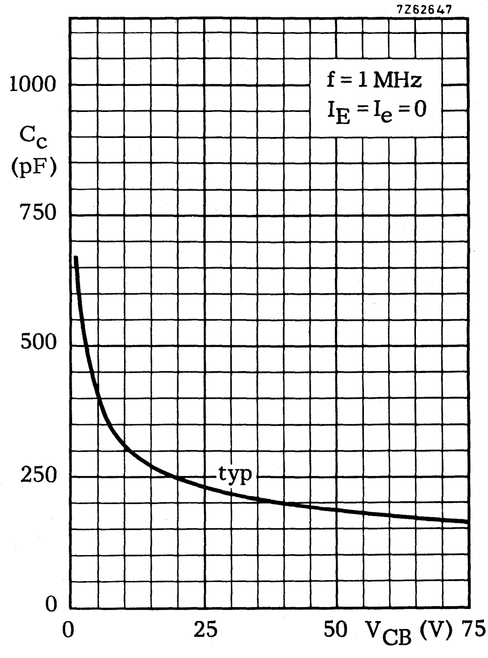
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	0,75	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,15	K/W

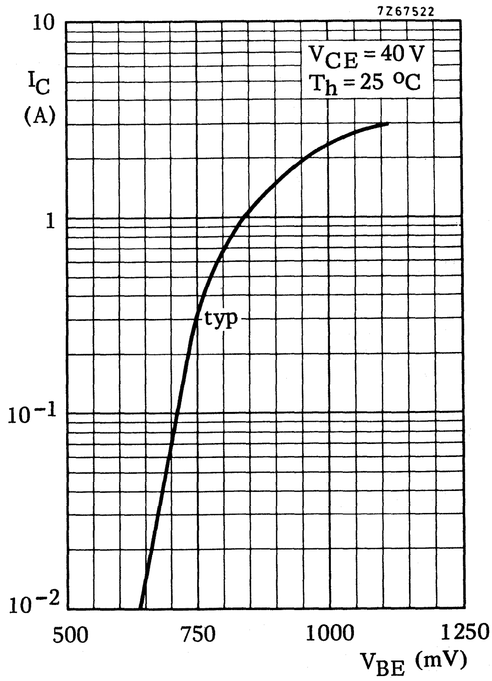
CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage				
open emitter ; I_C = 100 mA	$V_{(BR)CBO}$	>	110	V
Collector-emitter voltage				
R_{BE} = 5 Ω ; I_C = 100 mA	$V_{(BR)CER}$	>	110	V
Collector-emitter voltage				
open base ; I_C = 100 mA	$V_{(BR)CEO}$	>	53	V
Emitter-base voltage				
open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4,0	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	12,5	ms
$-V_{BE}$ = 1,5 V; R_{BE} = 33 Ω	E	>	12,5	ms
D.C. current gain				
I_C = 1,4 A ; V_{CE} = 6 V	h_{FE}		15 to 50	
D.C. current gain ratio of matched devices				
I_C = 1,4 A ; V_{CE} = 6 V	h_{FE1}/h_{FE2}	<	1,2	
Transition frequency				
I_C = 6,0 A ; V_{CE} = 35 V	f_T	typ.	275	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0 ; V_{CB} = 50 V	C_c	typ.	185	pF
		<	220	pF
Feedback capacitance at f = 1 MHz				
I_C = 150 mA; V_{CE} = 50 V	C_{re}	typ.	115	pF
Collector-stud capacitance	C_{cs}	typ.	3,5	pF


7Z67531
typ. values
400
300
200
100
0
f_T
(MHz)
V_{CE} = 35 V
25 V
15 V
10 V
5 V
2 V
0
5
10
I_C (A)
15


7Z62647
f = 1 MHz
$I_E = I_e = 0$
1000
750
500
250
0
C_c
(pF)
typ
0
25
50
V_{CB} (V)
75


7Z67522
V_{CE} = 40 V
T_h = 25 °C
10
1
10^{-1}
10^{-2}
I_C
(A)
typ
500
750
1000
1250
V_{BE} (mV)

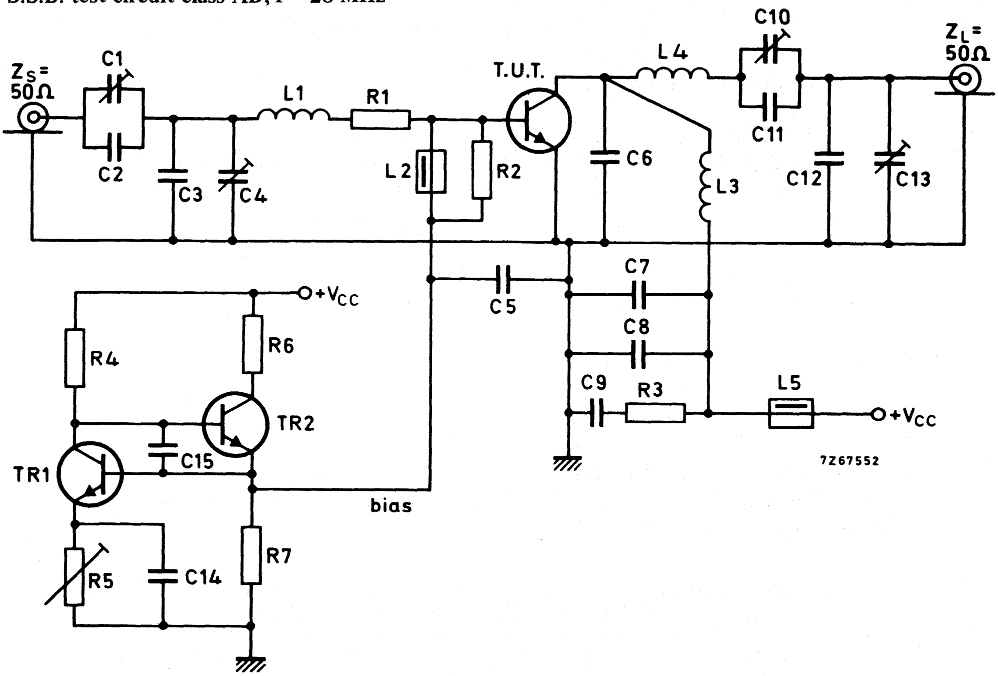
APPLICATION INFORMATION

R.F. performance in s.s.b. operation (linear power amplifier)

T_h up to 25 °C
f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power (W)	G_p (dB)	η_{dt} (%)	d_3 (dB) [1]	d_5 (dB) [1]	I_{CZS} (A)	I_C (A)	V_{CE} (V)	Class
20 to 150 (PEP)	> 14	> 37,5	< −30	< −30	0,10	< 4	50	AB
typ. 30 (PEP)	> 14	typ. 15	< −40	< −40	2,5	–	40	A

S.S.B. test circuit class AB; f = 28 MHz



List of components: see next page.

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)

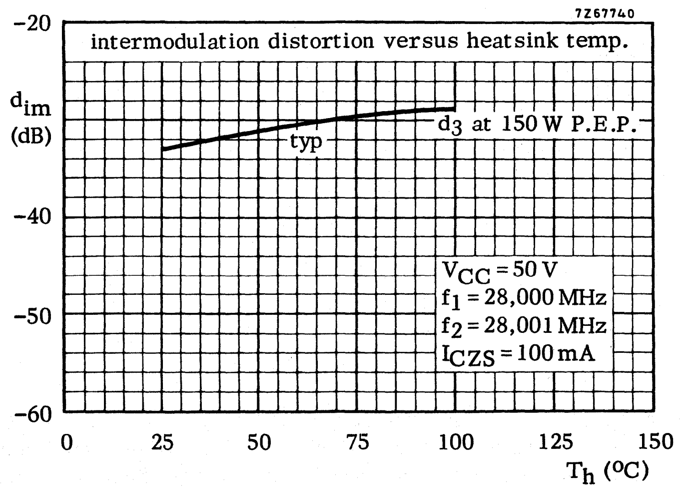
List of components:

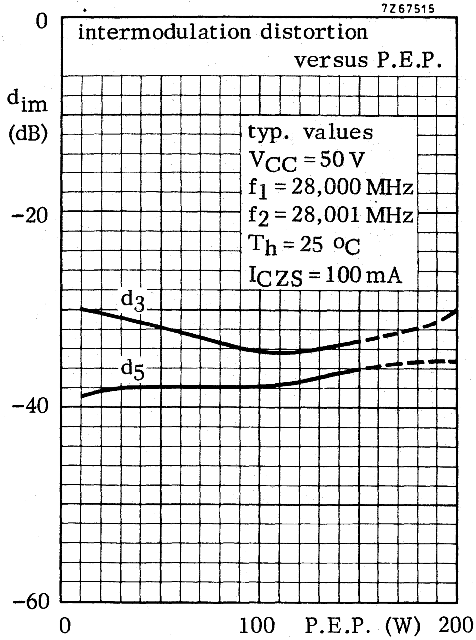
Tr1 = BD135
Tr2 = BD228

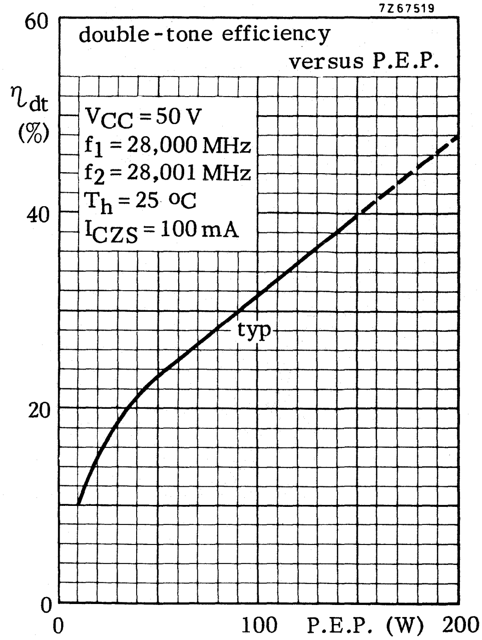
C1 = C10 =	100 pF	air dielectric capacitor (single insulated rotor type)
C2 = C6 =	27 pF	ceramic capacitor
C3 =	180 pF	ceramic capacitor
C4 = C13 =	100 pF	air dielectric capacitor (single non-insulated rotor)
C5 = C7 =	3,9 nF	polyester capacitor (±10%)
C8 = C14 = C15 =	100 nF	polyester capacitor (±10%)
C9 =	2,2 μF	moulded metallized polyester capacitor
C11 =	68 pF	ceramic capacitor
C12 =	220 pF	ceramic capacitor

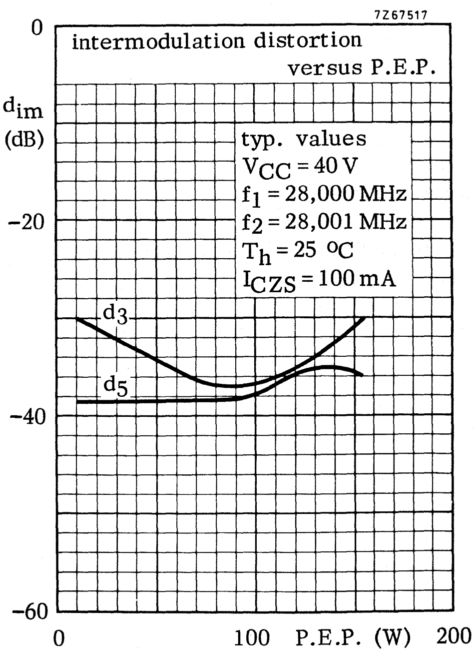
L1 = 88 nH; 3 turns Cu wire (1,0 mm); internal diameter 9 mm; coil length 6,1 mm; leads 2 x 5 mm
L2 = L5 = ferroxcube bead, grade 3B (code number 4312 020 36640)
L3 = 180 nH; 4 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 9,9 mm; leads 2 x 10 mm
L4 = 350 nH; 7 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 19,1 mm; leads 2 x 10 mm

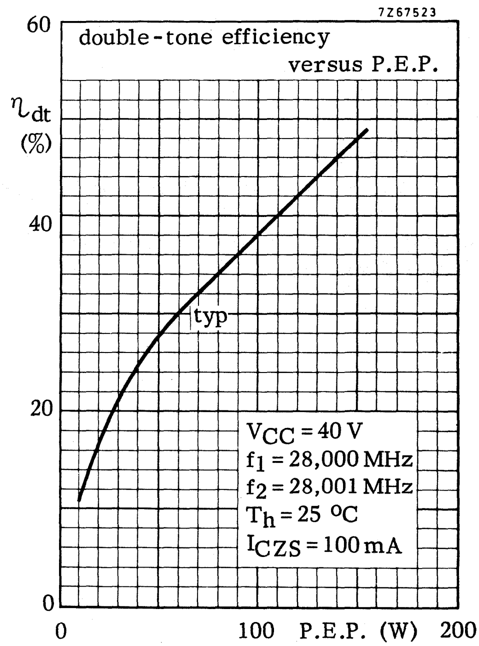
R1 = 0,66 Ω parallel connection of 5 x 3,3 Ω carbon resistors (±5%; 0,5 W each)
R2 = 27 Ω carbon resistor (±5%; 0,5 W)
R3 = 4,7 Ω carbon resistor (±5%; 0,5 W)
R4 = 5,6 kΩ carbon resistor (±5%; 1 W)
R5 = 15 Ω wire-wound potentiometer (3W)
R6 = 157 Ω parallel connection of 3 x 470 Ω wire-wound resistors (5,5W each)
R7 = 68 Ω carbon resistor (±5%; 0,5 W)

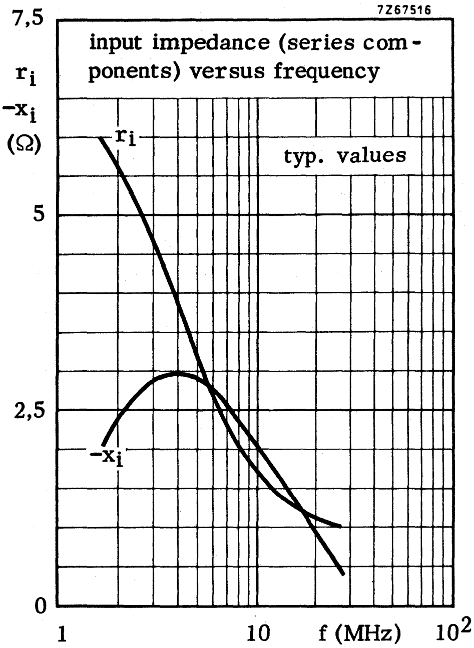


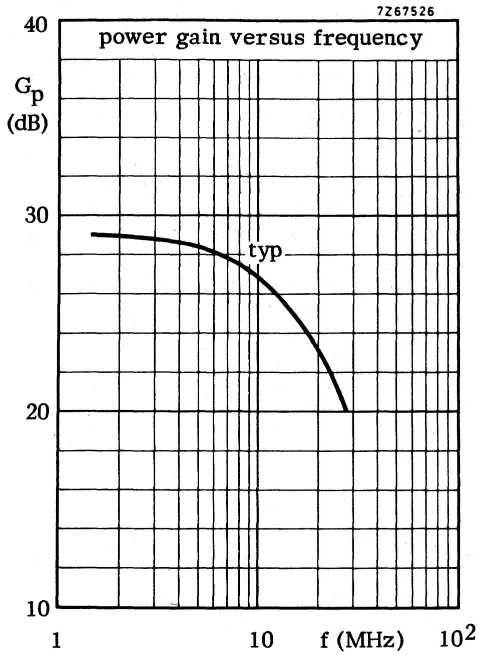

7Z67515
intermodulation distortion versus P.E.P.
d_{im} (dB)
typ. values
V_{CC} = 50 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
d_3
d_5
0
-20
-40
-60
0
100
P.E.P. (W)
200


7Z67519
double-tone efficiency versus P.E.P.
η_{dt} (%)
V_{CC} = 50 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
typ
60
40
20
0
0
100
P.E.P. (W)
200


7Z67517
intermodulation distortion versus P.E.P.
d_{im} (dB)
typ. values
V_{CC} = 40 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
d_3
d_5
0
-20
-40
-60
0
100
P.E.P. (W)
200


7Z67523
double-tone efficiency versus P.E.P.
η_{dt} (%)
typ
V_{CC} = 40 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
60
40
20
0
0
100
P.E.P. (W)
200

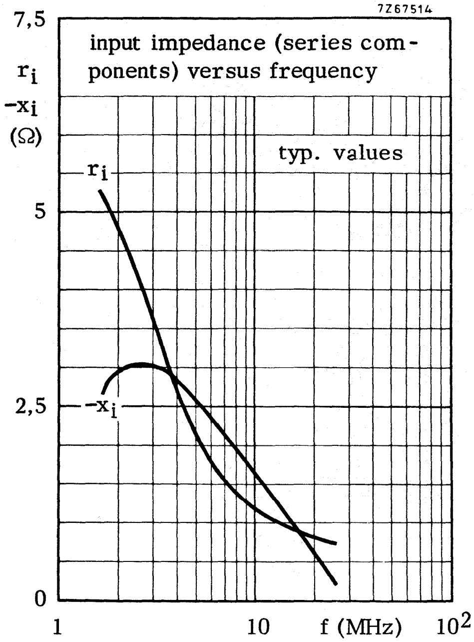


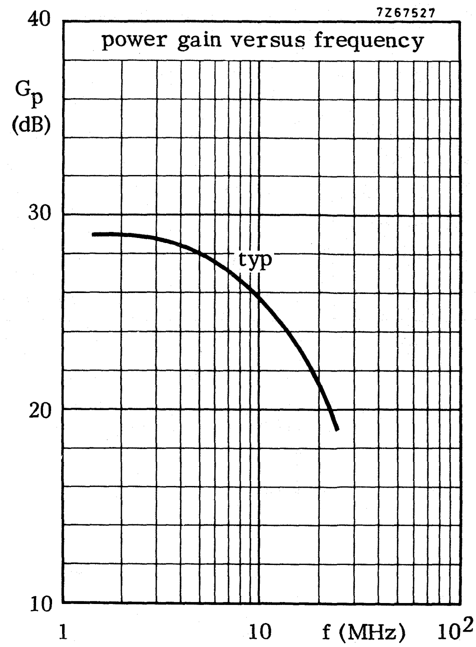


S.S.B. class AB operation

P_L = 150 W (PEP)
V_{CC} = 50 V
I_{CZS} = 100 mA
T_h = 25 °C
Z_L = 6,25 Ω in series with 10,4 nH (in parallel with −267 pF)

The graphs hold for one transistor of a push-pull amplifier with cross neutralization; collector (Tr1) − base (Tr2), neutralizing capacitor: 82 pF.





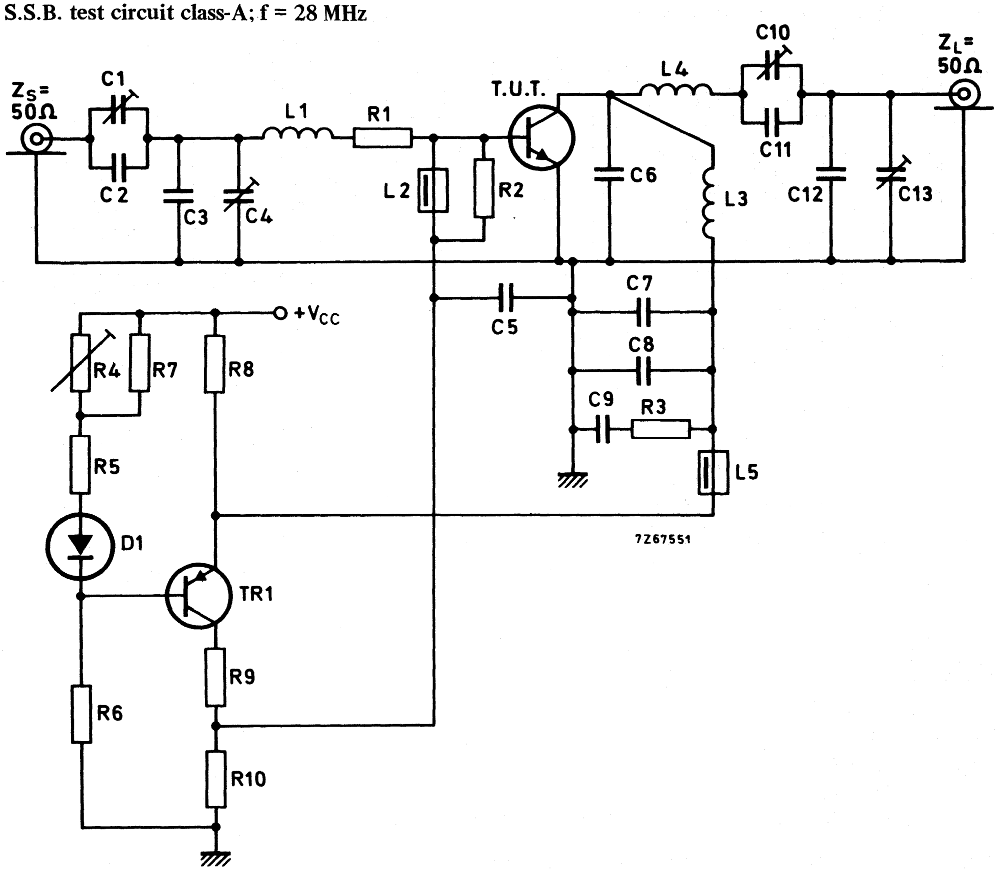
S.S.B. class AB operation

P_L = 150 W (PEP)
V_{CC} = 50 V
I_{CZS} = 100 mA
T_h = 25 °C
Z_L = 6,25 Ω 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 MHz



List of components:

D1 = BY206
TR1 = BD204

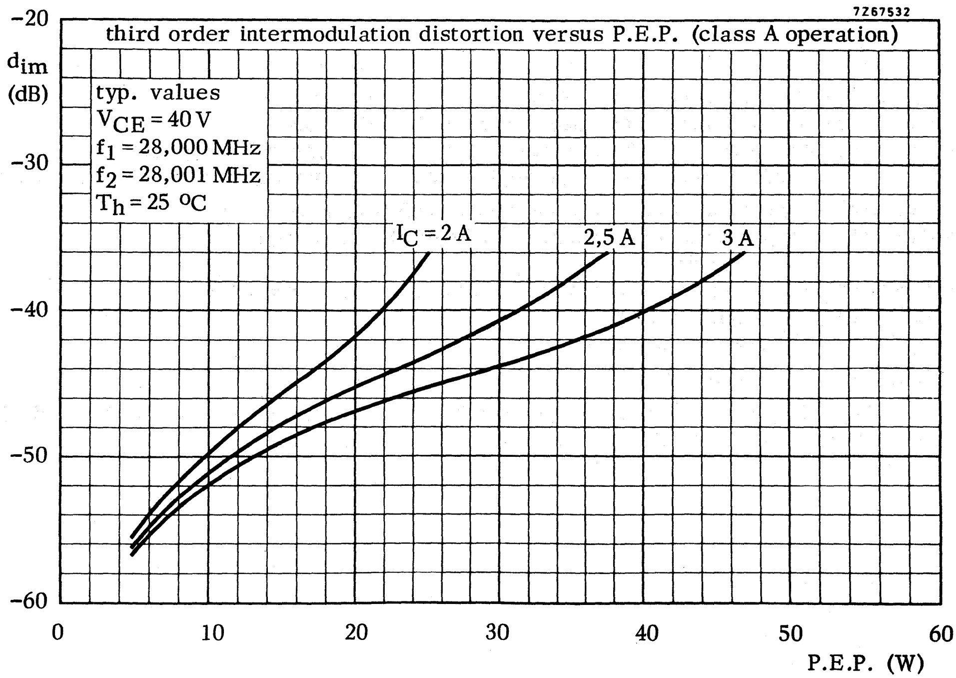
C1 = C10 = 100 pF air dielectric capacitor (single insulated rotor type)
C2 = C6 = 27 pF ceramic capacitor
C3 = 180 pF ceramic capacitor
C4 = C13 = 100 pF air dielectric capacitor (single non-insulated rotor)
C5 = C7 = 3,9 nF polyester capacitor (±10%)
C8 = 100 nF polyester capacitor (±10%)
C9 = 2,2 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 (±5%; 0,5 W each)
R2 = 27 Ω carbon resistor (±5%; 0,5 W)
R3 = 4,7 Ω carbon resistor (±5%; 0,5 W)
R4 = 50 Ω wire-wound potentiometer (1 W)
R5 = 10 Ω carbon resistor (±5%; 1 W)
R6 = 560 Ω enamelled wire-wound resistor (5,5 W)
R7 = 270 Ω carbon resistor (±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 (±5%; 1 W)



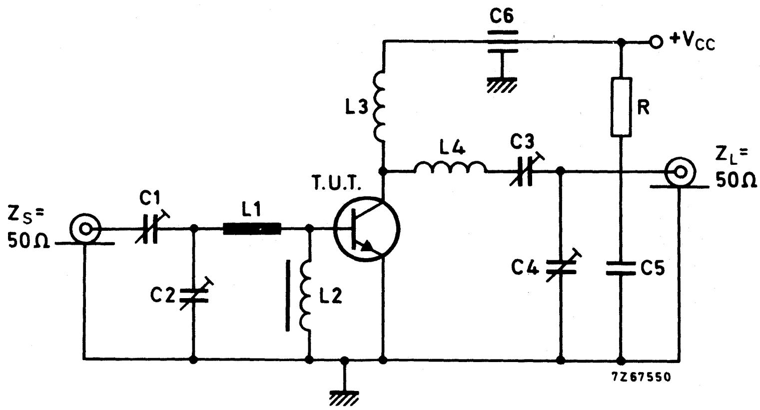
APPLICATION INFORMATION (continued)

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

V_{CE} = 50 V; T_h up to 25 °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.



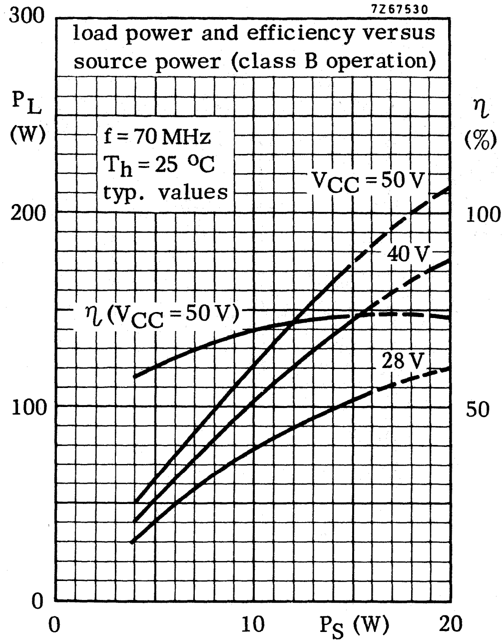
List of components:

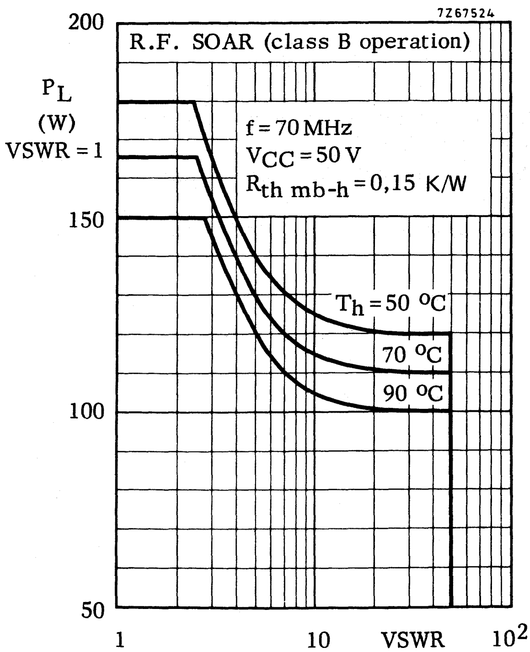
L1 = 60 mm straight enamelled Cu wire (1,6 mm); 9 mm above chassis
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 18 turns enamelled Cu wire (1,6 mm); internal diameter 10 mm; pitch 2 mm; leads 55 mm totally
L4 = 3 turns enamelled Cu wire (1,6 mm); internal diameter 10 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 (± 10%)
C6 = 1 nF ceramic feed-through capacitor

R = 10 Ω carbon resistor (0,5 W)

At P_L = 150 W and V_{CE} = 50 V, the output power at heatsink temperatures between 25 °C and 75 °C relative to that at 25 °C is diminished by 100 mW/K.



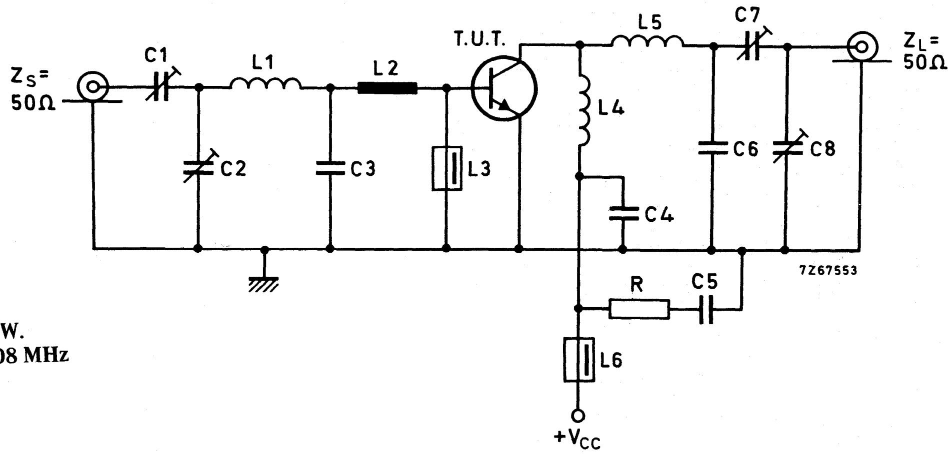


Indicated load power as a function of overload.

The graph has been derived from an evaluation of the performance of transistors matched up to 180 W load power in the test amplifier and subsequently subjected to various mismatch conditions at 50 V with VSWR up to 50 and elevated heatsink temperatures.
This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

APPLICATION INFORMATION (continued)

Test circuit:



C.W.
108 MHz

List of components:

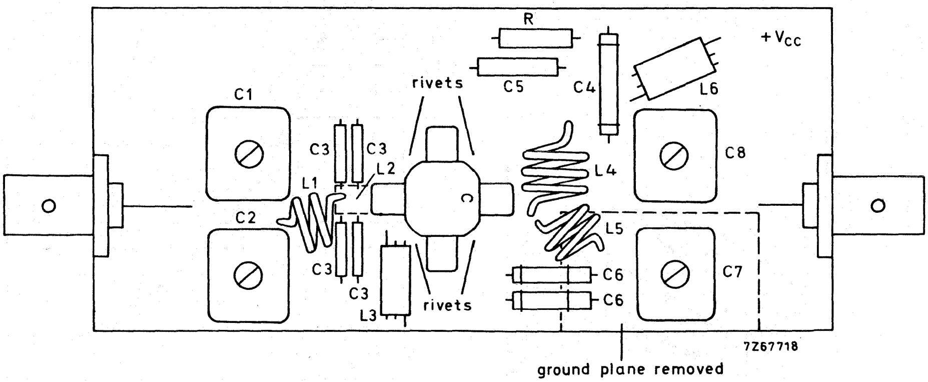
C1 = C2 = 40 pF film dielectric trimmer
C3 = 400 pF parallel connection of 4 x 100 pF ceramic capacitors
C4 = 270 pF ceramic capacitor
C5 = 100 nF polyester capacitor (± 10%)
C6 = 20 pF parallel connection of 2 x 10 pF ceramic capacitors
C7 = C8 = 60 pF film dielectric trimmer

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

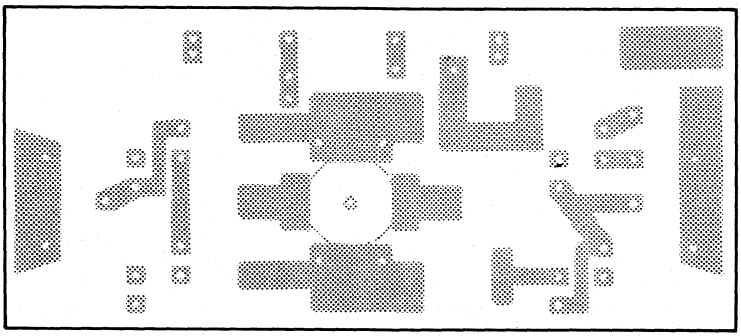
R = 10 Ω carbon resistor (0,5 W)

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 108 MHz test circuit.

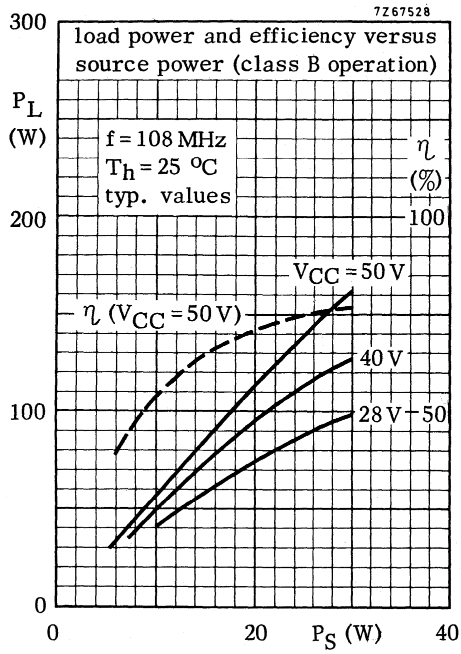


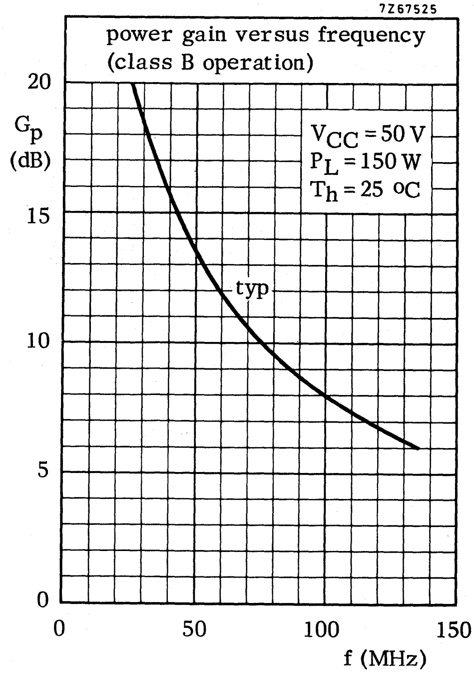
Dimensions of printed circuit board 123 mm x 55 mm.

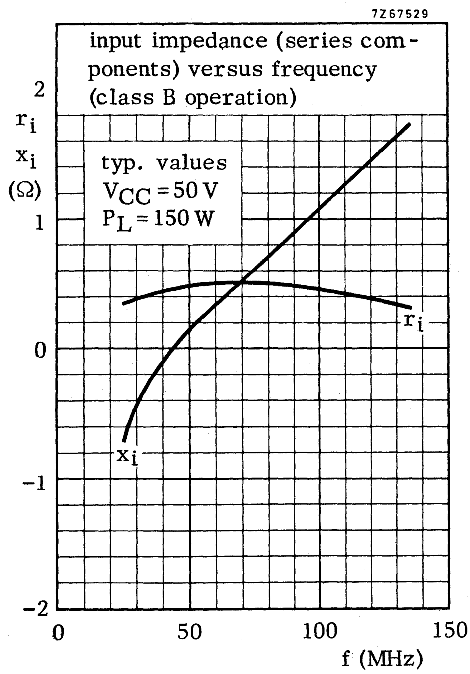


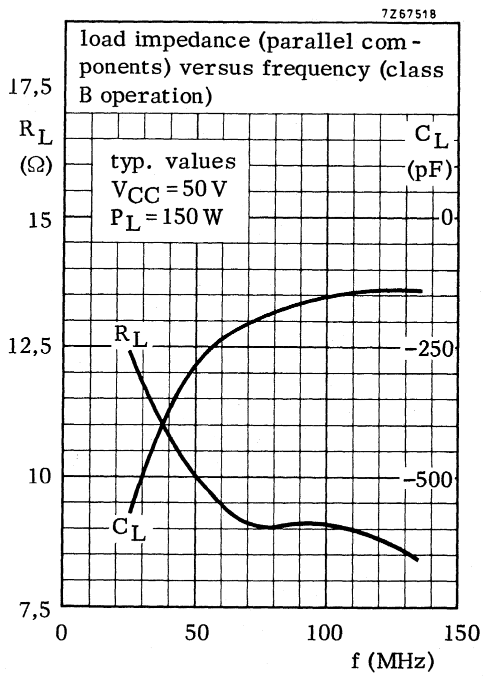
7Z67664

The circuit has been built on epoxy fibre-glass double copper clad printed circuit board (thickness 1/16"). To minimize the dielectric losses, the ground plane under the interconnection of L5, C6 and C7 has been removed.


7Z67528
load power and efficiency versus source power (class B operation)
P_L (W)
f = 108 MHz
T_h = 25 °C
typ. values
η (%)
V_{CC} = 50 V
η (V_{CC} = 50 V)
40 V
28 V
300
200
100
0
100
50
0
20
P_S (W)
40


7Z67525
power gain versus frequency (class B operation)
G_p (dB)
V_{CC} = 50 V
P_L = 150 W
T_h = 25 °C
typ
20
15
10
5
0
0
50
100
150
f (MHz)


7Z67529
input impedance (series components) versus frequency (class B operation)
r_i
x_i
(Ω)
typ. values
V_{CC} = 50 V
P_L = 150 W
r_i
x_i
2
1
0
−1
−2
0
50
100
150
f (MHz)


7Z67518
load impedance (parallel components) versus frequency (class B operation)
R_L (Ω)
C_L (pF)
typ. values
V_{CC} = 50 V
P_L = 150 W
R_L
C_L
17,5
15
12,5
10
7,5
0
−250
−500
0
50
100
150
f (MHz)

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

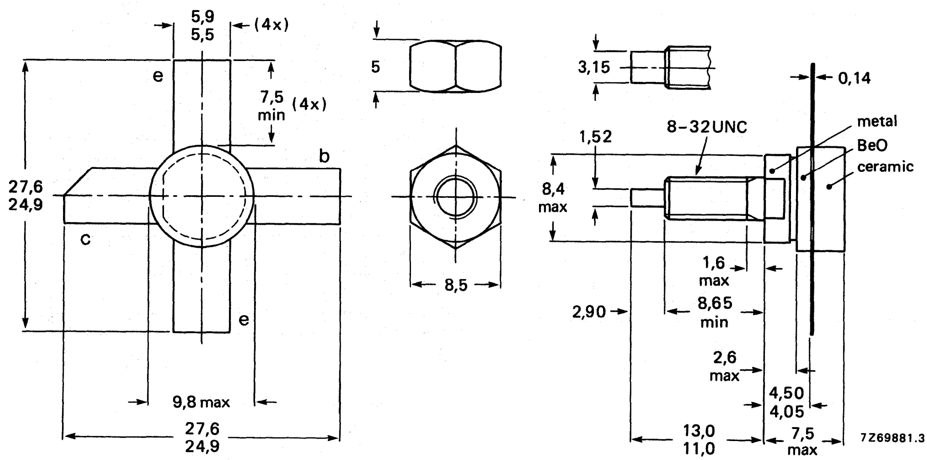
R.F. performance up to T_h = 25 °C

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

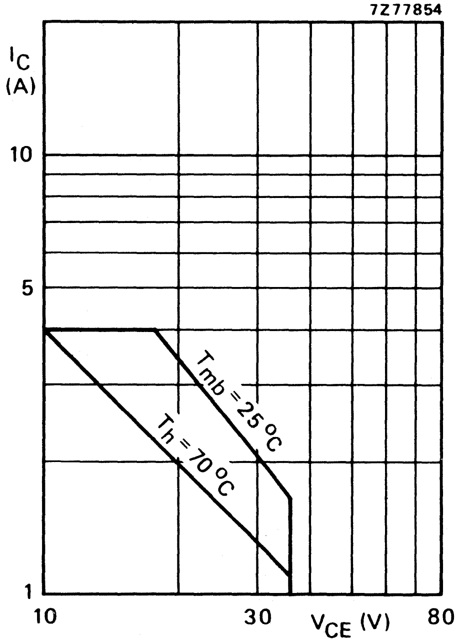


Fig. 2 D.C. SOAR.

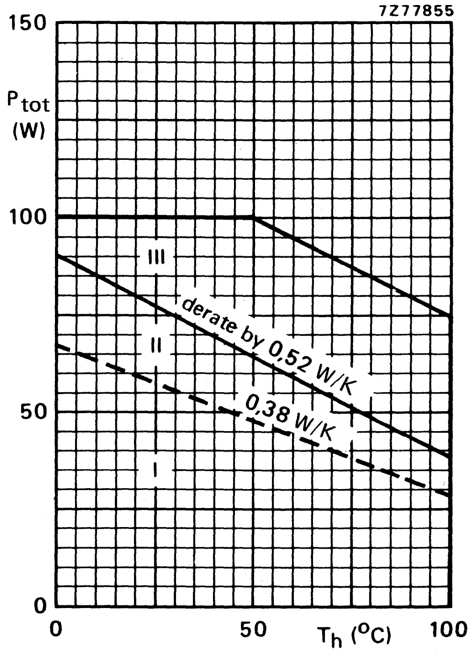


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 28 V; f > 1 MHz.

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)	$R_{th\ j\text{-}mb(dc)}$	=	2,8	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,05	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	36 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	8 mJ
R_{BE} = 10 Ω	E_{SBR}	>	8 mJ
D.C. current gain * I_C = 2,5 A; V_{CE} = 5 V	h_{FE}	typ.	45
			10 to 80
D.C. current gain ratio of matched devices * I_C = 2,5 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage * I_C = 7,5 A; I_B = 1,5 A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz * $-I_E$ = 2,5 A; V_{CB} = 28 V	f_T	typ.	570 MHz
$-I_E$ = 7,5 A; V_{CB} = 28 V	f_T	typ.	570 MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 28 V	C_c	typ.	82 pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	54 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

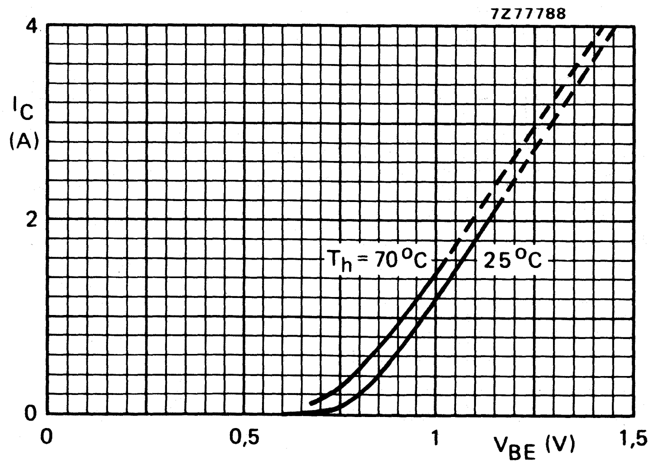


Fig. 4 Typical values; V_{CE} = 28 V.

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

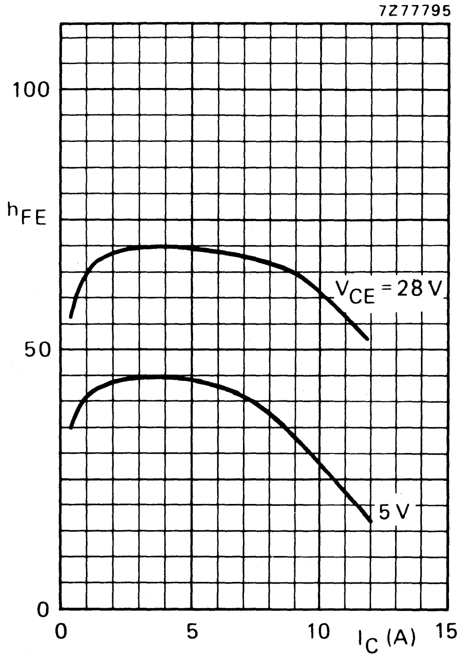


Fig. 5 Typical values; T_j = 25 °C.

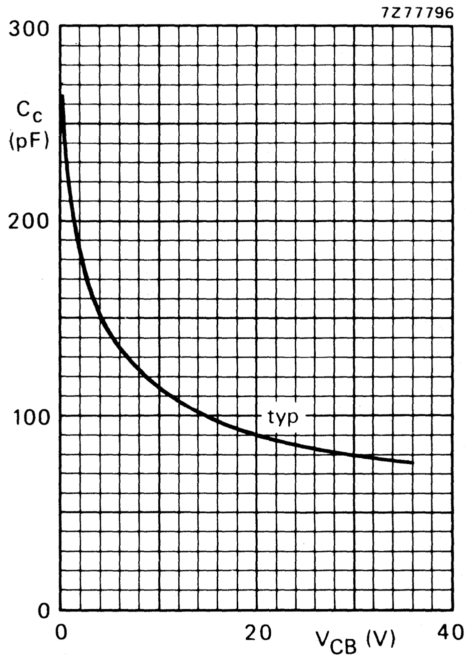


Fig. 6 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C.

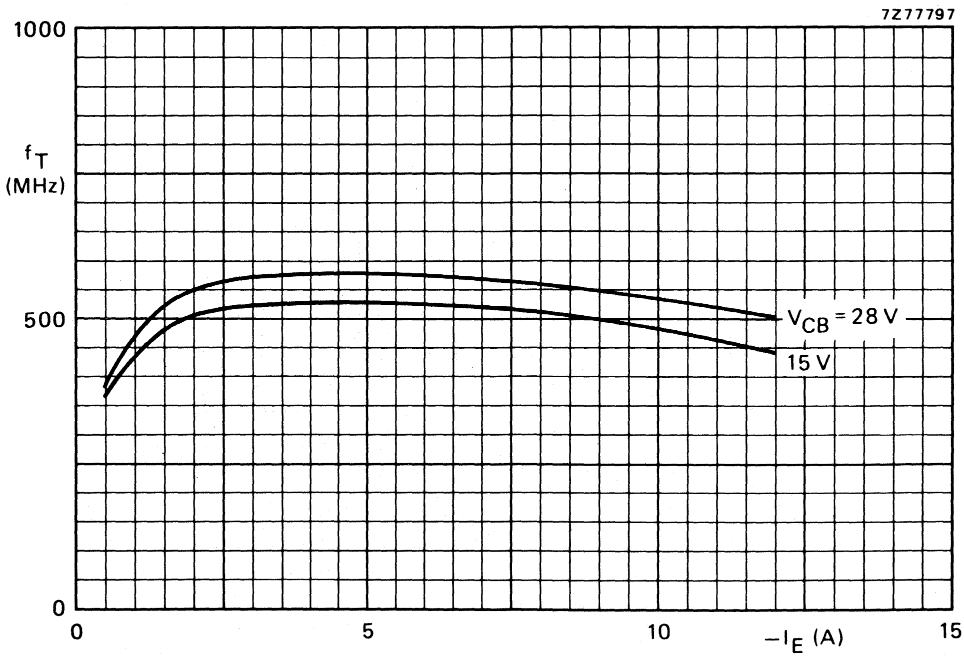


Fig. 7 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	45	< 8	> 7,5	< 2,47	> 70	0,7 + j1,3	110 − j62

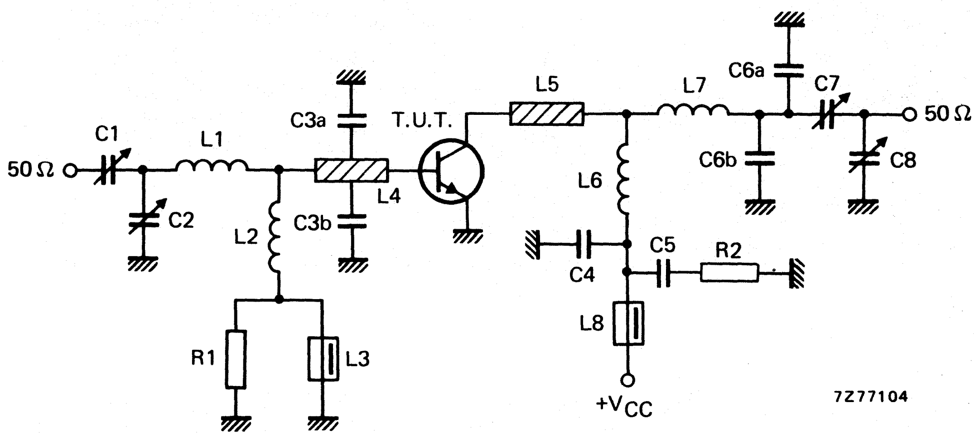


Fig. 8 Test circuit; c.w. class-B.

List of components:

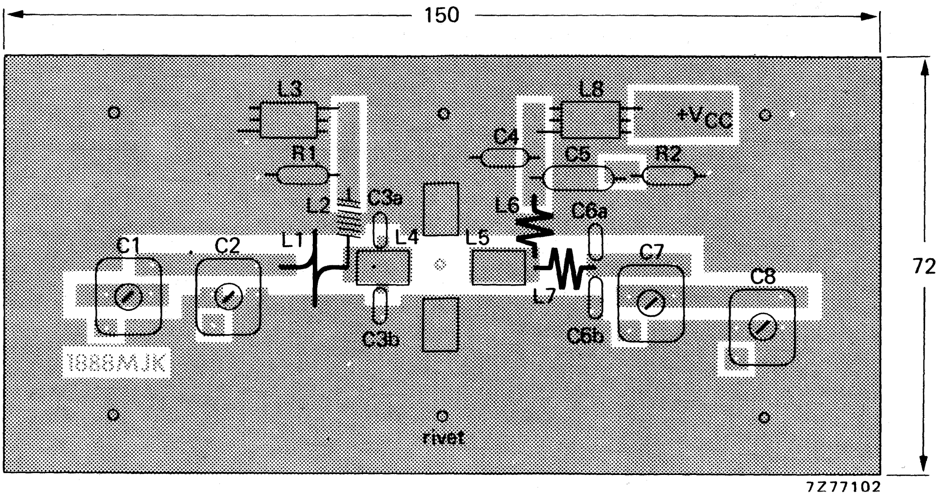
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C6a = 2,2 pF ceramic capacitor (500 V)
C6b = 1,8 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.



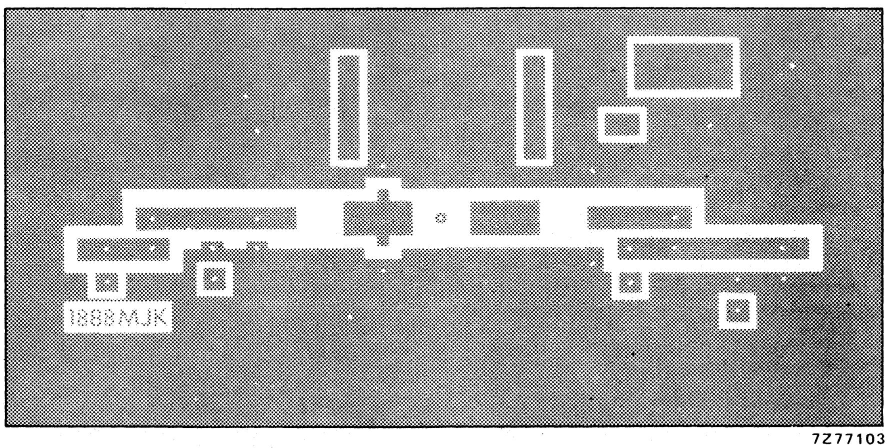


Fig. 9 Component layout and printed-circuit board for 175 MHz test circuit.

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.

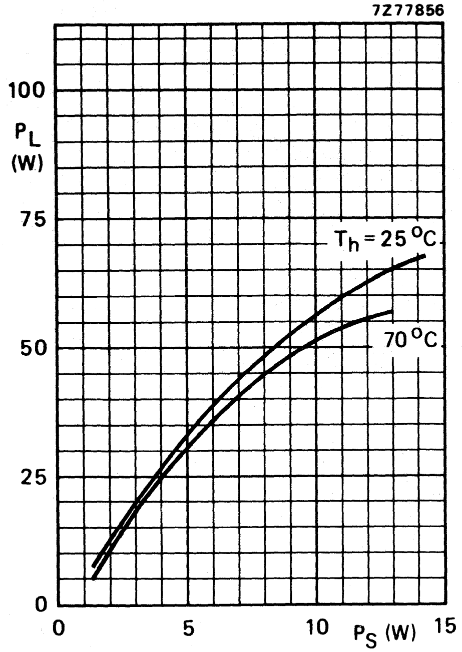


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

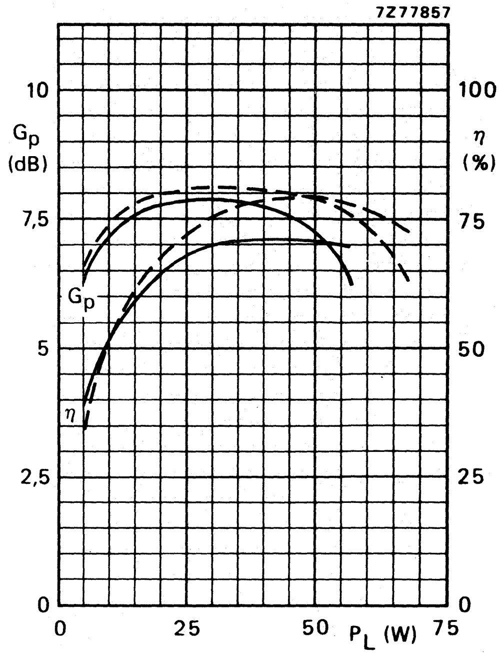


Fig. 11 Typical values; V_{CE} = 28 V; f = 175 MHz;
– – – T_h = 25 °C; —— T_h = 70 °C.

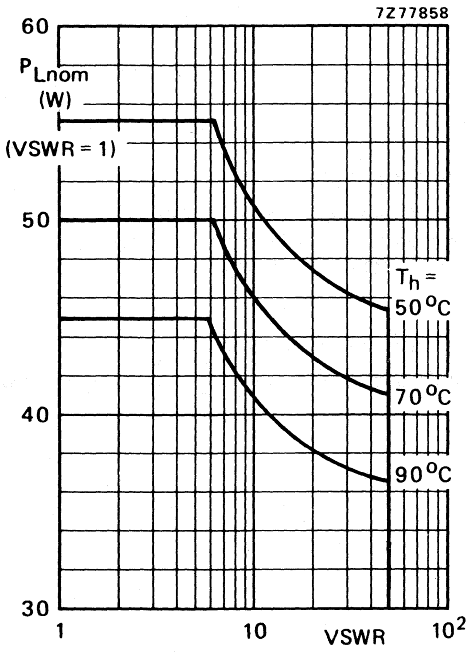


Fig. 12 R.F. SOAR; c.w. class-B operation;
f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb-h}$ = 0,45 K/W.
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

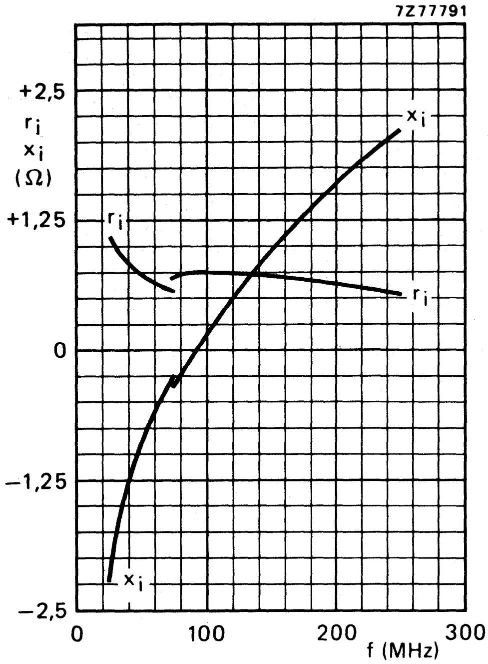


Fig. 13 Input impedance (series components).

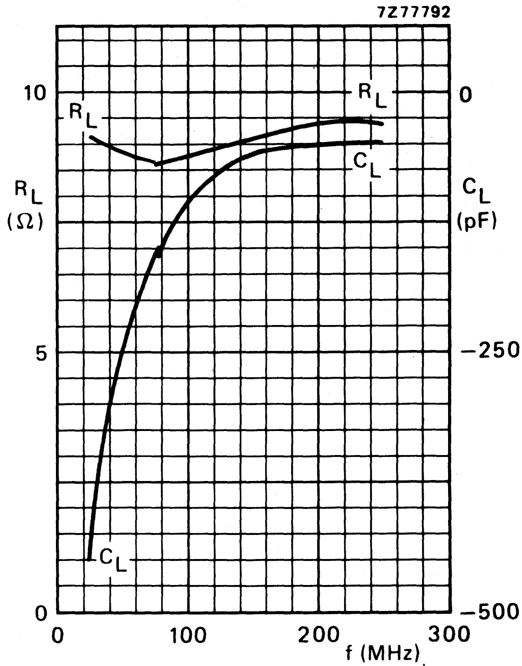


Fig. 14 Load impedance (parallel components).

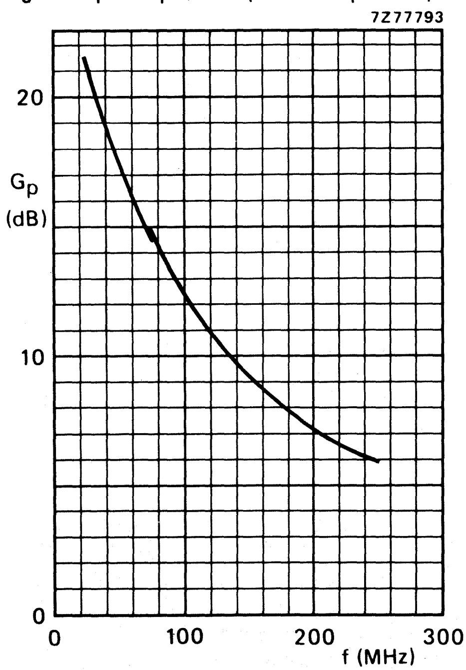


Fig. 15 Power gain versus frequency.

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 V; P_L = 45 W; T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt}(%) at 42,5 W (P.E.P)	I_C (A) at 42,5 W (P.E.P)	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

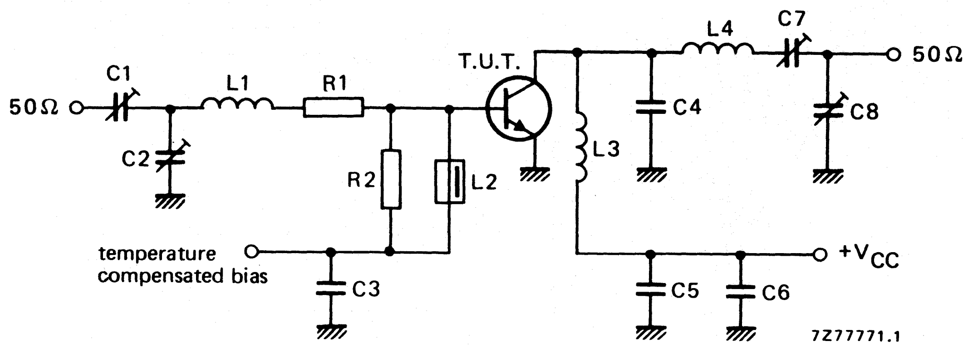


Fig. 16 Test circuit; s.s.b. class-AB.

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.

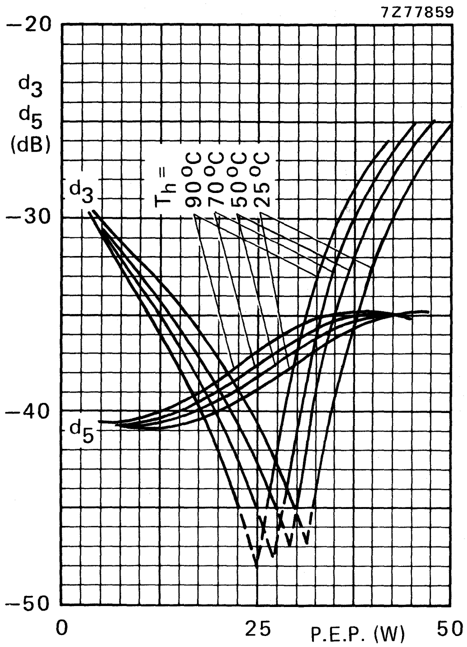


Fig. 17 Intermodulation distortion as a function of output power.*

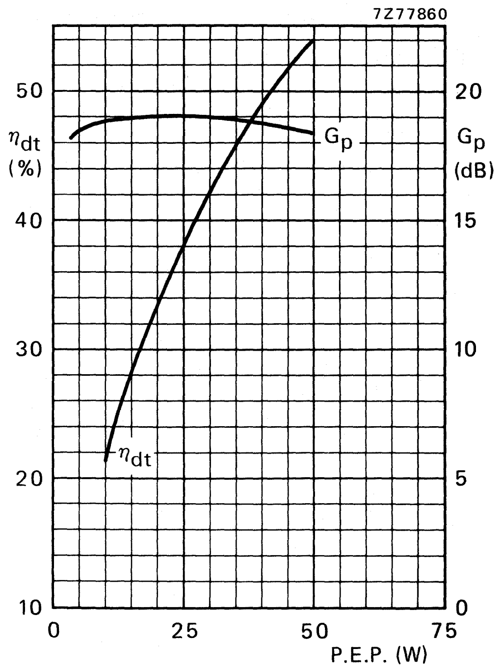


Fig. 18 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 17:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 18:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 70 °C; typical values.

* See note on previous page.

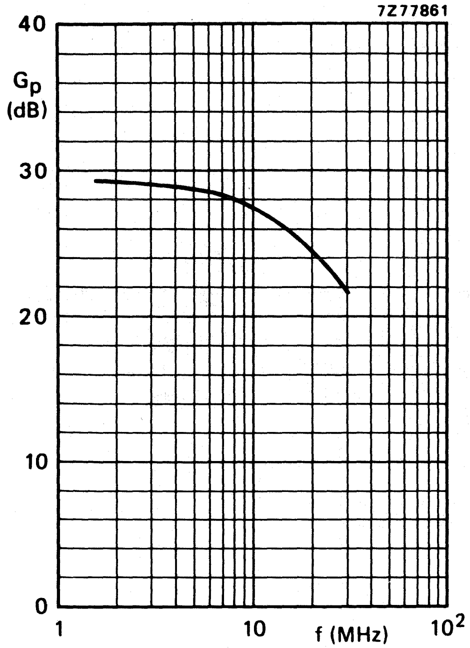


Fig. 19 Power gain as a function of frequency.

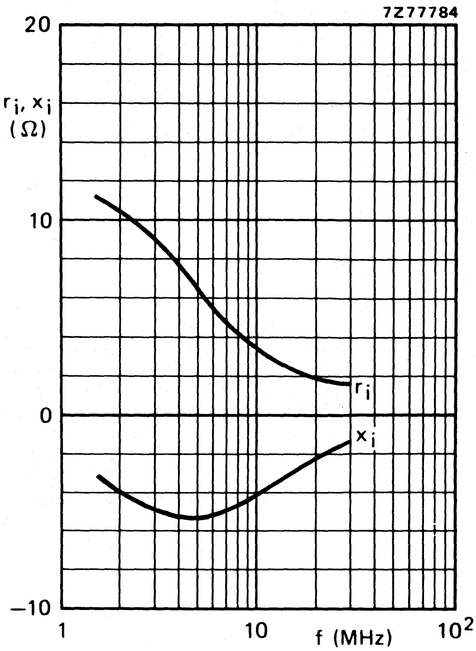


Fig. 20 Input impedance (series components) as a function of frequency.

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 42,5 W; T_h = 25 °C; Z_L = 7,4 Ω.

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 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; T_h = 70 °C and P_{Lnom} = 45 W P.E.P.

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 26 V; T_h = 70 °C; f_1 = 28,000 MHz; f_2 = 28,001 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

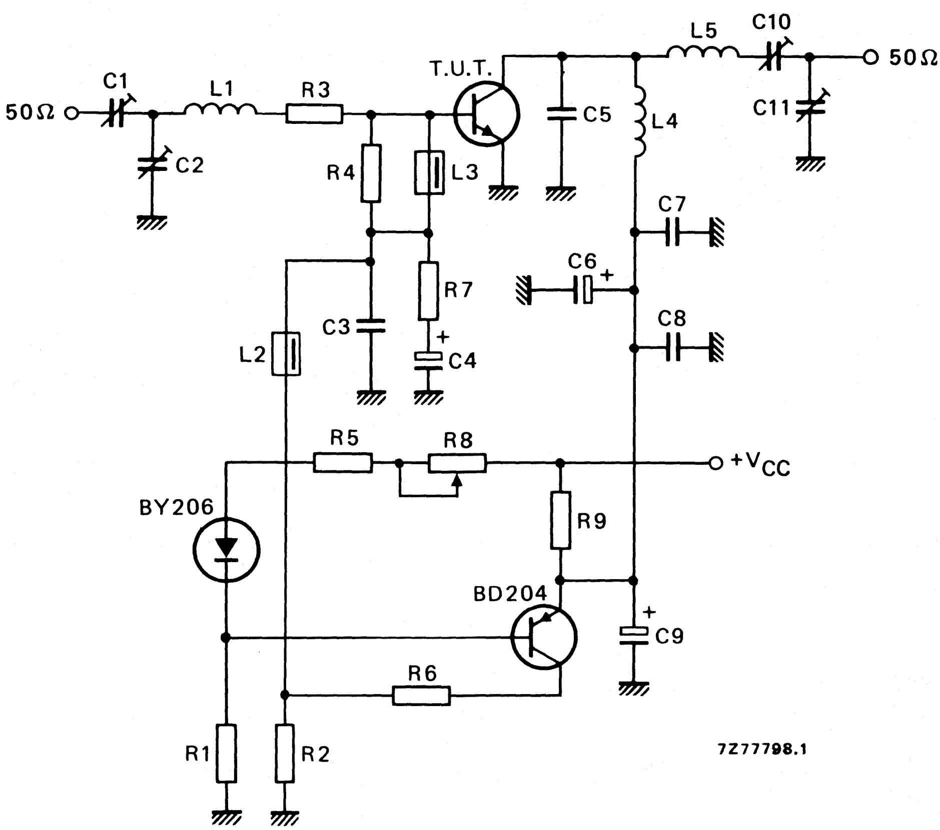


Fig. 21 Test circuit; s.s.b. class-A.

* 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 μF/10 V electrolytic capacitor
C5 = 56 pF ceramic capacitor (500 V)
C6 = 47 μF/35 V electrolytic capacitor
C7 = C8 = 220 nF polyester capacitor
C9 = 10 μF/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 kΩ carbon resistors (± 5% ; 0,5 W each)
R2 = 15 Ω carbon resistor (± 5% ; 0,25 W)
R3 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors (± 5% ; 0,125 W each)
R4 = 33 Ω carbon resistor (± 5% ; 0,25 W)
R5 = 18 Ω carbon resistor (± 5% ; 0,25 W)
R6 = 120 Ω wirewound resistor (± 5% ; 5,5 W)
R7 = 1 Ω carbon resistor (± 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 (± 5% ; 5,5 W each)

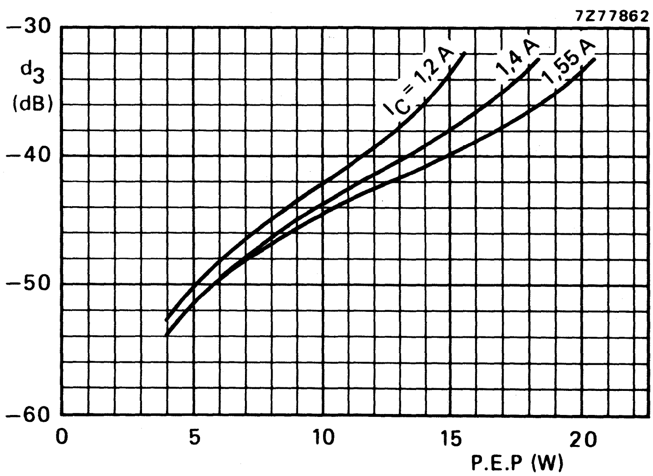


Fig. 22 Intermodulation distortion as a function of output power. Typical values; V_{CE} = 26 V; T_h = 70 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

U.H.F. 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 ¼″ capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

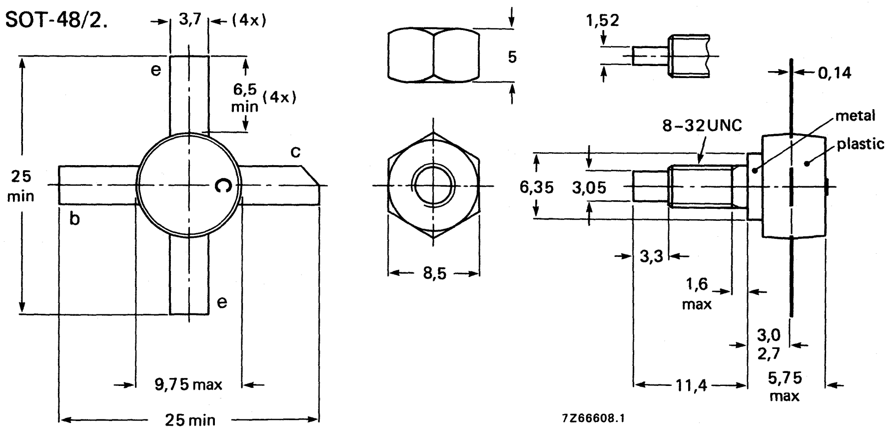
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A	860	25	850	70	−60	> 3,5	> 5,0
class-A	860	25	850	70	−60	typ. 4,0	typ. 5,5

* 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

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.

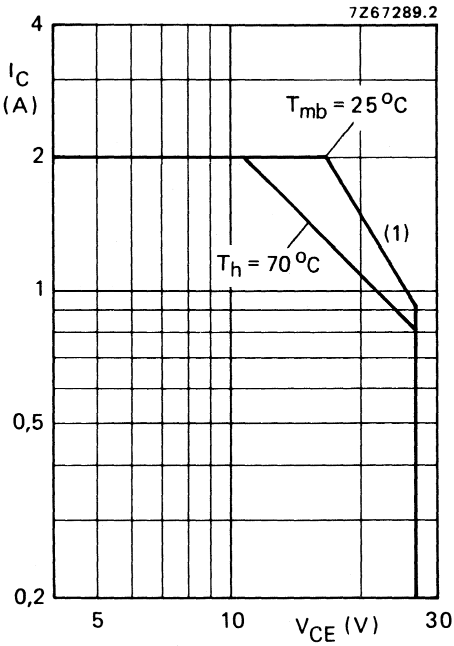
When locking is required an adhesive is preferred instead of a lock washer.

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.

RATINGS

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

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	50	V
open base	V_{CEO}	max.	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 $T_h = 70\ ^oC$	P_{tot}	max.	21,5	W
Storage temperature	T_{stg}	−65 to + 200		^oC
Junction temperature	T_j	max.	200	^oC



(1) Second breakdown limit (independent of temperature.

Fig. 2 D.C. SOAR.

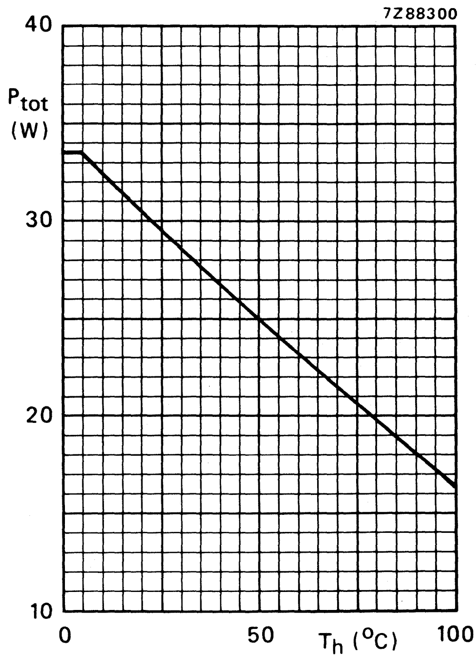


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (dissipation = 21,25 W; $T_{mb} = 82,75\ ^oC$, i.e. $T_h = 70\ ^oC$).

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	5,45	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

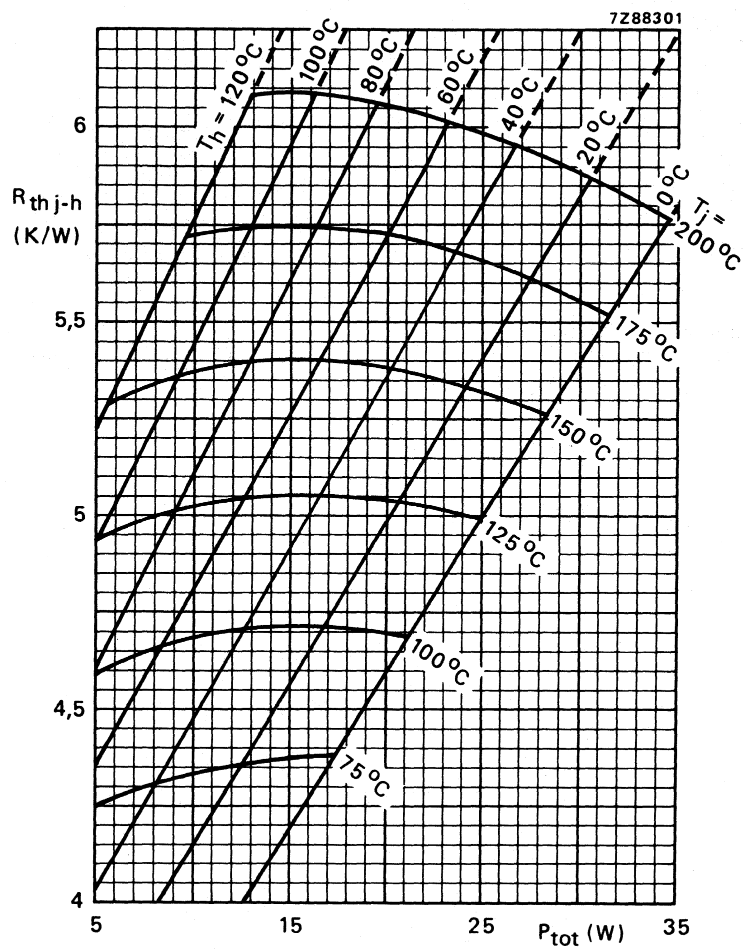


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,6 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 850 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j\text{-}h}$	max.	6,05 K/W
	T_j	max.	200 °C
Typical device:	$R_{th\ j\text{-}h}$	typ.	5,35 K/W
	T_j	typ.	183 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 25 mA	$V_{(BR)CEO}$	>	27 V
Emitter-base breakdown voltage			
open collector; I_E = 5 mA	$V_{(BR)EBO}$	>	3,5 V
D.C. current gain*		>	15
I_C = 850 mA; V_{CE} = 25 V	h_{FE}	typ.	40
Collector-emitter saturation voltage*			
I_C = 500 mA; I_B = 100 mA	V_{CEsat}	typ.	0,25 V
Transition frequency at f = 500 MHz**			
$-I_E$ = 850 mA; V_{CB} = 25 V	f_T	typ.	2,5 GHz
Collector capacitance at f = 1 MHz		typ.	24 pF
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	<	30 pF
Feedback capacitance at f = 1 MHz			
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	15 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

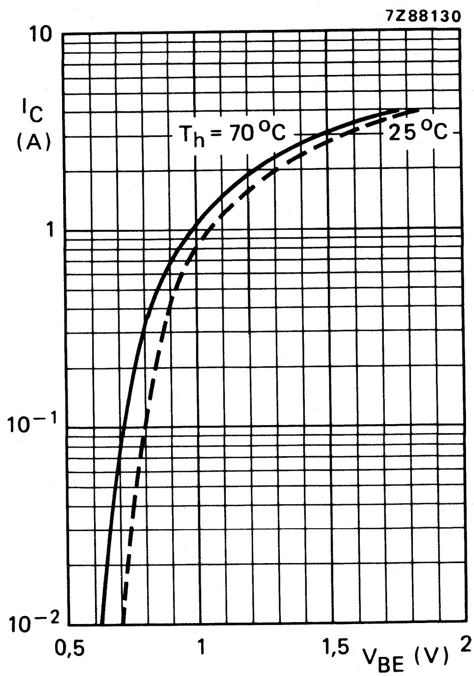


Fig. 5 Typical values; V_{CE} = 25 V.

* Measured under pulse conditions: $t_p \leq 300\ \mu s$; $\delta \leq 0,02$.
** Measured under pulse conditions: $t_p \leq 50\ \mu s$; $\delta \leq 0,01$.

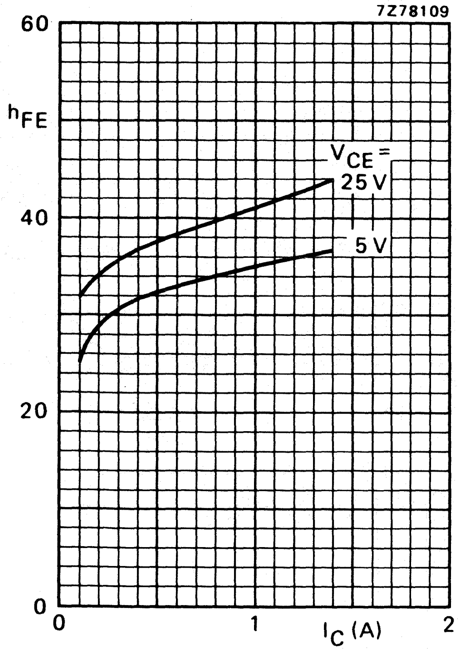


Fig. 6 Typical values; T_j = 25 °C.

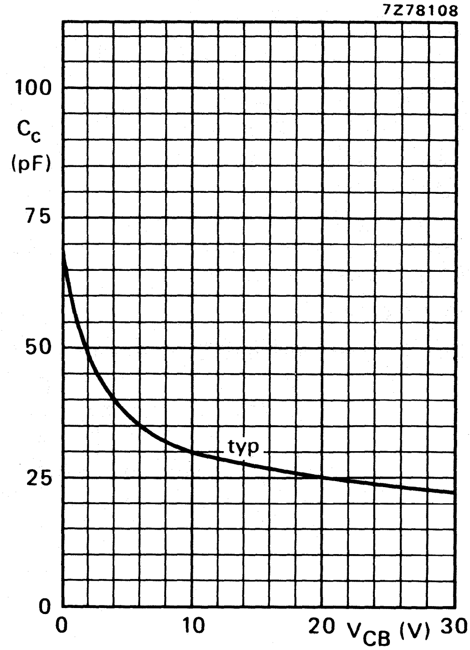


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

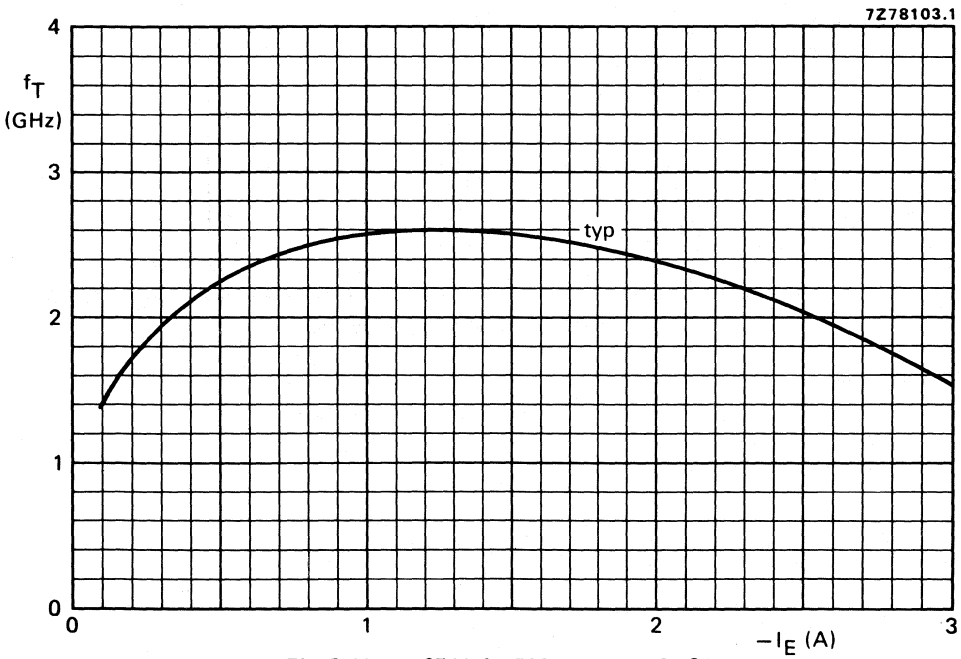


Fig. 8 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

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)*	$P_{o\,sync}$ (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.

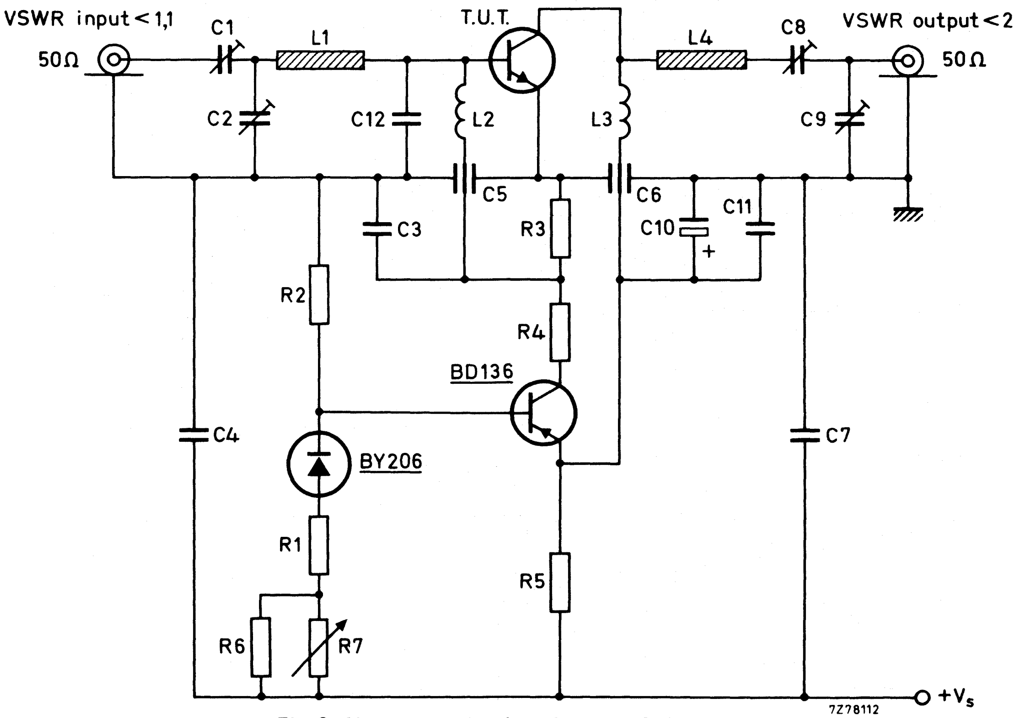


Fig. 9 Class-A test circuit at f_{vision} = 860 MHz.

List of components:

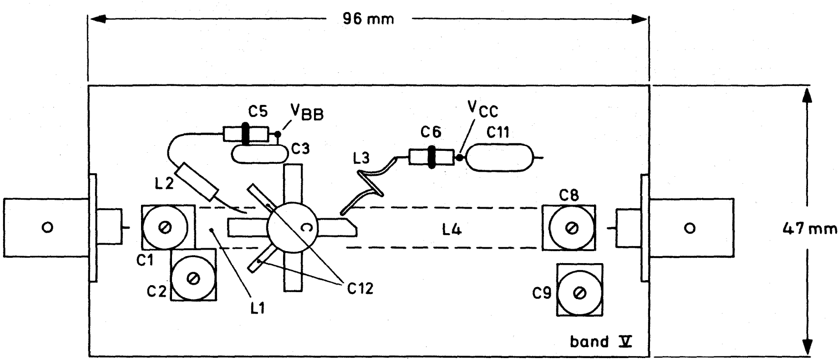
C1 = C2 = 1,4 to 5,5 pF film dielectric trimmer (cat.no. 2222 809 09001)
C3 = C4 = 100 nF polyester capacitor
C5 = C6 = 1 nF feed-through capacitor
C7 = 5,6 pF ceramic capacitor
C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C9 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C10 = 10 μF/40 V solid aluminium electrolytic capacitor
C11 = 470 nF polyester capacitor
C12 = 2 x 3,3 pF chip capacitors (in parallel)

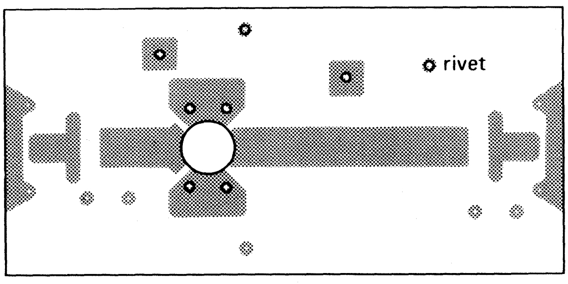
List of components: (continued)

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)
R5 = 4 x 12 Ω carbon resistors in parallel (1 W each)
R6 = 1 kΩ carbon resistor (0,25 W)
R7 = 220 Ω carbon potentiometer (0,25 W)

L1 = stripline (13,6 mm x 6,9 mm)
L2 = microchoke 0,47 μH (cat. no. 4322 057 04770)
L3 = 1 turn Cu wire (1 mm); internal diameter 5,5 mm; leads 2 x 5 mm
L4 = stripline (40,8 mm x 6,9 mm)

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1,5 mm.





Note
Hole in printed-circuit board: ϕ 9,7 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.

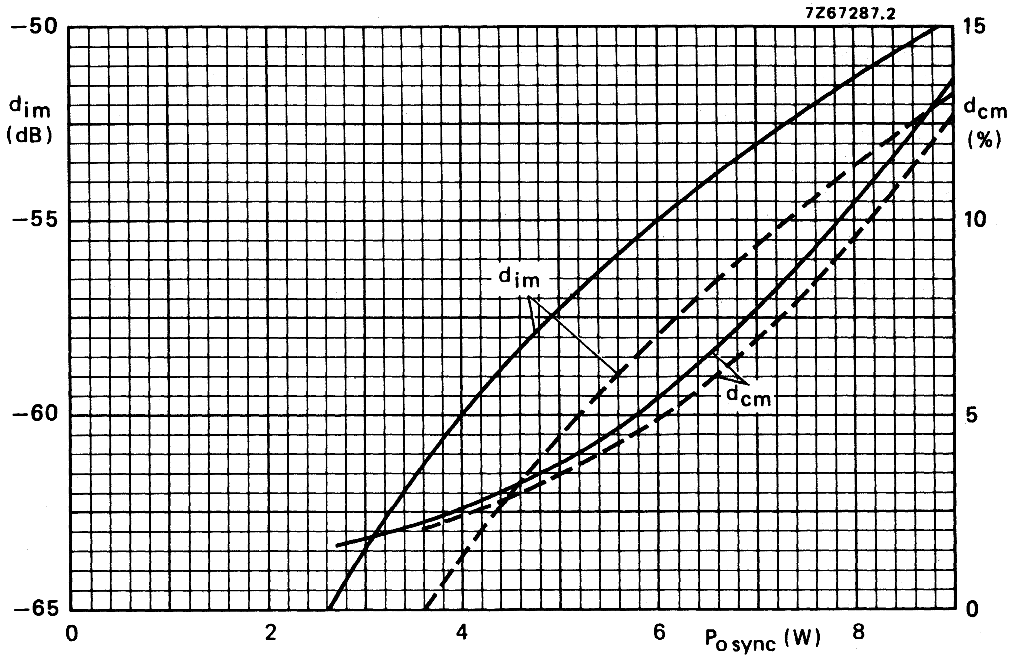


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of $P_{o\ sync}$. Typical values; V_{CE} = 25 C; I_C = 850 mA; – – – T_h = 25 °C; —— T_h = 70 °C; f_{vision} = 860 MHz.

* 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.

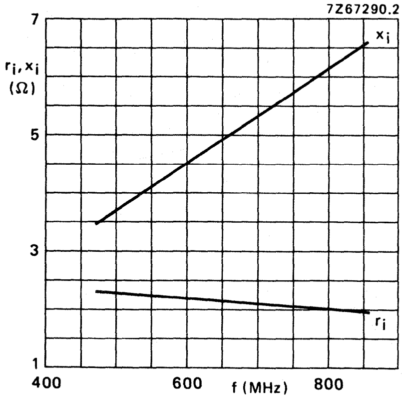


Fig. 12 Input impedance (series components).

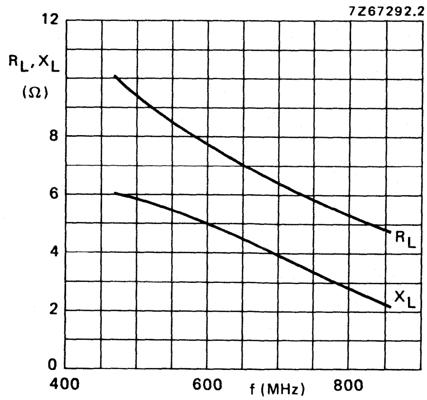


Fig. 13 Load impedance (series components).

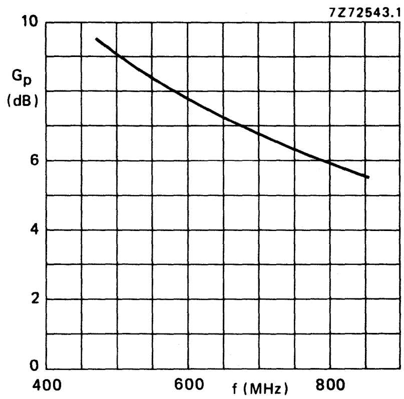


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 V; I_C = 850 mA; class-A operation; T_h = 70 °C.

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

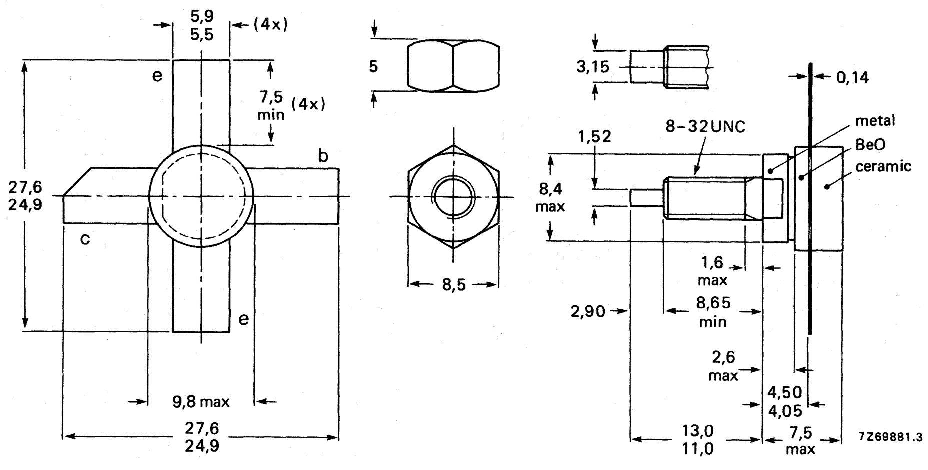
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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

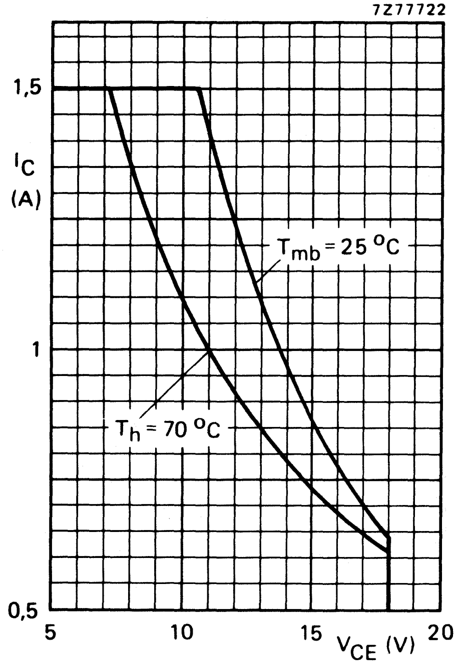


Fig. 2 D.C. SOAR.

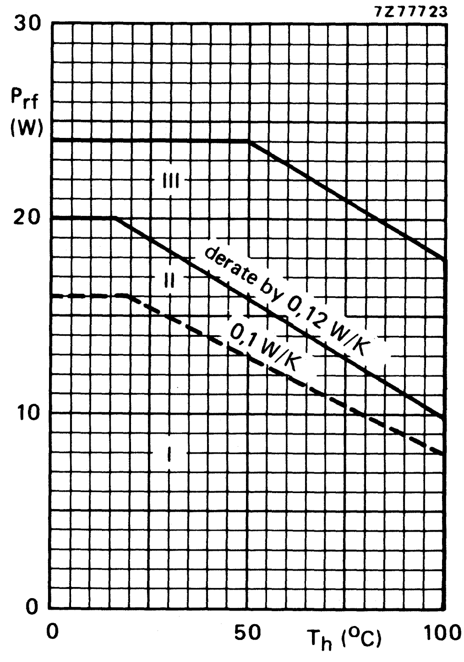


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 16,5 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

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)	$R_{th\ j\text{-}mb(dc)}$	=	10,7	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	8,6	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 5$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	2 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	0,5 mJ
D.C. current gain * $I_C = 0,75$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40 10 to 100
Collector-emitter saturation voltage * $I_C = 2$ A; $I_B = 0,4$ A	V_{CEsat}	typ.	0,85 V
Transition frequency at f = 100 MHz * $-I_E = 0,75$ A; $V_{CB} = 13,5$ V	f_T	typ.	950 MHz
$-I_E = 2$ A; $V_{CB} = 13,5$ V	f_T	typ.	850 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c	typ.	16,5 pF
Feedback capacitance at f = 1 MHz $I_C = 100$ mA; $V_{CE} = 13,5$ V	C_{re}	typ.	12 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

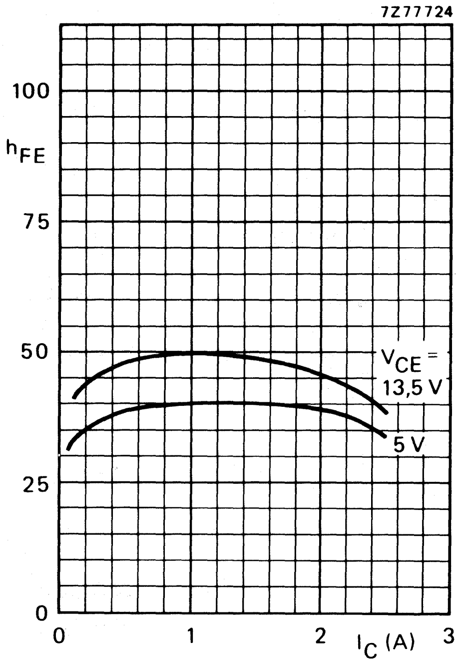


Fig. 4 Typical values; T_j = 25 °C.

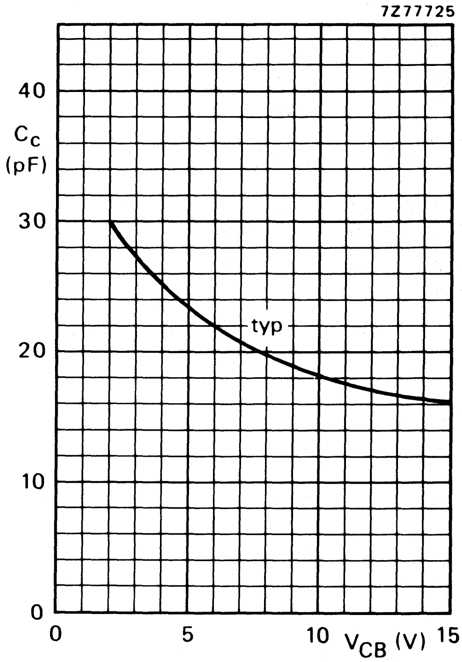


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

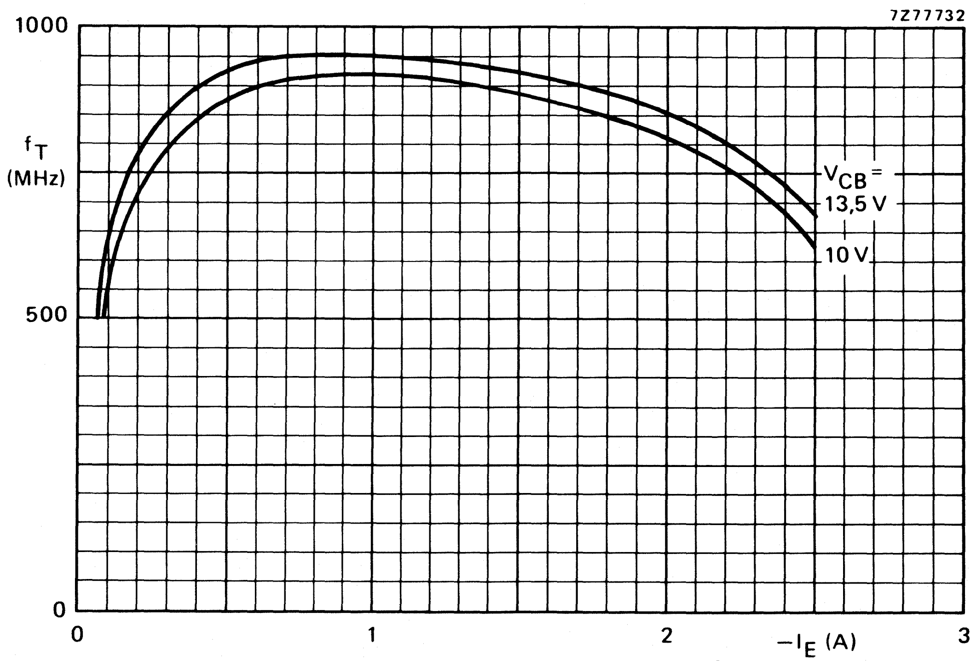


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	–	–

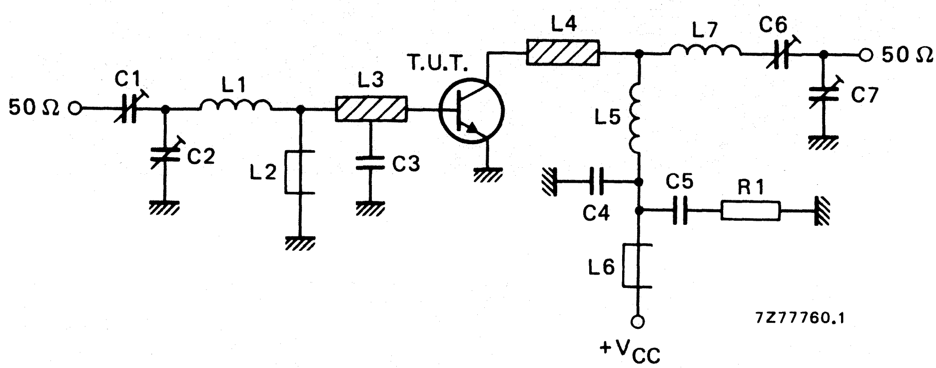


Fig. 7 Test circuit; c.w. class-B.

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.

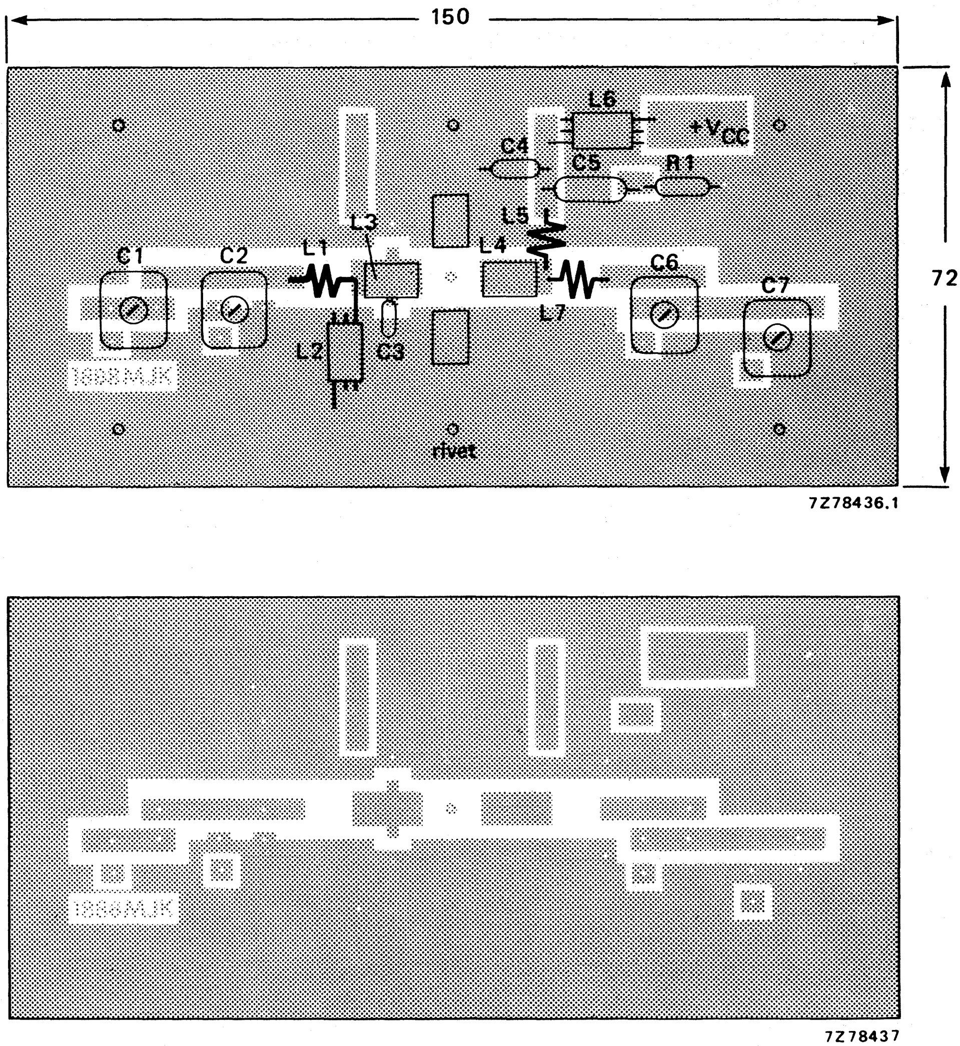


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

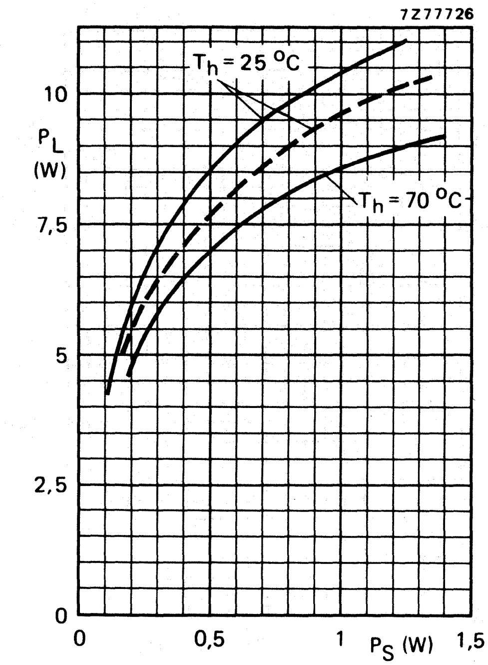


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

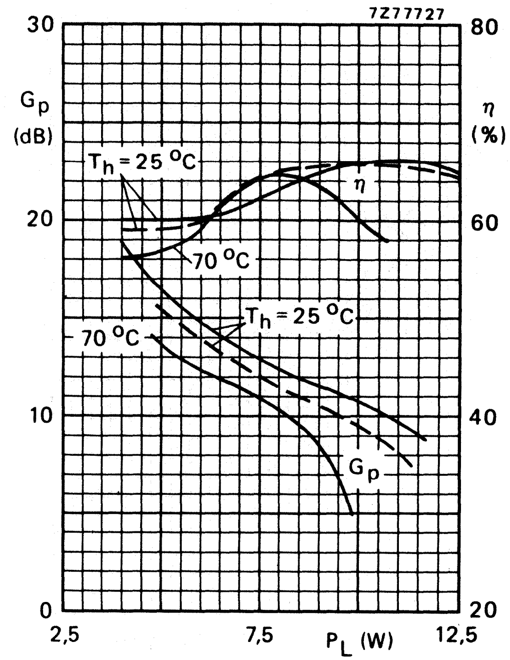


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

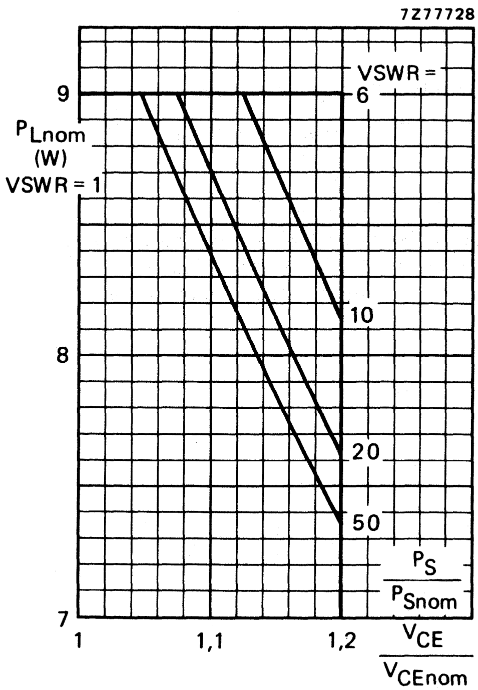


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,45 K/W ; V_{CEnom} = 13,5 V or 12,5 V; P_S = P_{Snom} at V_{CEnom} and VSWR = 1.

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.

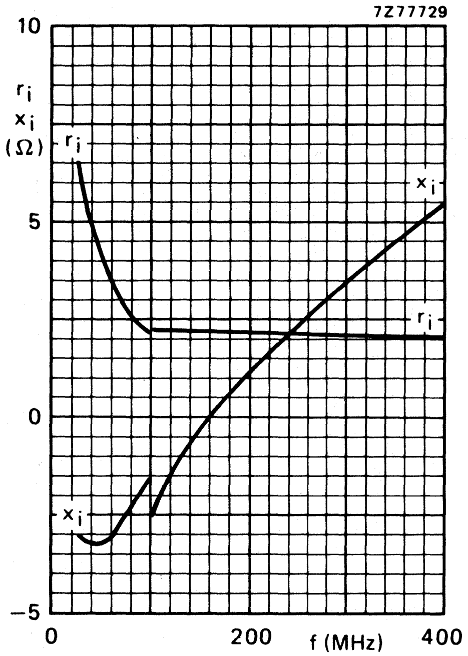


Fig. 12 Input impedance (series components).

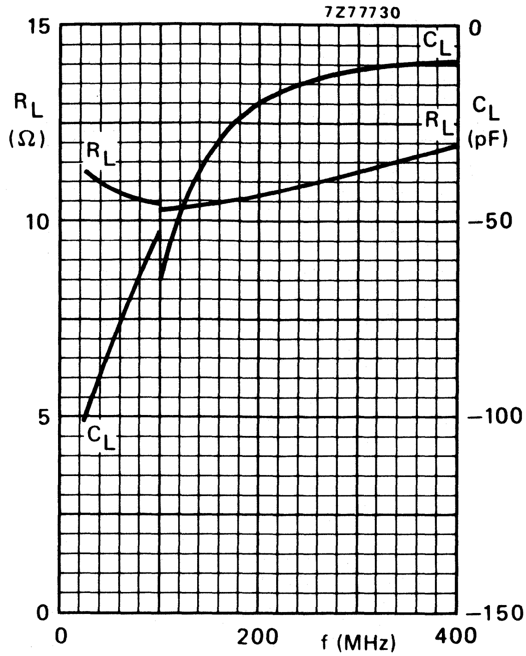


Fig. 13 Load impedance (parallel components).

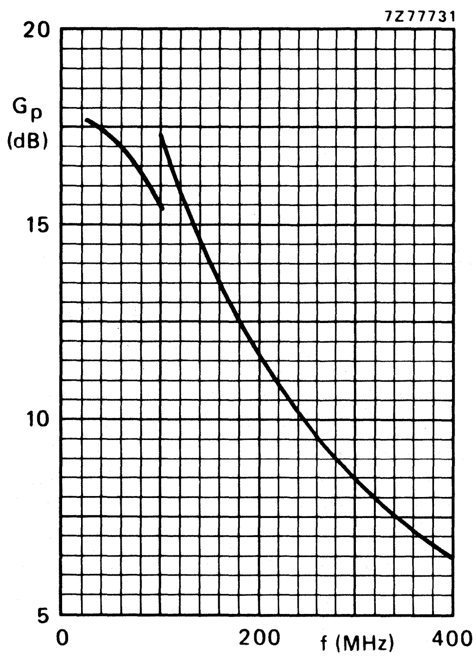


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 8 W; T_h = 25 °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 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 ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

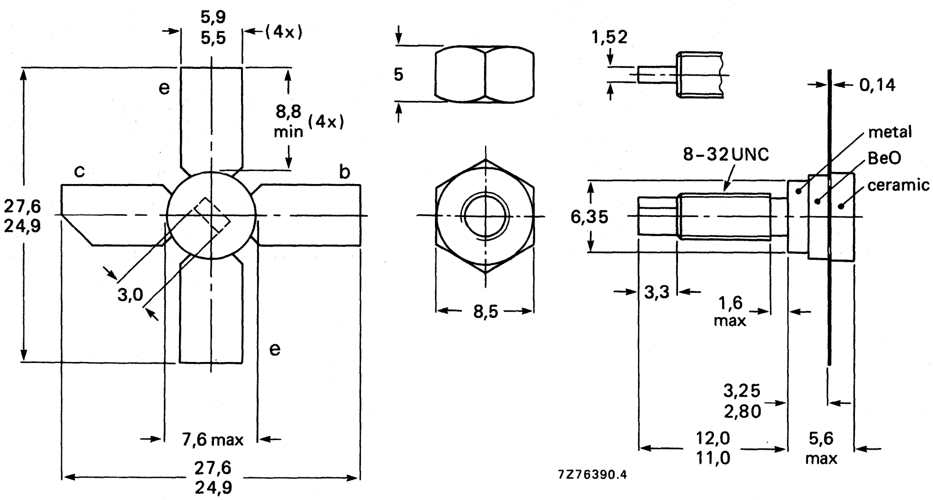
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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 SOT122A.



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

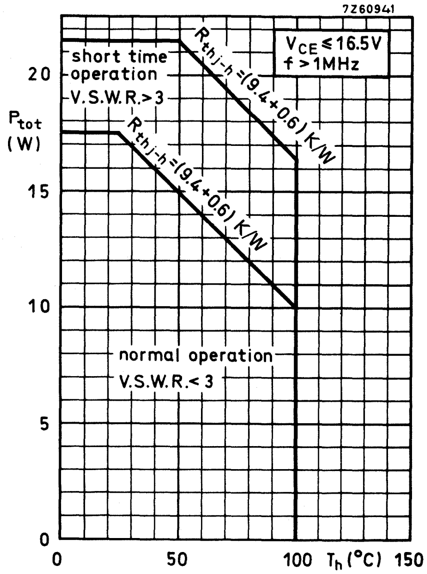
Diameter of clearance hole in heatsink: max. 4,2 mm. Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

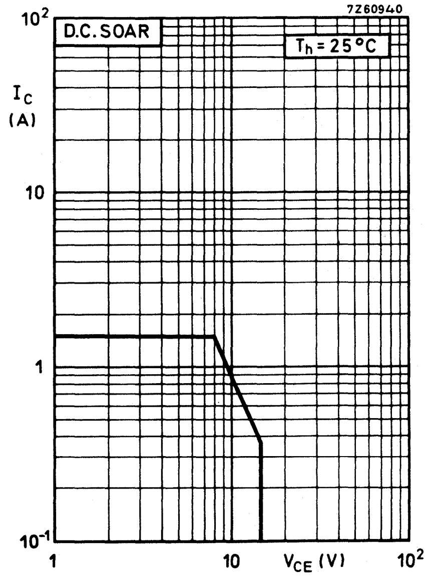
When locking is required an adhesive is preferred instead of a lock washer.

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 (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 °C f > 1 MHz	P_{tot}	max.	17.5	W





Storage temperature	T_{stg}		−30 to +200	°C
Operating junction temperature	T_j	max.	200	°C

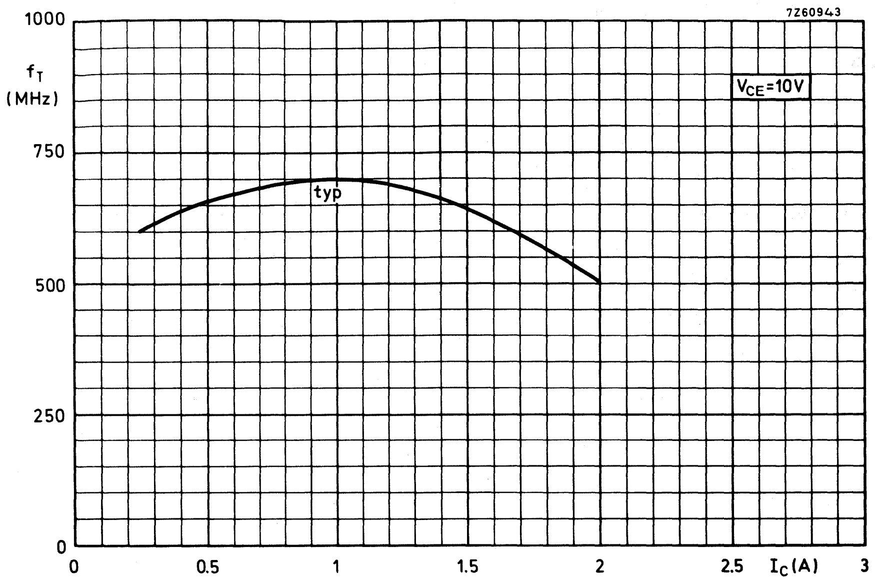
THERMAL RESISTANCE

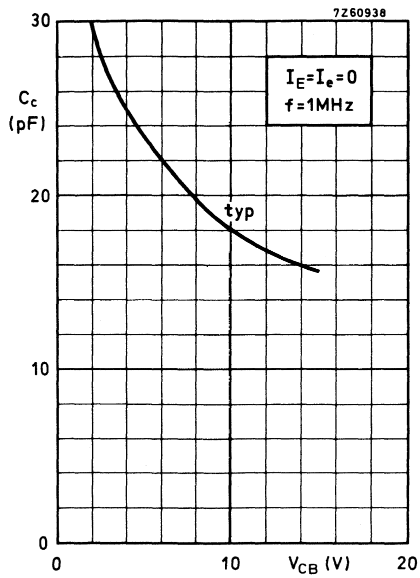
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	9.4	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0.6	K/W

CHARACTERISTICS

T_j = 25°C unless otherwise specified

Collector cut-off current				
$I_B = 0$; $V_{CE} = 14$ V	I_{CEO}	<	5	mA
Breakdown voltages				
Collector-base voltage open emitter, $I_C = 1$ mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base, $I_C = 10$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	0.5	mS
$-V_{BE} = 1.5$ V; $R_{BE} = 33\,\Omega$	E	>	0.5	mS
D.C. current gain				
$I_C = 500$ mA; $V_{CE} = 5$ V	h_{FE}	>	5	
Transition frequency				
$I_C = 500$ mA; $V_{CE} = 10$ V	f_T	typ.	700	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ. <	15 20	pF pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 15$ V	$-C_{re}$	typ.	11	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z60943
1000
f_T
(MHz)
750
500
250
0
0
0.5
1
1.5
2
2.5
I_C (A)
3
V_{CE}=10V
typ


7Z60938
30
C_c
(pF)
20
10
0
0
10
V_{CB} (V)
20
I_E=I_e=0
f=1MHz
typ

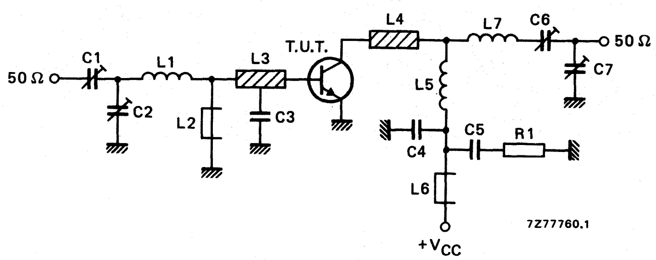
APPLICATION INFORMATION

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

f = 175 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)
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



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

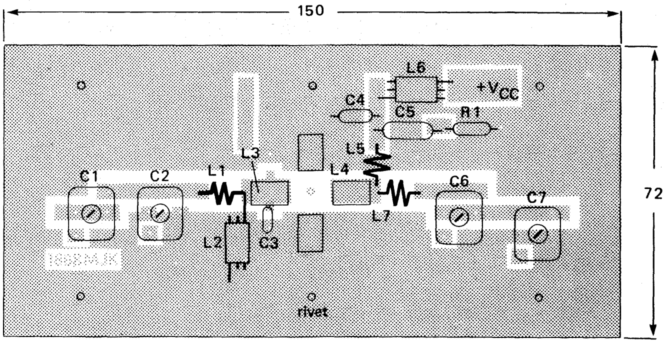
L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistor

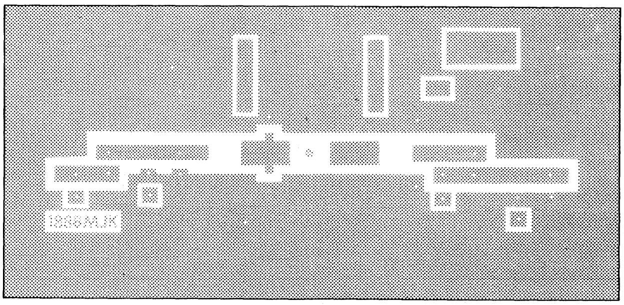
Component layout and printed-circuit board for 175 MHz test circuit see following page.

APPLICATION INFORMATION (continued)

Component layout and printed circuit board for 175 MHz test circuit.



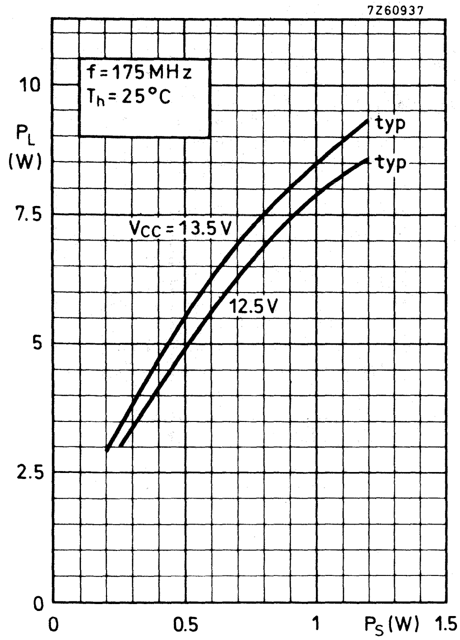
7Z78436.1

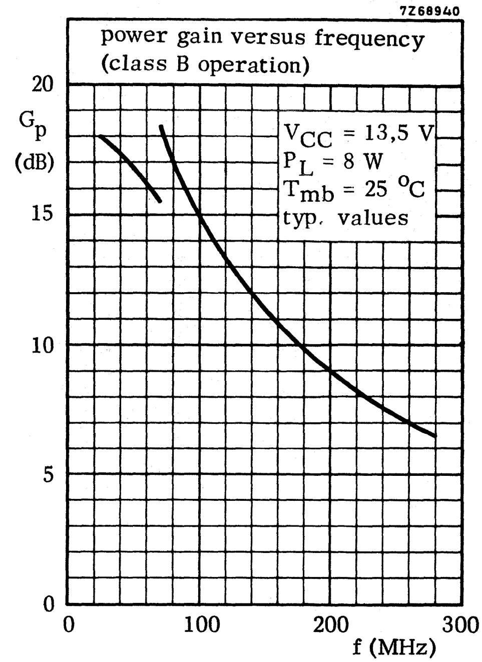


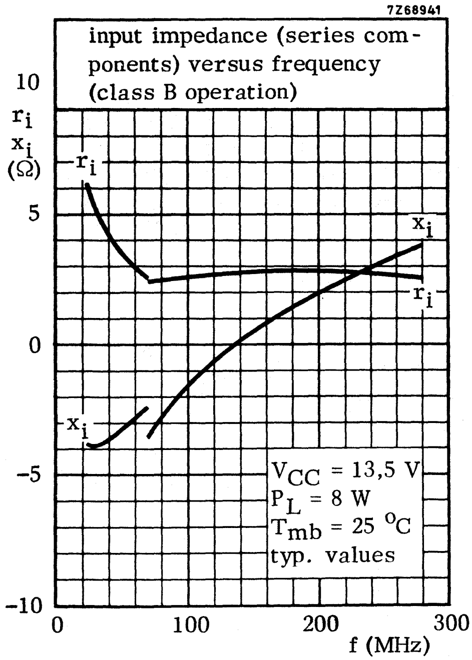
7Z78437

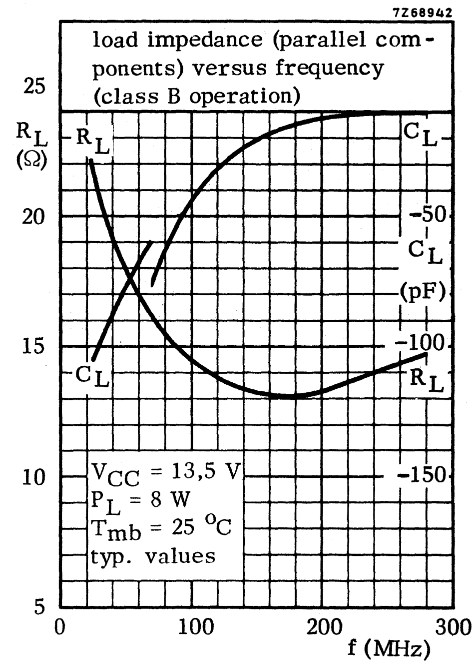
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

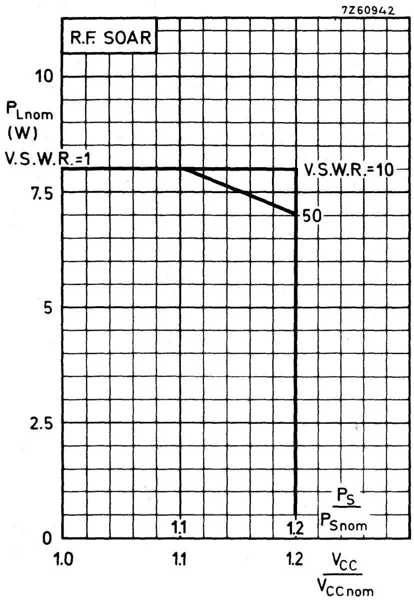
OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.

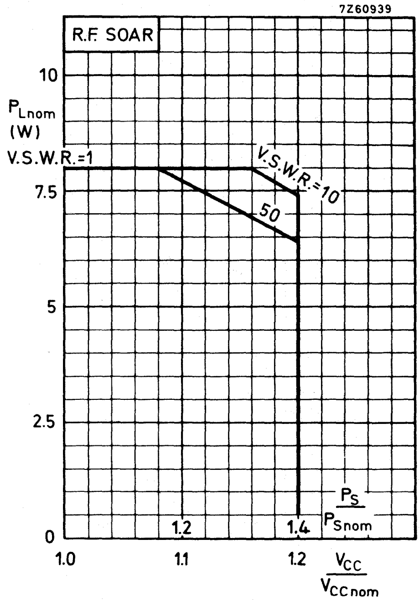












Conditions for R.F. SOAR:

f = 175 MHz
T_h = 70 °C
V_{CCnom} = 12.5 or 13.5 V
$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.R. = 1
$R_{th\ mb\text{-}h}$ = 0.6 K/W

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

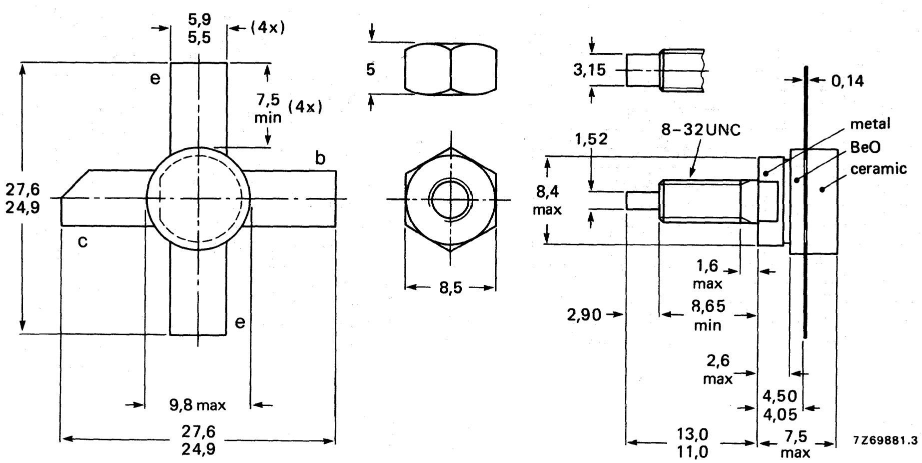
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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

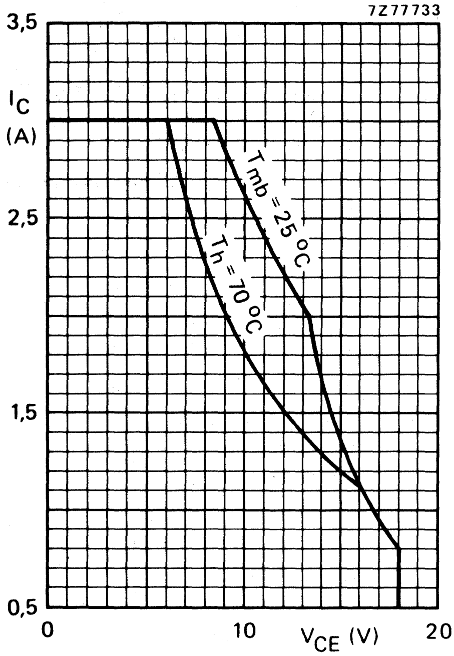


Fig. 2 D.C. SOAR.

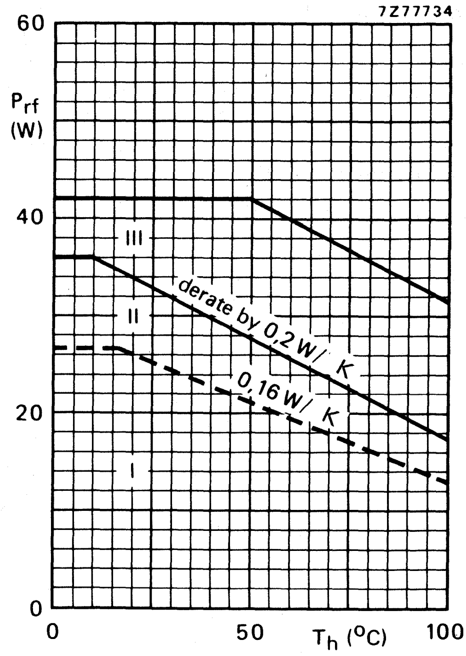


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 16,5$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

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

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	= 6,55	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	= 4,95	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	= 0,45	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; $I_E = 4$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	4 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	2,5 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	2,5 mJ
D.C. current gain* $I_C = 1,5$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40 10 to 100
Collector-emitter saturation voltage* $I_C = 4,5$ A; $I_B = 0,9$ A	V_{CEsat}	typ.	1,0 V
Transition frequency at f = 100 MHz* $-I_E = 1,5$ A; $V_{CB} = 13,5$ V	f_T	typ.	850 MHz
$-I_E = 4,5$ A; $V_{CB} = 13,5$ V	f_T	typ.	800 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c	typ.	32 pF
Feedback capacitance at f = 1 MHz $I_C = 200$ mA; $V_{CE} = 13,5$ V	C_{re}	typ.	23 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

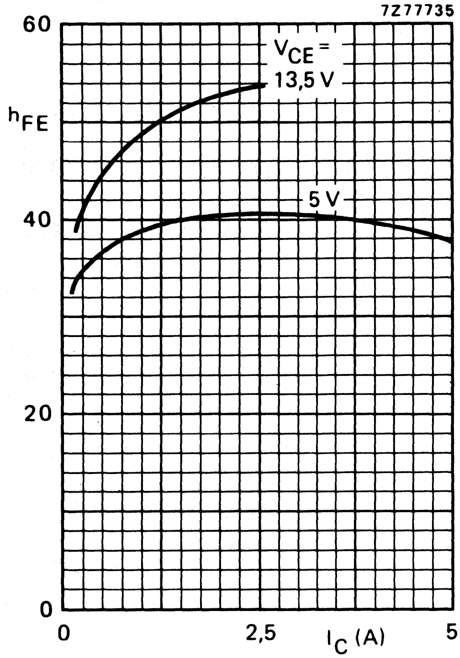


Fig. 4 Typical values; T_j = 25 °C.

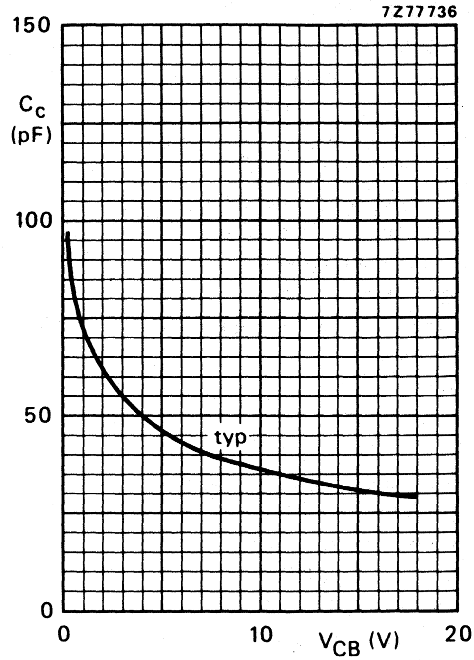


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

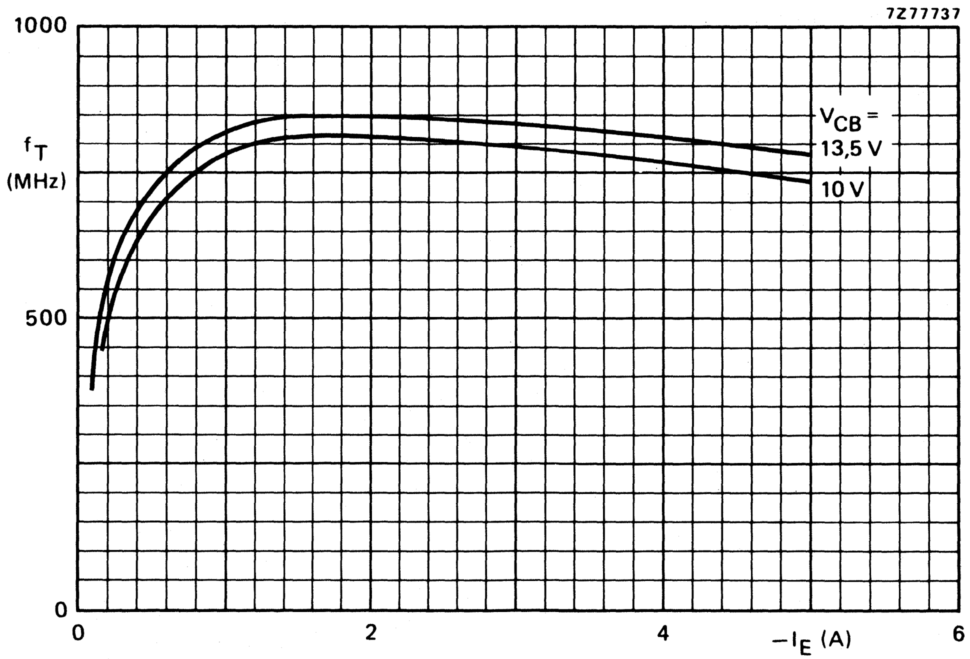


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

$T_h = 25\ ^oC$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (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	–	–

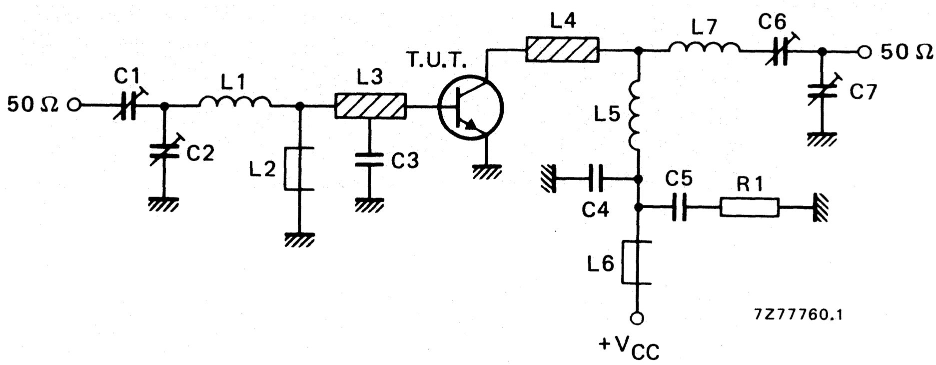


Fig. 7 Test circuit; c.w. class-B.

List of components:

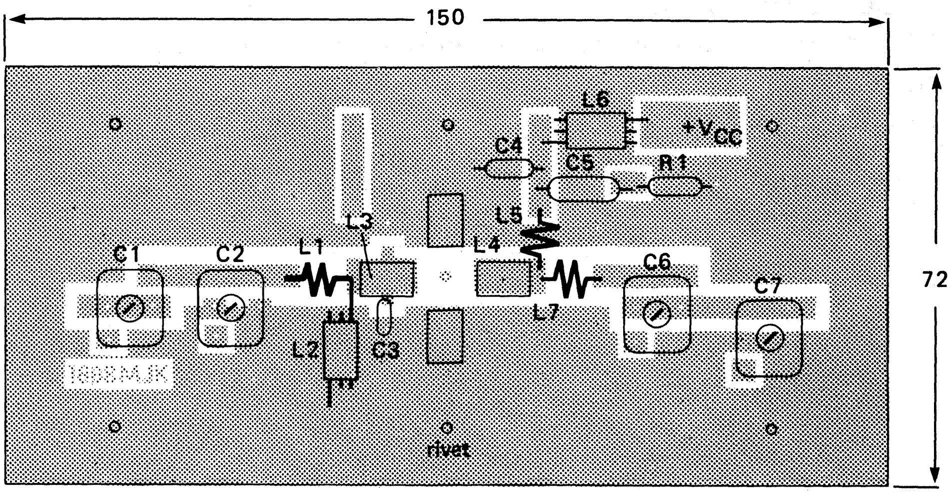
C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 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.



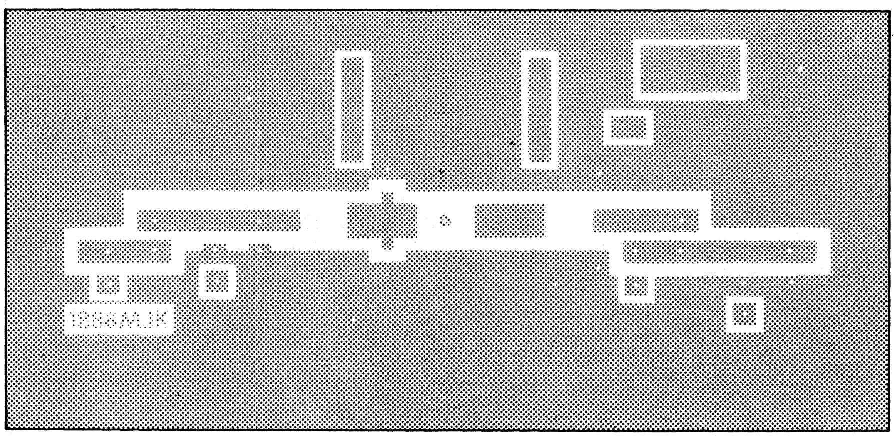


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

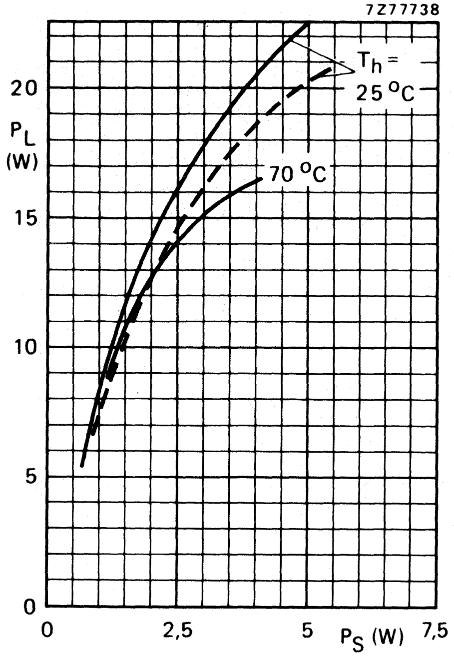


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – – V_{CE} = 12,5 V.

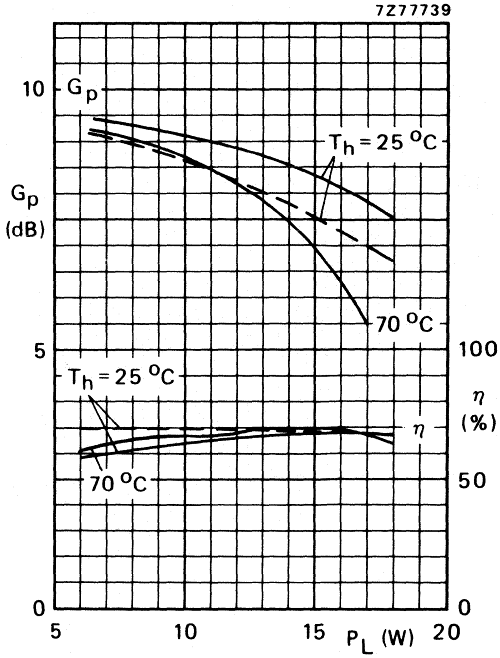


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – – V_{CE} = 12,5 V.

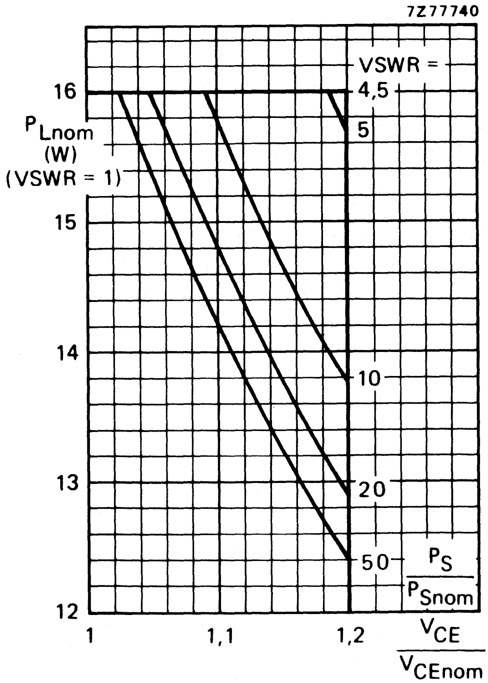


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,45 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

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.

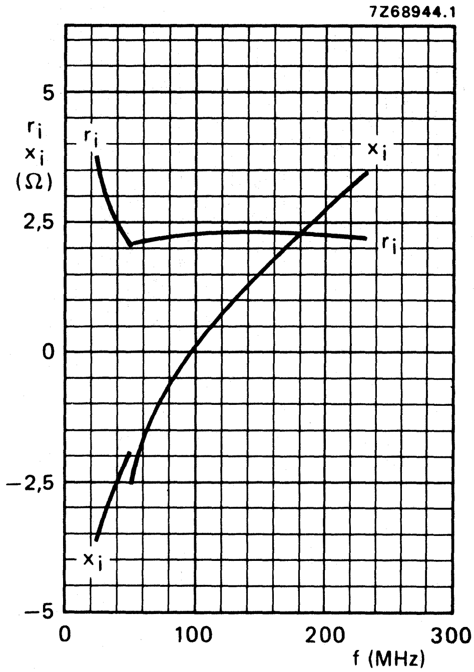


Fig. 12 Input impedance (series components).

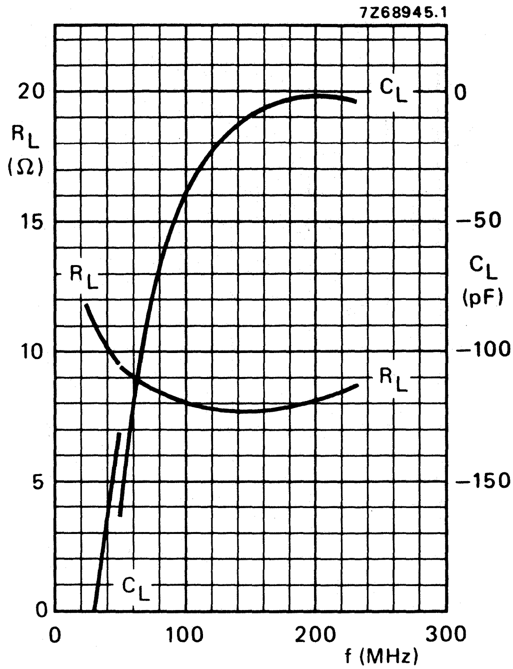


Fig. 13 Load impedance (parallel components).

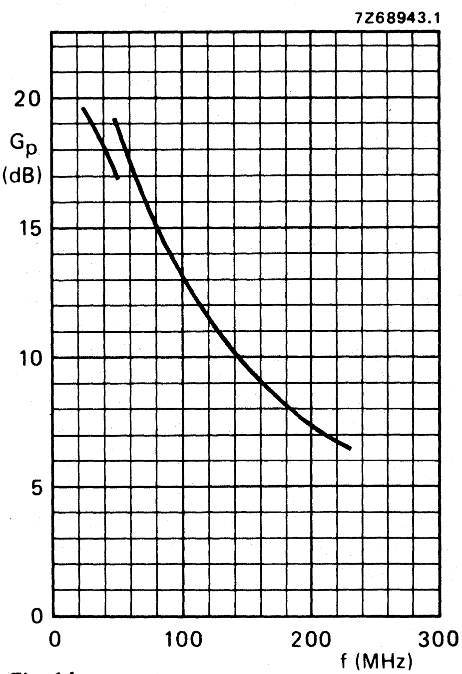


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values: V_{CE} = 13,5 V; P_L = 15 W;
T_h = 25 °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.

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 ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

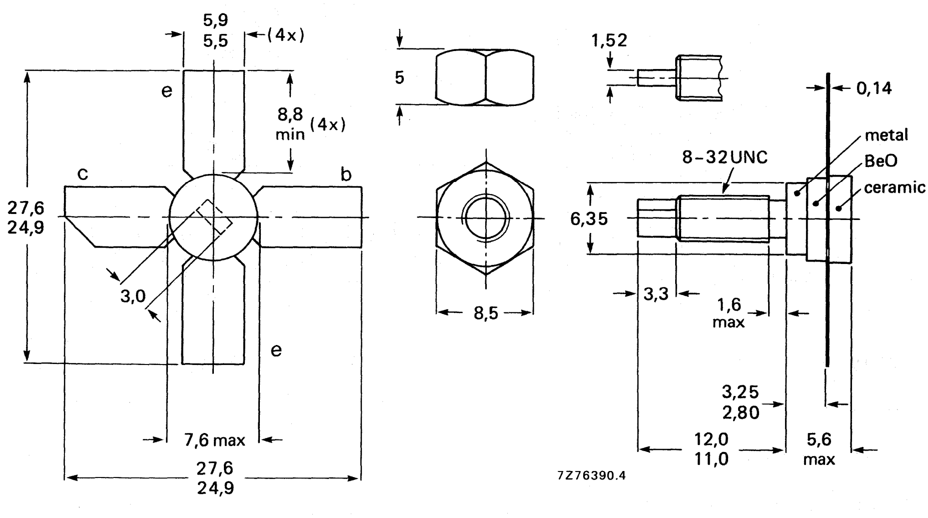
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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 SOT122A.



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

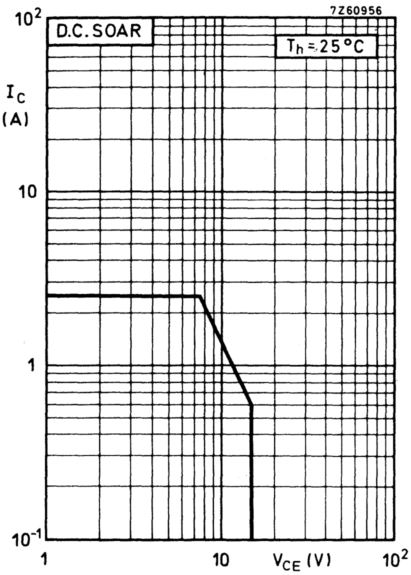
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

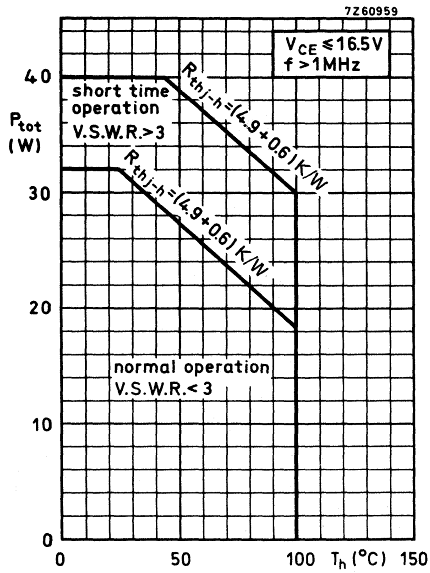
When locking is required an adhesive is preferred instead of a lock washer.

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 (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 °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

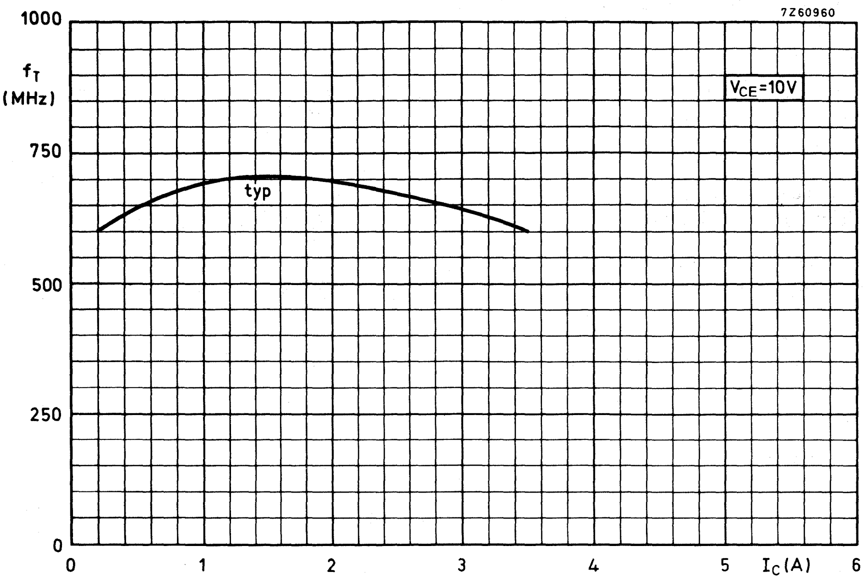
THERMAL RESISTANCE

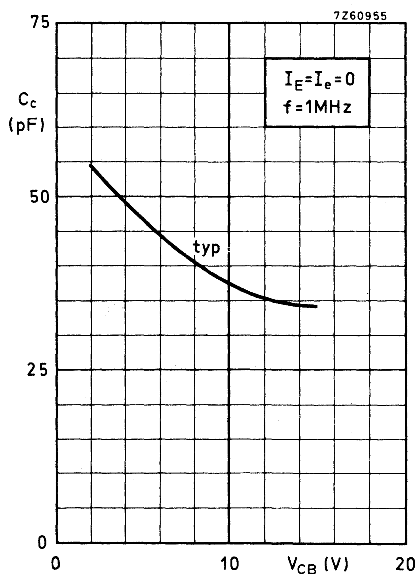
From junction to mounting base	$R_{th\,j\text{-}mb}$	=	4.9	K/W
From mounting base to heatsink	$R_{mb\text{-}h}$	=	0.6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_B = 0$; $V_{CE} = 14$ V	I_{CEO}	<	10	mA
Breakdown voltages				
Collector-base voltage, open emitter, $I_C = 3$ mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage, open base, $I_C = 25$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage, open collector; $I_E = 3$ mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
$L = 25$ mH; $f = 50$ Hz				
open base	E	>	2.0	mS
$-V_{BE} = 1.5$ V; $R_{BE} = 33\ \Omega$	E	>	4.5	mS
D.C. current gain				
$I_C = 500$ mA; $V_{CE} = 5$ V	h_{FE}	>	5	
Transition frequency				
$I_C = 1$ A; $V_{CE} = 10$ V	f_T	typ.	700	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ.	34	pF
		<	40	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 15$ V	$-C_{re}$	typ.	25	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z60960
1000
f_T
(MHz)
750
500
250
0
V_{CE}=10V
typ
0
1
2
3
4
5
I_C(A)
6


7Z60955
75
C_c
(pF)
50
25
0
I_E=I_e=0
f=1MHz
typ
0
10
V_{CB} (V)
20

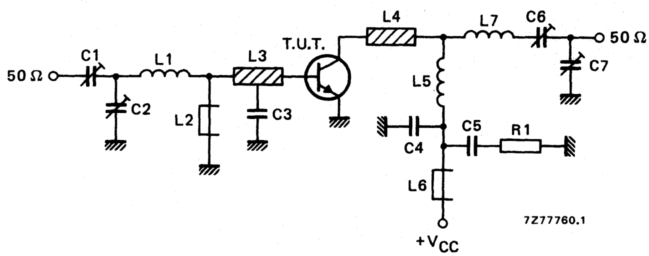
APPLICATION INFORMATION

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

f = 175 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)
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



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

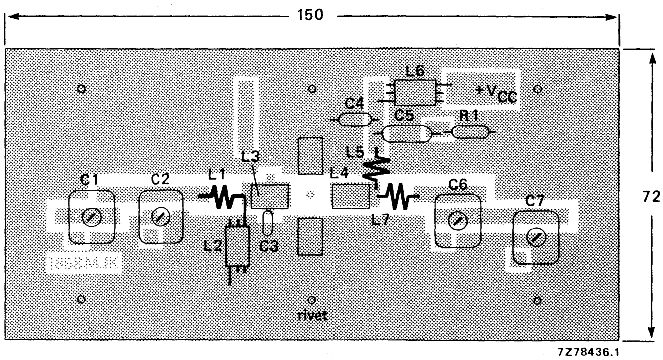
L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16″.

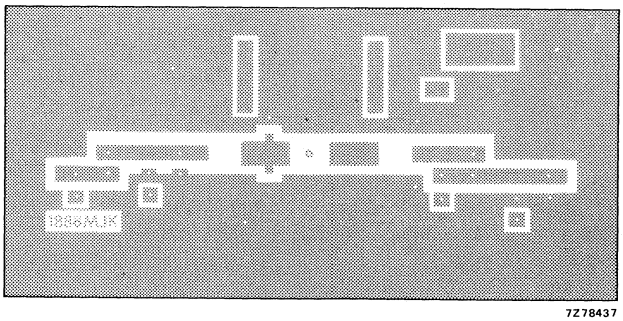
R1 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see following page.

APPLICATION INFORMATION (continued)

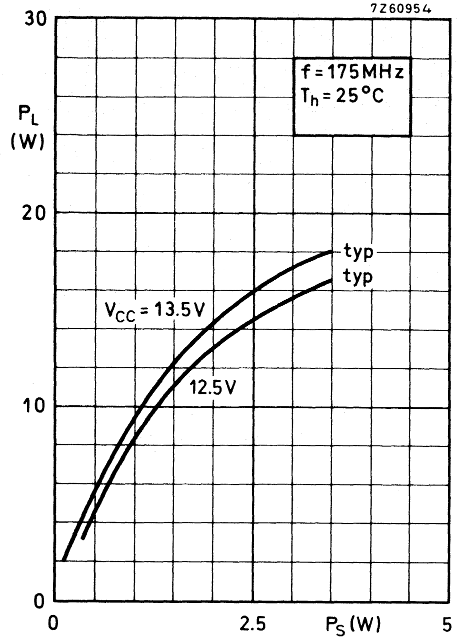
Component lay-out and printed circuit board for 175 MHz test circuit.

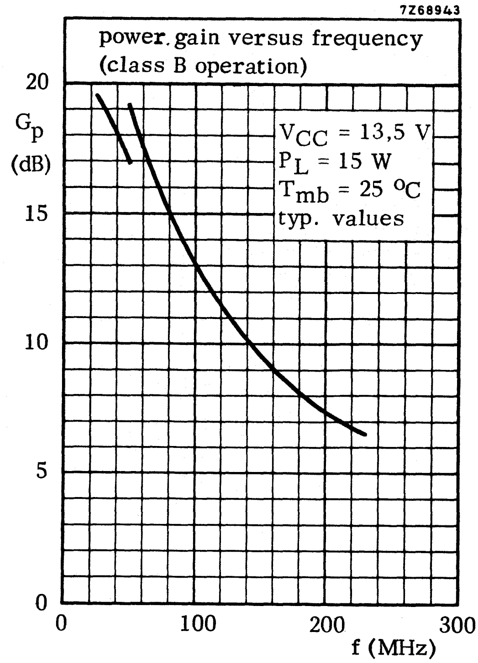


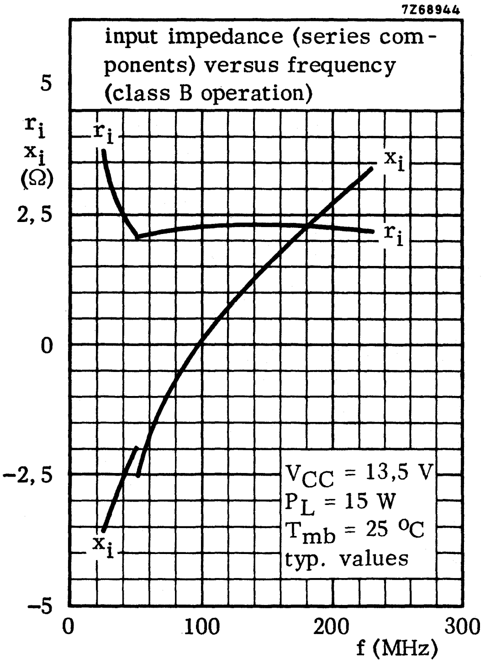


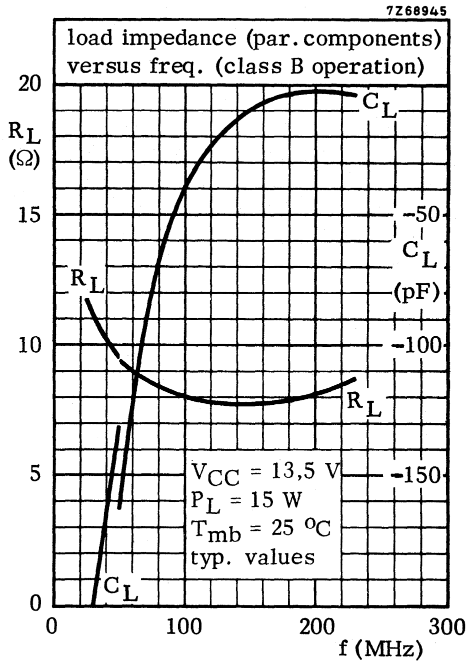
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

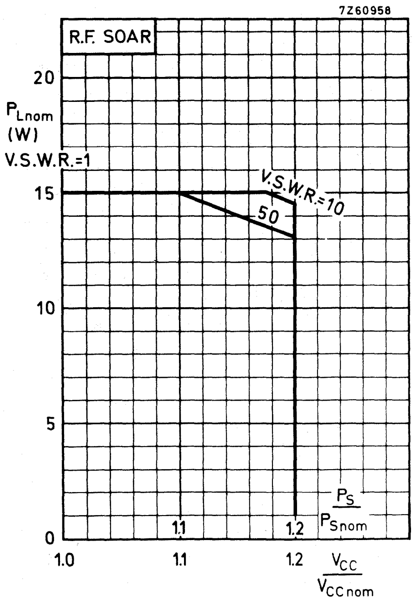
OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.

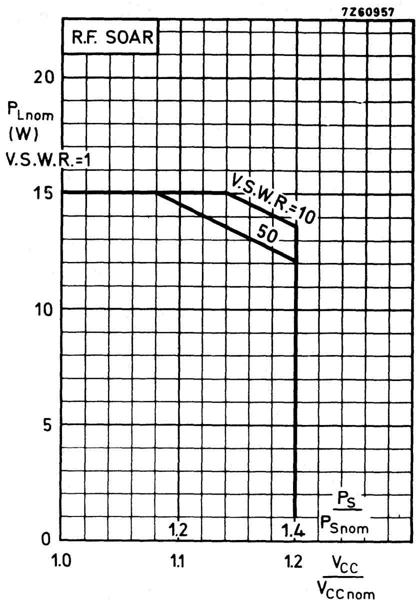












Conditions for R.F. SOAR:

f = 175 MHz
T_h = 70 °C
V_{CCnom} = 12.5 or 13.5V

$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.R. = 1
$R_{th\ mb-h}$ = 0.6 K/W

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, 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

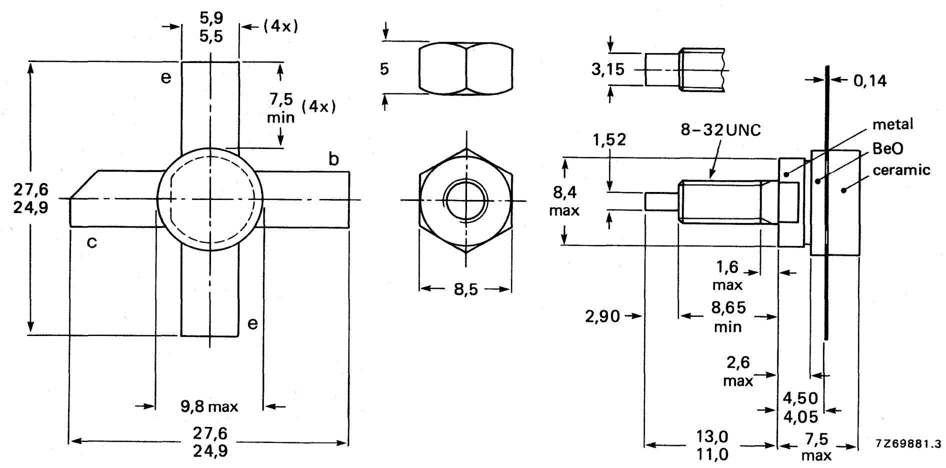
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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.

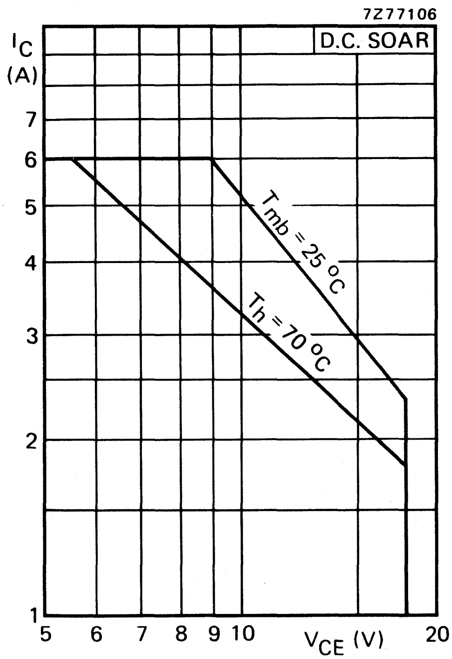
When locking is required an adhesive is preferred instead of a lock washer.

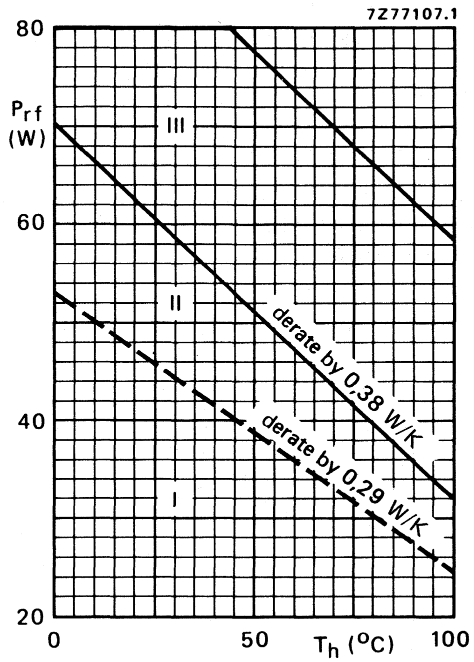
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

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; $V_{CE} \leqslant$ 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)	$R_{th\ j\text{-}mb(dc)}$	=	3,1 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,3 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45 K/W

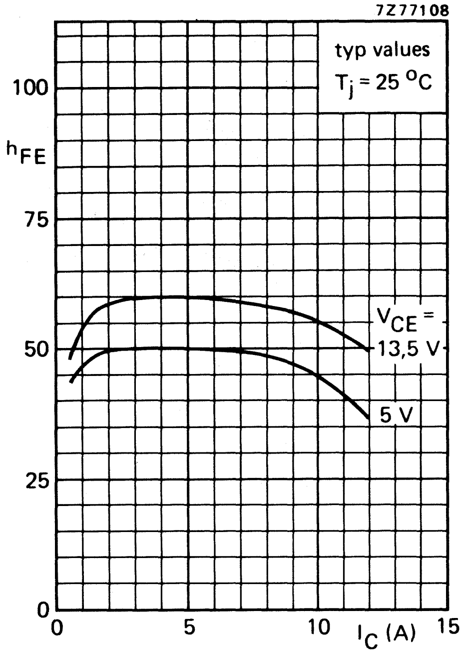
CHARACTERISTICS

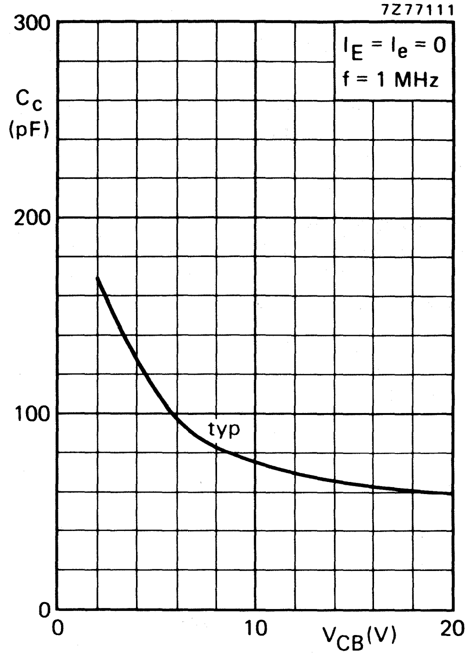
T_j = 25 °C

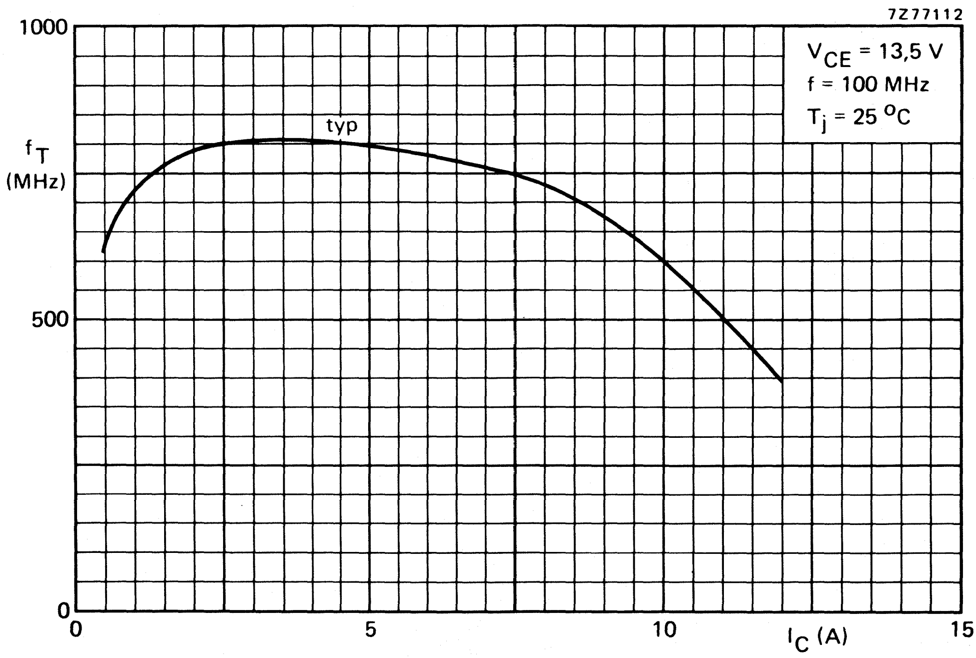
Breakdown voltage

Collector-emitter voltage V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	18 V
Emitter-base voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 18 V	I_{CES}	<	10 mA
Transient energy			
L = 25 mH; f = 50 Hz			
open base	E	>	8 ms
$-V_{BE}$ = 1,5 V; R_{BE} = 33 Ω	E	>	8 ms
D.C. current gain*			
I_C = 2,5 A; V_{CE} = 5 V	h_{FE}	typ	50
			10 to 80
Collector-emitter saturation voltage*			
I_C = 7,5 A; I_B = 1,5 A	V_{CEsat}	typ	1,7 V
Transition frequency at f = 100 MHz*			
I_C = 2,5 A; V_{CE} = 13,5 V	f_T	typ	800 MHz
I_C = 7,5 A; V_{CE} = 13,5 V	f_T	typ	750 MHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 15 V	C_c	typ	65 pF
		<	90 pF
Feedback capacitance at f = 1 MHz			
I_C = 100 mA; V_{CE} = 15 V	C_{re}	typ	41 pF
Collector-stud capacitance	C_{cs}	typ	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.


7Z77108
typ values
T_j = 25 °C
100
h_{FE}
75
50
25
0
V_{CE} =
13,5 V
5 V
0
5
10
I_C (A)
15


7Z77111
300
$I_E = I_e = 0$
f = 1 MHz
C_c
(pF)
200
100
typ
0
0
10
V_{CB}(V)
20


7Z77112
1000
V_{CE} = 13,5 V
f = 100 MHz
T_j = 25 °C
typ
f_T
(MHz)
500
0
0
5
10
I_C (A)
15

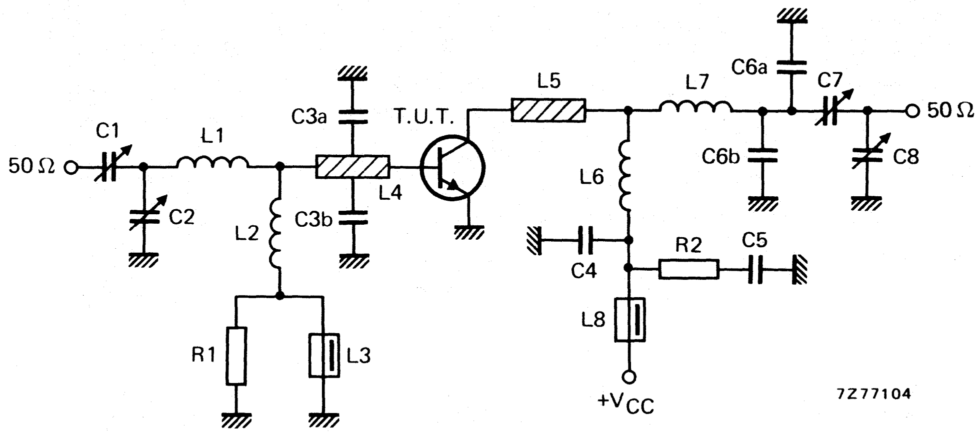
APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CC}(V)	P_L(W)	P_S(W)	G_p(dB)	I_C(A)	η (%)	$\overline{z_i}$(Ω)	$\overline{Y_L}$ (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



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)

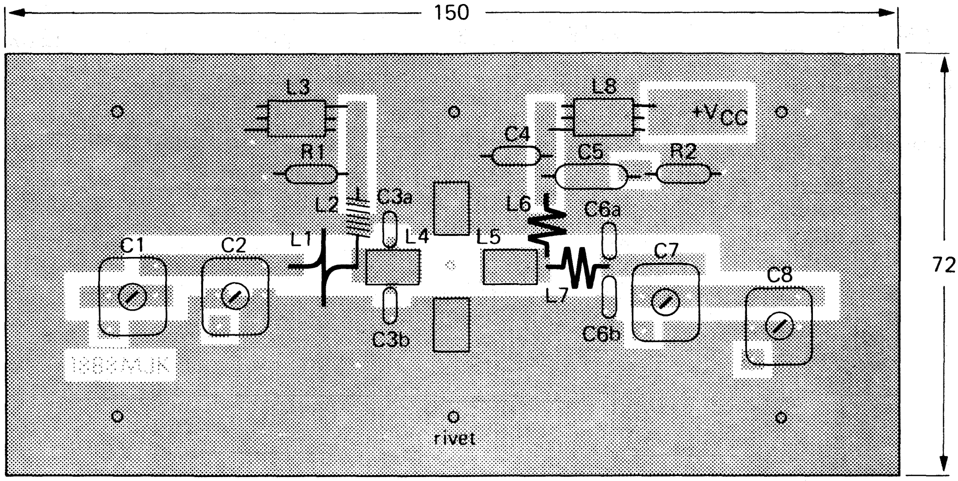
L1 = 1 turn enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube choke coil (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
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".

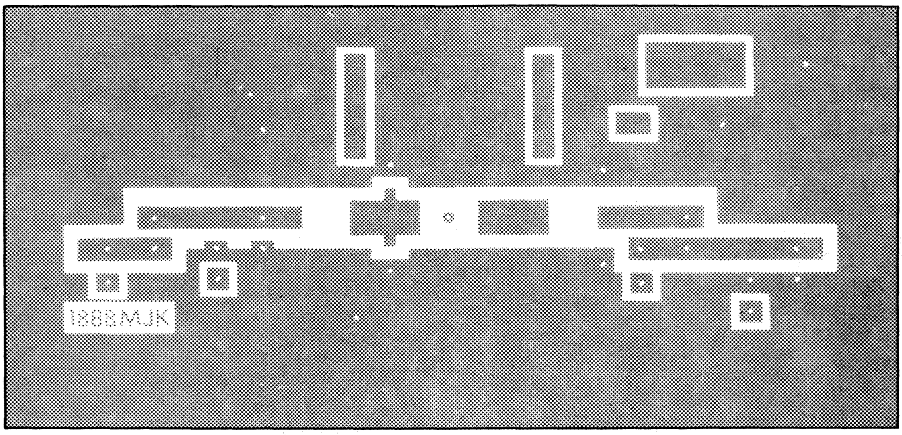
R1 = 10 Ω (±10%) carbon resistor
R2 = 4,7 Ω (±5%) carbon resistor

APPLICATION INFORMATION (continued)

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

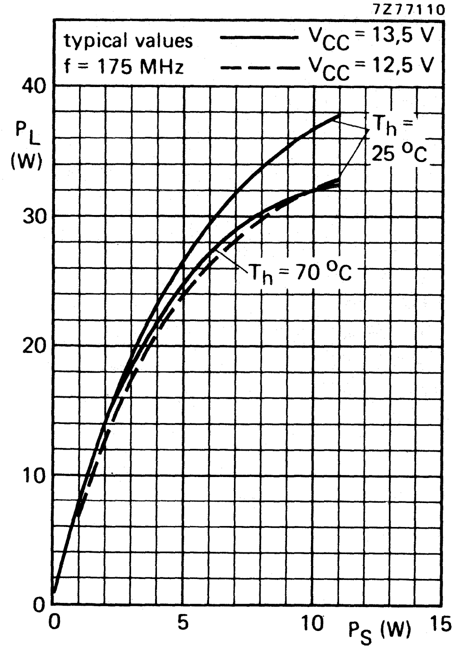


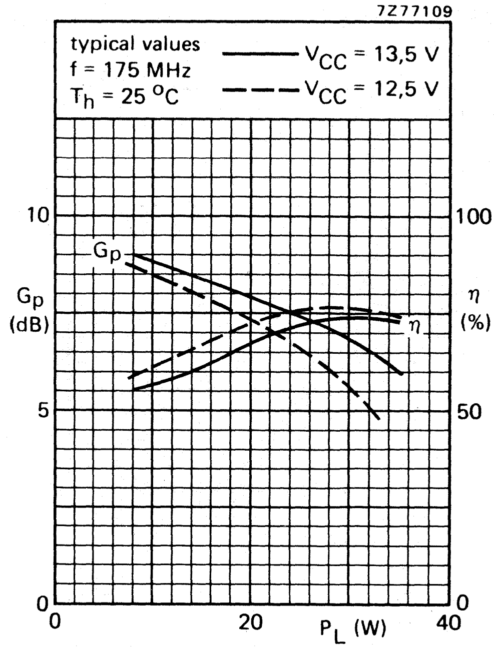
7Z77102

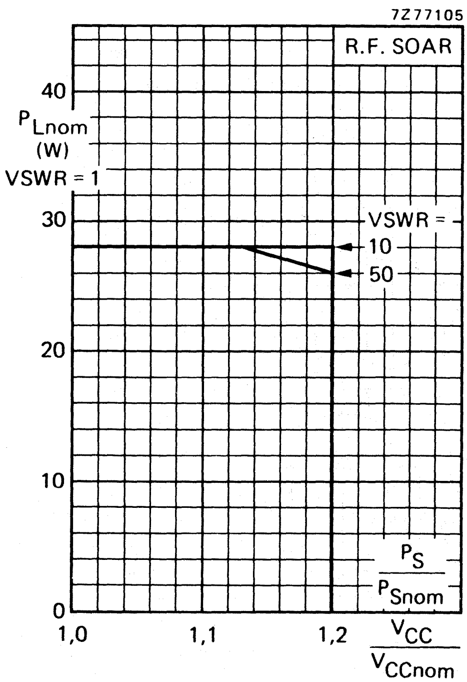


7Z77103

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.







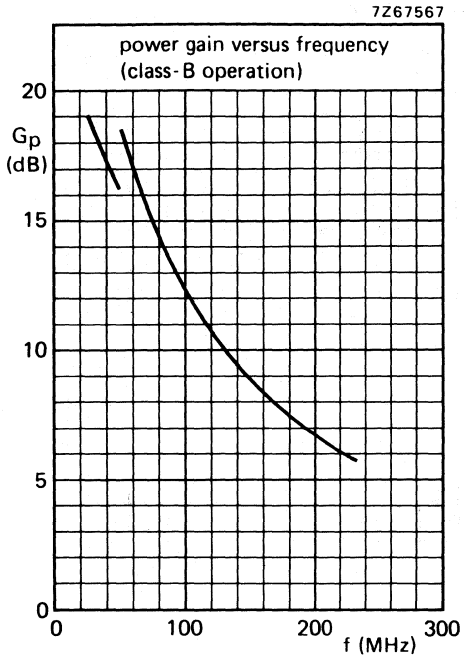
Conditions for R.F. SOAR

f = 175 MHz
T_h = 70 °C
$R_{th\ mb\text{-}h}$ = 0,45 K/W
V_{CCnom} = 13,5 V
$P_S = P_{Snom}$ at V_{CCnom} = 13,5 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.

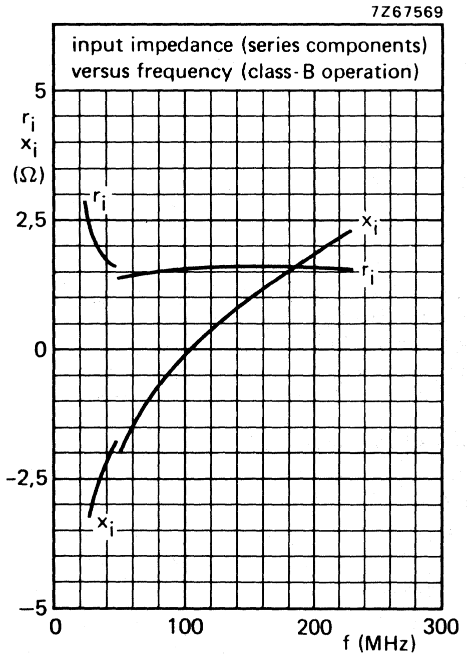
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

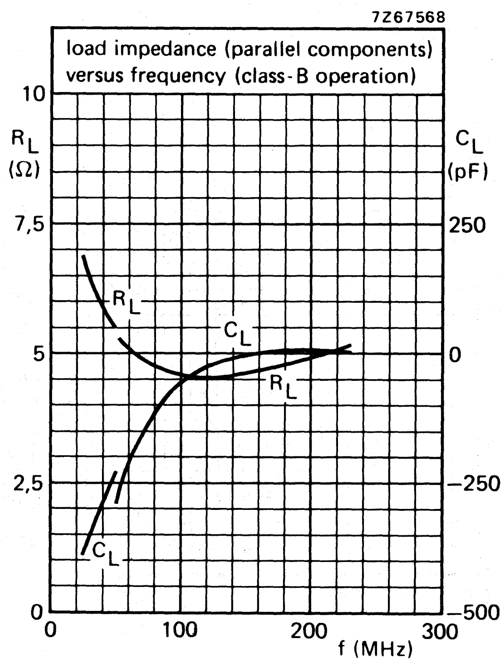
OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.



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 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

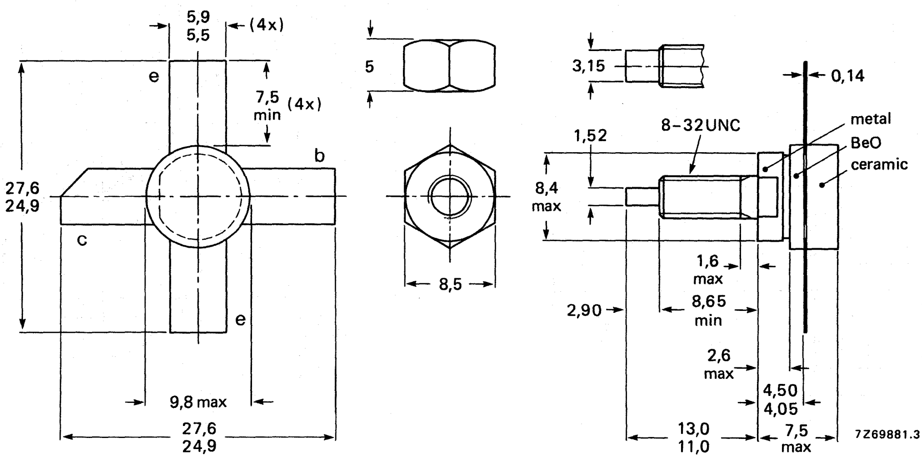
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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

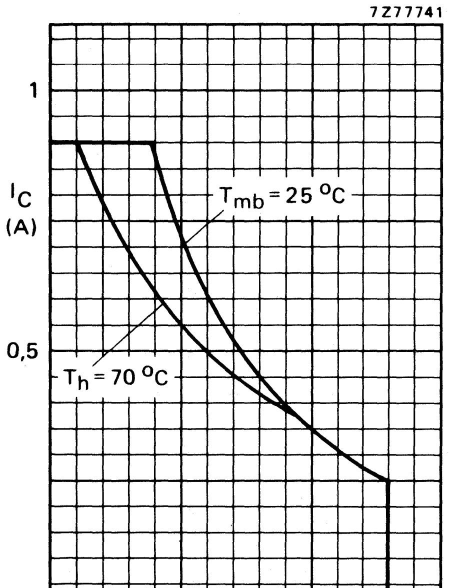


Fig. 2 D.C. SOAR.

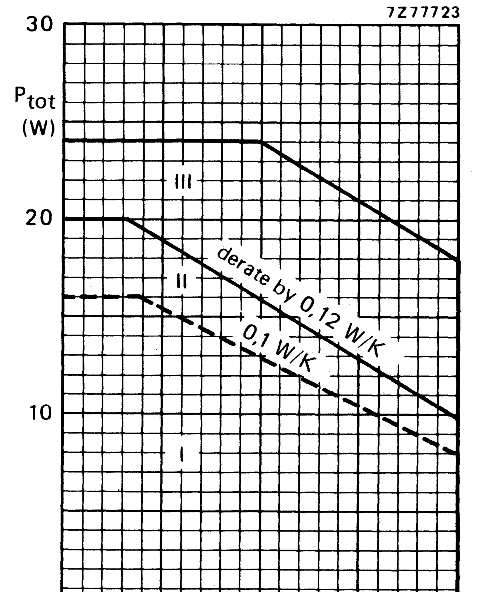


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f > 1 MHz.

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)	$R_{th\ j\text{-}mb(dc)}$	=	10,7	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	8,6	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 2$ mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage open base; $I_C = 10$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 36$ V	I_{CES}	<	1	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	0,5	mJ
D.C. current gain* $I_C = 0,4$ A; $V_{CE} = 5$ V	h_{FE}	typ.	50	
			10 to 100	
Collector-emitter saturation voltage* $I_C = 1,25$ A; $I_B = 0,25$ A	V_{CEsat}	typ.	0,8	V
Transition frequency at f = 100 MHz* $-I_E = 0,4$ A; $V_{CB} = 28$ V	f_T	typ.	600	MHz
$-I_E = 1,25$ A; $V_{CB} = 28$ V	f_T	typ.	525	MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	10	pF
Feedback capacitance at f = 1 MHz $I_C = 50$ mA; $V_{CE} = 28$ V	C_{re}	typ.	7,1	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

7Z77742

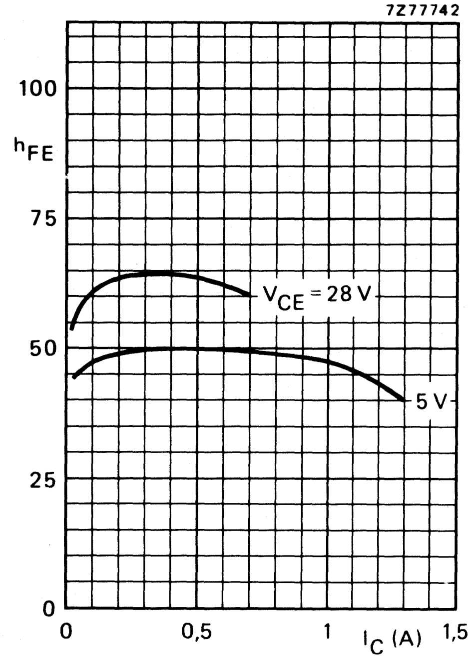


Fig.4 Typical values; T_j = 25 °C.

7Z77743

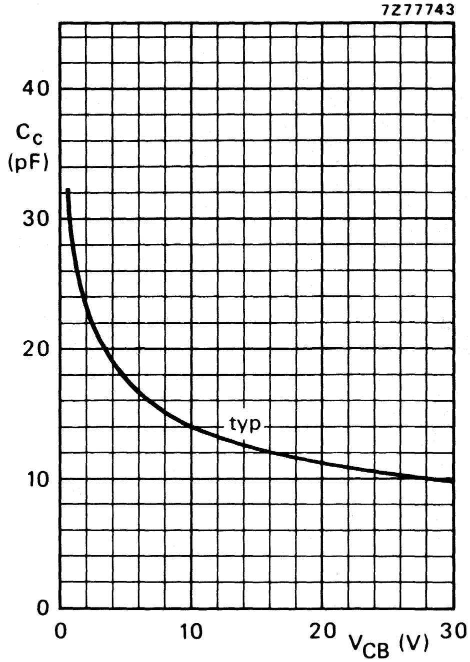


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

7Z77744

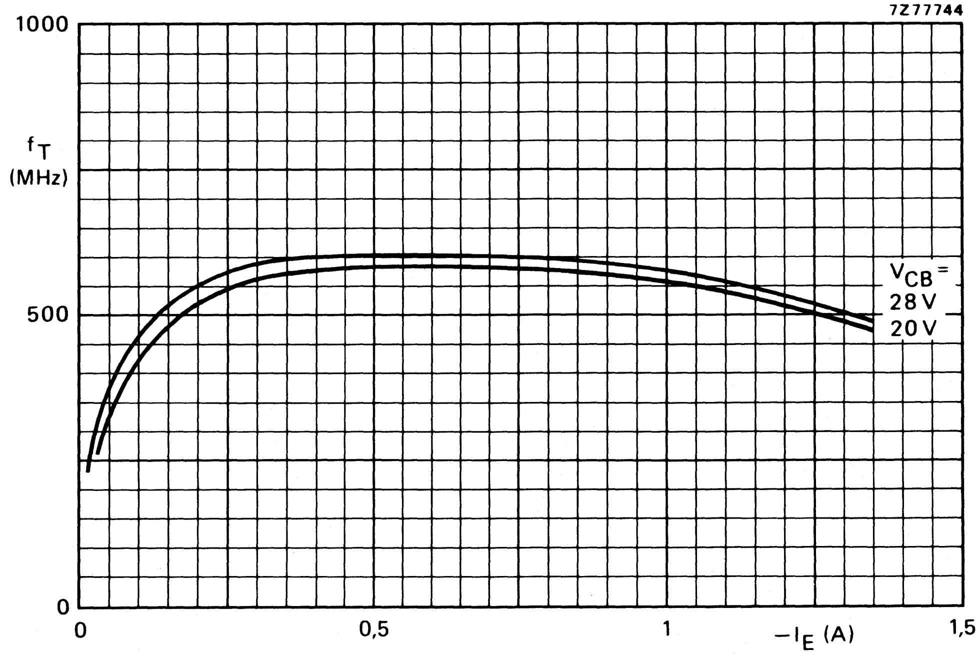


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	8	< 0,5	> 12	< 0,44	> 65	1,8 + j0,7	18 − j20

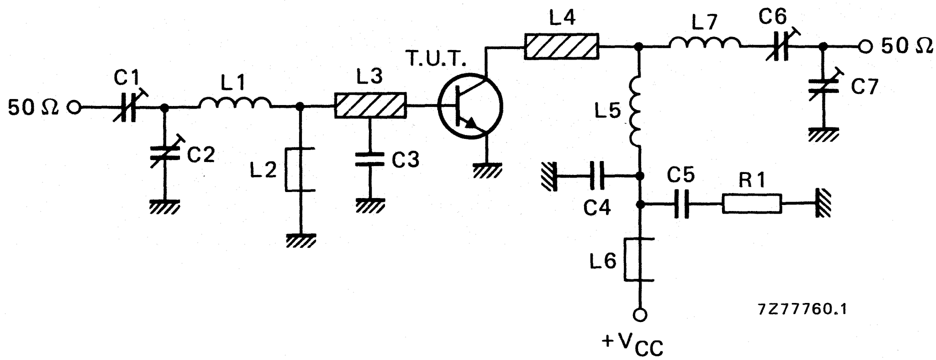


Fig. 7 Test circuit; c.w. class-B.

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.

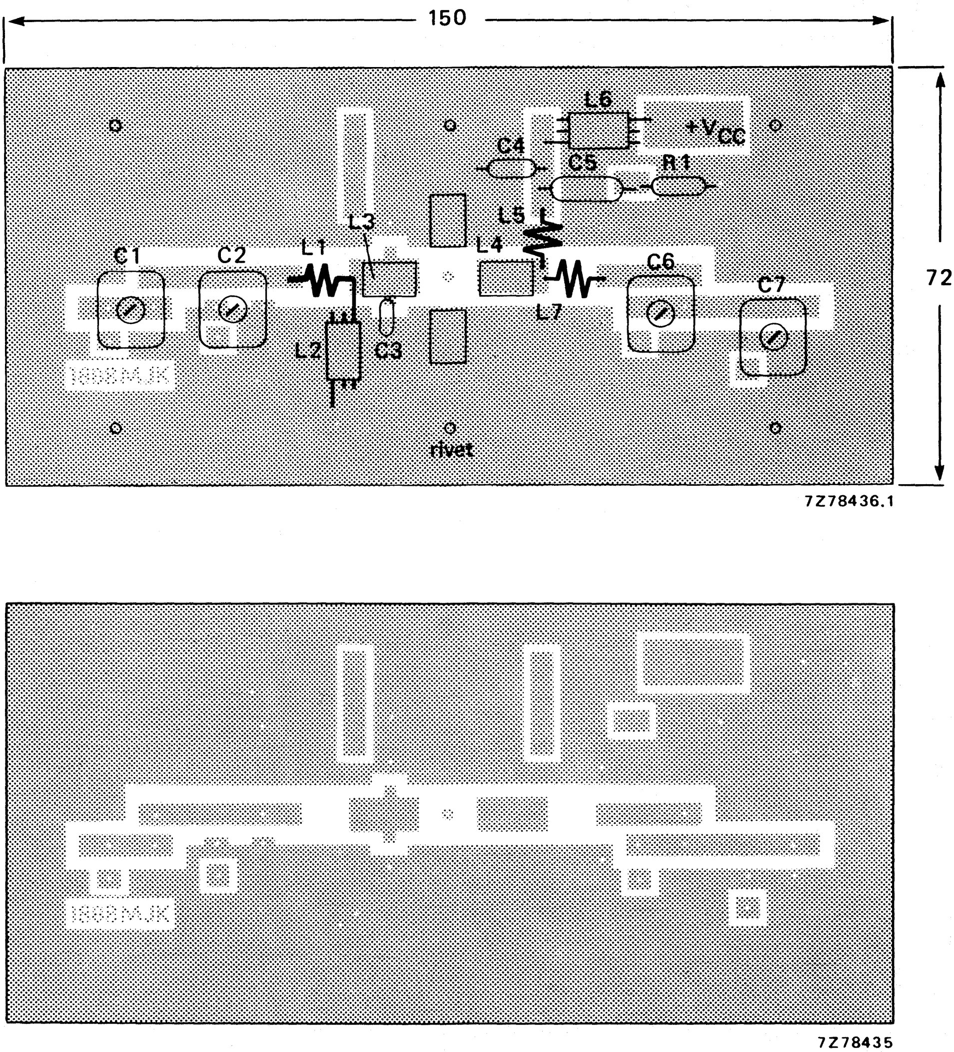


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

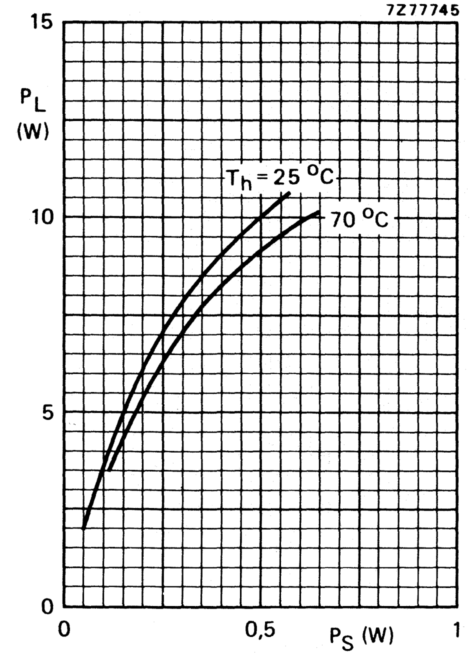


Fig. 9 Typical values; V_{CE} = 28 V; f = 175 MHz.

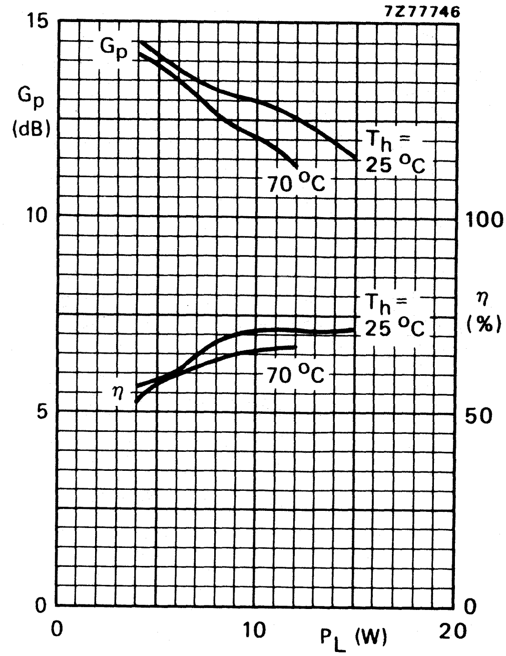


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

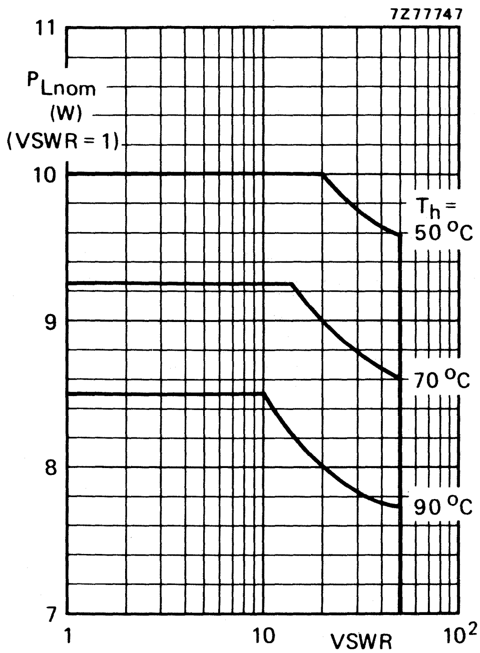


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,45 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

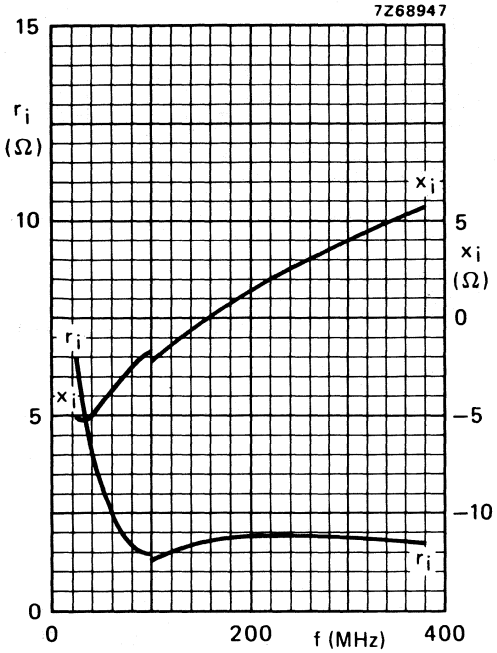


Fig. 12 Input impedance (series components).

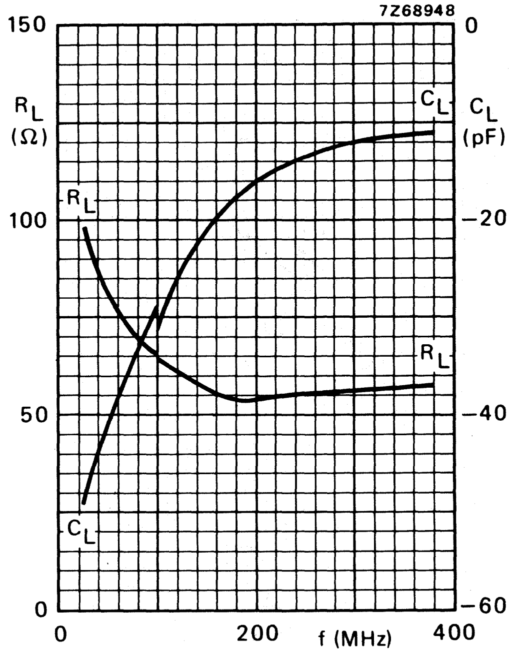


Fig. 13 Load impedance (parallel components).

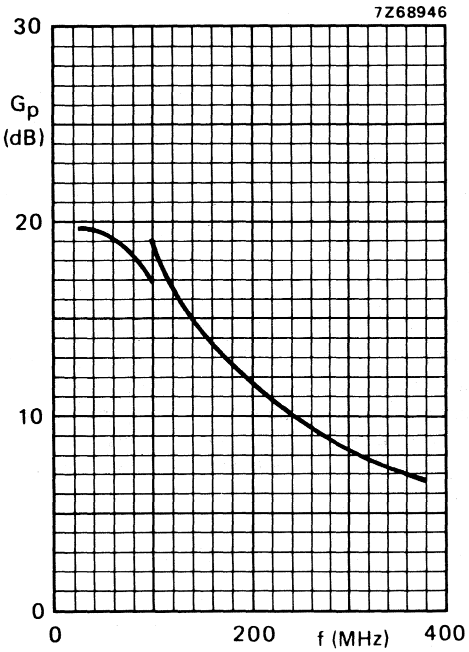


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; V_{CE} = 28 V; P_L = 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.

VHF power transistor — BLY91C/01

DESCRIPTION

NPN silicon planar epitaxial transistor designed 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 SOT122F ¼ inch capstan envelope with a ceramic cap. All leads are isolated from the stud.

PIN CONFIGURATION

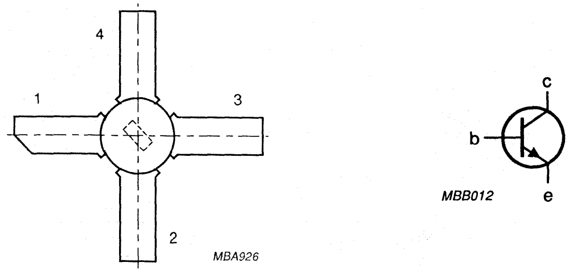


Fig.1 Simplified outline and symbol.

PINNING - SOT122F

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

WARNING

Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in an un-neutralized common emitter class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)	$\overline{Z_i}$ (Ω)	$\overline{Y_L}$ (mS)
c.w. class-B	175	28	8	> 12	> 65	1.8 + j0.7	18 – j20

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBOM}	collector-base voltage	open emitter; peak value	–	65	V
V_{CEO}	collector-emitter voltage	open base	–	36	V
V_{EBO}	emitter-base voltage	open collector	–	4	V
$I_{C(AV)}$	collector current	average value	–	0.75	A
I_{CM}	collector current	peak value f > 1 MHz	–	2.25	A
P_{tot}	total power dissipation	f > 1 MHz; T_h = 25 °C	–	17.5	W
T_{stg}	storage temperature range		–30	200	°C
T_j	junction operating temperature		–	200	°C

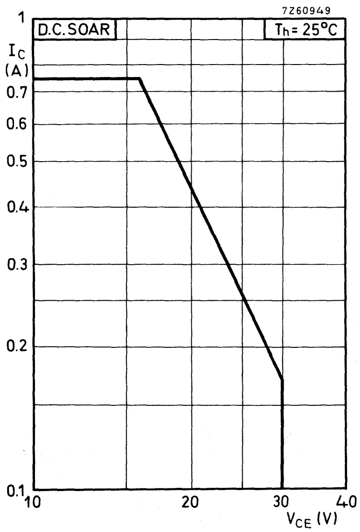


Fig.2 DC SOAR.

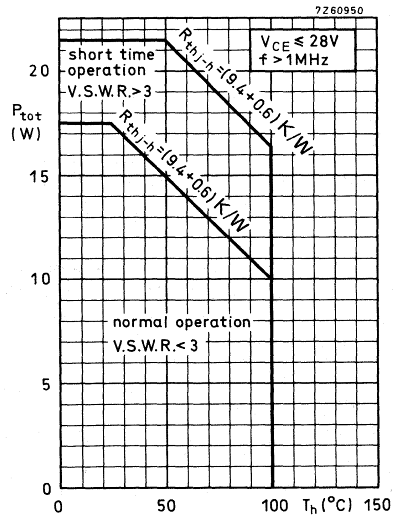


Fig.3 Power/temperature derating curve.

THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j\text{-}mb}$	from junction to mounting base	9.4	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink	0.6	K/W

CHARACTERISTICS

T_j = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 1 mA	65	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 10 mA	36	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 1 mA	4	–	–	V
I_{CEO}	collector-emitter leakage current	V_{CE} = 28 V; I_B = 0	–	–	5	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 0.5 A	5	–	–	
f_T	transition frequency	V_{CE} = 20 V; I_E = 0.4 A	–	500	–	MHz
E_{SBR}	second breakdown energy	open base; L = 25 mH; f = 50 Hz	0.5	–	–	mJ
		$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω; L = 25 mH; f = 50 Hz	0.5	–	–	mJ
C_c	collector capacitance	V_{CB} = 30 V; I_E = I_e = 0; f = 1 MHz	–	10	15	pF
C_{re}	feedback capacitance	V_{CE} = 30 V; I_C = 50 mA; f = 1 MHz	–	7.5	–	pF
C_{c-s}	collector-stud capacitance	f = 1 MHz	–	2	–	pF

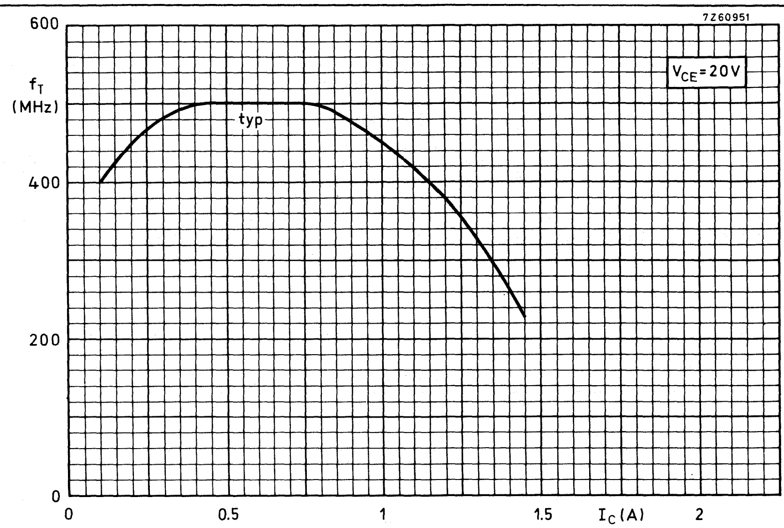
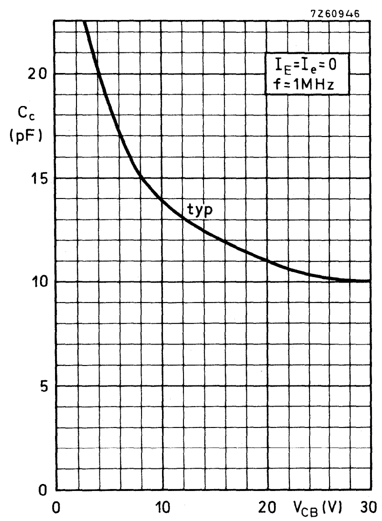


Fig.4 Transition frequency as a function of collector current, typical values.



$I_E = i_e = 0$; f = 1 MHz.

Fig.5 Collector capacitance as a function of collector-base voltage, typical values.

APPLICATION INFORMATION

RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)	$\overline{Z_i}$ (Ω)	$\overline{Y_L}$ (mS)
c.w. class-B	175	28	8	> 12	> 65	1.8 + j0.7	18 – j20

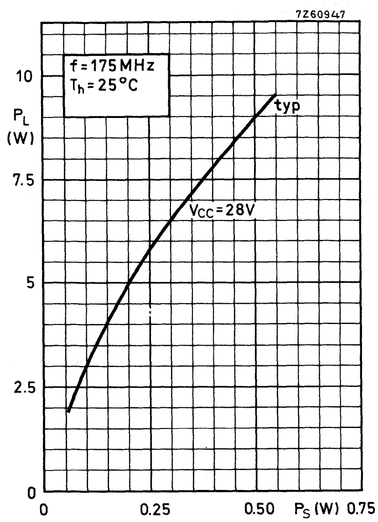
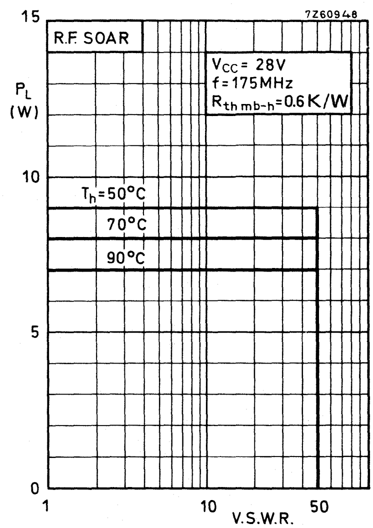


Fig.6 Load power as a function of drive power, typical values.



For high voltage operation, a stabilized supply is generally used. The graph shows allowable output power under nominal conditions of the VSWR, with heatsink temperature as parameter.

Fig.7 RF SOAR.

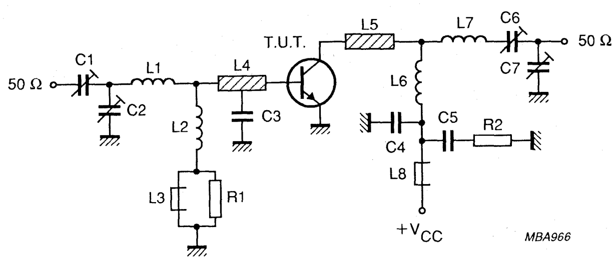


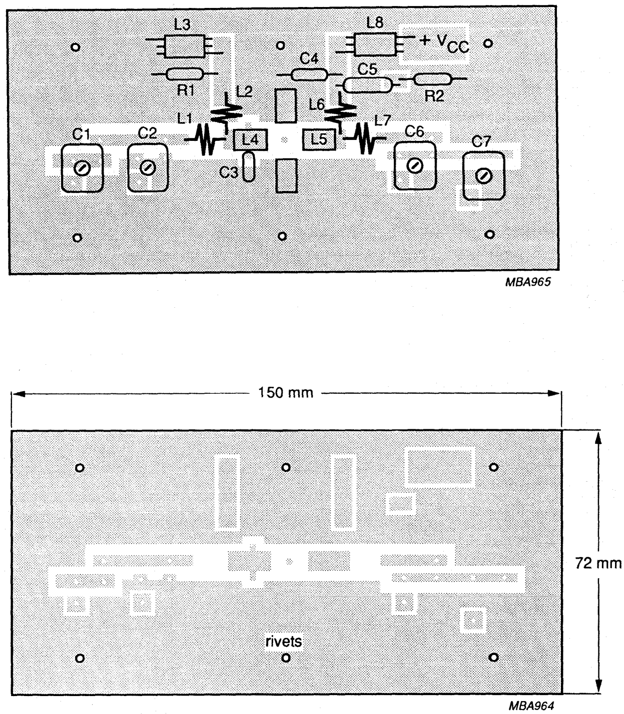
Fig.8 Class-B test circuit at f = 175 MHz.

List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C7	film dielectric trimmer	2.2 to 20 pF		2222 809 07004
C2, C6	film dielectric trimmer	5 to 60 pF		2222 809 07011
C3	500 V ceramic capacitor	47 pF	(note 1)	
C4	500 V ceramic capacitor	120 pF		
C5	polyester capacitor	100 nF		
L1	1 turn 1.6 mm copper wire		int. dia. 8.4 mm; leads 2 x 5 mm	
L2	7 turns closely wound enamelled 0.5 mm copper wire		int. dia. 3 mm; leads 2 x 5 mm	
L3, L8	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4, L5	stripline (note 2)		12 mm x 6 mm	
L6	3 turns closely enamelled 1 mm copper wire		int. dia. 9 mm; leads 2 x 5 mm	
L7	3 turns closely wound enamelled 1 mm copper wire		int. dia. 8.2 mm; leads 2 x 5 mm	
R1, R2	carbon resistor	10 Ω		

Notes

1. Tap for capacitor C3 situated 5 mm from the transistor.
2. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric, thickness 1⁄16 inch.



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

Fig.9 Component layout for 175 MHz class-B test circuit.

Operating note

Below 100 MHz, a base-emitter resistor of 10 Ω is recommended, to avoid oscillation. This resistor must be effective for both DC and RF.

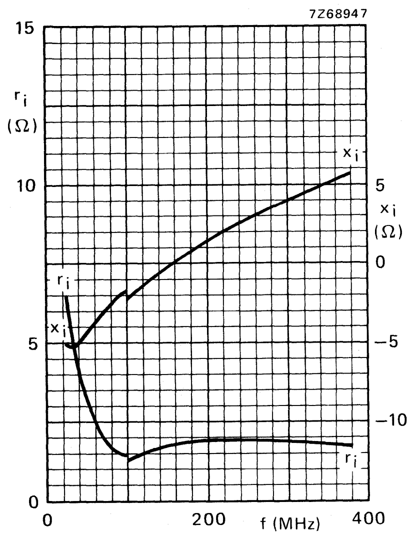


Fig.10 Input impedance (series components) as a function of frequency, typical values.

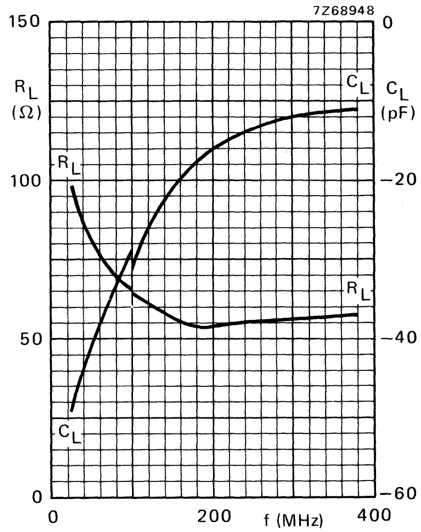


Fig.11 Load impedance (parallel components) as a function of frequency, typical values.

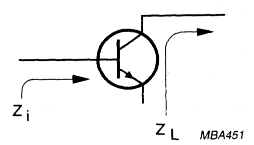


Fig.12 Definition of transistor impedance.

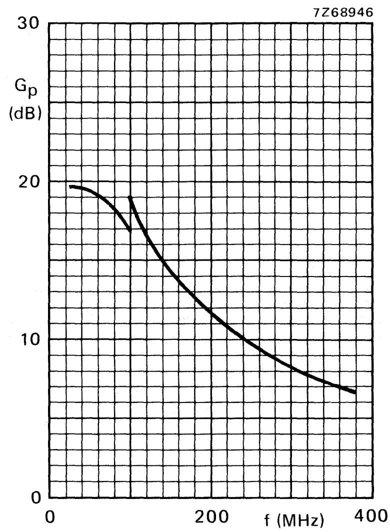


Fig.13 Power gain as a function of frequency, typical values.

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

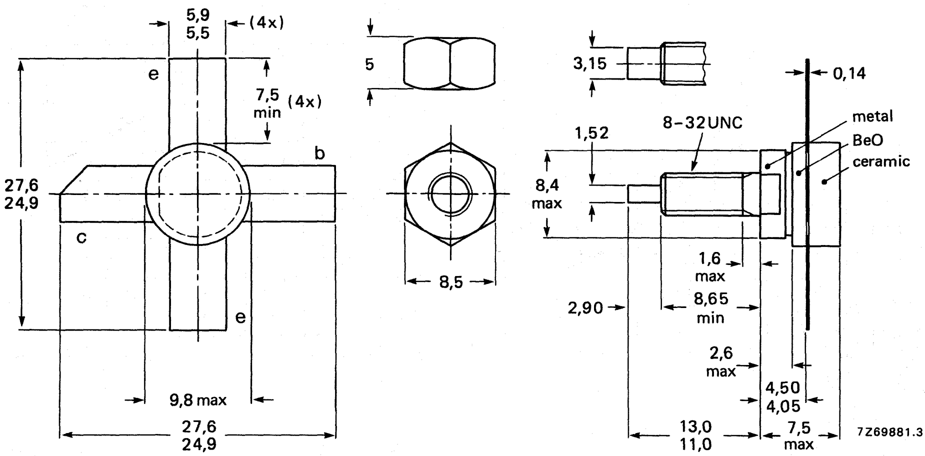
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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_{rf}	max.	36	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

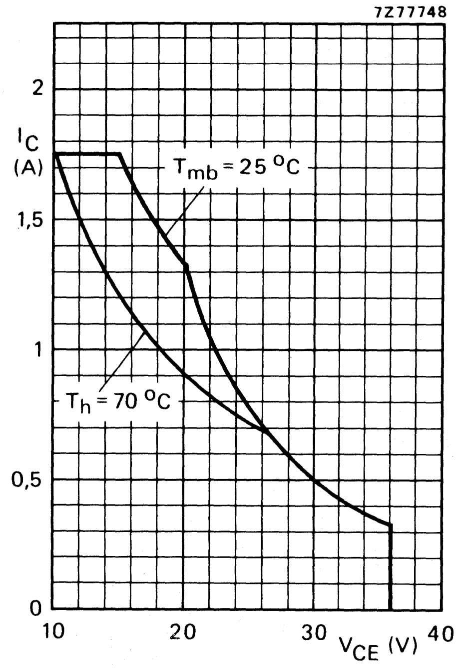


Fig. 2 D.C. SOAR.

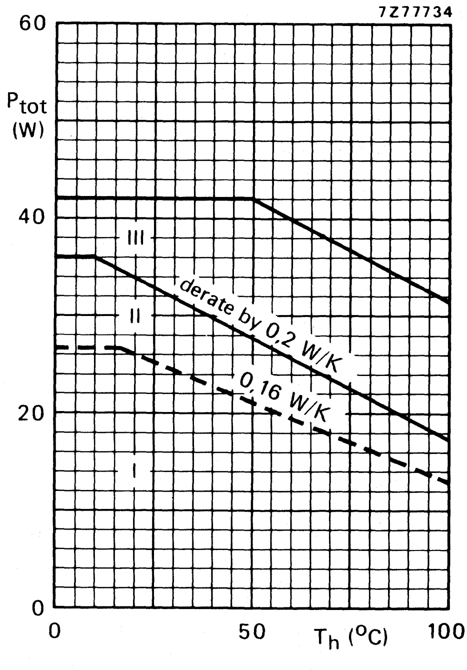


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

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

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 5$ mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage				
open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; $I_E = 2$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 36$ V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	2,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	2,5	mJ
D.C. current gain*				
$I_C = 0,7$ A; $V_{CE} = 5$ V	h_{FE}	typ.	50	
			10 to 100	
Collector-emitter saturation voltage*				
$I_C = 2$ A; $I_B = 0,4$ A	V_{CEsat}	typ.	0,65	V
Transition frequency at f = 100 MHz*				
$-I_E = 0,7$ A; $V_{CB} = 28$ V	f_T	typ.	650	MHz
$-I_E = 2$ A; $V_{CB} = 28$ V	f_T	typ.	625	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	18	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 28$ V	C_{re}	typ.	12,8	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

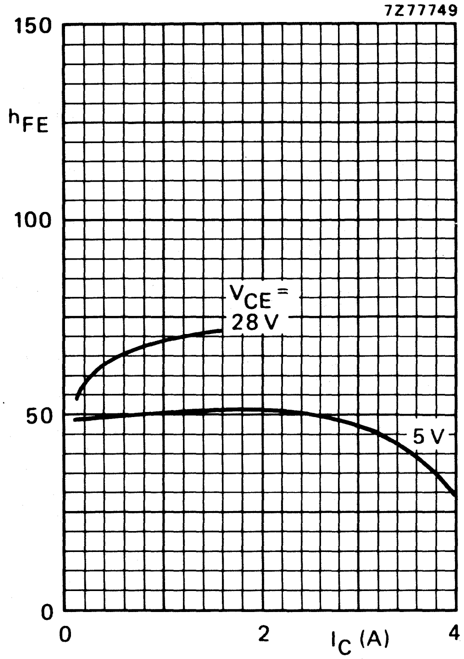


Fig. 4 Typical values; T_j = 25 °C.

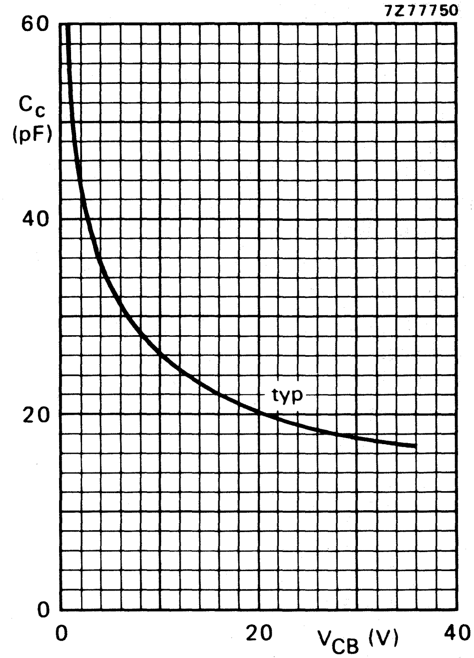


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

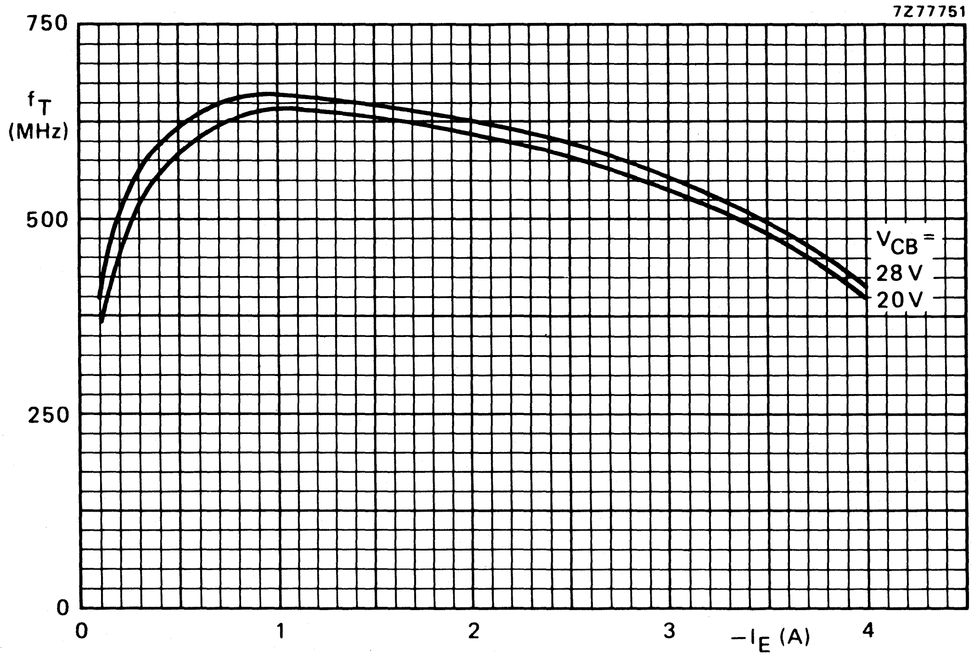


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	15	< 1,5	> 10	< 0,83	> 65	1,4 + j1,85	33 – j27,5

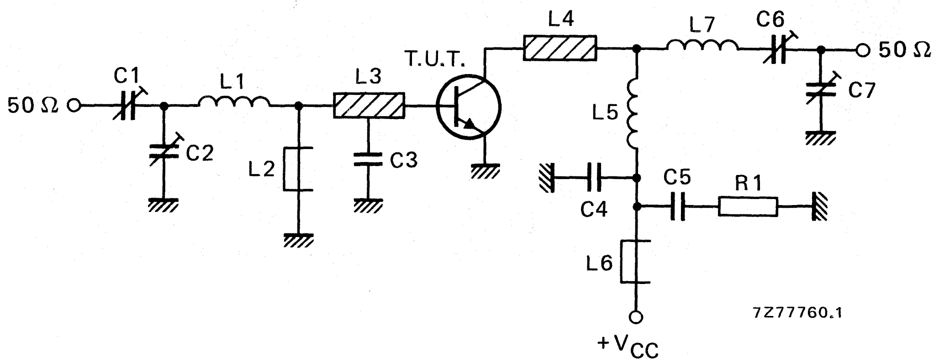


Fig. 7 Test circuit; c.w. class-B.

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.

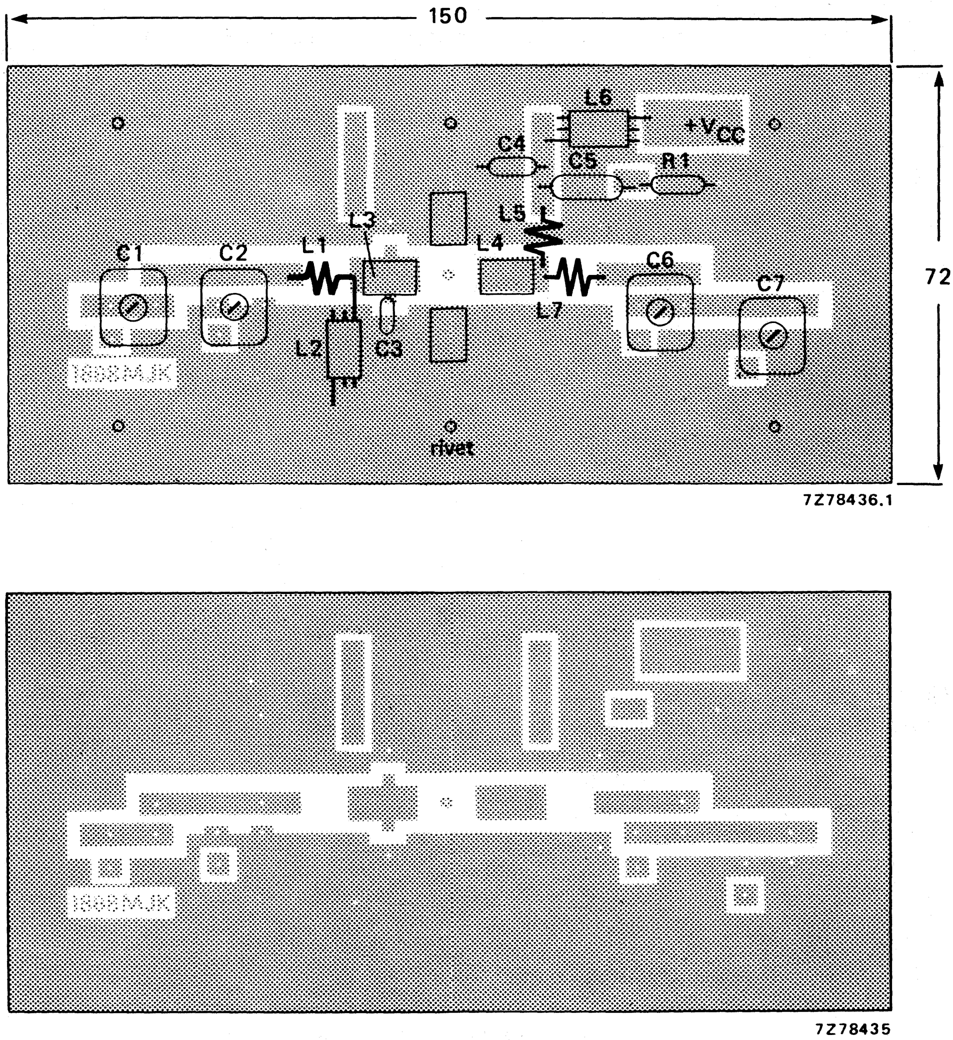


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

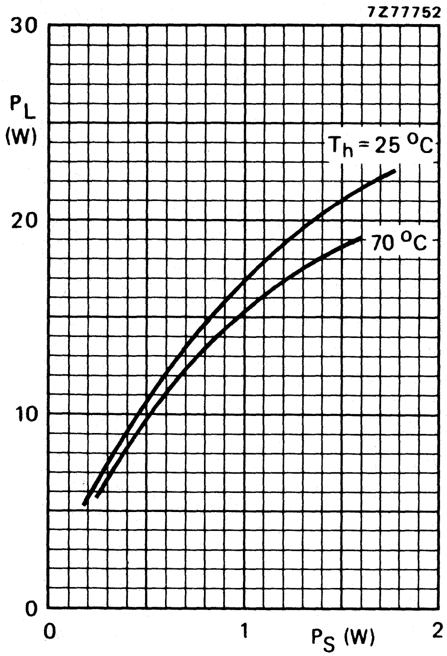


Fig. 9 Typical values; V_{CE} = 28 V;
f = 175 MHz.

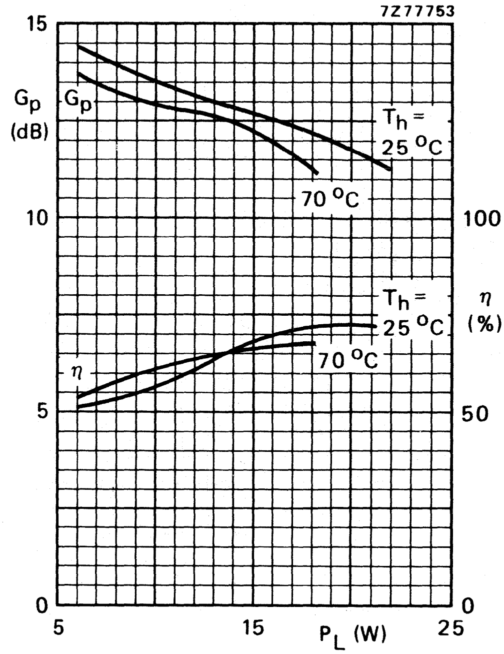


Fig. 10 Typical values; V_{CE} = 28 V;
f = 175 MHz.

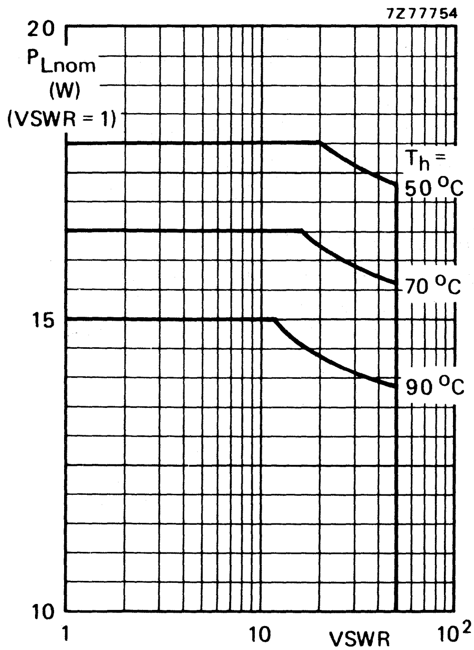


Fig. 11 R.F. SOAR; c.w. class-B operation;
f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb-h}$ = 0,45 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

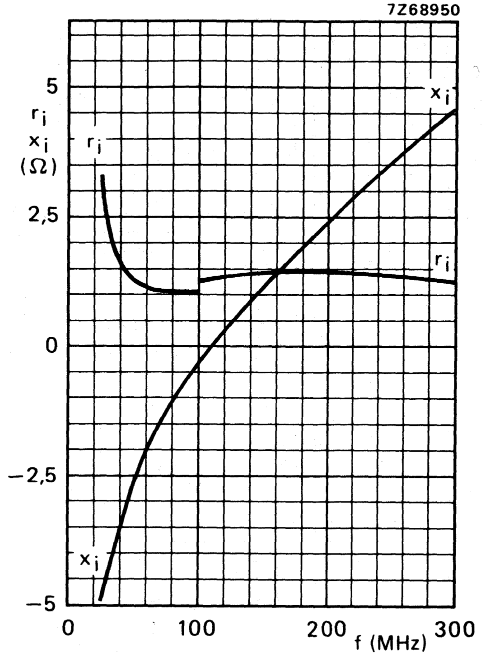


Fig. 12 Input impedance (series components).

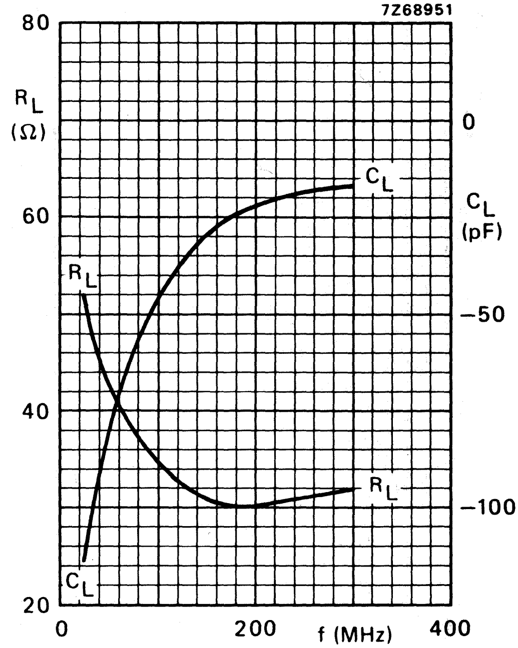


Fig. 13 Load impedance (parallel components).

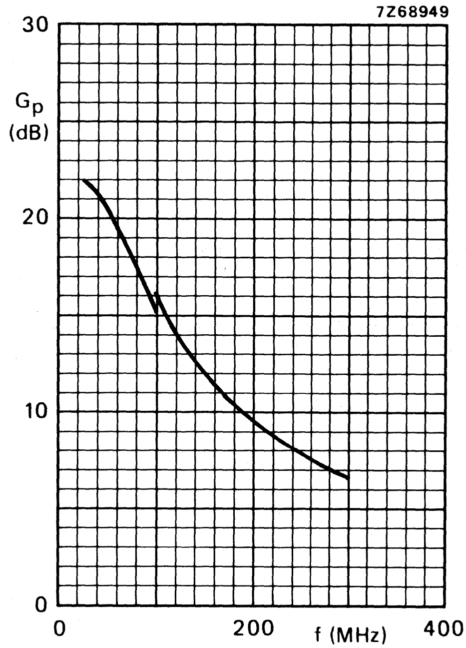


Fig. 14.

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.

VHF power transistor BLY92C/01

DESCRIPTION

NPN silicon planar epitaxial transistor designed 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 SOT122F ¼ inch capstan envelope with a ceramic cap. All leads are isolated from the stud.

PINNING - SOT122F

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

PIN CONFIGURATION

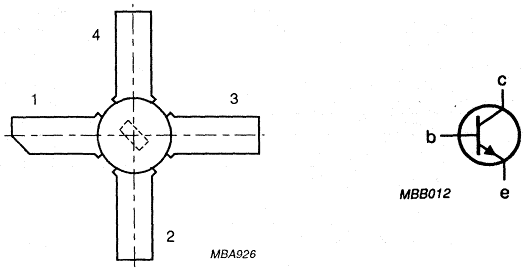


Fig.1 Simplified outline and symbol.

WARNING

Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in an un-neutralized common emitter class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)	$\overline{Z_i}$ (Ω)	$\overline{Y_L}$ (mS)
c.w. class-B	175	28	15	> 10	> 65	1.4 + j1.85	33 – j27.5

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBOM}	collector-base voltage	open emitter; peak value	–	65	V
V_{CEO}	collector-emitter voltage	open base	–	36	V
V_{EBO}	emitter-base voltage	open collector	–	4	V
$I_{C(AV)}$	collector current	average value	–	1.5	A
I_{CM}	collector current	peak value f > 1 MHz	–	4.5	A
P_{tot}	total power dissipation	f > 1 MHz; T_h = 25 °C	–	32	W
T_{stg}	storage temperature range		–30	200	°C
T_j	junction operating temperature		–	200	°C

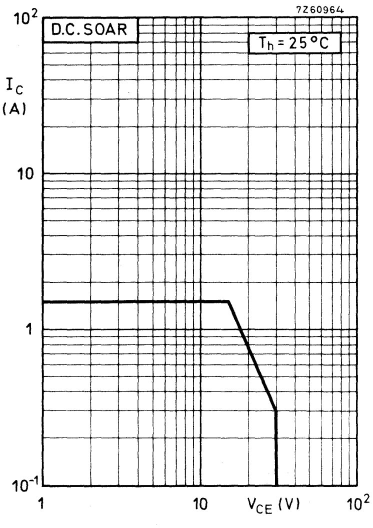


Fig.2 DC SOAR.

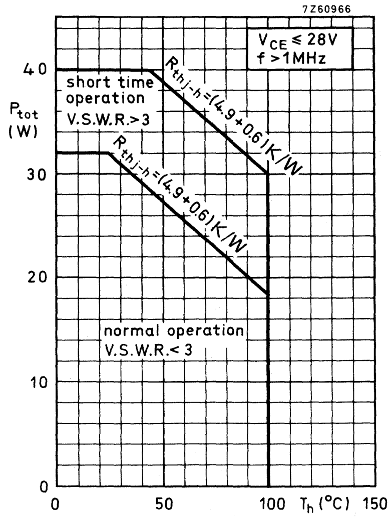


Fig.3 Power/temperature derating curve.

THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j\text{-}mb}$	from junction to mounting base	4.9	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink	0.6	K/W

CHARACTERISTICS

T_j = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 3 mA	65	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 25 mA	36	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 3 mA	4	–	–	V
I_{CEO}	collector-emitter leakage current	V_{CE} = 28 V; I_B = 0	–	–	10	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 0.5 A	5	–	–	
f_T	transition frequency	V_{CE} = 20 V; I_E = 0.6 A	–	500	–	MHz
E_{SBR}	second breakdown energy	open base; L = 25 mH; f = 50 Hz	2	–	–	mJ
		$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω; L = 25 mH; f = 50 Hz	4.5	–	–	mJ
C_c	collector capacitance	V_{CB} = 30 V; $I_E = I_e$ = 0; f = 1 MHz	–	20	30	pF
C_{re}	feedback capacitance	V_{CE} = 30 V; I_C = 50 mA; f = 1 MHz	–	15	–	pF
$C_{c\text{-}s}$	collector-stud capacitance	f = 1 MHz	–	2	–	pF

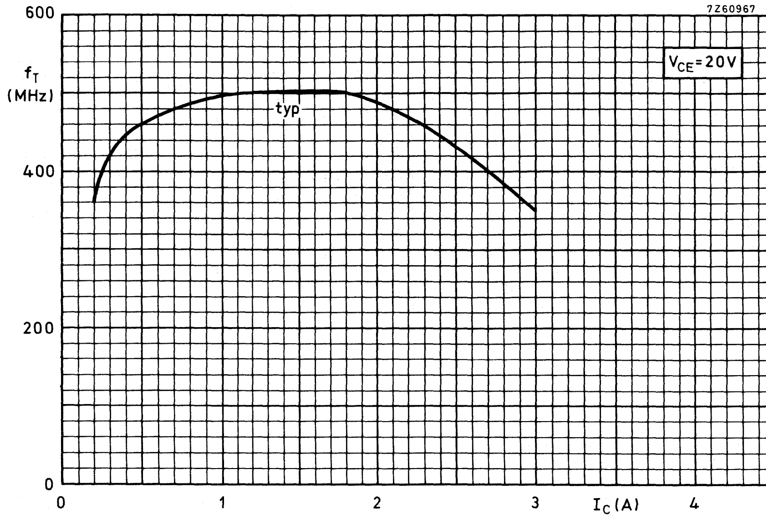
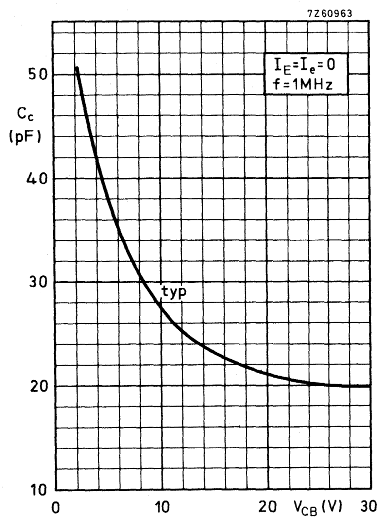


Fig.4 Transition frequency as a function of collector current, typical values.



$I_E = i_e = 0$; f = 1 MHz.

Fig.5 Collector capacitance as a function of collector-base voltage, typical values.

APPLICATION INFORMATION

RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)	$\overline{Z_i}$ (Ω)	$\overline{Y_L}$ (mS)
c.w. class-B	175	28	15	> 10	> 65	1.4 + j1.85	33 – j27.5

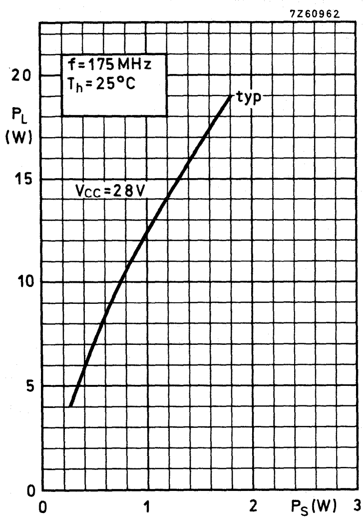
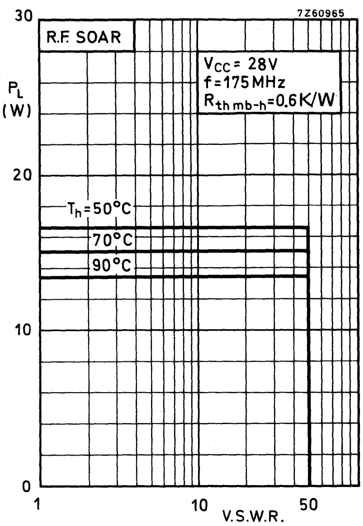


Fig.6 Load power as a function of drive power, typical values.



For high voltage operation, a stabilized supply is generally used. The graph shows allowable output power under nominal conditions of the VSWR, with heatsink temperature as parameter.

Fig.7 RF SOAR.

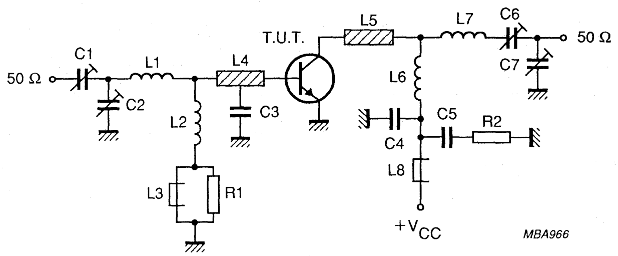


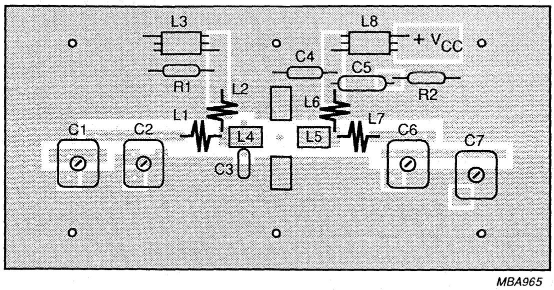
Fig.8 Class-B test circuit at f = 175 MHz.

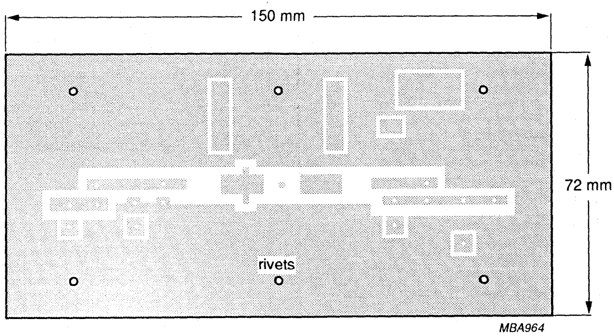
List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C7	film dielectric trimmer	2.2 to 20 pF		2222 809 07004
C2, C6	film dielectric trimmer	5 to 60 pF		2222 809 07011
C3	500 V ceramic capacitor	47 pF	(note 1)	
C4	500 V ceramic capacitor	120 pF		
C5	polyester capacitor	100 nF		
L1	1 turn 1.6 mm copper wire		int. dia. 8.4 mm; leads 2 x 5 mm	
L2	7 turns closely wound enamelled 0.5 mm copper wire		int. dia. 3 mm; leads 2 x 5 mm	
L3, L8	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4, L5	stripline (note 2)		12 mm x 6 mm	
L6	3 turns closely enamelled 1 mm copper wire		int. dia. 9 mm; leads 2 x 5 mm	
L7	3 turns closely wound enamelled 1 mm copper wire		int. dia. 8.2 mm; leads 2 x 5 mm	
R1, R2	carbon resistor	10 Ω		

Notes

1. Tap for capacitor C3 situated 5 mm from the transistor.
2. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric, thickness 1/16 inch.





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

Fig.9 Component layout for 175 MHz class-B test circuit.

Operating note

Below 100 MHz, a base-emitter resistor of 10 Ω is recommended, to avoid oscillation. This resistor must be effective for both DC and RF.

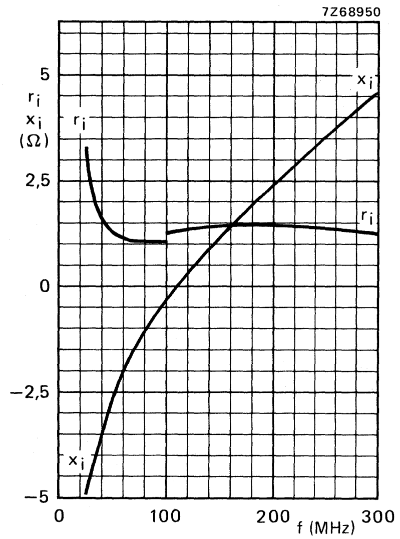


Fig.10 Input impedance (series components) as a function of frequency, typical values.

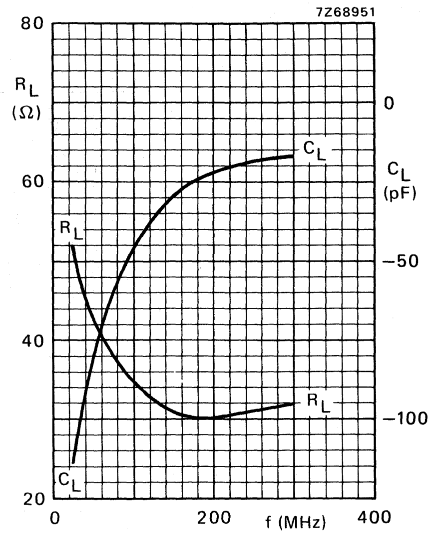


Fig.11 Load impedance (parallel components) as a function of frequency, typical values.

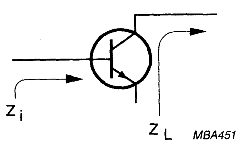


Fig.12 Definition of transistor impedance.

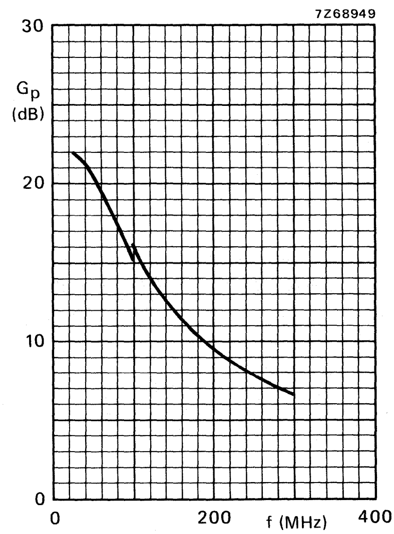


Fig.13 Power gain as a function of frequency, typical values.

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

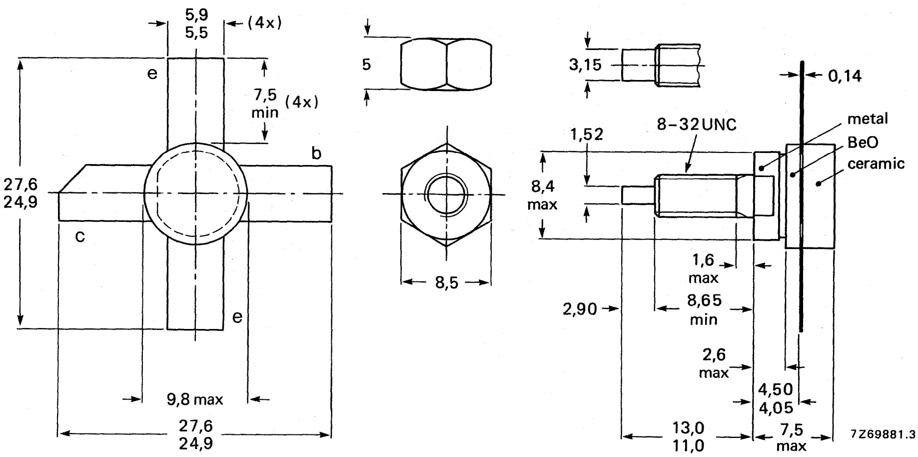
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**28**	**175**	**25**	**> 9**	**> 60**	**1,0 + j1,2**	**59–j54**

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



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

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

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

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.	70	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

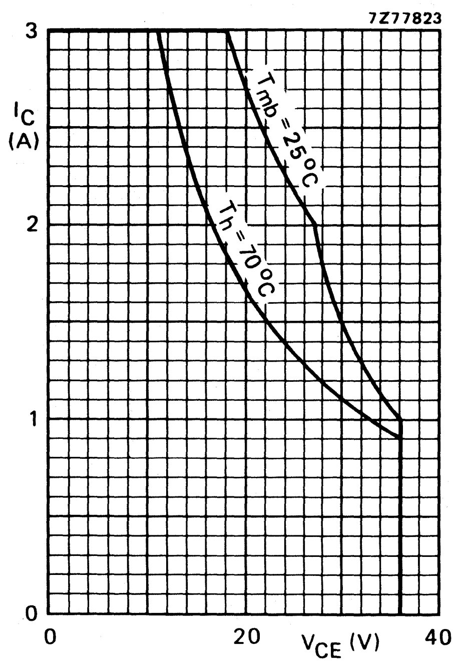


Fig. 2 D.C. SOAR.

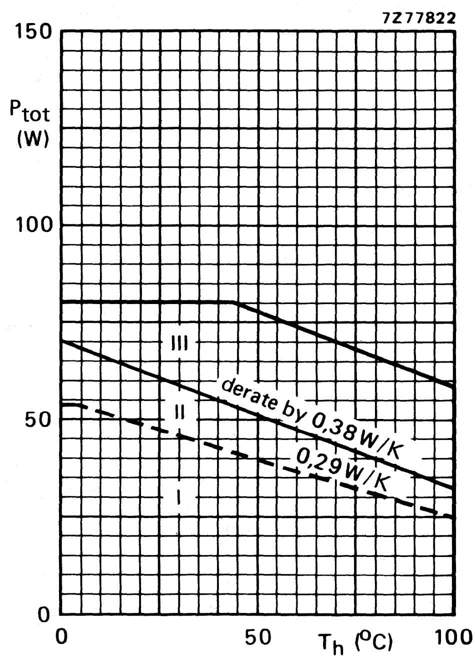


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 28 V; f $\geqslant$ 1 MHz.

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)	$R_{th\ j\text{-}mb\ (dc)}$	=	3,1	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb\ (rf)}$	=	2,3	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage				
open base; I_C = 50 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	4	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
R_{BE} = 10 Ω	E_{SBR}	>	8	mJ
D.C. current gain *				
I_C = 1,25 A; V_{CE} = 5 V	h_{FE}	typ.	45	
			10 to 100	
Collector-emitter saturation voltage *				
I_C = 3,75 A; I_B = 0,75 A	V_{CEsat}	typ.	1,5	V
Transition frequency at f = 100 MHz *				
$-I_E$ = 1,25 A; V_{CB} = 28 V	f_T	typ.	625	MHz
$-I_E$ = 3,75 A; V_{CB} = 28 V	f_T	typ.	625	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 28 V	C_c	typ.	45	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	28	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

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

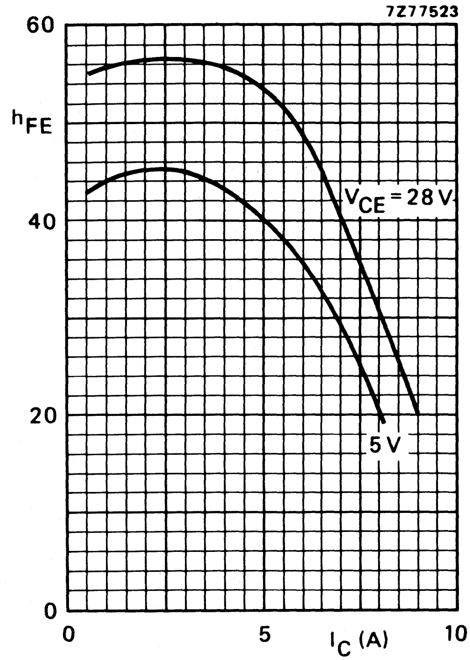


Fig. 4 Typical values; T_j = 25 °C.

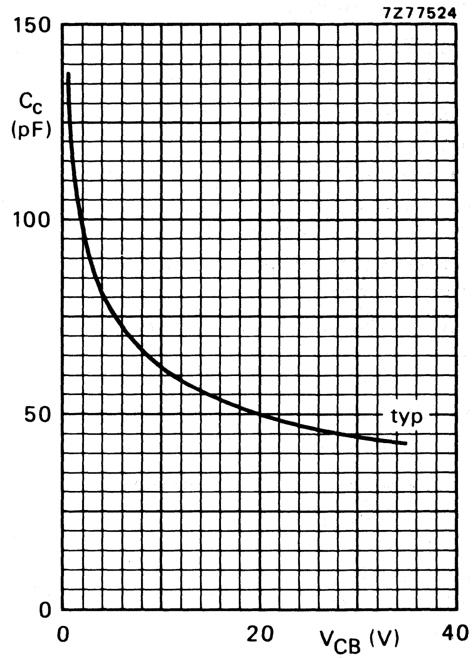


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

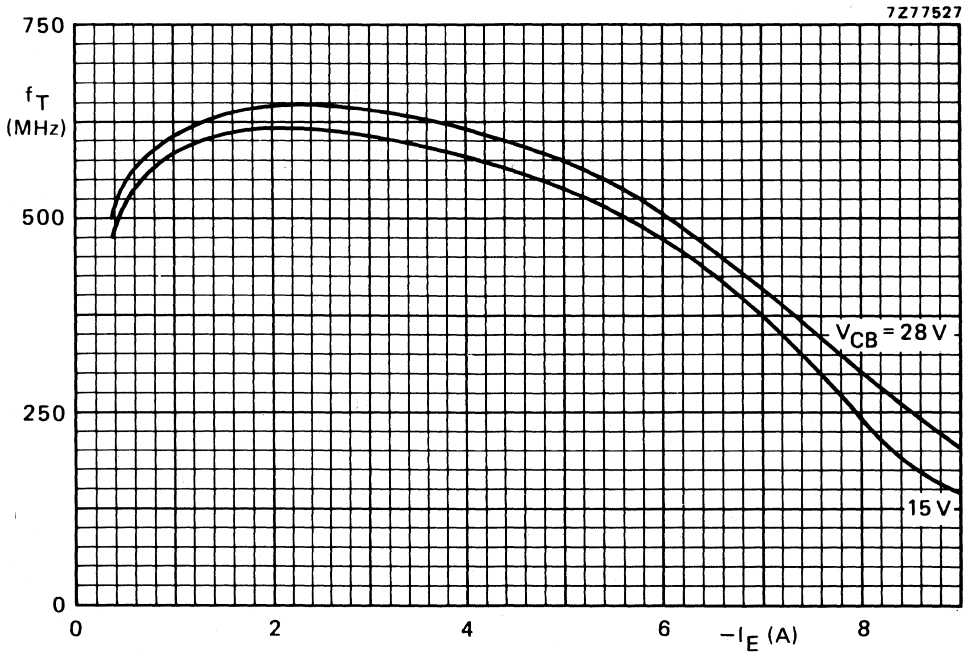


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

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

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**28**	**25**	**< 3,15**	**> 9**	**< 1,5**	**> 60**	**1,0 + j1,2**	**59–j54**

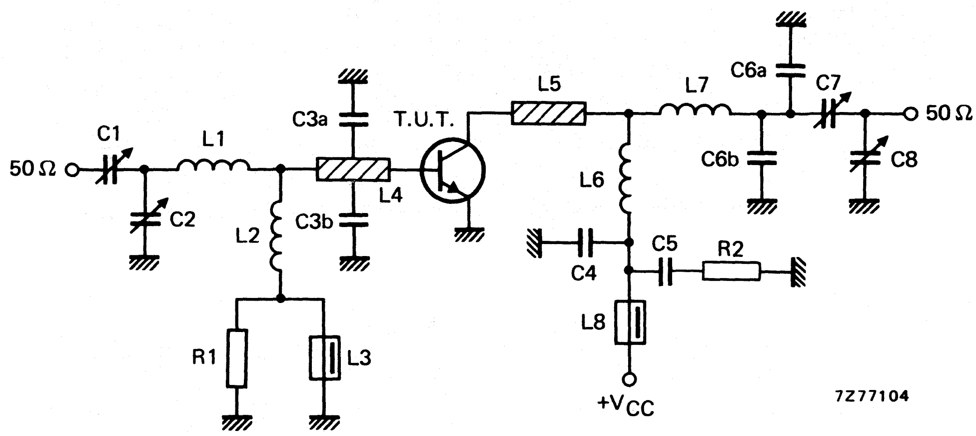


Fig. 7 Test circuit; c.w. class-B.

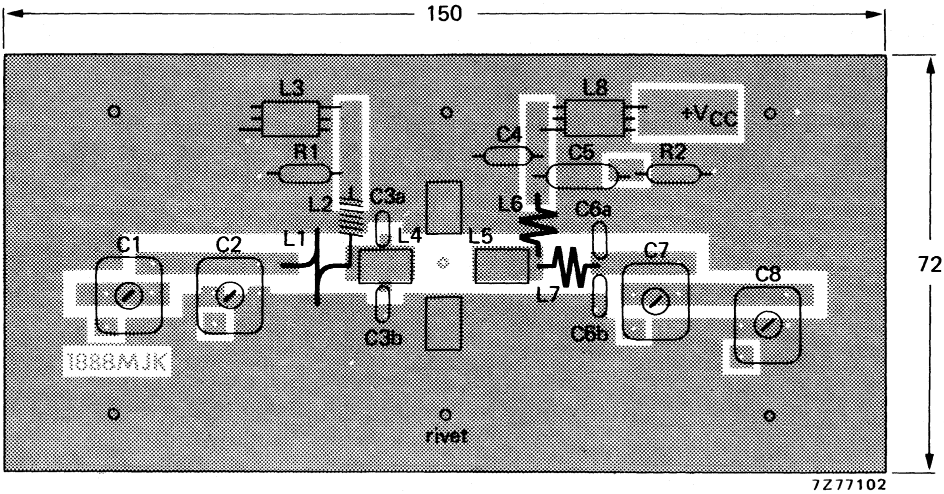
List of components
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor
C5 = 100 nF polyester capacitor
C6a = 2,2 pF ceramic capacitor (500 V)
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.



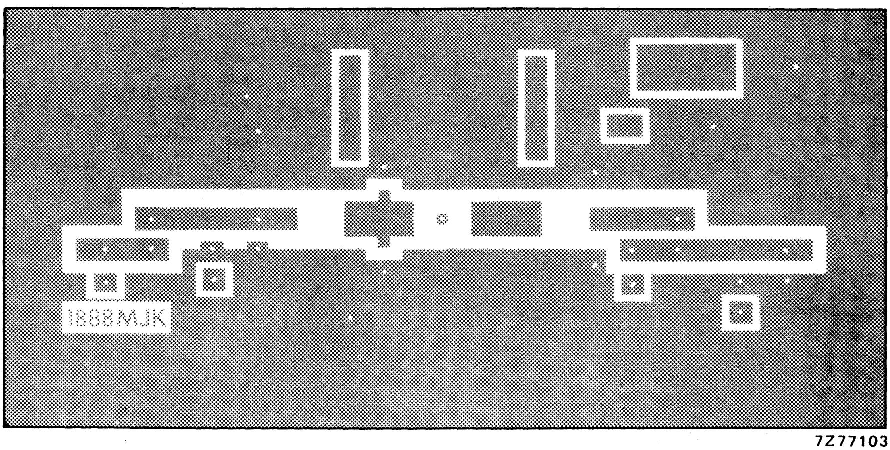


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

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.

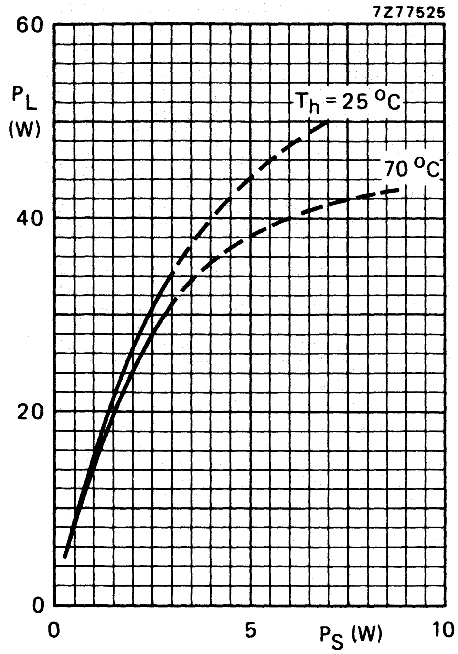


Fig. 9 V_{CE} = 28 V; f = 175 MHz; typical values.

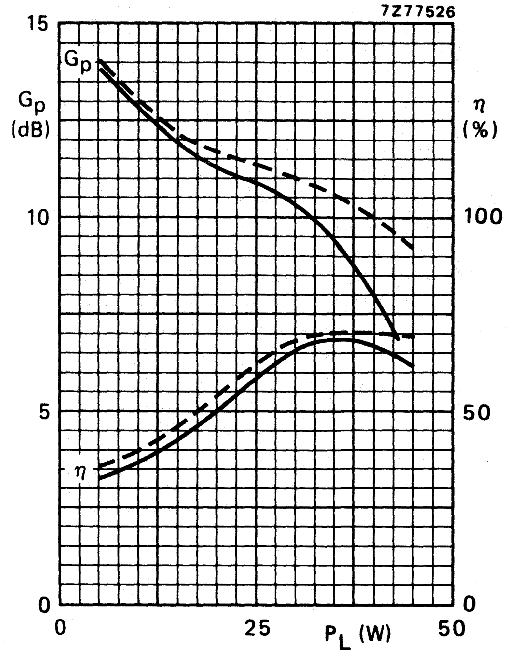


Fig. 10 V_{CE} = 28 V; f = 175 MHz; typical values; – – – T_h = 25 °C; ——— T_h = 70 °C.

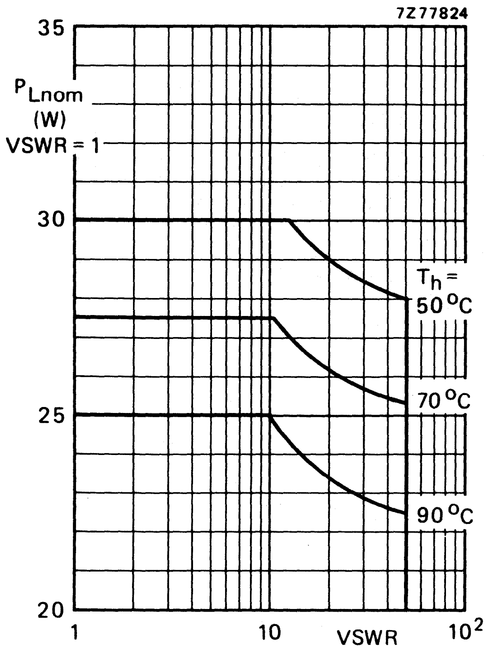


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,45 K/W

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.

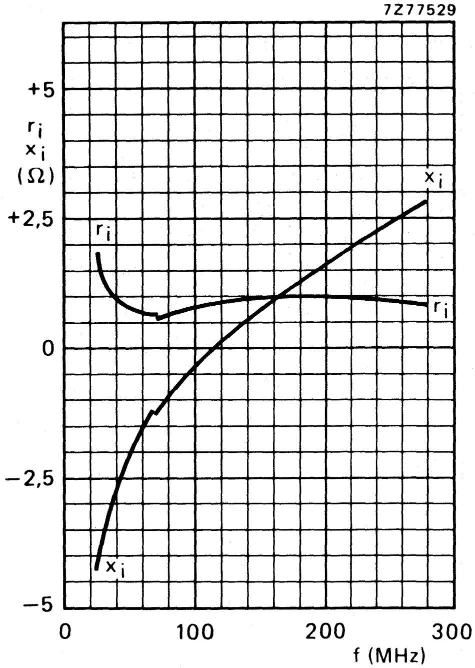


Fig. 12 Input impedance (series components).

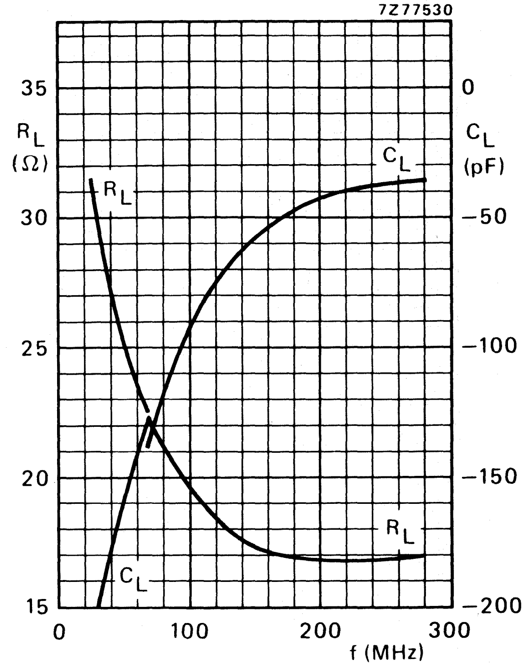


Fig. 13 Load impedance (parallel components).

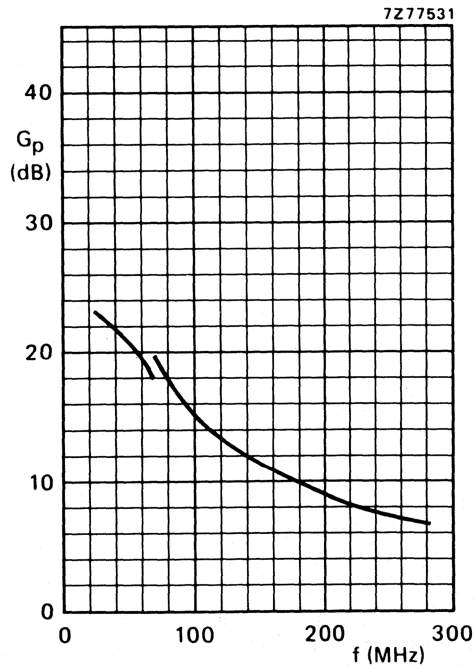


Fig. 14 Power gain versus frequency.

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 V; P_L = 25 W; T_h = 25 °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

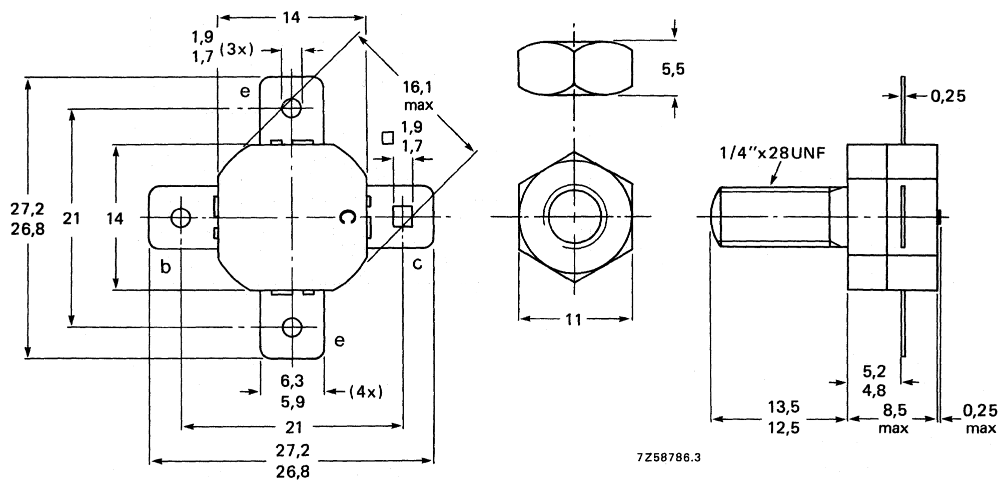
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ 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)

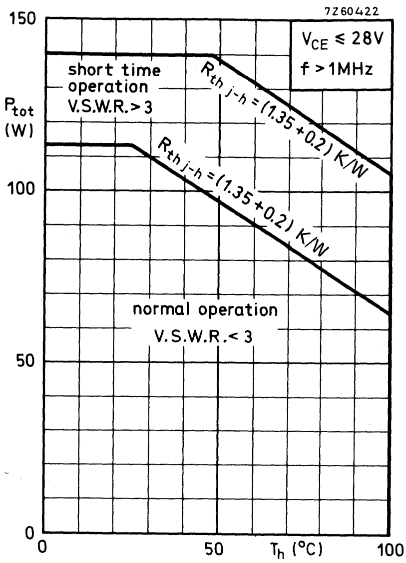
Diameter of clearance hole in heatsink: max. 6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

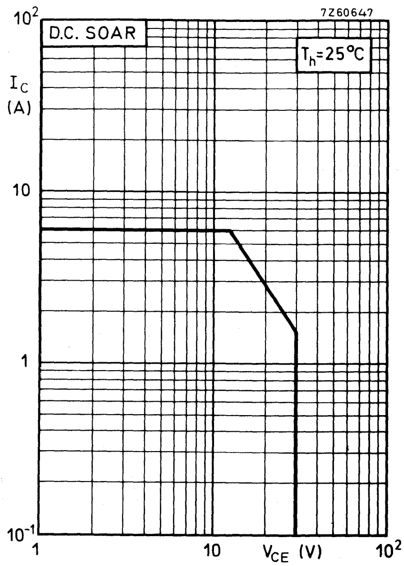
When locking is required an adhesive is preferred instead of a lock washer.

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 °C f > 1 MHz	P_{tot}	max.	130	W





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

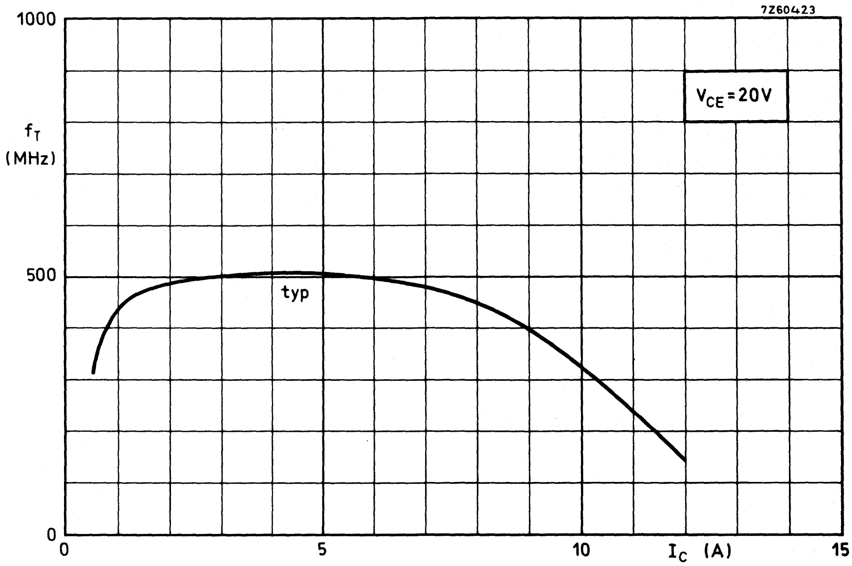
THERMAL RESISTANCE

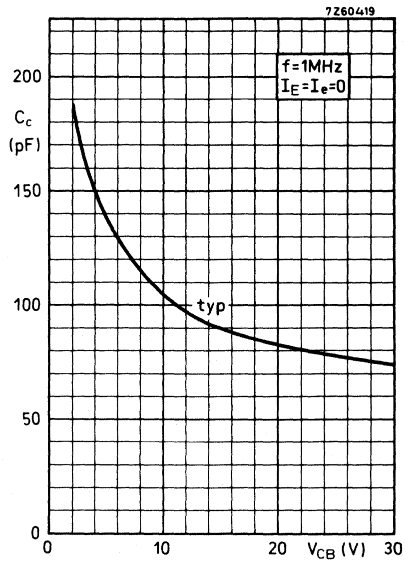
From junction to mounting base	$R_{th\,j-mb}$	=	1.35	K/W
From mounting base to heatsink	$R_{th\,mb-h}$	=	0.2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, I_C = 100 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, I_C = 100 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; I_E = 25 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	8	ms
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	8	ms
D.C. current gain				
I_C = 1 A; V_{CE} = 5 V	h_{FE}	10 to 120		
Transition frequency				
I_C = 6 A; V_{CE} = 20 V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 30 V	C_c	typ. <	75 130	pF pF
Feedback capacitance				
I_C = 100 mA; V_{CE} = 30 V	$-C_{re}$	typ.	47	pF
Collector-stud capacitance	C_{cs}	typ.	3.5	pF


7Z60423
1000
500
0
f_T (MHz)
V_CE = 20V
typ
0
5
10
I_C (A)
15


7Z60419
200
150
100
50
0
C_c (pF)
f = 1MHz
I_E = I_e = 0
typ
0
10
20
V_CB (V)
30

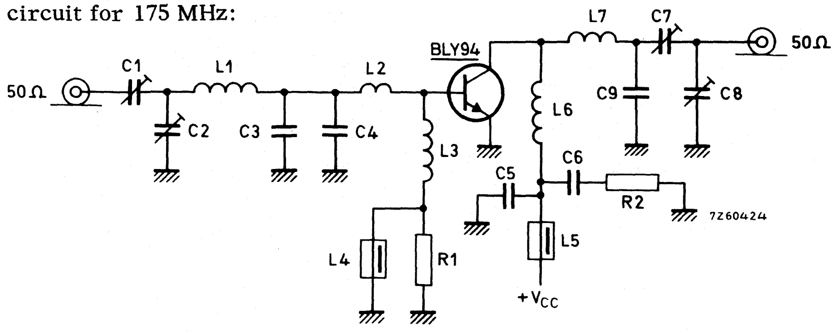
APPLICATION INFORMATION

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

f = 175 MHz; T_{mb} up to 25 ^{o}C

V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
28	< 10	50	< 2.75	> 7	> 65	0.8+j1.45	125 – j66

Test circuit for 175 MHz:



List of components:

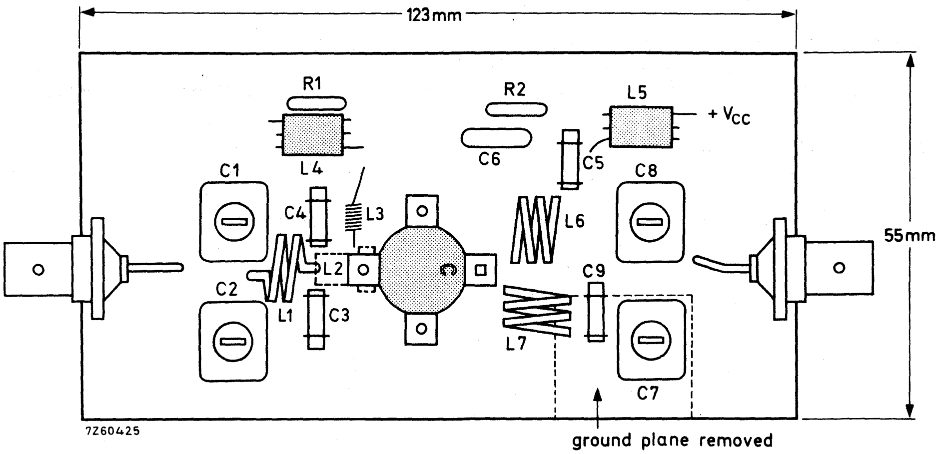
C1 = 2 to 20 pF film dielectric trimmer (code number 2222 809 07004)
C2 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
C3 = C4 = 56 pF ceramic
C5 = 100 pF ceramic
C6 = 100 nF polyester
C7 = 4 to 60 pF film dielectric trimmer (code number 2222 809 07011)
C8 = 4 to 100 pF film dielectric trimmer (code number 2222 809 07015)
C9 = 6.8 pF ceramic

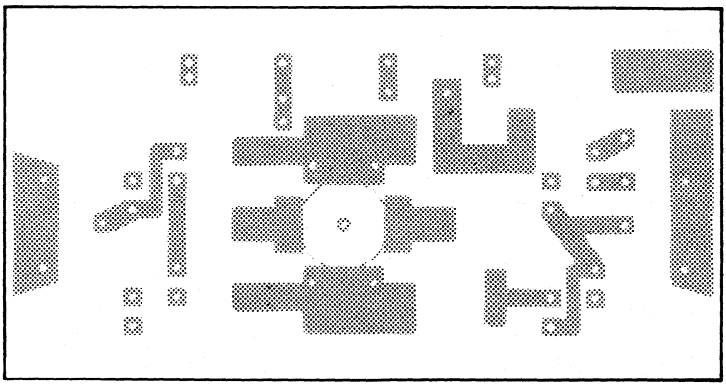
L1 = 36 nH; 2 turns enamelled Cu wire (1.5 mm); int. diam. 7 mm; length 5 mm; lead length 2 x 5 mm
L2 = formed by the metallization on the p.c. board; see component lay-out
L3 = 100 nH; 7 turns closely wound enamelled Cu wire (0.5 mm); int. diam 3 mm; lead length 2 x 5 mm
L4 = L5 = ferroxcube choke (code number 4312 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

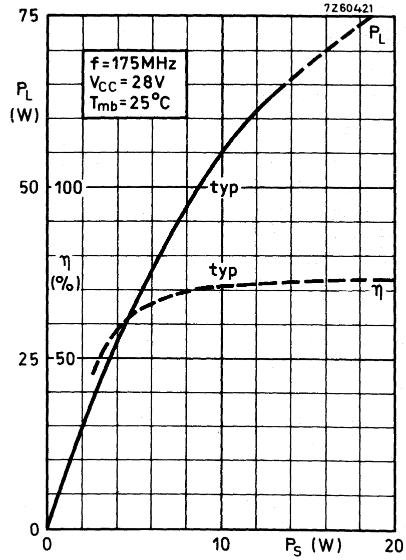
APPLICATION INFORMATION (continued)

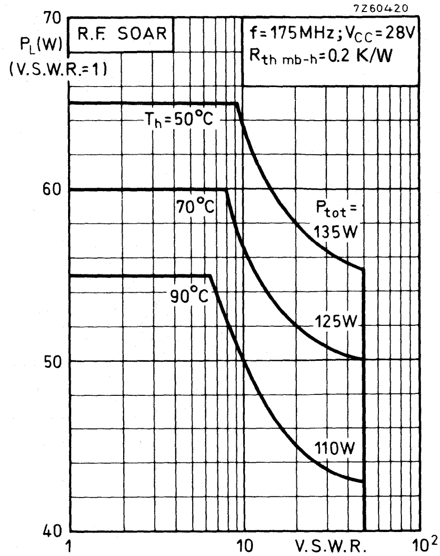
Component lay-out and printed circuit board for 175 MHz test circuit.





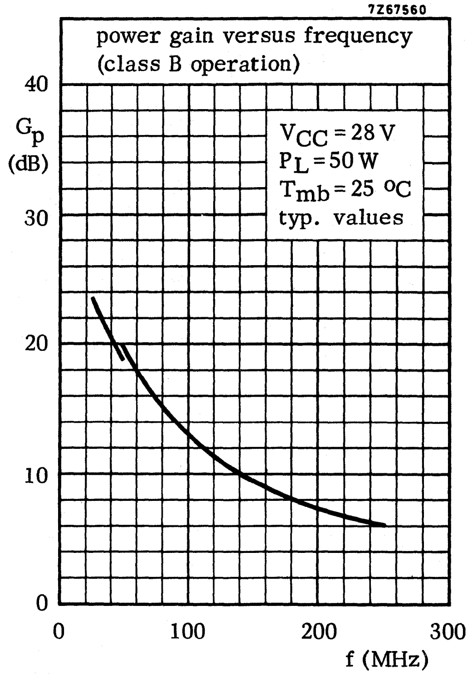
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

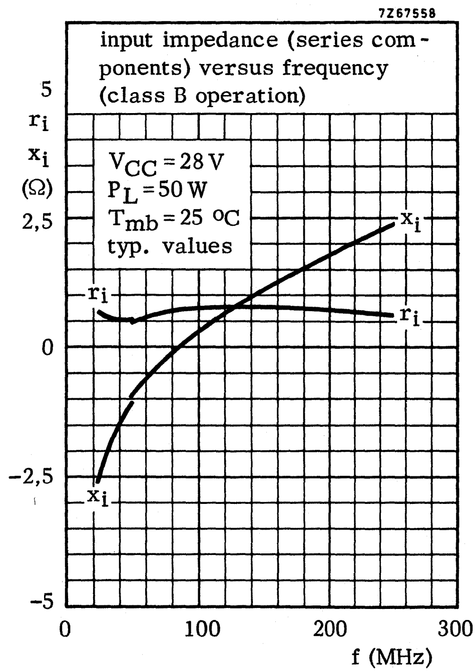


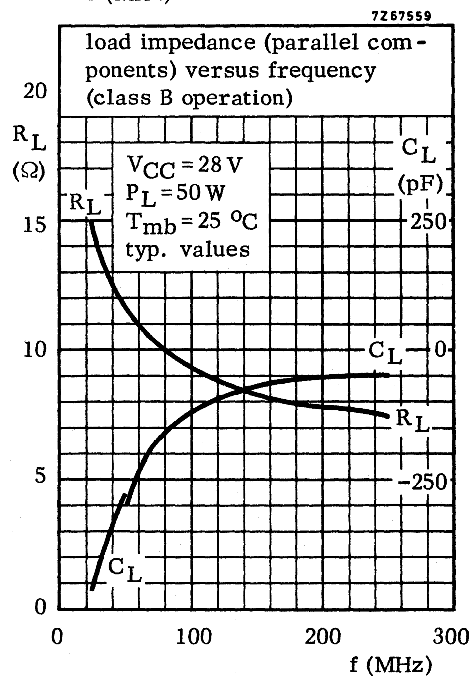


For high voltage operation, a stabilized power supply is generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

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







Silicon planar epitaxial overlay transistor

2N3553

APPLICATIONS

- The 2N3553 is intended for use in VHF and UHF transmitting applications.

DESCRIPTION

The device is a silicon NPN overlay transistor in a TO-39 metal package with the collector connected to the case.

PINNING - TO-39/3

PIN	DESCRIPTION
1	emitter
2	base
3	collector

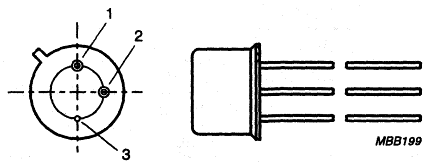


Fig.1 Simplified outline.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
V_{CEX}	collector-emitter voltage	$I_C \leq 200$ mA; $V_{BE} = -1.5$ V	65	V
V_{CEO}	collector-emitter voltage	open base; $I_C \leq 200$ mA	40	V
I_{CM}	peak collector current		1.0	A
P_{tot}	total power dissipation	up to $T_{mb} = 25$ °C	7.0	W
T_j	junction temperature		200	°C
f_T	transition frequency	$I_C = 125$ mA; $V_{CE} = 28$ V	500	–

RF performance

f (MHz)	V_{CE} (V)	P_o (W)	G_p (dB)	η (%)
175	28	2.5	>10	>50

WARNING
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

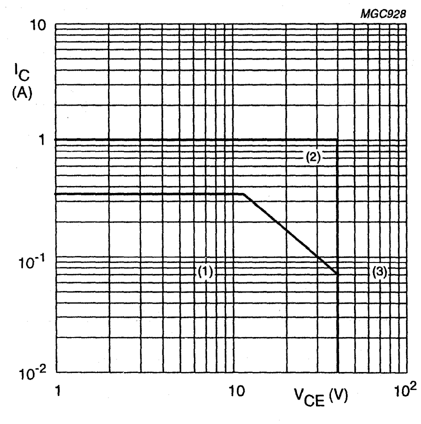
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	65	V
V_{CEX}	collector-emitter voltage	$I_C \leq 200$ mA; $V_{BE} = -1.5$ V	–	65	V
V_{CEO}	collector-emitter voltage	open base; $I_C \leq 200$ mA	–	40	V
V_{EBO}	emitter-base voltage	open collector	–	4	V
I_C	collector current (DC)		–	0.35	A
I_{CM}	peak collector current		–	1	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	7	W
T_{stg}	storage temperature		–65	+200	°C
T_j	junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	25	K/W



(1) All frequencies, including DC.
(2) f ≥ 1 MHz.
(3) Allowed during switching off, provided the transistor is cut-off with $V_{BB} \leq -1.5$ V; $R_{BE} \geq 33$ Ω; $I_C \leq 200$ mA and the transient energy ≤ 0.5 mW.

Fig.2 DC SOAR.

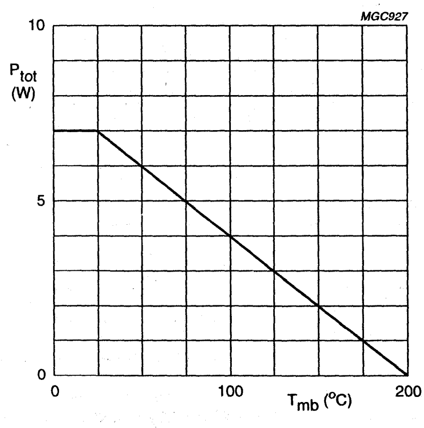


Fig.3 Power derating curve.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 0.25 mA	65	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C up to 200 mA; note 1	40	–	–	V
$V_{(BR)CEX}$	collector-emitter breakdown voltage	I_C up to 200 mA; V_{BE} = −1.5 V; R_B = 33 Ω; note 1	65	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 0.25 mA	4	–	–	V
V_{BE}	base-emitter voltage	I_C = 250 mA; V_{CE} = 5 V	–	–	1.5	V
V_{CEsat}	collector-emitter saturation voltage	I_C = 250 mA; I_B = 50 mA	–	–	1.0	V
I_{CEO}	collector leakage current	open base; V_{CE} = 30 V	–	–	0.1	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 125 mA	15	–	200	
		V_{CE} = 5 V; I_C = 250 mA	10	–	100	
f_T	transition frequency	I_C = 125 mA; V_{CE} = 28 V	–	500	–	MHz
$Rho_{ie})$	real part of input impedance	I_C = 125 mA; V_{CE} = 28 V; f = 200 MHz	–	–	20	Ω
C_c	collector capacitance	V_{CB} = 28 V; I_E = i_e = 0; f = 1 MHz	–	–	10	pF

Note

1. Pulsed through an inductor of 25 mH; δ = 0.5; f = 50 Hz.

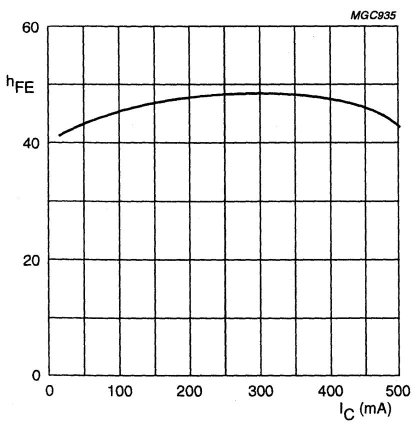


Fig.4 DC current gain as a function of collector current; typical values.

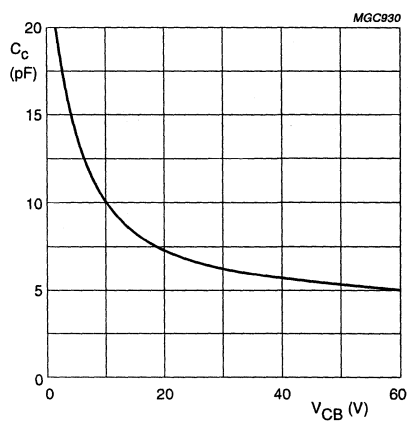


Fig.5 Collector capacitance as a function of collector-base voltage; typical values.

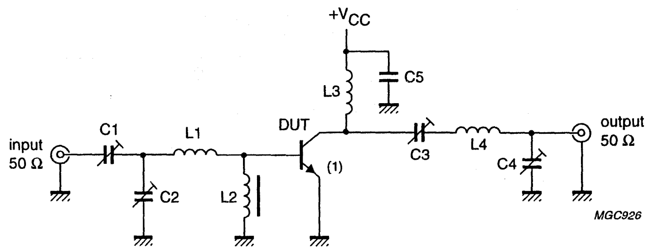
APPLICATION INFORMATION

RF performance at T_{mb} = 25 °C.

f (MHz)	V_{CE} (V)	P_o (W)	G_p (dB)	η (%)
175	28	2.5	>10	>50

Ruggedness

The transistor is capable of withstanding a load mismatch corresponding to VSWR = 3 : 1 varied through all phases, under the conditions: V_{CE} = 28 V; f = 175 MHz; T_{mb} = 25 °C; P_o = 2.5 W.

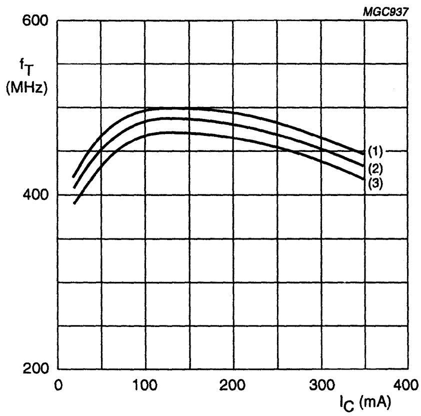


(1) The length of the external emitter wire is 1.6 mm.

Fig.6 Test circuit at 175 MHz.

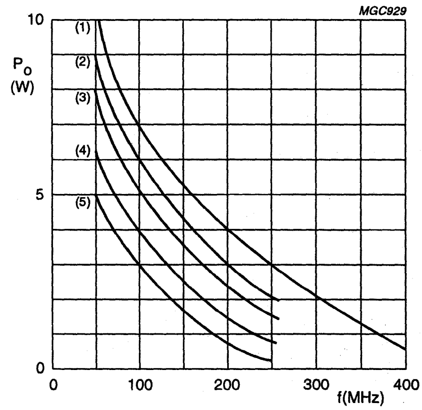
List of components (see Fig.6)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C2, C3, C4	air trimmer capacitor	4 to 29 pF		
C5	polyester capacitor	10 nF		
L1	1 turn 1.0 mm copper wire		int. diameter 10 mm; leads 2 × 10 mm	
L2	Ferroxcube choke coil	Z = 550 Ω ±20%; f = 175 MHz		4312 020 36640
L3	15 turns enamelled 0.7 mm copper wire		int. diameter 4 mm; closely wound	
L4	3 turns enamelled 1.5 mm copper wire		int. diameter 12 mm; leads 2 × 20 mm; closely wound	



T_j = 25 °C.
(1) V_{CE} = 28 V.
(2) V_{CE} = 14 V.
(3) V_{CE} = 7 V.

Fig.7 Transition frequency as a function of collector current; typical values.



V_{CE} = 28 V; T_{mb} = 25 °C.
(1) P_i = 0.5 W.
(2) P_i = 0.375 W.
(3) P_i = 0.25 W.
(4) P_i = 0.1 W.
(5) P_i = 0.05 W.

Fig.8 Output power as a function of frequency; typical values.

Silicon planar epitaxial overlay transistors

2N3866; 2N4427

DESCRIPTION

NPN overlay transistors in TO-39 metal packages with the collector connected to the case. The devices are primarily intended for class-A, B or C amplifiers, frequency multiplier and oscillator circuits.

APPLICATIONS

- The transistors are intended for use in output, driver or pre-driver stages in VHF and UHF equipment.

PINNING - TO-39/1

PIN	DESCRIPTION
1	emitter
2	base
3	collector

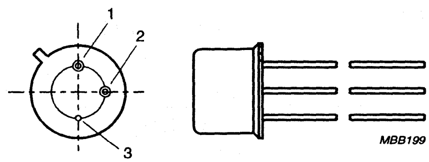


Fig.1 Simplified outline.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CER}	collector-emitter voltage	$R_{BE} = 10\ \Omega$			
	2N3866		–	55	V
	2N4427		–	40	V
V_{CEO}	collector-emitter voltage	open base			
	2N3866		–	30	V
	2N4427		–	20	V
V_{EBO}	emitter-base voltage	open collector			
	2N3866		–	3.5	V
	2N4427		–	2.0	V
I_C	collector current (DC)		–	0.4	A
$I_{C(AV)}$	average collector current	measured over any 20 ms period	–	0.4	A
P_{tot}	total power dissipation	up to $T_{mb} = 25$ °C	–	3.5	W
f_T	transition frequency	$I_C = 50$ mA; $V_{CE} = 15$ V; f = 200 MHz	500	–	MHz
T_j	junction temperature		–	200	°C

RF 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

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

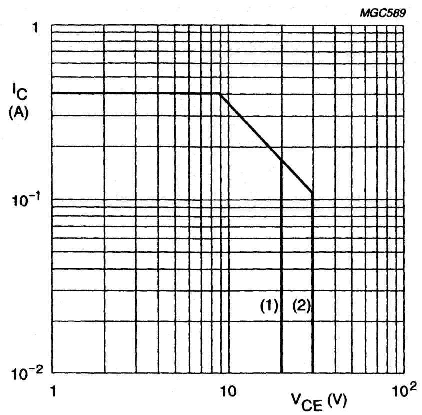
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter			
	2N3866		–	55	V
	2N4427		–	40	V
V_{CER}	collector-emitter voltage	R_{BE} = 10 Ω			
	2N3866		–	55	V
	2N4427		–	40	V
V_{CEO}	collector-emitter voltage	open base			
	2N3866		–	30	V
	2N4427		–	20	V
V_{EBO}	emitter-base voltage	open collector			
	2N3866		–	3.5	V
	2N4427		–	2.0	V
I_C	collector current (DC)		–	0.4	A
$I_{C(AV)}$	average collector current	measured over any 20 ms period	–	0.4	A
I_{CM}	collector current peak value		–	0.4	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C	–	3.5	W
T_{stg}	storage temperature		–65	+200	°C
T_j	junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air		200	K/W
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base		50	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	note 1	1.0	K/W
		note 2	2.5	K/W

Notes

1. Mounted with top clamping washer 56218.
2. Mounted with top clamping washer 56218 and a boron nitride washer for electrical insulation.



T_{mb} = 25 °C.
(1) 2N4427.
(2) 2N3866.

Fig.2 DC SOAR.

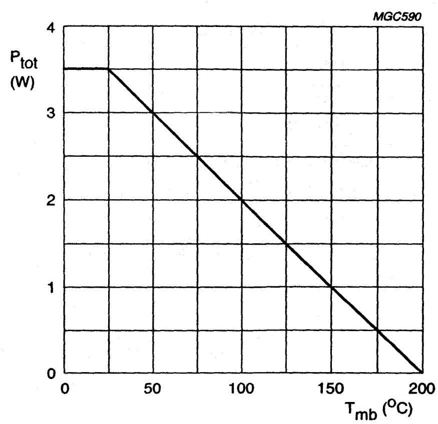


Fig.3 Power derating curve.

Silicon planar epitaxial overlay transistors

2N3866; 2N4427

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 100 μA			
	2N3866		55	–	V
	2N4427		40	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 5 mA			
	2N3866		30	–	V
	2N4427		20	–	V
$V_{(BR)CER}$	collector-emitter breakdown voltage	R_{BE} = 10 Ω; I_C = 5 mA			
	2N3866		55	–	V
	2N4427		40	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 100 μA			
	2N3866		3.5	–	V
	2N4427		2	–	V
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 20 mA			
	2N3866		–	1	V
	2N4427		–	0.5	V
I_{CEO}	collector leakage current				
	2N3866	open base; V_{CE} = 28 V	–	20	μA
	2N4427	open base; V_{CE} = 12 V	–	20	μA
h_{FE}	DC current gain				
	2N3866	I_C = 50 mA; V_{CE} = 5 V	10	200	
	2N3866	I_C = 360 mA; V_{CE} = 5 V	5	–	
	2N4427	I_C = 100 mA; V_{CE} = 5 V	10	200	
	2N4427	I_C = 360 mA; V_{CE} = 5 V	5	–	
f_T	transition frequency	I_C = 50 mA; V_{CE} = 15 V; f = 200 MHz	500	–	MHz
C_c	collector capacitance				
	2N3866	V_{CB} = 28 V; $I_E = I_e$ = 0; f = 1 MHz	–	3	pF
	2N4427	V_{CB} = 12 V; $I_E = I_e$ = 0; f = 1 MHz	–	4	pF

APPLICATION INFORMATION

Table 1 RF performance at T_{mb} = 25 °C.

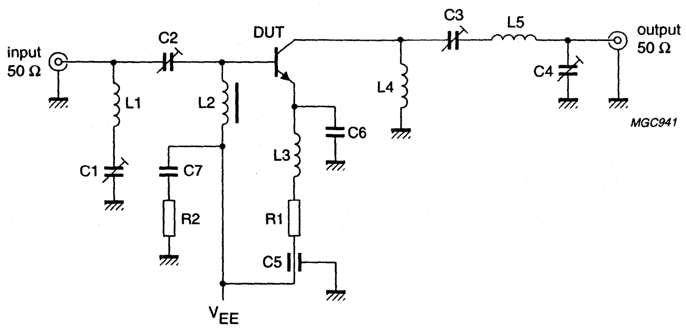
TYPE NUMBER	f (MHz)	V_{CE} (V)	P_o (W)	G_p (dB)	I_C (mA)	η (%)
2N3866	100	28	1.8	>10	<107	>60
	250	28	1.5	>10	<107	>50
	400	28	1.0	>10	<79	>45
2N4427	175	12	1.0	>10	<167	>50
	470	12	0.4	>10	67	50

Silicon planar epitaxial overlay transistors

2N3866; 2N4427

Ruggedness

The transistors are capable of withstanding a load mismatch corresponding to VSWR = 3 : 1 varied through all phases, under the conditions mentioned in Table 1.

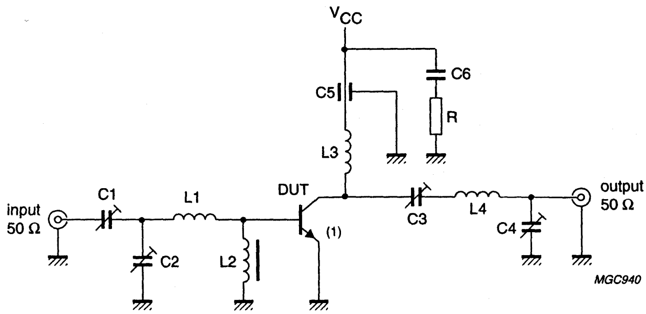


V_{EE} = −28 V

Fig.4 Test circuit for the 2N3866 at 400 MHz.

List of components (see Fig.4)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C2, C3	air trimmer capacitor	4 to 29 pF		
C4	air trimmer capacitor	4 to 14 pF		
C5	feed-through capacitor	1 nF		
C6	capacitor	12 pF		
C7	capacitor	12 nF		
R1	resistor	5.6 Ω		
R2	resistor	10 Ω		
L1	2 turns 1.0 mm copper wire	−	int. diameter 6 mm; winding pitch 3 mm	
L2	Ferroxcube choke coil	Z = 450 Ω; f = 250 MHz		4312 020 36690
L3, L4	6 turns enamelled 0.5 mm copper wire	100 nH	int. diameter 3.5 mm	
L5	2 turns 1.0 mm copper wire	−	int. diameter 7 mm; winding pitch 2.5 mm; leads 2 × 15 mm	



V_{CC} = +12 V.

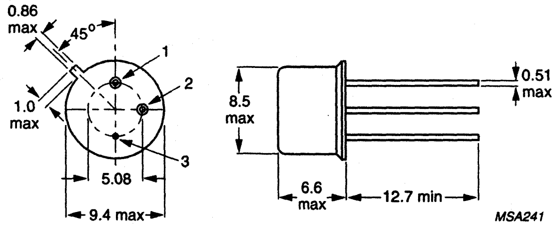
(1) The length of the external emitter wire is 1.6 mm.

Fig.5 Test circuit for the 2N4427 at 175 MHz.

List of components (see Fig.5)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C2, C3, C4	air trimmer capacitor	4 to 29 pF		
C5	feed-through capacitor	1 nF		
C6	capacitor	12 nF		
R	resistor	10 Ω		
L1	2 turns 1.0 mm copper wire	–	int. diameter 6 mm; winding pitch 2 mm; leads 2 × 10 mm	
L2	Ferroxcube choke coil	Z = 550 Ω; f = 175 MHz		4312 020 36640
L3	2 turns 1.0 mm copper wire	–	int. diameter 5 mm; winding pitch 2 mm; leads 2 × 10 mm	
L4	3 turns 1.5 mm copper wire	–	int. diameter 10 mm; winding pitch 2 mm; leads 2 × 15 mm	

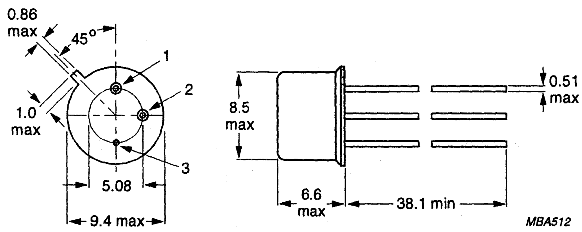
PACKAGE OUTLINE



Dimensions in mm.

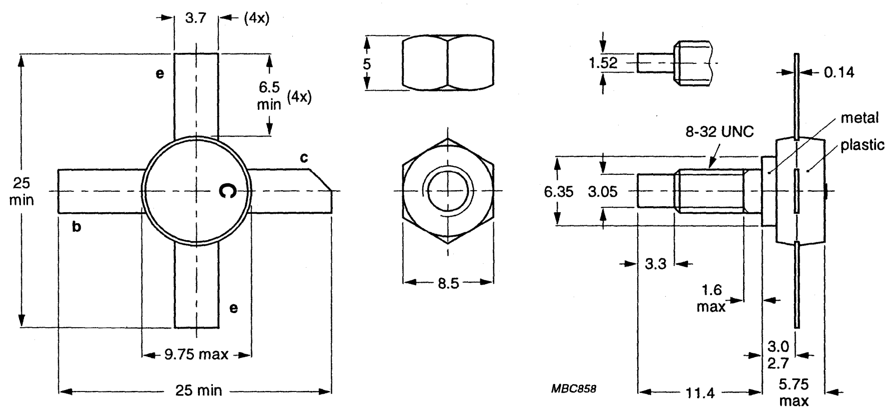
Fig.6 TO-39.

PACKAGE OUTLINES



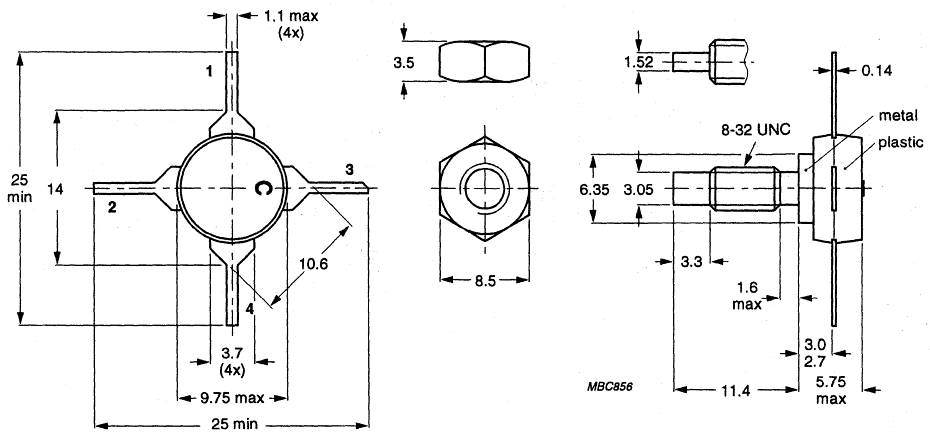
Dimensions in mm.

Fig.1 SOT5 (TO-39/1; TO-39/3).



Dimensions in mm.
Torque on nut: min. 0.75 Nm; max. 0.85 Nm.
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.

Fig.2 SOT48/2.



Dimensions in mm.

Torque on nut: min. 0.75 Nm; max. 0.85 Nm.

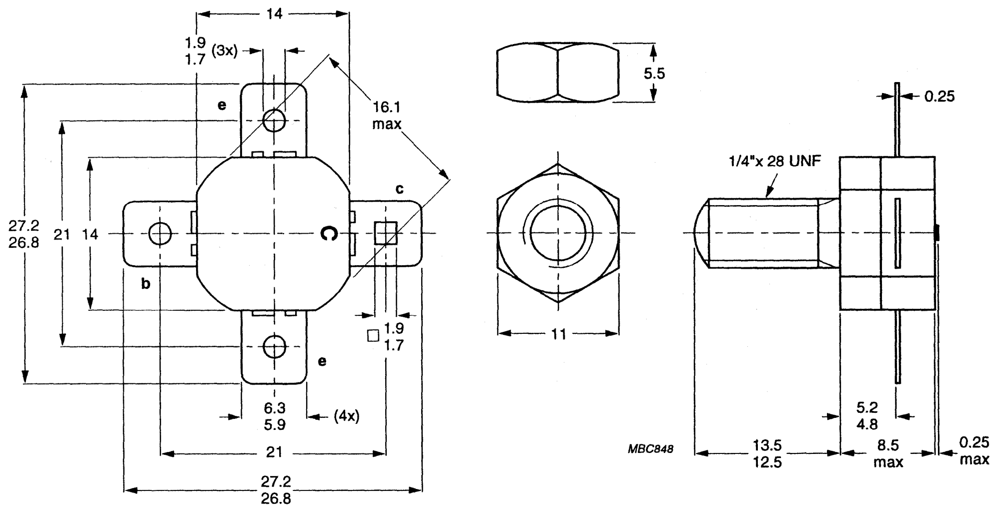
Diameter of clearance hole in heatsink: max. 4.2 mm.

Mounting hole to have no burrs at either end.

De-burring must leave surface flat; do not chamfer or countersink either end of hole.

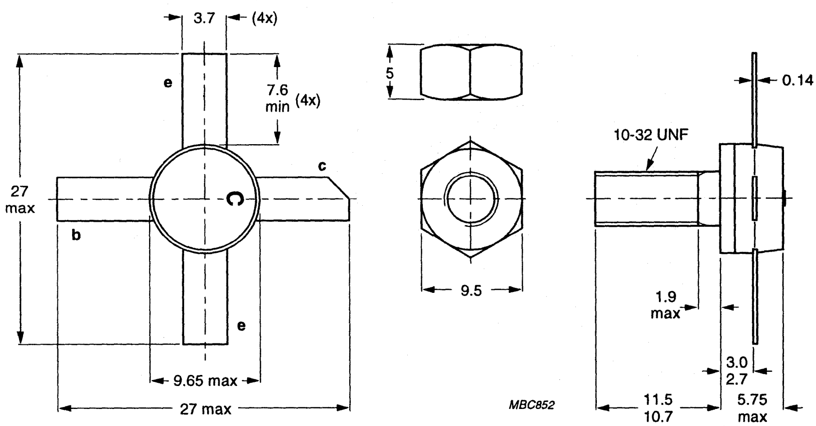
When locking is required an adhesive is preferred instead of a lock washer.

Fig.3 SOT48/3.



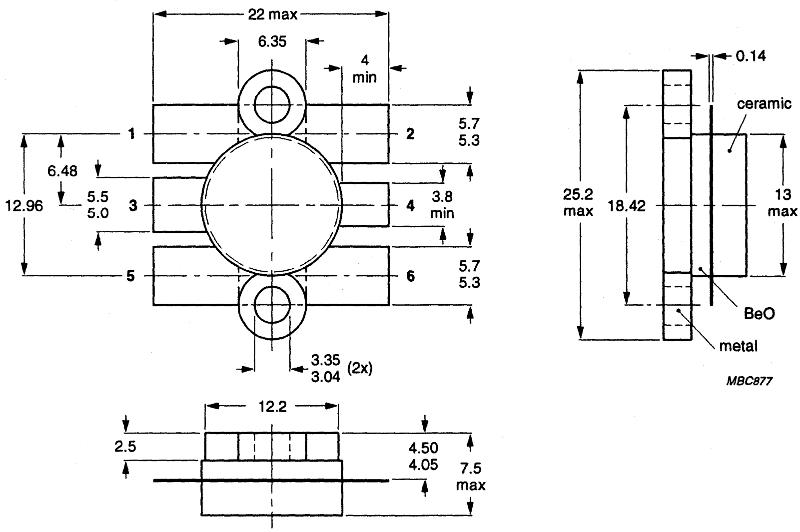
Dimensions in mm.
Torque on nut: min. 2.3 Nm; max. 2.7 Nm.
Diameter of clearance hole in heatsink: max. 6.4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.
When locking is required an adhesive is preferred instead of a lock washer.

Fig.4 SOT55.



Dimensions in mm.
Torque on nut: min. 1.5 Nm; max. 1.7 Nm.
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.

Fig.5 SOT56.



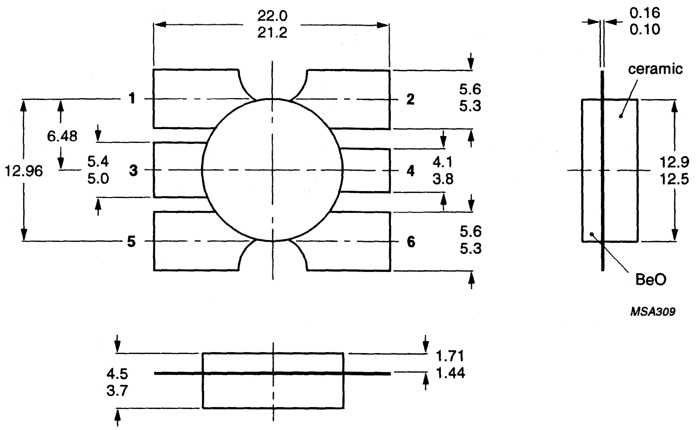
Dimensions in mm.

Torque on screw: min. 0.6 Nm; max. 0.75 Nm.

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

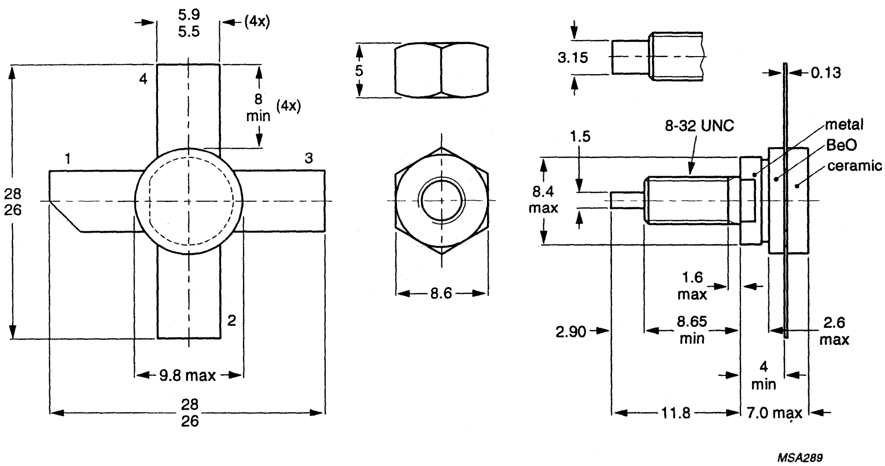
Heatsink compound must be applied sparingly and evenly distributed.

Fig.6 SOT119A.



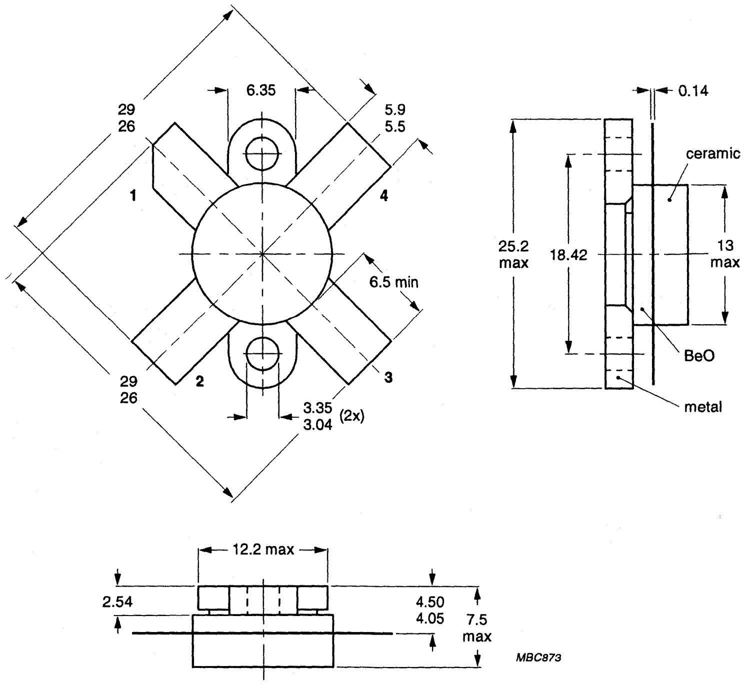
Dimensions in mm.

Fig.7 SOT119D.



Dimensions in mm.
Torque on nut: min. 1.5 Nm; max. 1.7 Nm.
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.

Fig.8 SOT120.



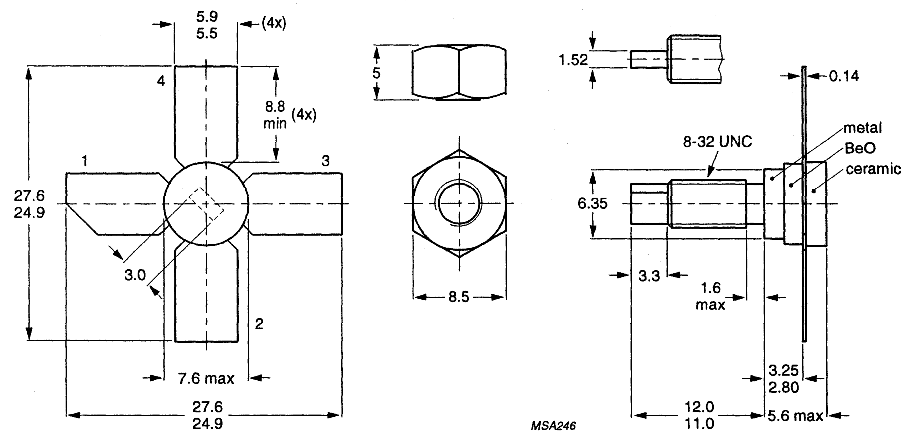
Dimensions in mm.

Torque on screw: min. 0.6 Nm; max. 0.75 Nm.

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

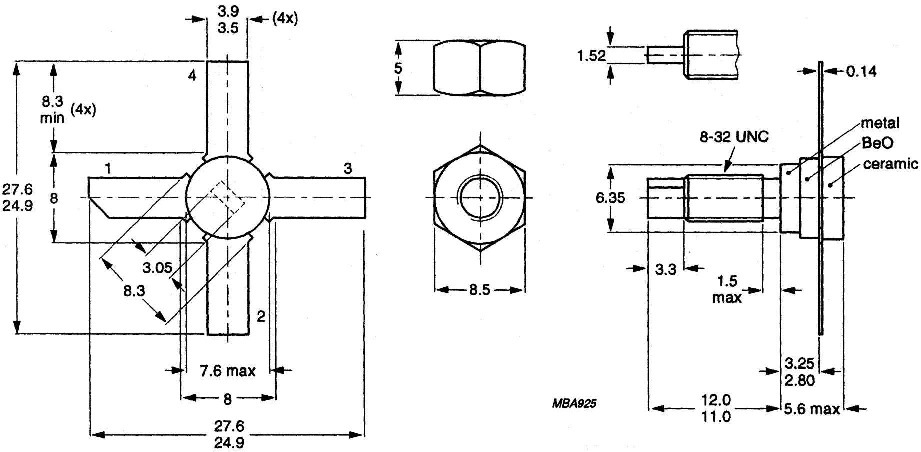
Heatsink compound must be applied sparingly and evenly distributed.

Fig.9 SOT121.



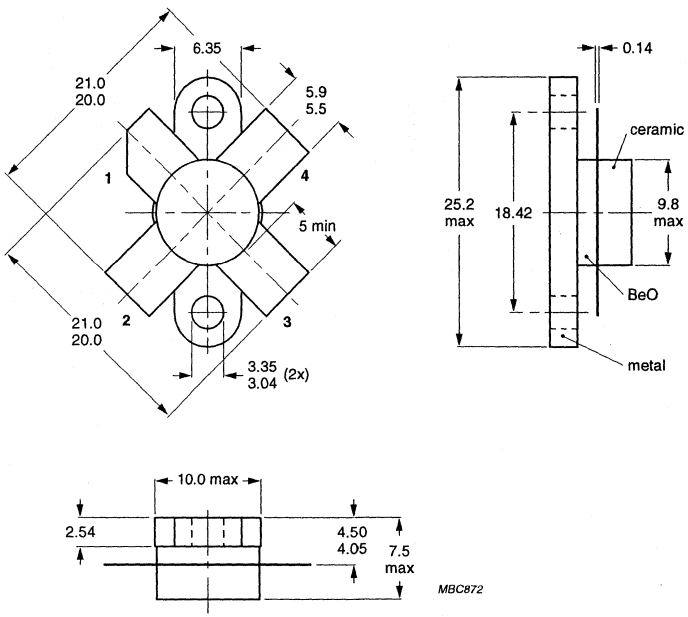
Dimensions in mm.
Torque on nut: min. 0.75 Nm; max. 0.85 Nm.
Diameter of clearance hole in heatsink: max. 4.2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.
When locking is required an adhesive is preferred instead of a lock washer.

Fig.10 SOT122A.



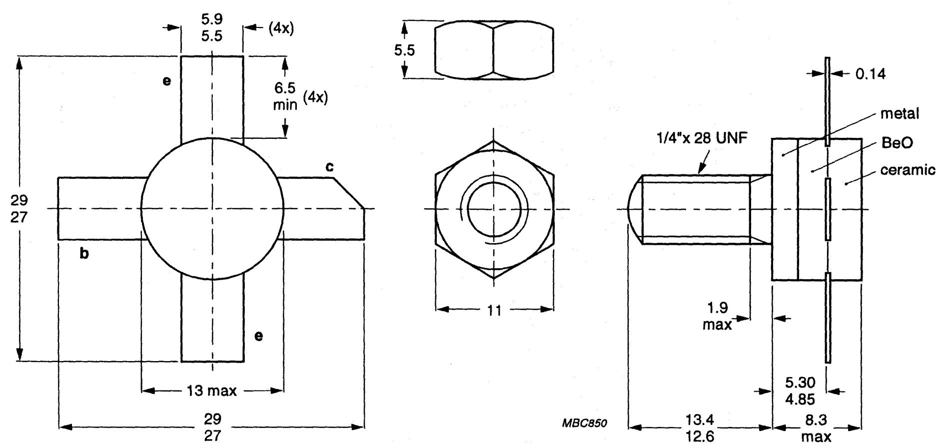
Dimensions in mm.
Torque on nut: min. 0.75 Nm; max. 0.85 Nm.
Diameter of clearance hole in heatsink: max. 4.2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.
When locking is required an adhesive is preferred instead of a lock washer.

Fig.11 SOT122F.



Dimensions in mm.
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.

Fig.12 SOT123.



Dimensions in mm.

Torque on nut: min. 2.3 Nm; max. 2.7 Nm.

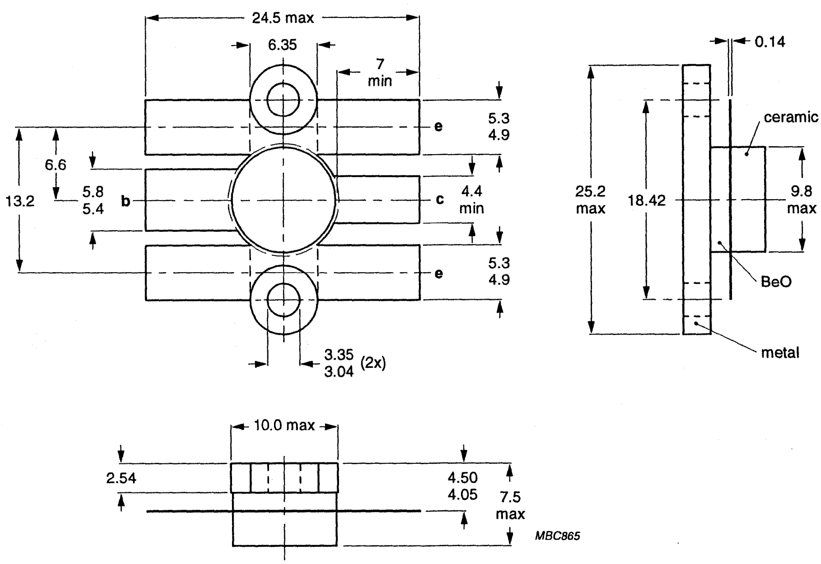
Diameter of clearance hole in heatsink: max. 6.4 mm.

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.

Fig.13 SOT147.



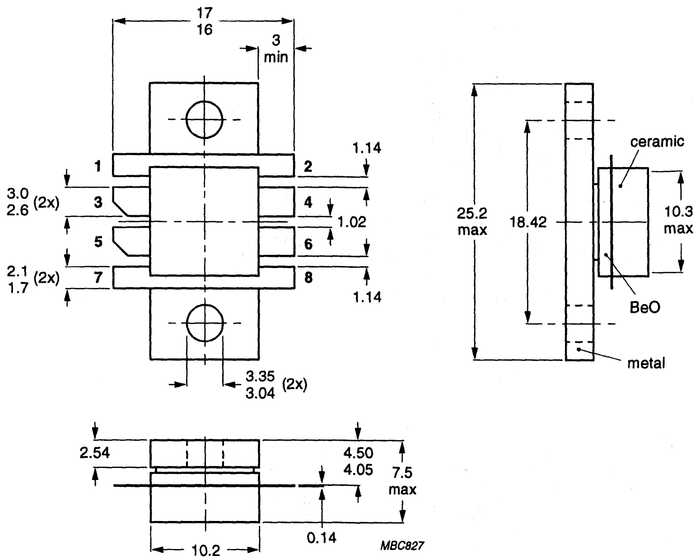
Dimensions in mm.

Torque on screw: min. 0.6 Nm; max. 0.75 Nm.

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

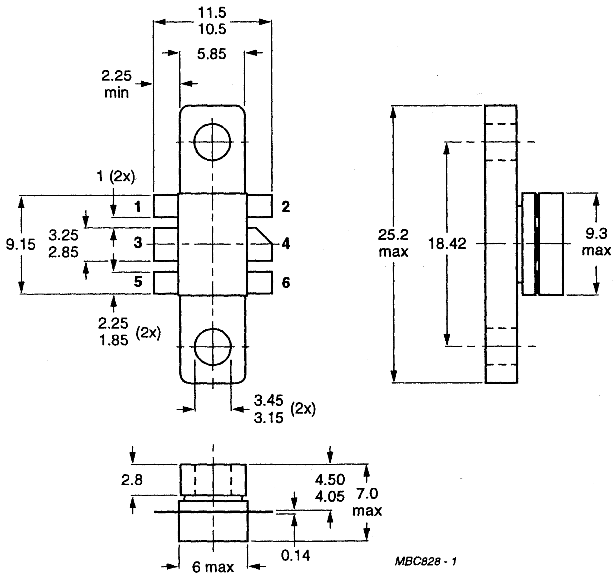
Heatsink compound must be applied sparingly and evenly distributed.

Fig.14 SOT160.



Dimensions in mm.
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.

Fig.15 SOT161.



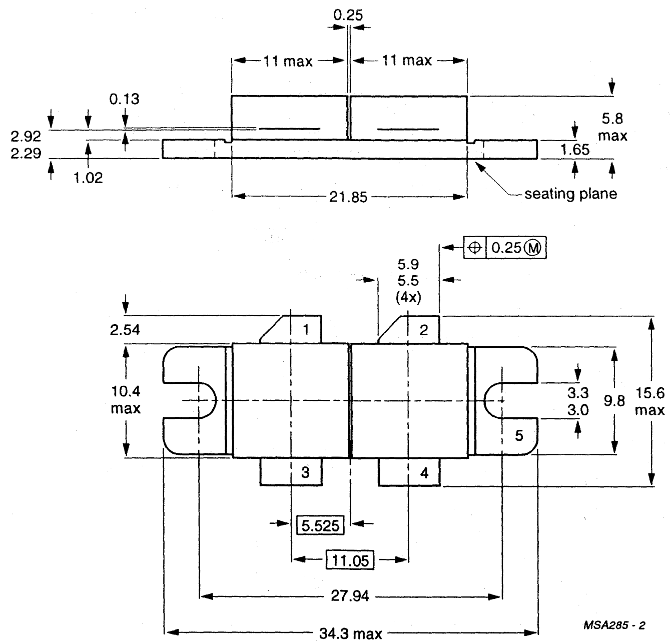
Dimensions in mm.

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.

Fig.16 SOT171.



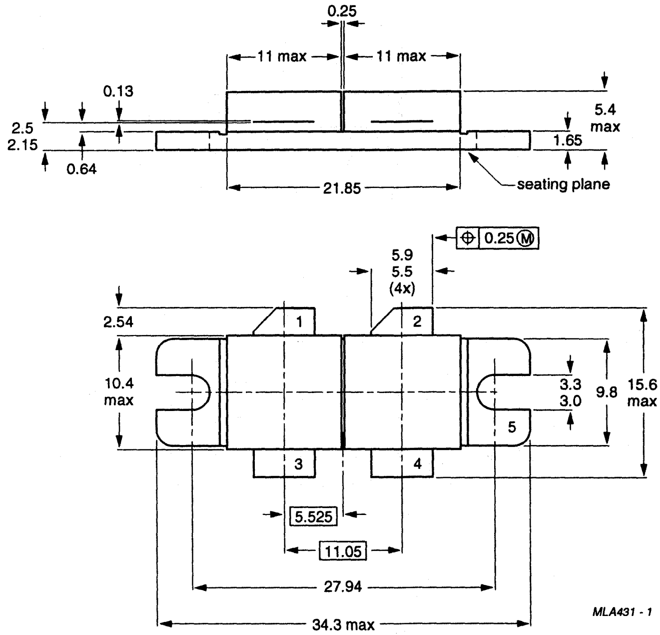
Dimensions in mm.

Torque on screw: min. 0.6 Nm; max. 0.75 Nm.

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

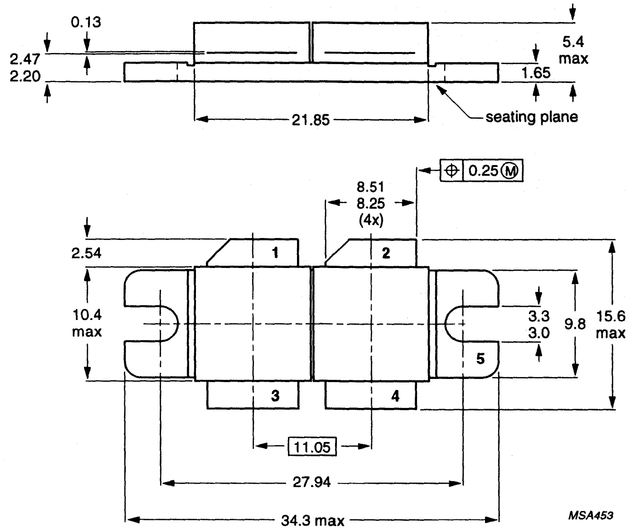
Heatsink compound must be applied sparingly and evenly distributed.

Fig.17 SOT262A1.



Dimensions in mm.
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.

Fig.18 SOT262A2.



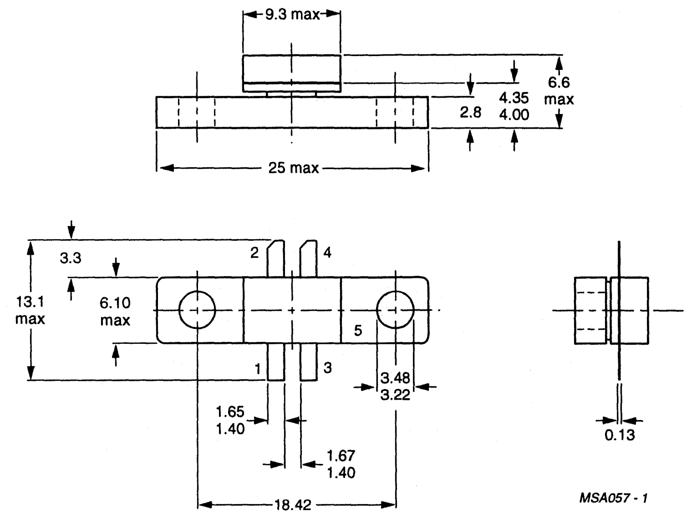
Dimensions in mm.

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.

Fig.19 SOT262B.



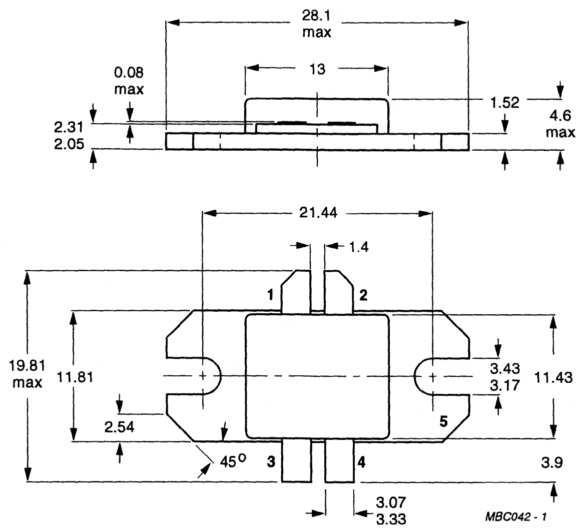
Dimensions in mm.

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.

Fig.20 SOT279.



Dimensions in mm.

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.

Fig.21 SOT289.

DATA HANDBOOK SYSTEM

Data handbook system

DATA HANDBOOK SYSTEM

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SC05	Video Transistors and Modules for Monitors
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SC07	Small-signal Field-effect Transistors
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SC08b	RF Power Transistors for UHF
SC09	RF Power Modules
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Data handbook system

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DC03	Television Tuners, Coaxial Aerial Input Assemblies
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MA03	Piezoelectric Ceramics Specialty Ferrites
MA04	Dry-reed Switches

Passive components

PA01	Electrolytic Capacitors
PA02	Varistors, Thermistors and Sensors
PA03	Potentiometers
PA04	Variable Capacitors
PA05	Film Capacitors
PA06	Ceramic Capacitors
PA07	Quartz Crystals for Special and Industrial Applications
PA08	Fixed Resistors
PA10	Quartz Crystals for Automotive and Standard Applications
PA11	Quartz Oscillators

Professional components

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PC05	Plumbicon Camera Tubes and Accessories
PC07	Vidicon and Newvicon Camera Tubes and Deflection Units
PC08	Image Intensifiers
PC12	Electron Multipliers

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